RENISHAW

COMPANY CONFIDENTIAL

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Document Title**: RMP40 system description and functional block diagrams.**

Summary/Scope:

This document provides a description and block diagram as required by FCC regulations.

This document applies to RMP40.

Reason for Issue/Nature of change:

This document has been updated to describe the RMP40 and RMI using the Nordic nRF2401A radio modem. It will be supplied to the FCC as an exhibit for the type approval application for KQGRMP40.

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Summary of RMP40 system

RMP40 is a point to point touch trigger probe radio transmission system for use on CNC (computer numerically controlled) machine tools. It consists of two components, the RMP (Radio Machine Probe) and RMI (Radio Machine Interface) which are the two radio stations.

Radio details

RMP40 uses FHSS (frequency hopping spread spectrum) transmission in the frequency band from 2400 to 2483.5 MHz. There are 79 * 1 MHz wide channels. The maximum ERP (emitted radio power) is 1mw (0dBm) and the transmission range is up to 15m. The radio link is bi-directional with half duplex transmission. Both RMP40 and RMI use a nRF2401A Nordic radio modem. The nRF2401A is a transceiver circuit.

When transmitting the modem uses a synthesiser to generate the desired carrier from the 16MHz clock. The modem then modulates this carrier using the input serial data and then amplifies it for transmission to the antenna via a filter. When receiving the signal from the antenna is fed via the filter to a low noise amplifier and then to the built in heterodyne receiver. The receiver circuits generate intermediate frequencies of 350MHz and 3 MHz which are used to down mix the signal. Following the mixers the signal is demodulated and the resulting serial received data is output.

RMP (see Fig 1)

The RMP is 40mm diameter, and 67mm long, and has a standard mounting face for fitment to a machine tool shank on one end and a M4 stylus mount on the other. The RMP contains a touch trigger probe similar to the Renishaw MP7 probe module. The RMP is battery powered by 2* ½ AA batteries, the total voltage of which must be between 4.0V and 7.5V. The RMP contains the electronic circuitry needed to process the probe signals and convert them into radio transmissions. The RMP is controlled by a microprocessor. The microprocessor encodes and decodes the radio messages that are sent or received via the FPGA to or from the radio modem. The FPGA contains a correlator which is used to recognise messages addressed to the RMP. The FPGA contains the timing logic required for the radio modem. The microprocessor and the FPGA use the 8MHz clock. There is a radio standby mode of operation during which most of the circuitry is switched off and only the microprocessor runs continuously using the 32768Hz clock.

RMI (see Fig 2)

The RMI dimensions are 108*90*40mm (L*W*H), with a cable exit gland which can be fitted to its side or rear faces. The RMI is intended to be connected to the machine tool controller using a multicore screened cable supplied with the RMI. The RMI is powered from the machine tool by 10-30V DC. The RMI contains the electronic circuitry needed to process the radio transmissions to and from the RMP, and the inputs and outputs to and from the machine tools CNC controller. The RMI is controlled by a microprocessor. The microprocessor encodes and decodes the radio messages that are sent or received via the FPGA to or from the radio modem. The FPGA contains a correlator which is used to recognise messages addressed to the RMI. The FPGA contains the timing logic required for the radio modem. The microprocessor and the FPGA use the 40MHz clock. The RMI outputs to the machine tool include 3 * solid state relay outputs (probe status/ skip, low battery and error) and 2 driven outputs (for probe status/ skip). The RMI has an input for an M code start for the system.

Fig 1 RMP40 Functional Block Diagram

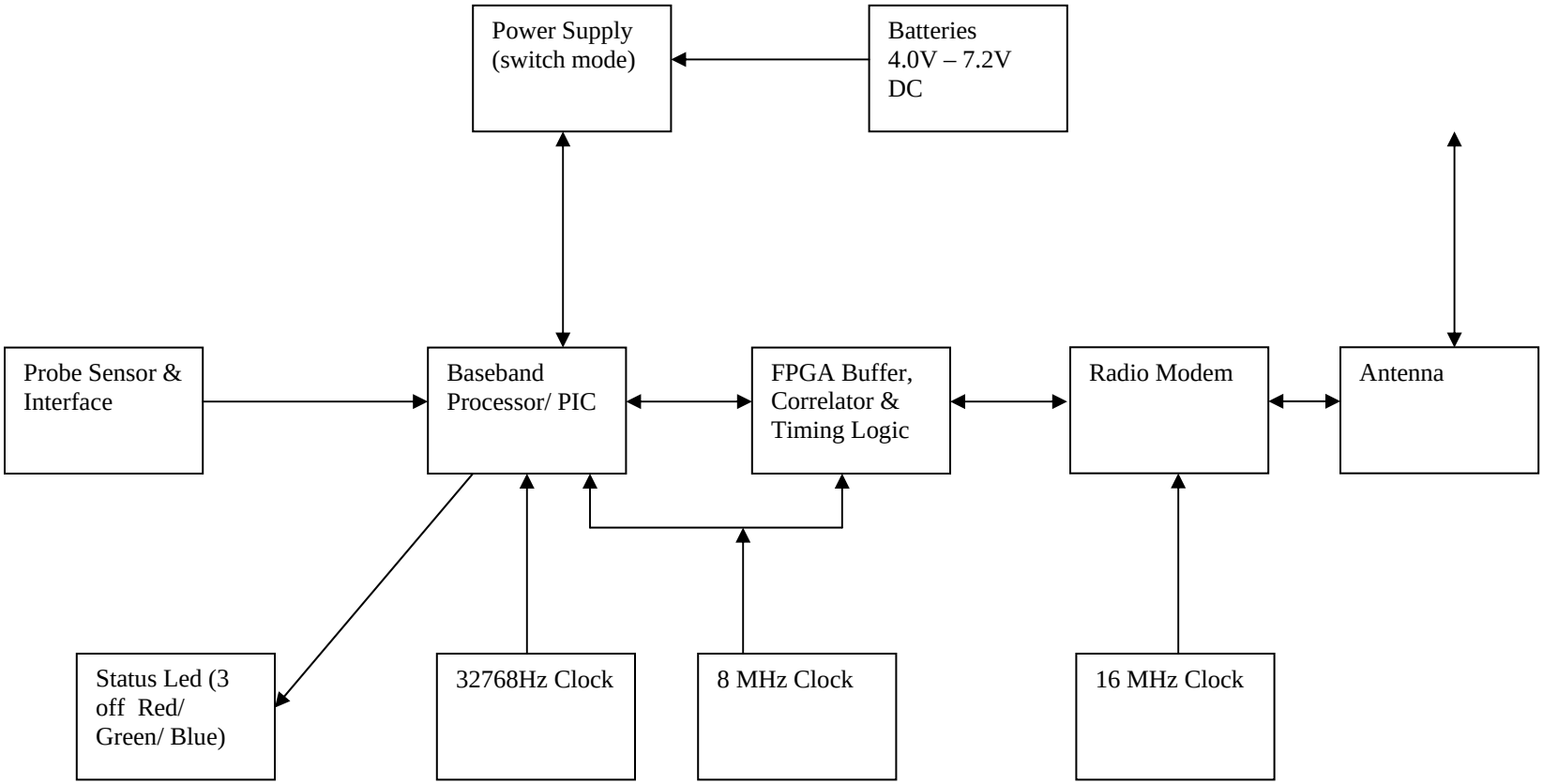

Fig 2 RMI Functional block diagram