

## RMI - radio machine interface



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Renishaw part no: H-2000-5220-1-A

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## EC DECLARATION OF CONFORMITY

Renishaw plc declare that the product:-

Name: RMI

Description: Radio Machine Interface

has been manufactured in conformity with the following standard: -

BS EN 61326:1998/ Electrical equipment for measurement, control and  
laboratory use - EMC requirements.  
Immunity to annex A - industrial locations.  
Emissions to class A (non-domestic) limits.

and that it complies with the requirements of directive (as amended): -

89/336/EEC Electromagnetic compatibility

The above information is summarised from the full EC declaration of conformity. A copy is available from Renishaw on request.

## Installation and user's guide

### Warranty

Equipment requiring attention under warranty must be returned to your supplier. No claims will be considered where Renishaw equipment has been misused, or repairs or adjustments have been attempted by unauthorised persons.

### Care of the RMI

Keep system components clean and treat the RMI with care.

Do not apply metallic labels to the front of the RMI.

### Changes to equipment

Renishaw reserve the right to change specifications without obligation to change equipment previously sold.

### Weight

RMI including 15 metres (49.2 ft) of cable  
= 1,700 g (60 oz).



**CAUTION:** Only qualified persons should adjust switches.

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### CNC machine

CNC machine tools must always be operated by competent persons in accordance with manufacturers instructions.

### Environment

#### Temperature

The RMI is specified for storage over  $-10^{\circ}$  to  $70^{\circ}$  C ( $14^{\circ}$  to  $158^{\circ}$  F) and operation over  $5^{\circ}$  to  $60^{\circ}$  C ( $41^{\circ}$  to  $140^{\circ}$  F) ambient temperature range.

#### Sealing

The unit is fully sealed to IPX8.

### Patent notice

Features of products shown in this guide, and of related products, are the subject of the following patents and/or patent applications:

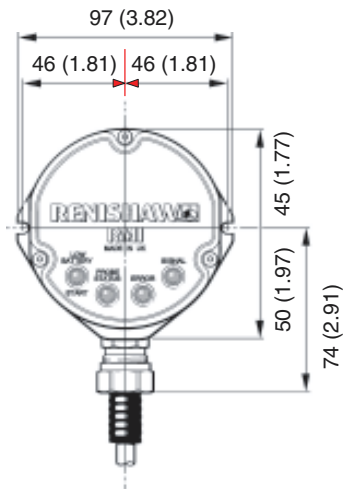
EP	0652413
US	4599524
US	5,279,042
JP	3,126,797
WO	02/063235
WO	03/021182

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## RMI



### RMI

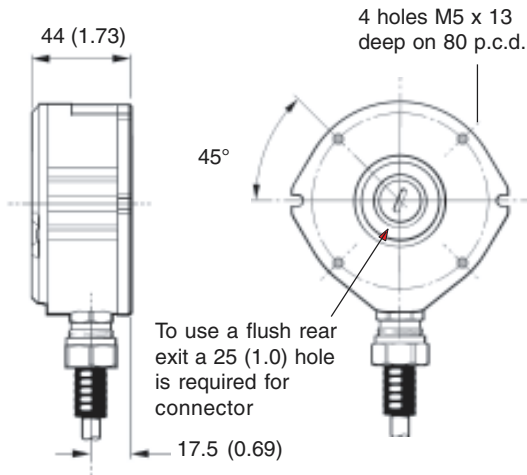
The RMI is a combined radio tranceiver and machine interface.

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 V to 30 V d.c. supply and presents a

dimensions mm (in)



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 shall not cause the voltage to fall below 12 V, or rise above 30 V.

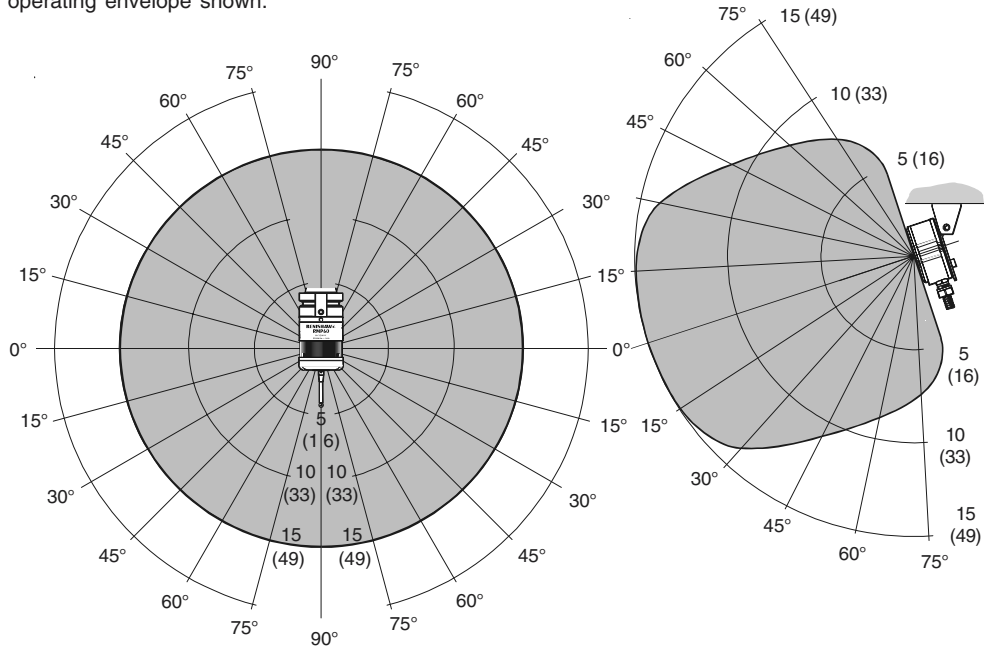
# Operating envelope

## RMP60 probe + RMI

RMP60 and RMI must be within each others operating envelope shown.

Range metres (feet)

■ OPERATING AND SWITCH ON/OFF



## RMI visual diagnostics

A visual indication of system status is provided by LED's.

Status is continuously updated and indication is provided for

START, LOW BATTERY, PROBE STATUS, ERROR, SIGNAL STRENGTH

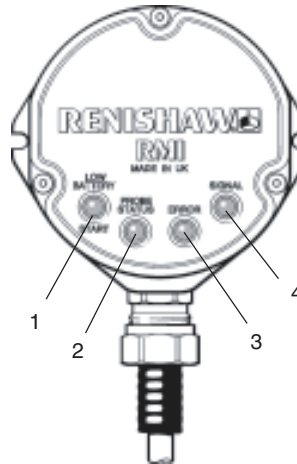
### LED LIGHT SIGNALS

#### 1. LOW BATTERY

- |               |   |
|---------------|---|
| <b>Red</b>    | Battery is low.   |
| <b>Green</b>  | M code start/stop in progress.                          |
| <b>Yellow</b> | Battery low & M code start/stop in progress.            |
| <b>Off</b>    | Battery is O.K. (and no M code start/stop in progress). |

#### 2. PROBE STATUS

- |              |                                    |
|--------------|------------------------------------|
| <b>Red</b>   | Probe triggered or unknown status. |
| <b>Green</b> | Probe is seated.                   |



KEEP THE  
FRONT COVER  
CLEAN



**3. ERROR**

<b>Red</b>	Error, other outputs may be incorrect.
<b>Off</b>	No Error.

**4. SIGNAL**

<b>Green</b>	Full signal strength.
<b>Yellow</b>	Medium signal strength.
<b>Red</b>	Low signal strength, radio link may fail.
<b>Off</b>	No signal detected.
<b>Green/off</b>	Flashing: RMI is acquisition mode, and can acquire a partner RMP.
<b>Red/yellow</b>	Flashing: RMI has (just) acquired a new partner RMP.

**Notes.**

1. The probe status LED will always be illuminated when power is present. There is no 'power present' LED.
2. 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.
3. When the RMI is powered it will enter the acquire partner mode which will be indicated by the flashing green signal LED. After a short time (~12 secs) it will switch to its normal mode listening for its partner.
4. The conditions shown by the low battery, probe status and error LEDs are the same as those present on the electrical signal outputs.

## RMI outputs

### There are four outputs:

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

All outputs can be individually inverted by using switches SW1 and SW2 - see pages 16 and 17.

Switching time = Less than 10  $\mu$ s (low to high)

Switching time = Less than 10  $\mu$ s (high to low)

If overload occurs, remove source or problem, turn off power supply and the unit will reset itself.

### SSR outputs:

DC 'ON' resistance 60 ohms max.

Up to 50 mA protected.

Switching time = Less than 10  $\mu$ s (low to high)

Switching time = Less than 10  $\mu$ s (high to low)

**Power supply reversal will not damage the SSR outputs, but may trip the electronic over current circuits.**

### Driven outputs:

Sourcing - Up to 50 mA protected.

Sinking - Up to 50 mA unprotected, but overload will still be indicated by LEDs.

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## RMI outputs

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**CAUTION:****Power supply voltage**

Do not exceed 30 V between the black wire and the screen wire (grey/black), or the red wire and screen wire (grey/black), 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 should be made to machine ground (star point).

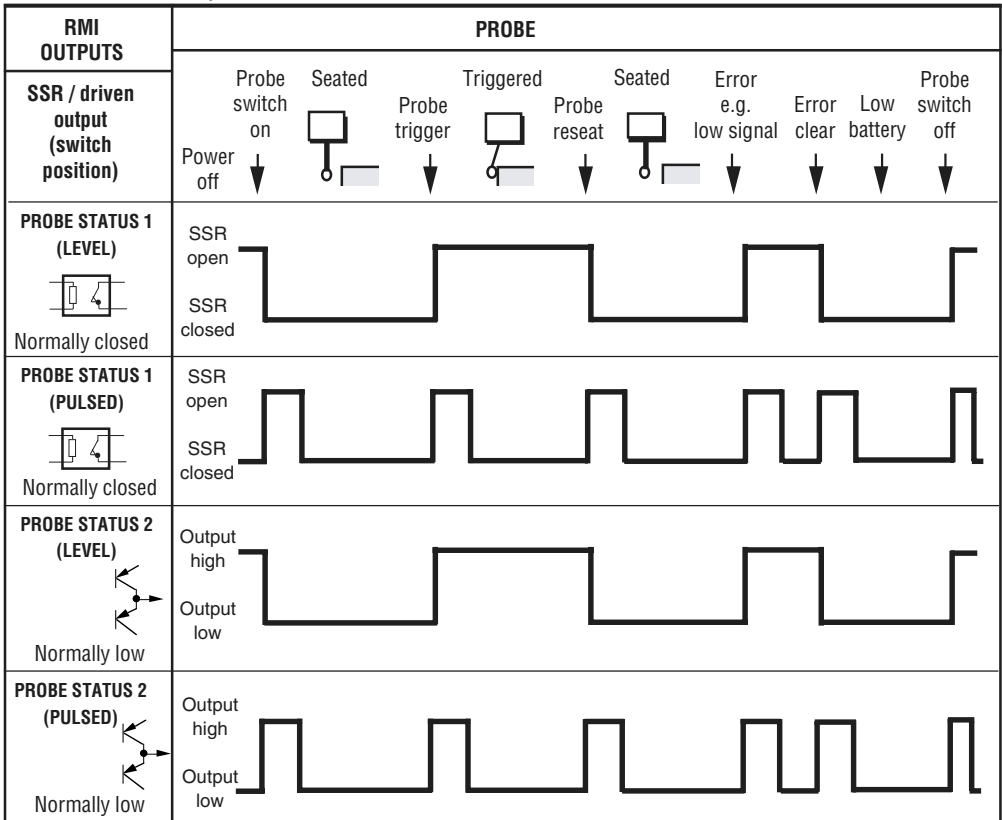
**Output stage circuit**

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.

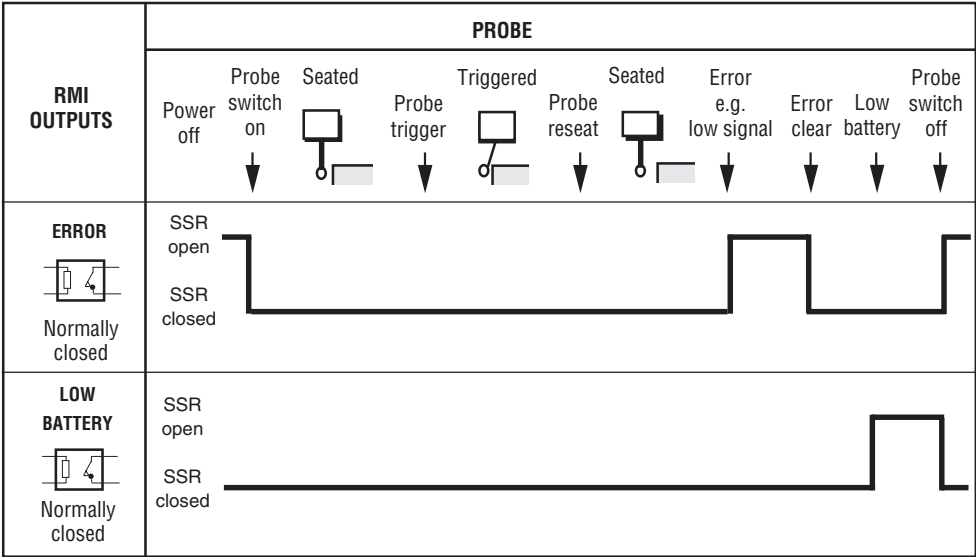
Ensure that outputs from the RMI do not exceed specified current ratings.

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# 10 RMI output waveforms



# RMI output waveforms (outputs can be inverted by switches)

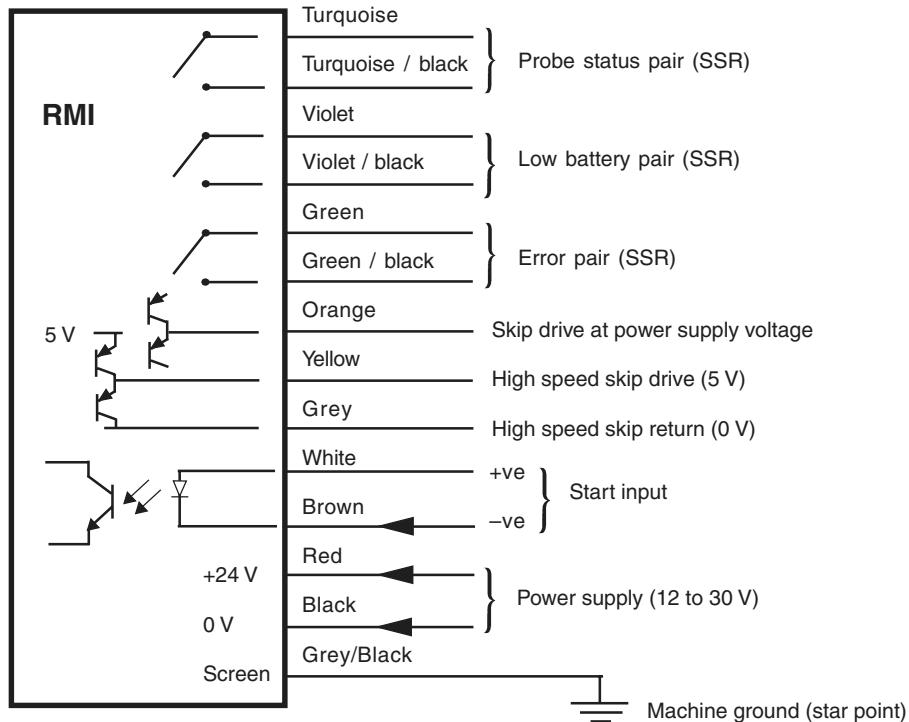


**SIGNAL DELAYS**

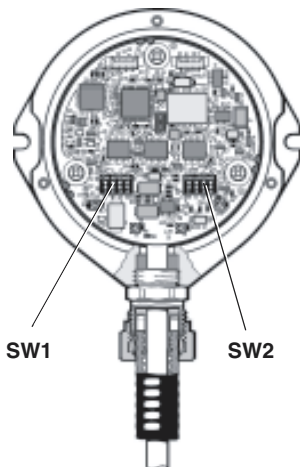
- 1. **Transmission delay** Probe trigger to output change of state = 10 ms ±10 μs.
- 2. **Start delay** Time from initiation of start signal to valid signal transmission = 1 second.

**Note :** Pulsed outputs are 40 ms ±1 ms duration.

## Wiring diagram (with the output groupings shown)



## Switches SW1, SW2 and start input



SW1

SW2

To gain access to the switches, remove the RMI cover - see page 20

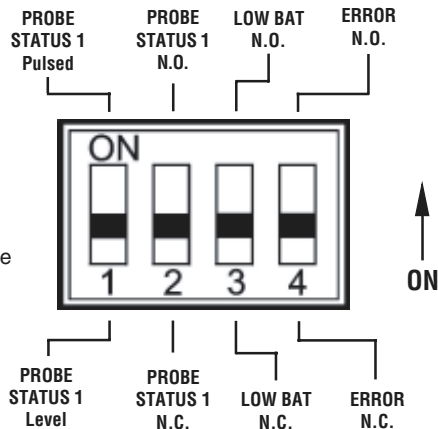
### Start input

To initiate a MACHINE START signal, an input of between 8 V and 30 V is required between the START wires (WHITE +ve and BROWN -ve). (Typical load up to 15 mA).

This is an isolated input. The minimum pulse width is 1 ms.

### SWITCH SW1 output configuration

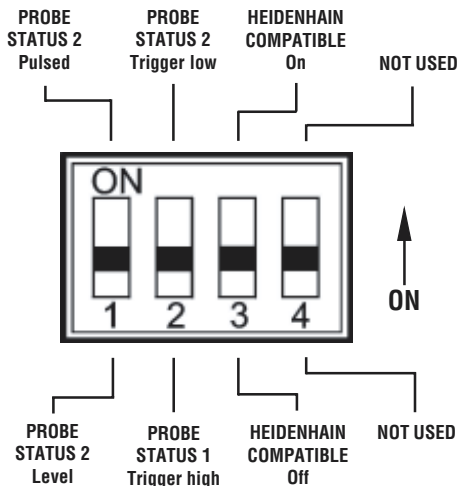
Factory settings shown



### NOTE:

Exercise caution when using error SSR in N.O. mode.

## Switch SW2 output configuration

**NOTE:**

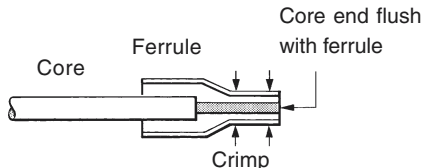
When in Heidenhain compatible on mode M code turn off cannot be used



## RMI cable

### Cable termination

A ferrule should be crimped onto each cable core for more positive connection at the terminal box. To fit a ferrule, insert the prepared core into ferrule, until the end is flush with the end of the ferrule as shown below. Then crimp with pliers.



### Standard cable

The RMI standard cable is 15 m (49.2 ft) long, longer cables are available (see page 25).

### Cable specification:

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

### NOTE:

Maximum total cable length is 50 m (164 ft) at 24V

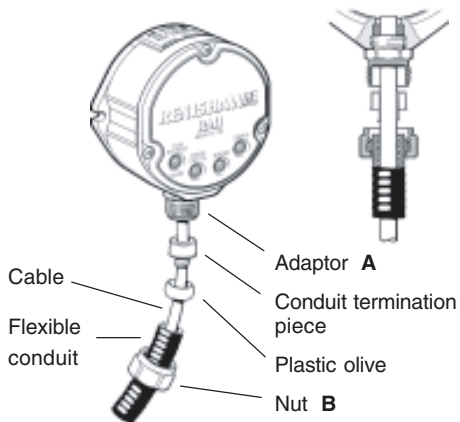
## RMI cable sealing

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

## Fitting flexible conduit

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

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



**CAUTION:** 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** onto conduit ensure that torque is only applied between **A** and **B**.

## System setup/establishing RMP-RMI partnership.

Set up is done by using the RMP trigger logic and powering on the RMI at a particular time during the process.

1. Use trigger logic to set RMP turn on/ off modes as desired.
2. Use trigger logic to access RMP acquisition mode (turquoise/light blue flashes 2 short and 1 long).
3. Power on the RMI.
4. Wait until RMI signal led flashes green.
5. Trigger the probe (min 0.1 sec, max 2 sec).
6. When the partnership is established the RMI signal LED will flash red and yellow.
7. Allow ~10 seconds for both RMP and RMI to timeout, all RMP LEDs off, RMI signal LED off. The system is then ready for use.
8. Note: If the RMP flashes 2 turquoise short followed by 1 red long it is still trying to partner an RMI.



### **WARNING:**

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

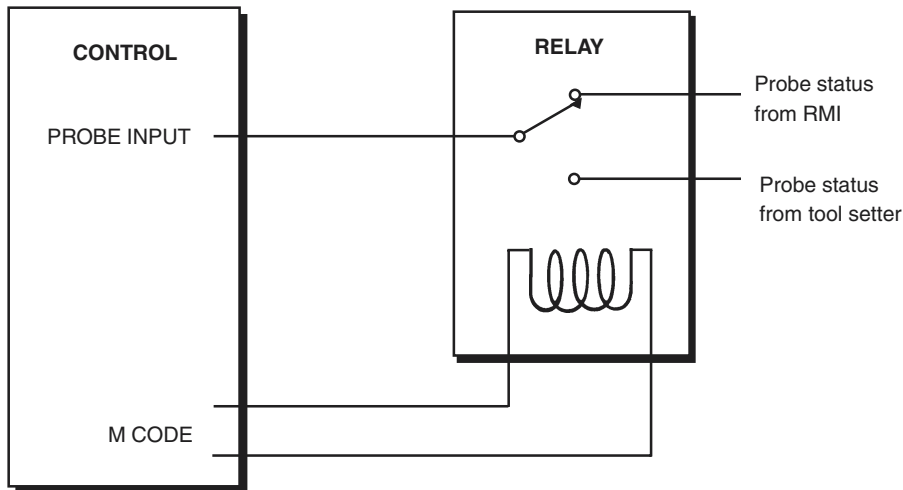
### **Note:**

When the RMP and RMI become partners the RMI records the RMP serial number. It is not possible for an RMI to be partners with more than one RMP.

It is possible for an RMP to be partners with more than one RMI, but the system will not work correctly if more than one partner RMI is powered on at any one time.

## Installation with inspection and tool setting probe

On machines where the RMI is to be integrated with a tool setting probe input, and only one probe input is provided on the control, an M code can be utilised to drive an external relay and effectively select which probe is to be monitored :



## Remote external audible output

The pulsed output can be utilized to operate an external remote audible indicator.

Wiring configurations are shown below.

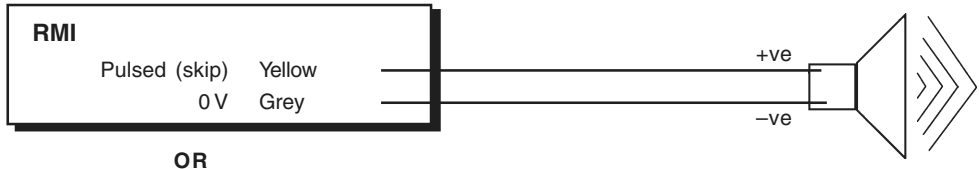
The audible indicator must comply with the output transistor specification

i.e. 50 mA peak  
30 V peak

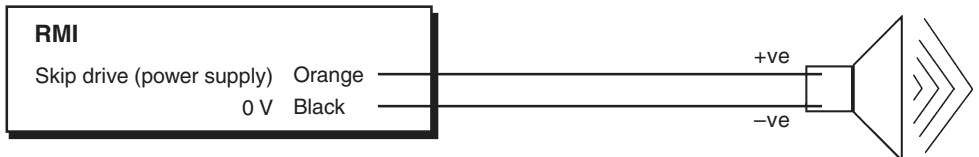
Pulse duration is 40 ms  $\pm$ 1 ms.

**Note:** This is not possible if both skip drives are being monitored by the control

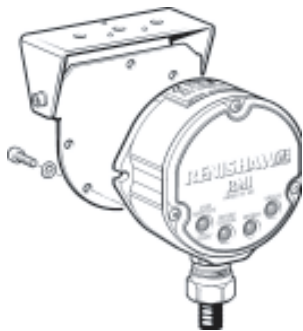
### Option 1. Using 5 V output



### Option 2. Using machine voltage output



## Mounting bracket (optional)



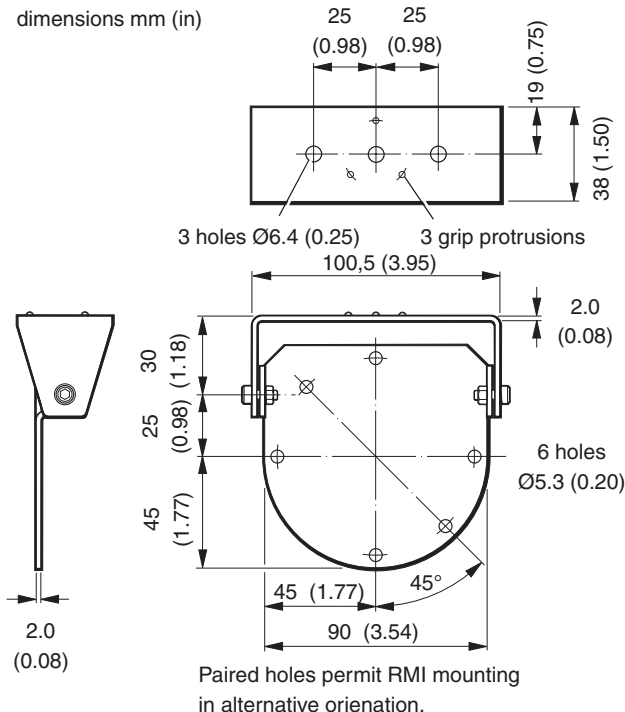
### NOTE:

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.

Do not apply any metallic label to the front cover, as this will shield the antenna.

dimensions mm (in)



## RMI cover

It is not necessary to remove the RMI from the machine, when adjusting the switches or installing new parts. For torque settings please see page 24.

## Removing the RMI cover

1. Clean RMI to ensure no debris enters unit.
2. Unscrew the three captive cover screws evenly (2 mm key).
3. When removing cover DO NOT twist or rotate by hand.

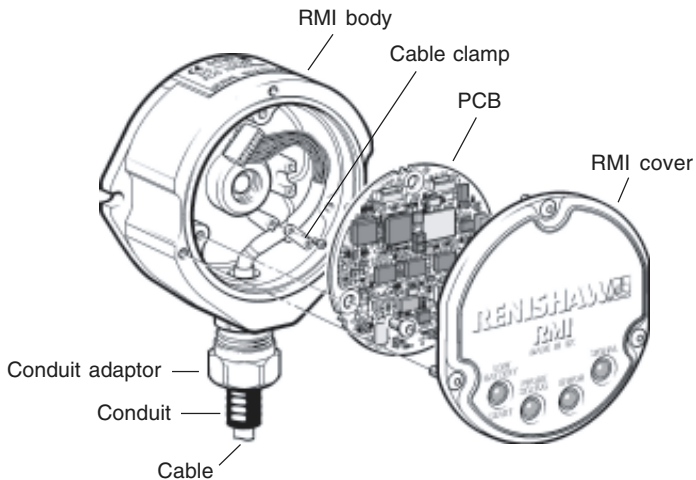
## Fitting the RMI cover

1. Before fitting the cover, check for any damage to screws or scratch marks which could prevent sealing.
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 cover, antenna contacts and 'O' ring 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 nicking. Do not get any grease on the antenna contacts.

5. Tighten each captive screw a few turns at a time, to pull the cover down evenly. Screw torque is 1.4 Nm (1.03 lbf.ft).

**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.



## Removing and refitting PCB

### To remove PCB

1. Remove the RMI cover (page 20).
2. Remove 3 crosshead screws retaining PCB. Carefully remove PCB and disconnect cable connection to PCB.

### To fit PCB

1. Connect PCB to cable connector. Insert PCB and retain with 3 cross head screws.
2. Replace RMI cover (page 20).



### CAUTION

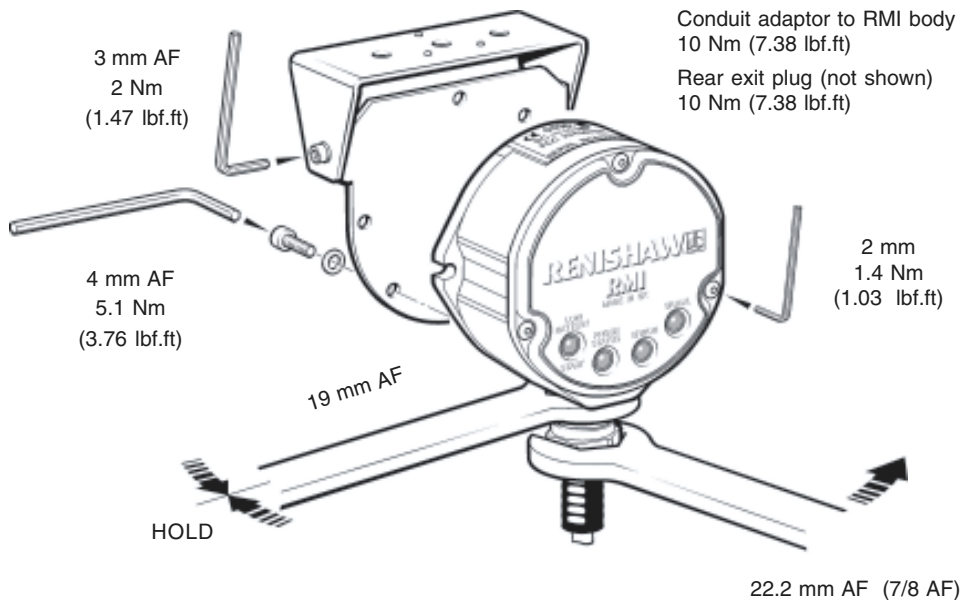
### TAKE CARE HANDLING THE PCB

**Hold edge of PCB only, do not touch surface components**

## Side exit cable to rear exit cable conversion

1. Remove RMI cover (page 20)
2. Remove PCB.
3. Unscrew cable clamp (2 x crosshead screws).
4. Unscrew conduit gland from RMI body.
5. Unscrew rear exit plug and rubber gromit from RMI body.
6. Carefully remove cable assembly and refit through rear exit hole. Tighten conduit gland.
7. Fit rubber gromit and rear exit plug to side exit hole and tighten.
8. Fit cable assembly using cable clamp at 3 o'clock position.
9. Replace PCB.
10. Replace RMI cover (page 20).

## Screw torque values Nm (lbf.ft).



**Parts list - Please quote the Part no. when ordering equipment.**

Type	Part No.	Description
RMI	A-4113-0050	RMI with 15 m (49.2 ft) of Cable.
Mtg Brkt	A-2033-0830	Mounting bracket.
Cover	A-4113-0105	Cover/antenna assembly: including cover screws and O ring.
Cable assy	A-4113-0101	Cable assembly 15 m (49.2 ft) long.
Cable assy	A-4113-0106	Cable assembly 30 m (98.4 ft) long.
Cable assy	A-4113-0107	Cable assembly 50 m (164 ft) long.
PCB	A-4113-0520	RMI circuit board
Tool kit	A-4113-0104	2mm hex key, 4 mm hex key, 14 x ferrules, 4 x M5 screw, 2 x M5 nut, 4 x M5 washer, O ring (34.5 x 3 mm)

The serial number of each RMI is found at the top of the housing.

**Renishaw plc**  
New Mills, Wotton-under-Edge,  
Gloucestershire, GL12 8JR  
United Kingdom

**T** +44 (0)1453 524524  
**F** +44 (0)1453 524901  
**E** [uk@renishaw.com](mailto:uk@renishaw.com)  
[www.renishaw.com](http://www.renishaw.com)

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