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Before you begin

Before you begin

Disclaimer

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Trademarks

RENISHAW® and the probe emblem used in the RENISHAW logo are registered trademarks of Renishaw plc in the UK and other countries.

apply innovation is a trademark of Renishaw plc.

All other brand names and product names used in this document are trade names, service marks, trademarks, or registered trademarks of their respective owners.

Warranty

Equipment requiring attention under warranty must be returned to your equipment supplier. No claims will be considered where Renishaw equipment has been misused, or where repairs or adjustments have been attempted by unauthorised persons. Prior consent must be obtained in instances where Renishaw equipment is to be substituted or omitted. Failure to comply with this requirement will invalidate the warranty.

Changes to equipment

Renishaw reserves the right to change equipment specifications without notice.

CNC machines

CNC machine tools must always be operated by fully trained personnel in accordance with the manufacturer's instructions.

Care of the RMI

Keep system components clean.

RMP probe family

The RMP family of probes currently consists of the RMP40, RMP40M, RLP40, RMP60, RMP60M and RMP600. The term RMP used throughout this installation guide refers to each of them.

Patents

Features of RMI (and features of similar products) are the subject of one or more of the following patents and/or patent applications:

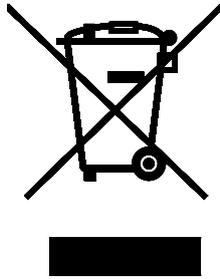
CNw	CN100466003C	JPw	2006-511860
CNw	CN101287958A	JPw	2009-507240
CNw	CN101482402A	JP	3,126,797
EP	0652413	TW	200720626
EP	1576560	USw	2006/0215614A1
EP	1931936	USw	2009-0049704-A1
IN	2004/057552	US	5,279,042
INw	2007/028964		
INw	215787		



EC declaration of conformity

Renishaw PLC hereby declares that the RMI is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. Contact Renishaw PLC at www.renishaw.com/rmi for the full EC Declaration of Conformity.

WEEE directive



The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

FCC declaration (USA)

FCC Section 15.19

This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device may accept any interference received, including interference that may cause undesired operation.

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 instruction 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.

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.

Radio approval

Extract from Taiwanese radio regulations

附件一

低功率電波輻射性電機管理辦法

第十二條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

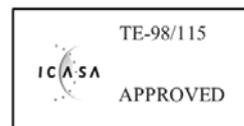
低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電通信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Radio approvals

Europe:	CE 0536!	Japan:	004NYCA0405
USA:	FCC ID KQGRMIV2	South Africa:	TA-2007/517
Canada:	IC: 3928A-RMP60V2		



Australia China Israel New Zealand Russia
Singapore Switzerland India Thailand
Korea Turkey Indonesia Malaysia Mexico

In the countries identified below an additional label is required. The label must be fitted on the side of the RMI, but not across the front cover:

Brazil  

Taiwan:  CCAC07LP0090T9

Safety

Information to the user

In all applications involving the use of machine tools or CMMs, eye protection is recommended.

Information to the machine supplier/ installer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product literature, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant EU and FCC regulatory requirements. It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

- any interface **MUST** be installed in a position away from any potential sources of electrical noise, i.e. power transformers, servo drives etc;
- all ground connections should be connected to the machine 'star point' (the 'star point' is a single point return for all equipment ground and screen cables). This is very important and failure to adhere to this can cause a potential difference between grounds;
- all screens must be connected as outlined in the user instructions;
- cables must not be routed alongside high current sources, i.e. motor power supply cables etc, or be near high speed data lines;
- cable lengths should always be kept to a minimum.

Equipment operation

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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RMI basics

Introduction

The RMI is a combined radio transceiver and machine interface.

The RMI is designed to be mounted within the machine's working envelope.

Power supply

The RMI can draw its supply from the CNC machine 12 Vdc to 30 Vdc supply and present a peak load of up to 250 mA during turn on (typically 100 mA from 24 V).

Alternatively, power may be supplied from a Renishaw PSU3 power supply unit.

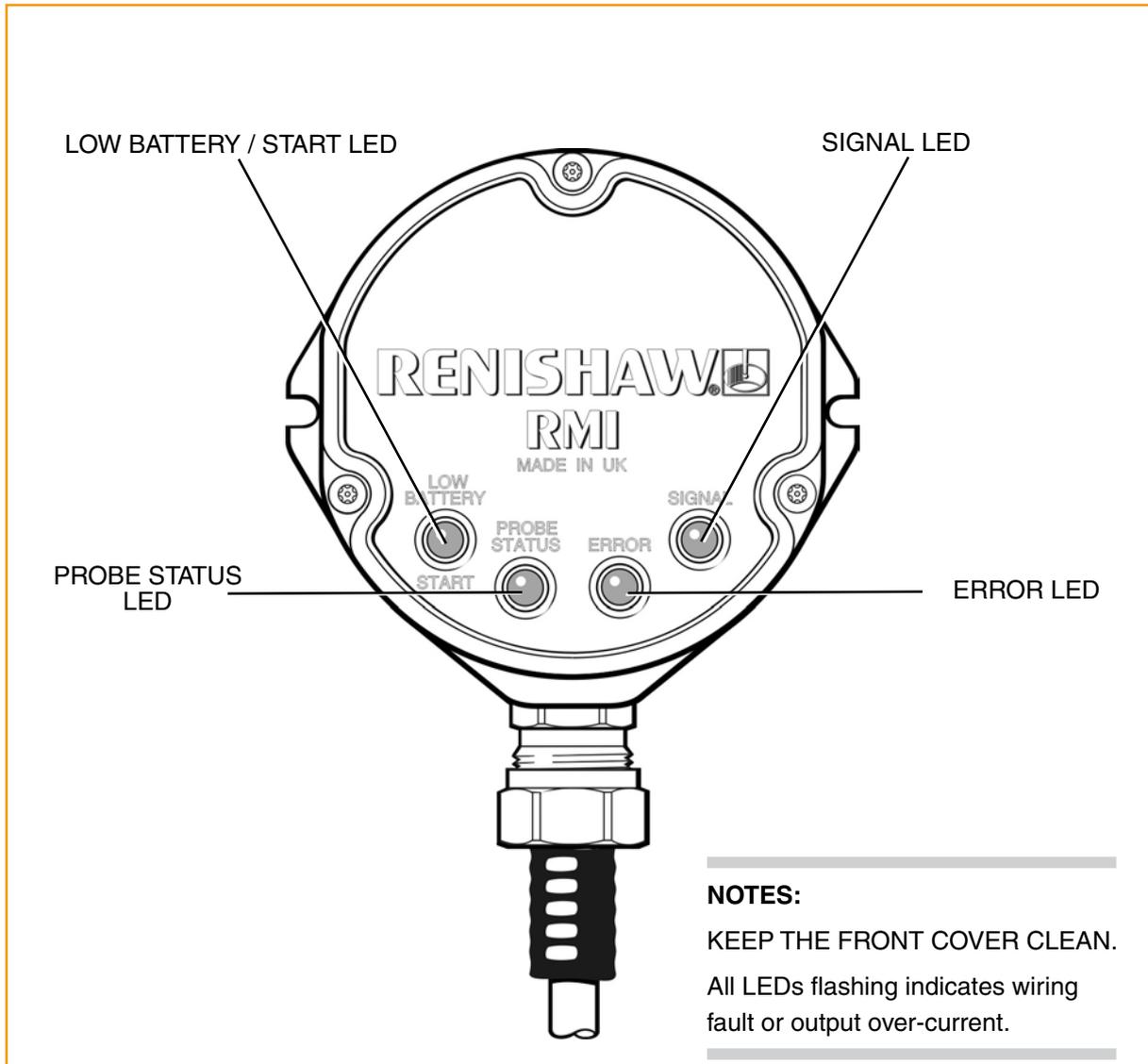
Input voltage ripple

The input voltage ripple must not cause the voltage to fall below 12 V or rise above 30 V.

RMI visual diagnostics

A visual indication of system status is provided by LEDs. Status is continuously updated and indication is provided for:

- START SIGNAL;
- LOW BATTERY;
- PROBE STATUS;
- ERROR;
- SIGNAL CONDITION.



LOW BATTERY / START LED

- Red - Battery is low.
- Green - M code start/stop in progress.
- Yellow - Battery low and M code start/stop in progress.
- Off - Battery is OK and no M code start/stop in progress.

PROBE STATUS LED

- Red - Probe is triggered or unknown status.
- Green - Probe is seated.

ERROR LED

- Red - Error, other outputs may be incorrect.
- Off - No error.

SIGNAL LED

- Green - Excellent communications.
- Yellow - Good communications.
- Red - Poor communications, radio link may fail.
- Off - No signal detected.
- Green/off - Flashing: RMI is in acquisition mode, and can acquire a partner RMP.
- Red/yellow - Flashing: RMI has just acquired a new partner RMP.

NOTES:

The probe status LED will always be illuminated when power is present.
There is no 'power present' LED/light.

All the indicators report the status of the partner RMP. If there is no partner in range, or the partner is off then the probe status and error LEDs will be red and the other LEDs will be off.

When the RMI is powered it will enter the acquire partner mode which will be indicated by the flashing green signal LED (no change in outputs). After a short time (~12 secs) it will switch to its normal mode listening for its partner.

The conditions shown by the low battery, probe status and error LEDs are the same as those present on the electrical signal outputs.

RMI inputs

Machine start inputs:

'Machine start' is configurable as a level or pulsed signal.

Level	10 to 30 V (2.4 mA at 24 V) When input is active, probe is switched on.
Pulsed	12 to 30 V (10 mA at 24 V) Probe toggles from being switched on/off. The minimum pulse width is 10 ms.

Machine start wires (white +ve and brown -ve)

RMI outputs

There are five outputs:

- Probe status 1 (SSR)
- Probe status 2a (5 V isolated driven skip)
- Probe status 2b (driven at power supply voltage)
- Error (SSR)
- Low battery (SSR)

All outputs can be inverted by using switches SW1 and SW2 - see [page 2.6 Switches SW1 and SW2](#).

Probe status 1, Error, Low battery (SSR):

- 'On' resistance = 50 ohm max.
- Load voltage = 40 V max.
- Load current = 100 mA max.

Probe status 2a (5 V isolated driven skip):

- Load current = 50 mA max.

Output voltages

- Sourcing = 4.2 V min at 10 mA.
= 2.2 V min at 50 mA.

- Sinking = 0.4 V max at 10 mA.
= 1.3 V max at 50 mA.

Probe status 2b (driven at power supply voltage):

- Load current = 50 mA max

Output voltages

- Sourcing (voltage supply - output voltage)
 - = 2.6 V max at 10 mA.
 - = 3.5 V max at 50 mA.
- Sinking
 - = 2.0 V max at 10 mA.
 - = 2.9 V max at 50 mA.

The Low Battery, Probe Status, and Error LEDs will start flashing red when an output overload has occurred. All outputs will be switched off. If this occurs, turn off the power supply and remove the source of the problem.

Turning on the power supply will reset the RMI.

CAUTIONS: Power supply voltage

Do not exceed 30 V between the black wire and the screen wire (green/yellow), or the red wire and screen wire (green/yellow), or the red and black wires (power supply), as this could result in permanent damage to the RMI and/or the customer power supply.

The use of in-line fuses at the machine cabinet end is recommended to provide protection for the RMI and cable.

Screen connection

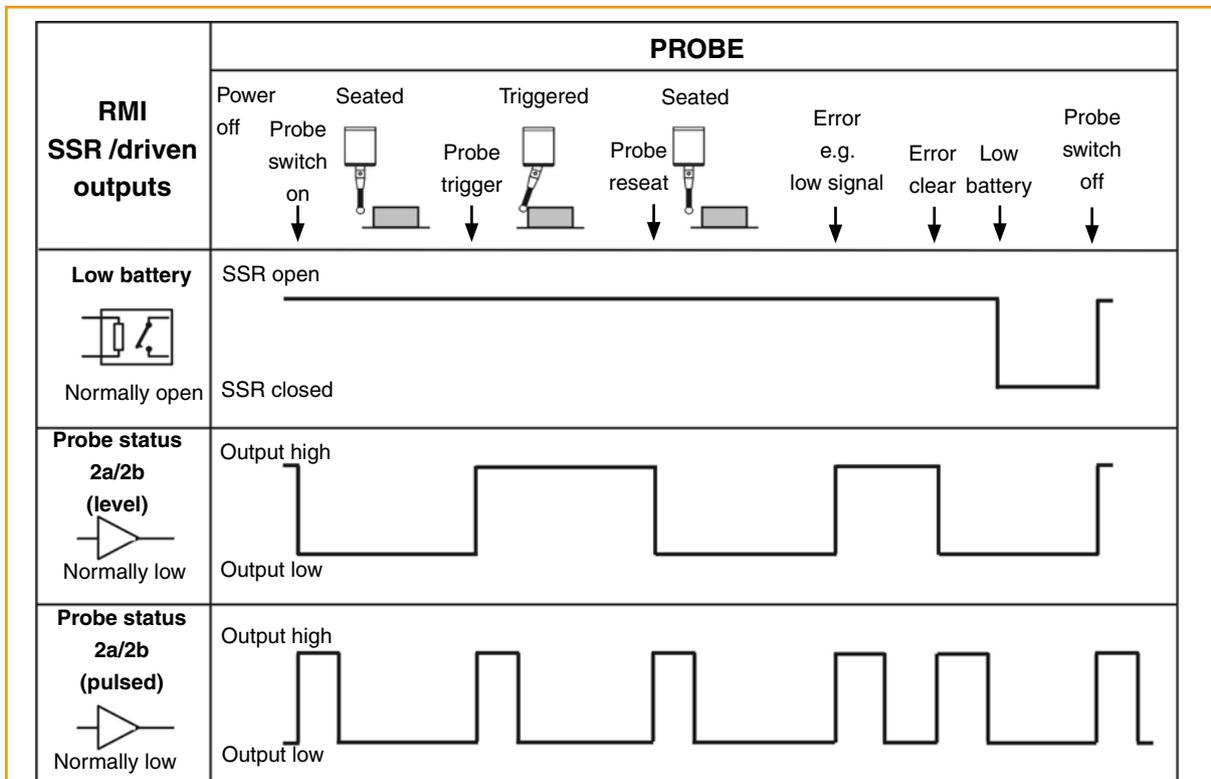
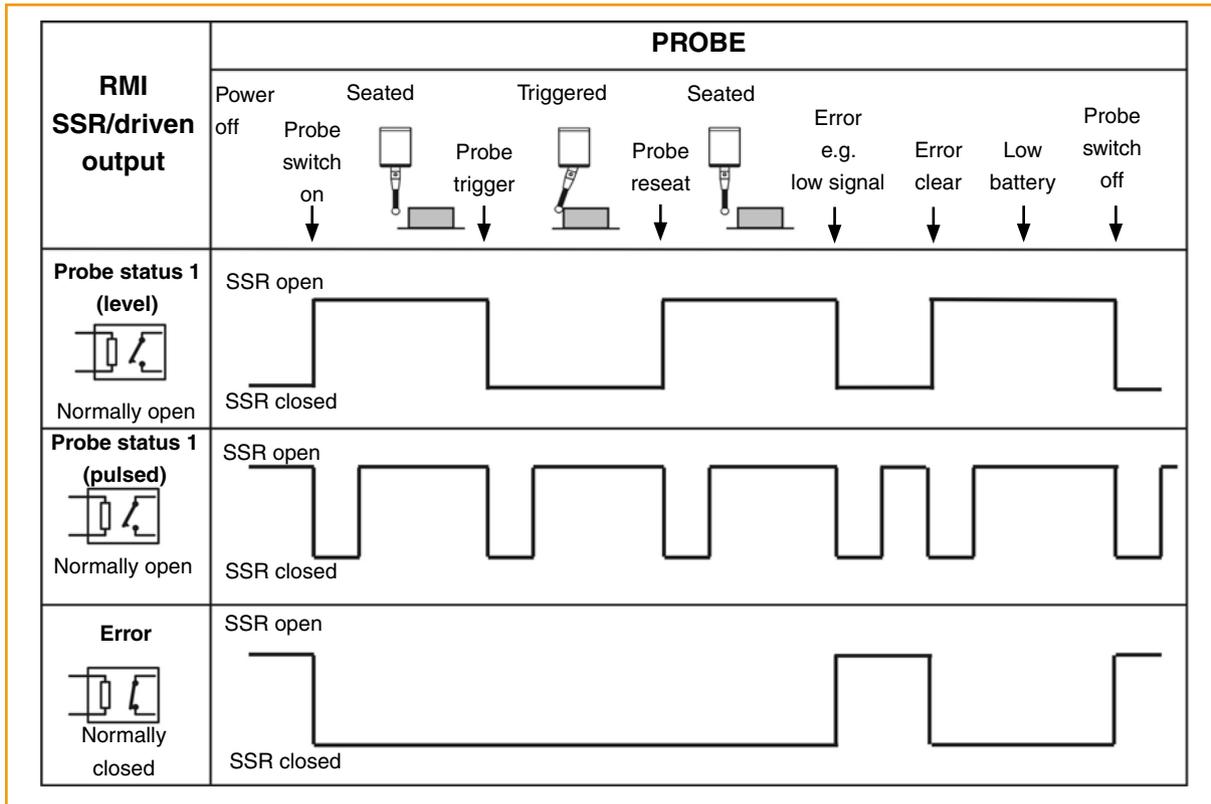
A good connection must be made to machine ground (star point).

Output stage circuit

Output stage supplies (+ve, -ve) should not be switched on and off to enable/disable them as this can cause the over current protection to switch off the output completely.

Ensure that outputs from the RMI do not exceed specified current ratings.

RMI output waveforms

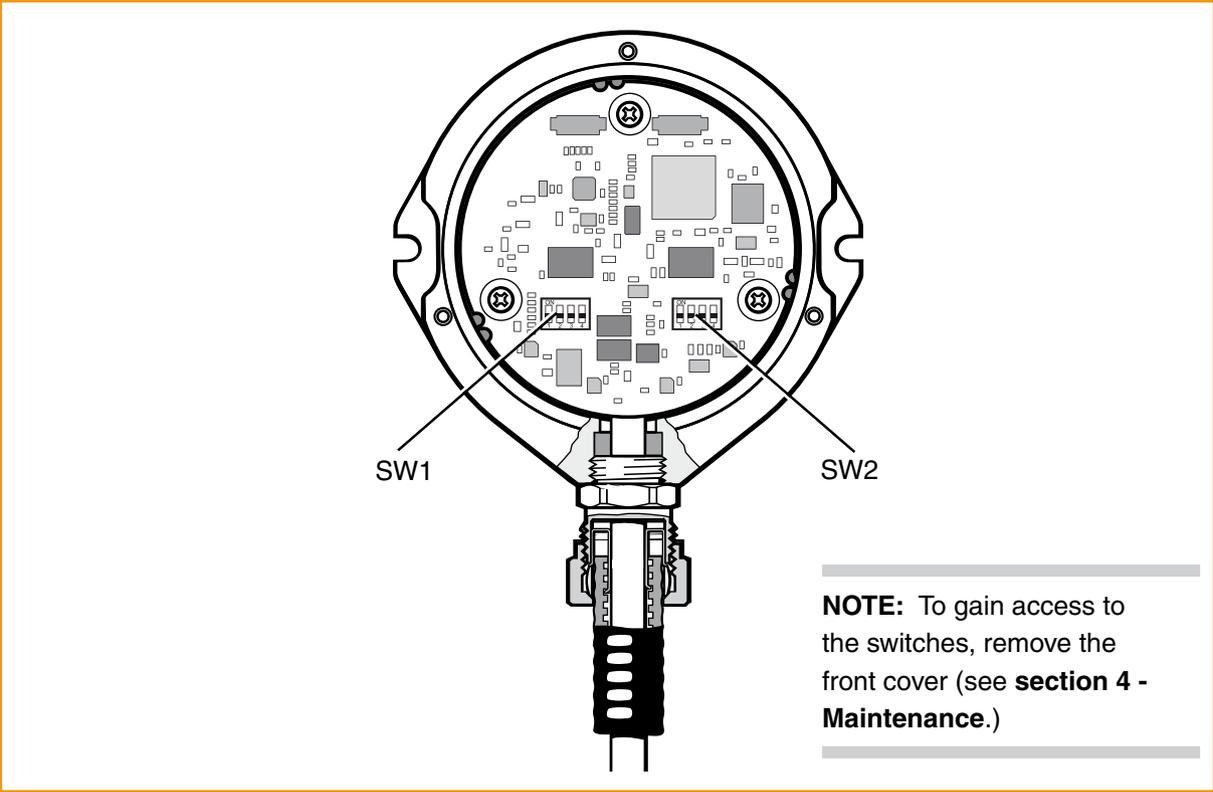


SIGNAL DELAYS

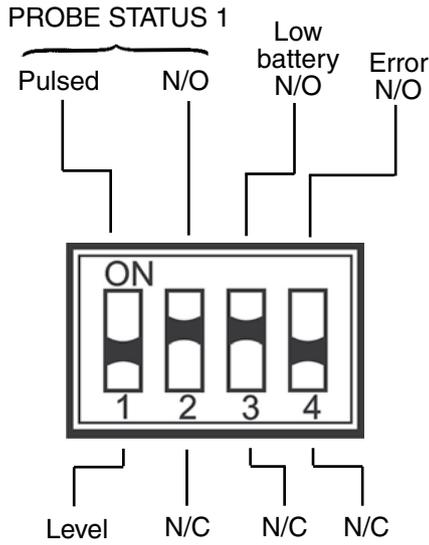
- Transmission delay** Probe trigger to output change of state = 10 ms ± 10 μs.
- Start delay** Time from initiation of start signal to valid signal transmission = 1 sec max.

NOTE : Pulsed outputs are 40 ms ± 1 ms duration.

Switches SW1 and SW2



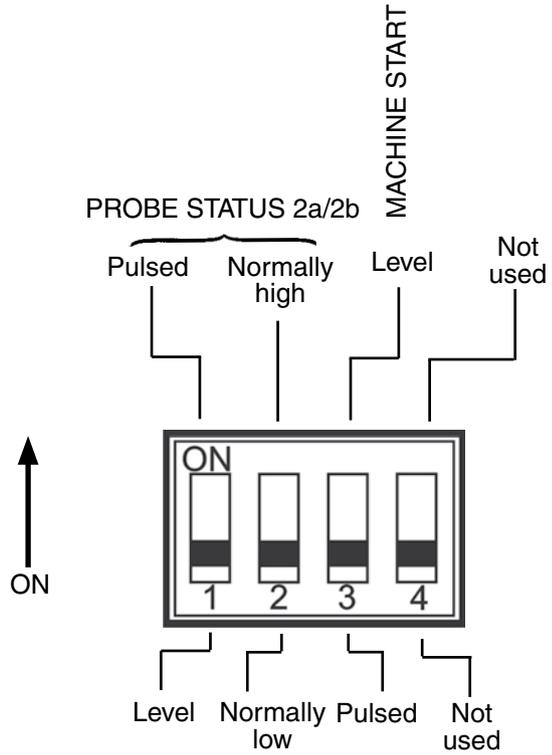
Switch SW1 output configuration



Factory settings shown are for:

- A-4113-0050

Switch SW2 output configuration



Abbreviations are as follows:

- **N/O** = Normally Open
- **N/C** = Normally Closed

CAUTION: Exercise caution when using error or probe SSR in N/O mode as a wiring fault could cause loss of error condition and therefore could result in a non-fail safe condition

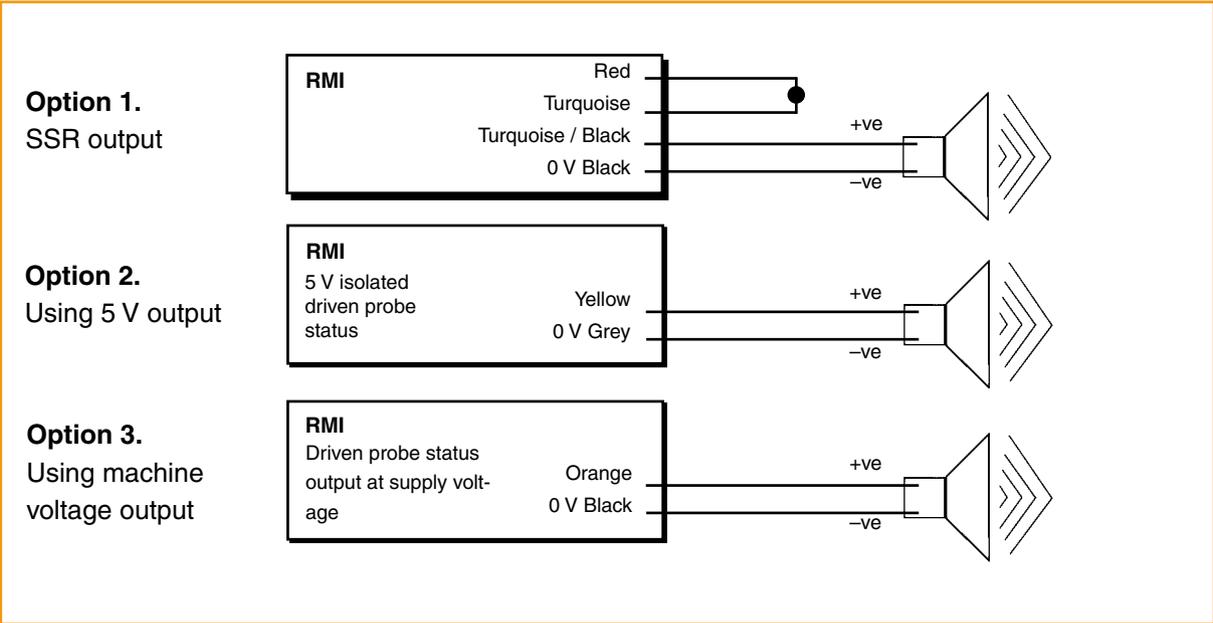
Remote external audible output

Any output (set to pulsed) can be utilised to operate an external remote audible indicator

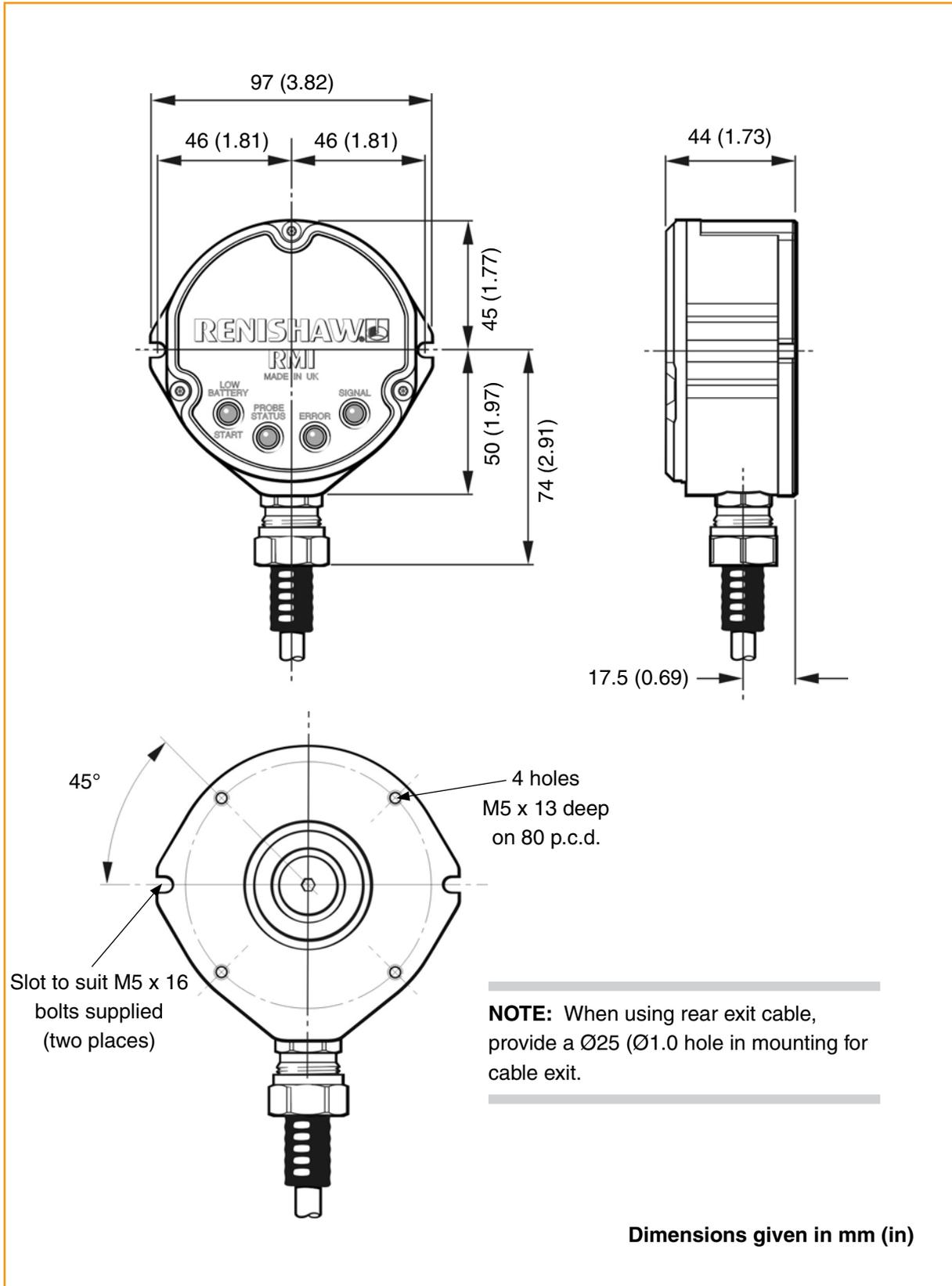
The audible indicator must comply with the output transistor specification.

- i.e. up to 50 mA.
- up to 30 V.

Wiring configurations are shown below.



RMI dimensions



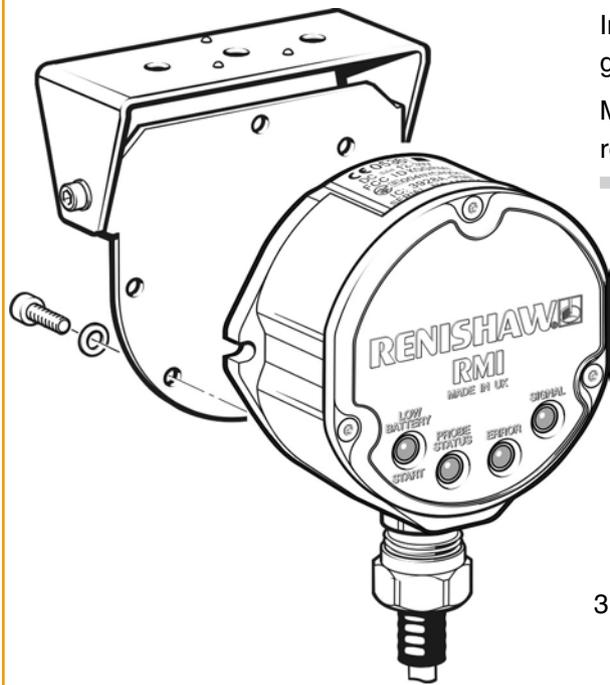
RMI specification

Principal application	Medium-to-large machining centres, 5-axis machines, twin spindle machines and vertical turret lathes.	
Dimensions	Height	119 mm (4.68 in)
	Width	97 mm (3.82 in)
	Depth	44 mm (1.73 in)
Weight	In box	1,980 g (69.84 oz)
	RMI including 15 m (49.2 ft) of cable	1,540 g (54.3 oz)
Transmission type	Frequency hopping spread spectrum (FHSS) radio. 2.400 - 2.4835 GHz 2400 - 2483.5 MHz	
Transmission range	Up to 15 m (49.2 ft)	
Power supply	12 Vdc to 30 Vdc	
Cable	15 m (49.2 ft) standard length Optional 30 m (98.42 ft) and 50 m (164.04 ft) cable assemblies are also available. 13 core screened cable, each core 18 x 0.1 mm	
Mounting	Mounting bracket allowing directional setting	
Compatible probes	Component setting/inspection: RMP40, RMP40M, RMP60, RMP60M and RMP600 Lathe inspection: RLP40	
Environment	IP rating	IPX8
	Storage temperature	-10 °C to 70 °C (14 °F to 158 °F)
	Operating temperature	5 °C to 50 °C (41 °F to 122 °F)

System installation

Mounting bracket (optional)

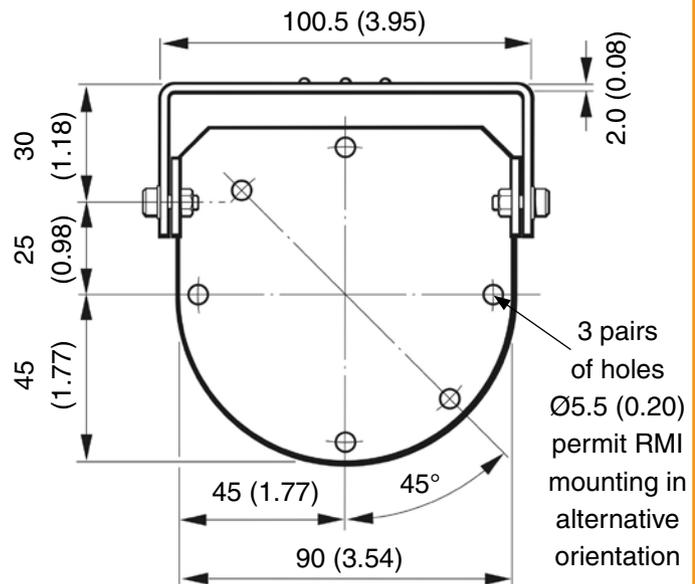
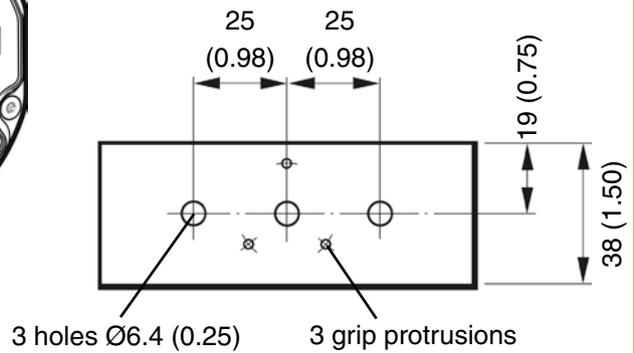
Dimensions given in mm (in)



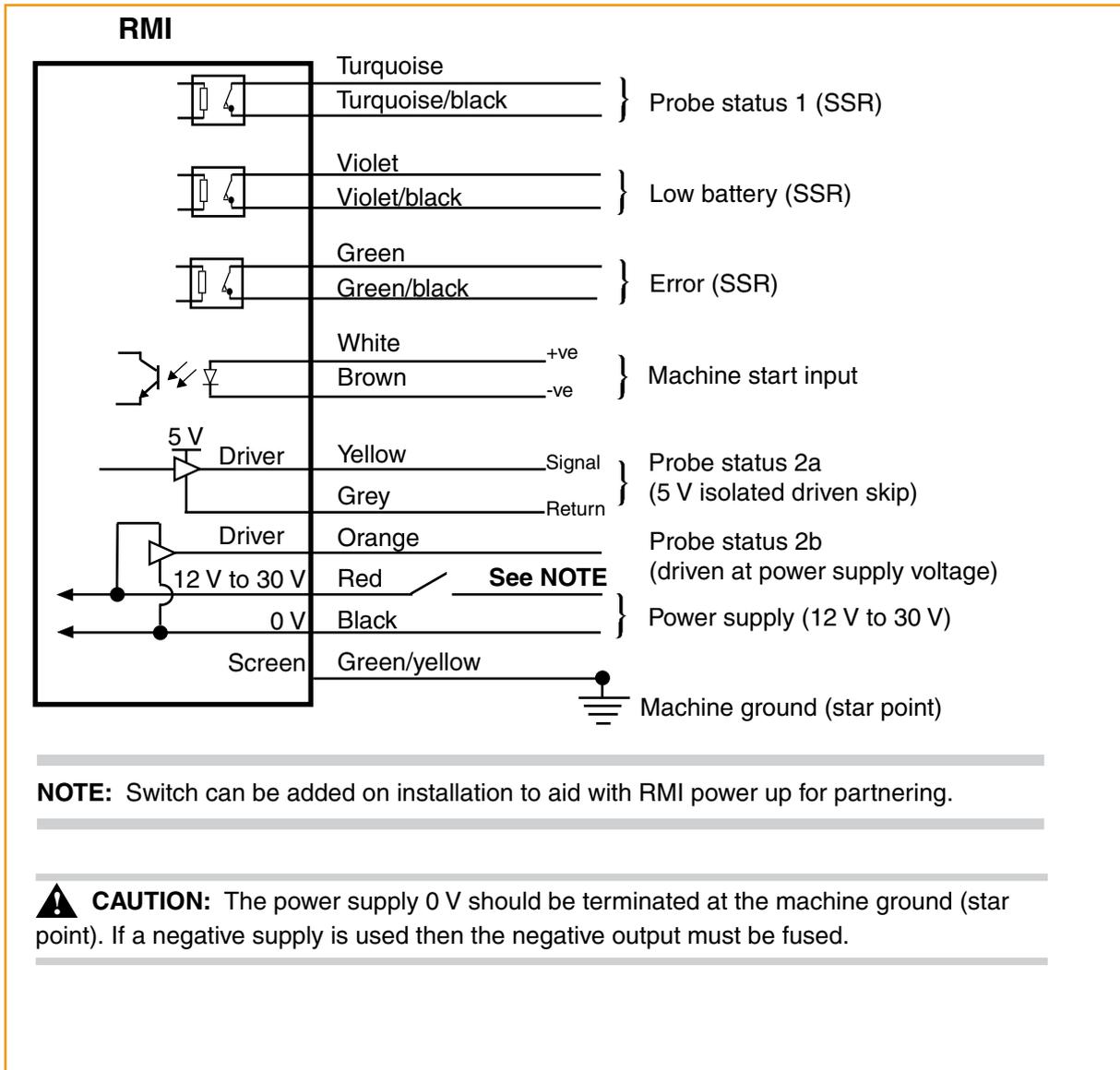
NOTES:

Install RMI with cable exiting from lower side for good coolant run off.

Mounting bracket cannot be used with an RMI in rear exit configuration.



Wiring diagram (With output groupings shown)



NOTE: Switch can be added on installation to aid with RMI power up for partnering.

CAUTION: The power supply 0 V should be terminated at the machine ground (star point). If a negative supply is used then the negative output must be fused.

RMP-RMI partnership

System set up is achieved using Trigger Logic and powering on the RMI.

Trigger Logic is a method that allows user configuration of the options available in the RMP. Trigger Logic uses a sequence of RMP triggering and battery insertion followed by further RMP triggering.

This leads the user through a series of choices allowing selection of the required options.

Reviewing of choices can be made by battery insertion alone. See the relevant RMP installation guide (see **section 6 - Parts list**).

To partner RMP and RMI

Partnering is only required during initial system set-up. Further partnering is only required if either the RMP or RMI is changed.

Partnering will not be lost by reconfiguration of probe settings or when changing batteries.

NOTE: Partnering will be lost when multiple probe mode is selected. See the relevant RMP installation guide (see **section 6 - Parts list**).

Partnering can take place anywhere within the operating envelope.

1. Use Trigger Logic to access RMP configuration mode.
2. Configure Switch-on method (if applicable).
3. Configure Switch-off method (if applicable).
4. Configure Enhanced trigger filter and Auto reset facility (if applicable).
5. Enter Acquisition mode and ensure steps 6 - 8 are completed within 20 seconds.
6. Power on RMI.
7. Watch the RMI signal LED; after a couple of seconds the LED will repeatedly flash on and off green. This is the start of a 10 second interval in which the RMI is in acquisition mode.
8. Deflect the stylus < 4 seconds to select 'Acquisition mode on'.
9. The RMI signal LED will change to repeatedly flashing red and yellow (for the remainder of the 10 second interval) indicating a successful partnering.
10. Leave RMP for 20 seconds to go into standby.
11. System is ready to use.

NOTES:

To check that turn on and off settings have not accidentally been changed insert batteries to review current probe settings.

When holding the RMP do NOT wrap a hand, or anything else, around the glass window.

When the RMP and RMI become partners the RMI records the RMP serial number.

The system will not function correctly if more than one partnered RMI is within the transmission range of the RMP.

RMI cable

Cable termination

A ferrule should be crimped onto each cable wire for more positive connection at the terminal box.

Standard cable variants

The RMI standard cable is 15 m (49.2 ft) long.

Longer cables are available, please see **section 6 -Parts list**.

Cable specification

Ø7.5 mm (0.29 in), 13 core screened cable, each core 18 x 0.1 mm.

NOTE:

Maximum cable length:
 30 m (98 ft) at 12 V
 50 m (164 ft) at 24 V

Cable sealing

Coolant and dirt are prevented from entering the RMI by the cable sealing gland. The RMI cable can be protected against physical damage by fitting flexible conduit if required.

Recommended flexible conduit is Anamet™ Sealtite HFX (5/16 in) polyurethane.

A conduit kit is available - see **section 6 - Parts list**.

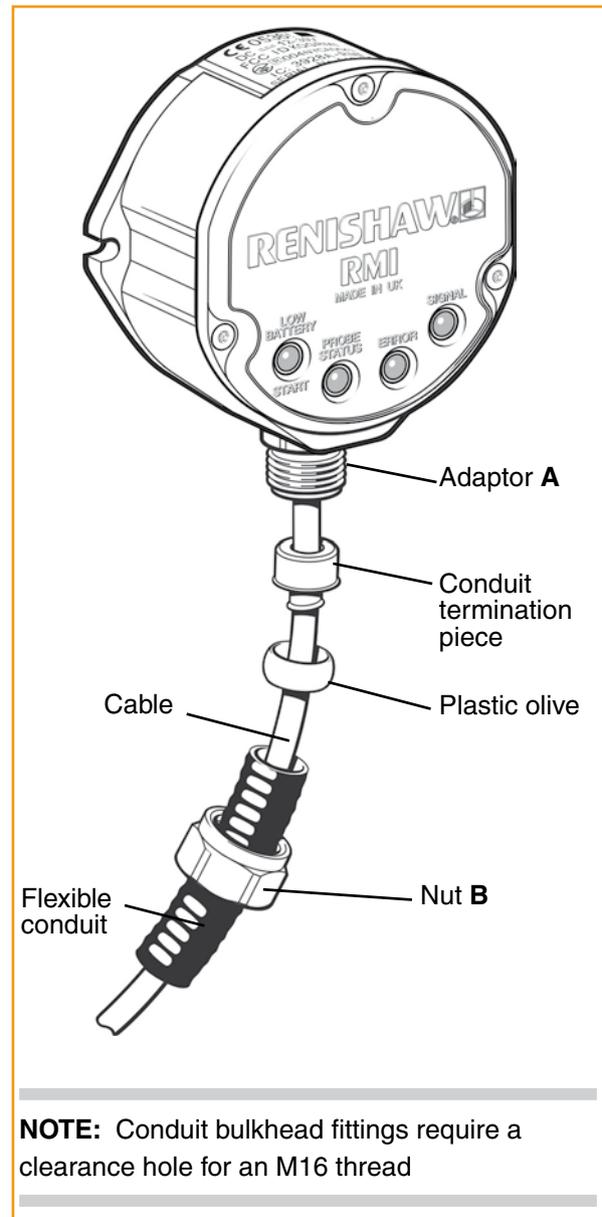
⚠ CAUTIONS:

Failure to adequately protect the cable can result in system failure due to either cable damage or coolant ingress through cores into the RMI.

Failure due to inadequate cable protection will invalidate the warranty.

When tightening or loosening nut **B** on the conduit, ensure that torque is only applied between **A** and **B**.

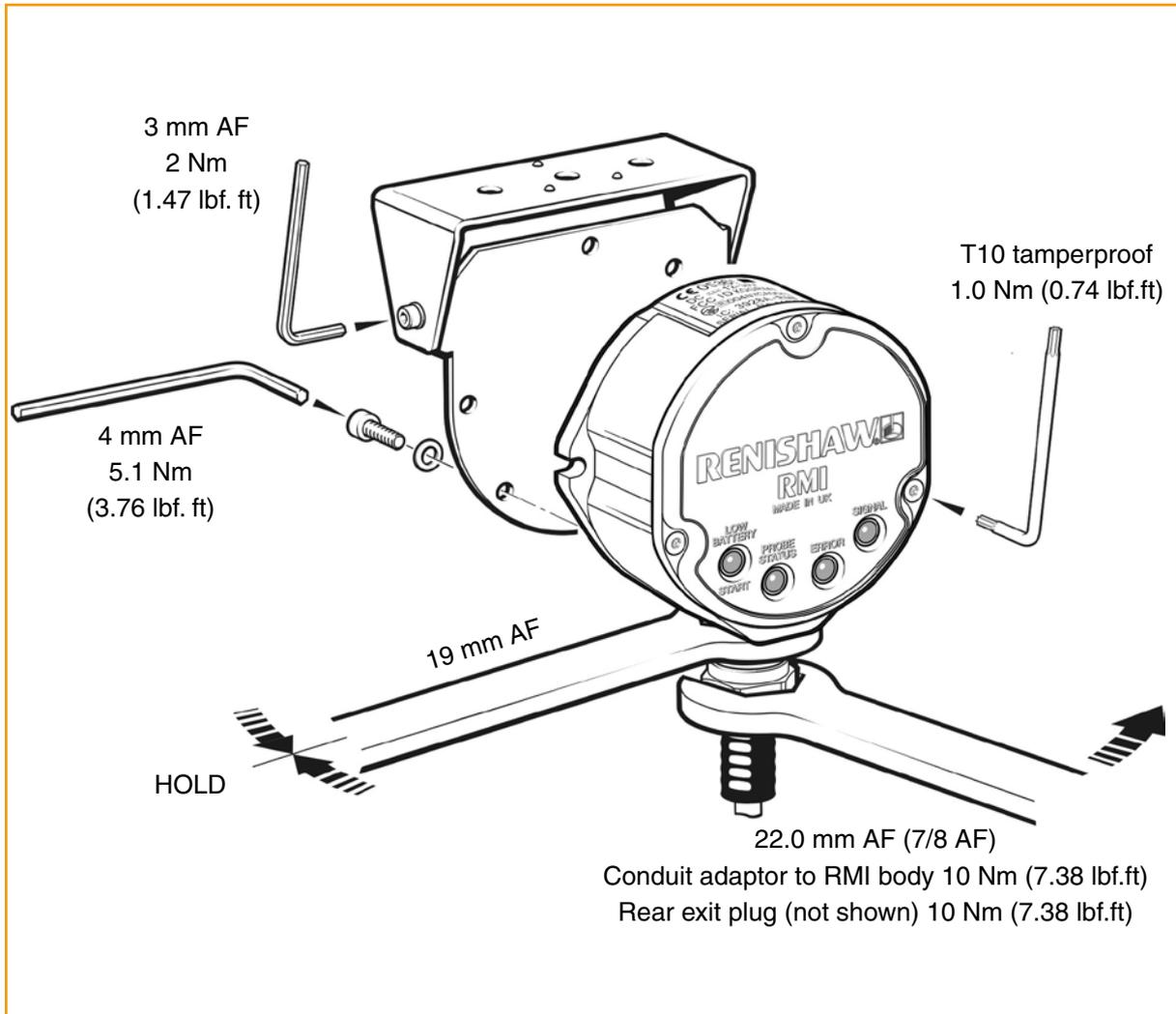
Fitting flexible conduit



NOTE: Conduit bulkhead fittings require a clearance hole for an M16 thread

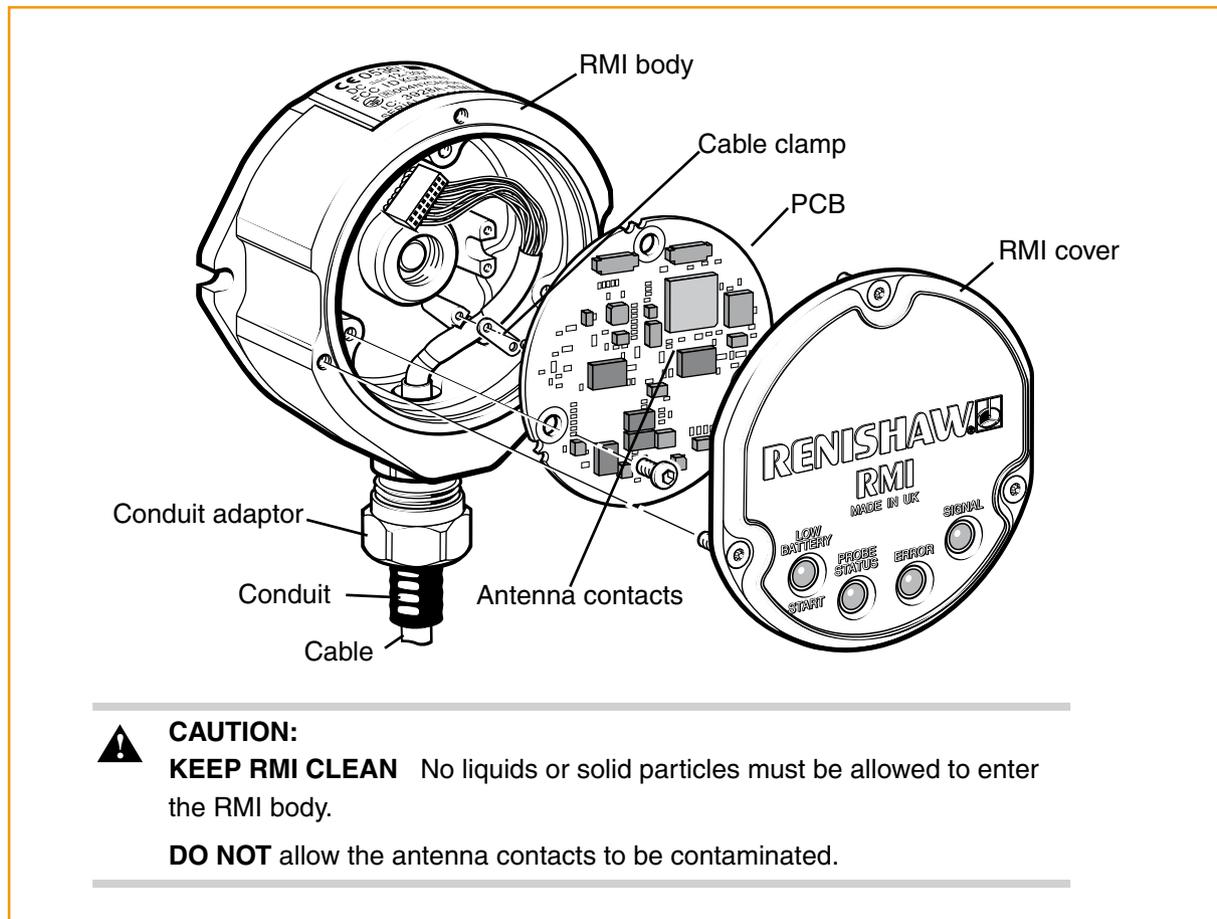
1. Slide nut **B** and plastic olive onto the conduit.
2. Screw conduit termination piece into end of the conduit.
3. Fit conduit to adaptor **A** and tighten nut **B**.

Screw torque values



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Maintenance



CAUTION:
KEEP RMI CLEAN No liquids or solid particles must be allowed to enter the RMI body.
DO NOT allow the antenna contacts to be contaminated.

RMI cover

It is not necessary to remove the RMI from the machine when adjusting the switch or installing replacement parts. For torque settings see **page 3.5 - Screw torque values**.

The front cover may be removed and replaced as described in the following pages to change configuration.

Removing the RMI cover

1. Clean the RMI thoroughly before servicing to ensure no debris or coolant enters the unit.
2. Unscrew, (but do not remove) each captive screw and washer, evenly from the cover, using the T10 tamper proof key (provided).
3. When removing cover, do not twist or rotate by hand.

Replacing the RMI cover

1. Remove O-ring from the cover, ensure that the O-ring, the O-ring groove and the cover sealing face are clean. Lubricate O-ring with silicone grease and refit to cover.
2. Ensure that the O-ring seating on the RMI body is clean, and there are no scratch marks which could prevent complete sealing.
3. Ensure that the antenna contacts are clean.
4. Place cover complete with O-ring onto the RMI body.

NOTE : The O-ring should be lubricated with silicone grease to prevent damage.

Do not get any grease on the antenna contacts.

IMPORTANT: Do not overtighten cover as distortion could occur.

5. Tighten each captive screw and washer a few turns at a time, to pull the cover down evenly. Screw torque is 1.0 Nm (0.74 lbf.ft.).

Side exit to rear exit cable conversion

1. Remove RMI cover (see **page 4.1 - Removing the RMI cover**).
2. Remove 3 crosshead screws retaining PCB. Carefully remove PCB and disconnect cable connection to PCB.
3. Unscrew cable clamp (2 x crosshead screws).
4. Unscrew conduit gland from RMI body.
5. Unscrew rear exit plug and rubber grommet from RMI body.
6. Carefully remove cable assembly and refit through rear exit hole. Tighten conduit gland. For torque settings see **page 3.5 - Screw torque values**.
7. Fit rubber grommet and rear exit plug to side exit hole and tighten.
8. Fit cable assembly using cable clamp at 3 o'clock position.
9. Connect PCB to cable connector. Insert PCB and retain with 3 cross head screws. For torque settings see **page 3.5 - Screw torque values**.
10. Fit the RMI cover (see **page 4.2 - Replacing the RMI cover**).

 **CAUTION** Conversion from side exit cable to rear exit cable must only be undertaken by qualified personnel. Failure to do so will invalidate the warranty.

Fault finding

Symptom	Cause	Action
No LEDs lit on RMI.	No power to RMI.	Check wiring.
RMI status LEDs do not correspond to RMP status LEDs.	Radio link failure - RMP out of RMI range.	Check position of RMI, see Operating envelope in the relevant RMP installation guide (see section 6 - Parts list).
	RMP has been enclosed / shielded by metal.	Review installation.
	RMP and RMI are not partnered.	Partner RMP and RMI.
RMI probe status LED continually lit red.	Dead RMP batteries.	Change RMP batteries.
RMI error LED lit during probing cycle.	Damaged cable.	Check wiring.
	Loss of power	Check wiring.
	Dead RMP batteries.	Change RMP batteries.
RMI error LED illuminated during intended probe cycle.	Probe not switched on.	Check configuration and alter as required.
	Probe out of range.	Check position of RMI, see Operating envelope in the relevant RMP installation guide (see section 6 - Parts list).
All RMI LEDs flashing.	Wiring fault.	Check wiring.
	Output over-current.	Check wiring, turn power to RMI off and on again to reset.
RMI low battery LED lit.	Low RMP batteries.	Change RMP batteries soon.
Reduced range.	Local radio interference.	Identify and move.

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Parts list

Type	Part number	Description
RMI kit	A-4113-0050	RMI, tool kit, quick-start guide and radio approval label.
Mounting bracket	A-2033-0830	Mounting bracket.
Conduit kit	A-4113-0306	Conduit kit with 1 m (3.28 ft) of polyurethane conduit and bulkhead connector (M16 thread).
Cover assembly	A-4113-0305	Cover/antenna assembly: including cover screws, torx key and O-ring.
Cable assembly	A-4113-0302	Cable assembly 15 m (49.2 ft) long.
Cable assembly	A-4113-0303	Cable assembly 30 m (98.4 ft) long.
Cable assembly	A-4113-0304	Cable assembly 50 m (164 ft) long.
Tool kit	A-4113-0300	Comprising: T10 tamperproof key, 4 mm hex key, 14 x ferrules, 4 x M5 screw, 2 x M5 nut, 4 x M5 washer, O-ring (Ø34.5 x 3 mm)
Publications. These can be downloaded from our web site at www.renishaw.com		
RMI	A-4113-8550	Quick-start guide: for rapid set-up of the RMI optical machine interface, includes CD with installation guides.
RMP60	A-4113-8501	Quick-start guide: for rapid set-up of the RMP60 probe, includes CD with installation guides.
RMP600	A-5312-8500	Quick-start guide: for rapid set-up of the RMP600 probe, includes CD with installation guides.
RMP40	A-5480-8500	Quick-start guide: for rapid set-up of the RMP40 probe, includes CD with installation guides.
RLP40	A-5627-8500	Quick-start guide: for rapid set-up of the RLP40 probe, includes CD with installation guides.
Styli	H-1000-3200	Technical specification: Styli and accessories.
Software features	H-2000-2289	Data sheet: Probe software for machine tools – illustrated features.
Software list	H-2000-2298	Data sheet: Probe software for machine tools – list of programs.

NOTE: The serial number of each RMI is found on the top of the housing.

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