Technical Description

Gasman II Vibrating Pager Unit

Crowcon Detection Instruments Limited
2 Blacklands Way
Abingdon Business Park
Abingdon
Oxfordshire
OX14 1DY
United Kingdom

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Functional Description

System Overview

The GasmanII Vibrating Pager Unit is designed to operate in conjunction with a GasmanII Portable Gas Detector fitted with the optional low power transmitter PCB. The standard GasmanII Portable Gas Detector monitors the level of a particular gas, or gases, in the atmosphere and provides both an audible and a visual alarm should the gas levels become unacceptable. When fitted with the optional low power transmitter PCB the unit also emits a 418MHz RF carrier wave that is 'On-Off-Key' (OOK) modulated at about 10Hz. It is this signal, which is only emitted while the alarm condition exists, that the GasmanII Vibrating Pager Unit is designed to intercept and produce a pulsing vibration to augment the audible and visual alarms provided by the GasmanII Portable Gas Detector.

Vibrating Pager Block Diagram

The circuit consists of the functional blocks as shown in Figure 1 below. The receiver section is provided by a pre-assembled and tested module manufactured by RF Monolithics of Dallas, Texas. The 10Hz signal extracted from the OOK modulation is rectified by the detector stage and used to provide a gating signal to the pulse generator. The vibration motor is thus driven in a slow pulsing fashion to obtain an extra dimension to the vibration the unit produces.

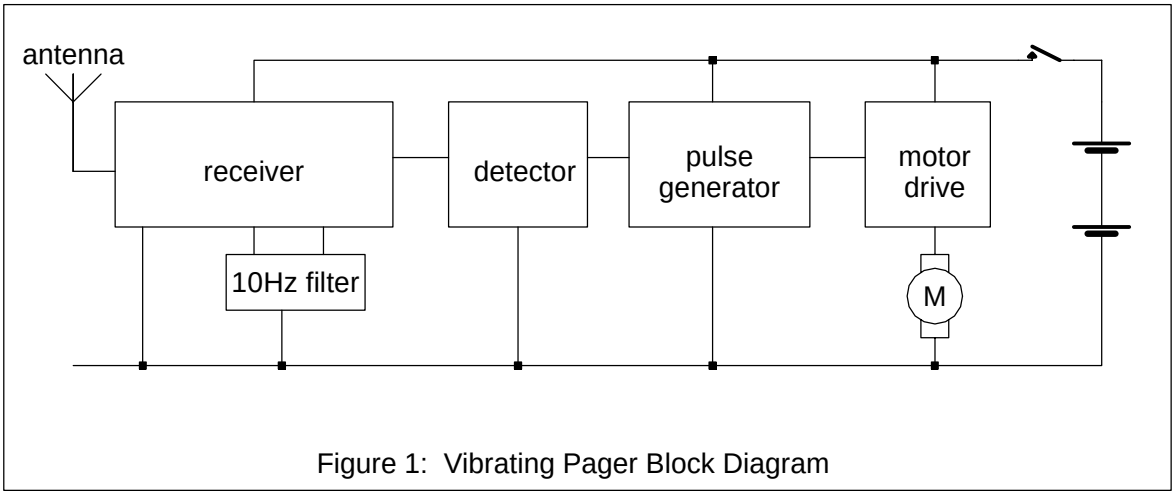


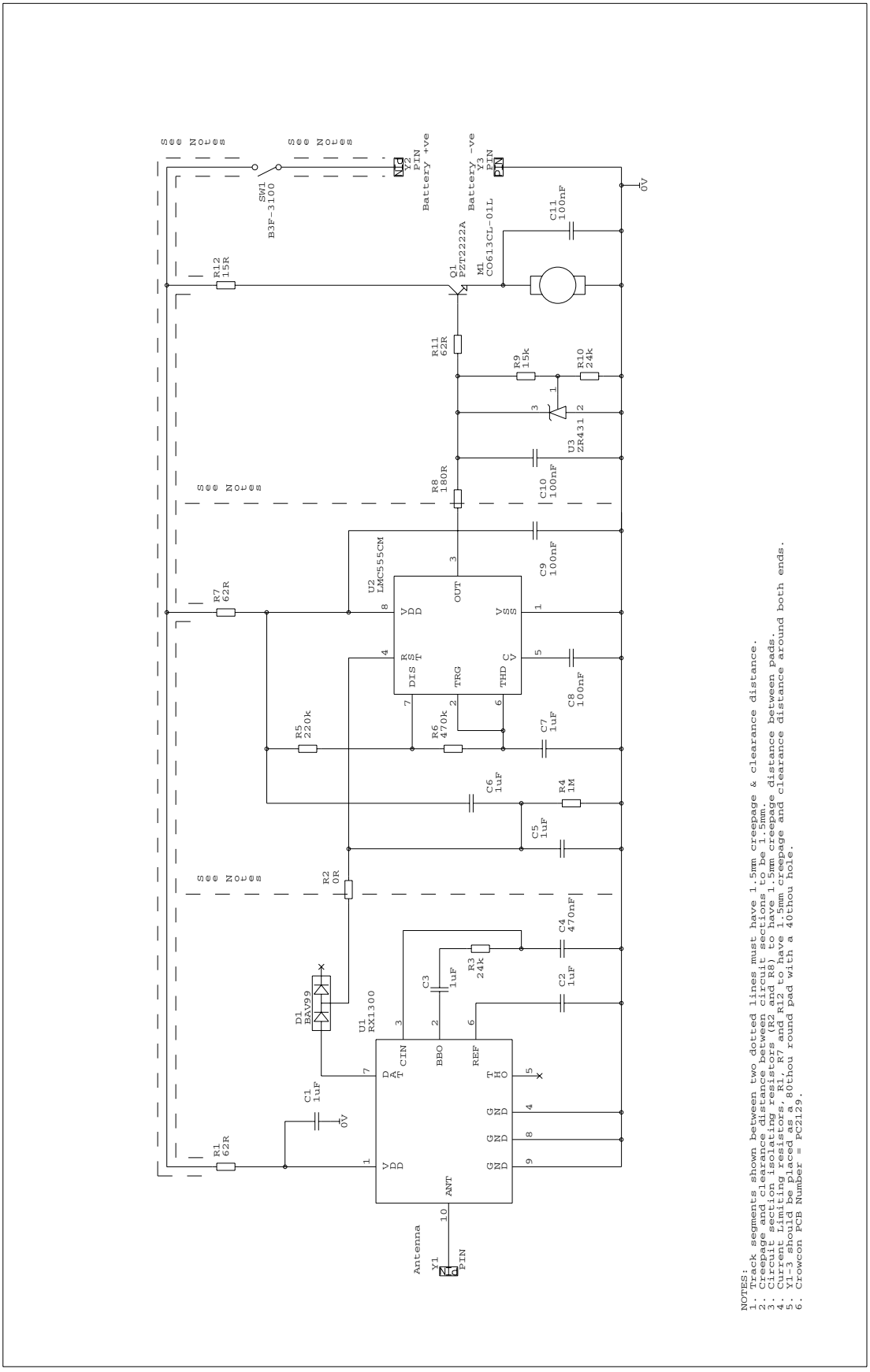
Figure 1: Vibrating Pager Block Diagram

Vibrating Pager Circuit Description

The following description of the circuit refers to the schematic shown in Appendix A.

The receiver function is provided by U1, an RF1300 AM receiver module manufactured by RF Monolithics, which takes its RF input from a short length of wire attached to the underside of the PCB at Y1. Its power supply is de-coupled by R1 and C1 with R1 also providing the current limiting function necessary for I.S. certification. The 10Hz demodulated signal is presented at U1 pin2, the 'base-band output', and has a limited amount of band-pass filtering applied using C3, R3 and C4. The filtered signal is fed back into the comparator stage of U1 which produces, at pin7, a rail-to-rail amplitude square wave form at the modulating frequency. Diode, D1, and capacitors, C5 and C6, provide the detector function and rectify the square-wave form to produce a DC level at their junction. This signal, when above about +1V releases the pulse generator circuit, U2, from its reset state causing it to oscillate at about 1.5Hz. When the unit is switched on the vibration motor is energised for a short while giving reassurance that the batteries are satisfactory. This function is provided by both C5 and C6 which, at closure of the on-off switch, provide a DC level of about 1.5V at their junction for about 1 second. This releases the pulse generator circuit from reset and momentarily energises the vibration motor. The pulse generator function is provided by a low power CMOS 555 timer IC configured as an astable oscillator. The output from the pulse generator stage feeds the motor drive power stage formed from Q1 and its associated components. U3 is included to regulate the voltage applied to the motor during operation and thus maintains a constant 'vibration feel' over a wide range of battery voltage. R7 and R12 provide current limiting in order to satisfy the requirements of Intrinsic Safety. There is no reverse-battery polarity provided as such but the current limiting functions provided by R1, R7 and R12 prevent any damage being done to the unit in the event both batteries are inserted incorrectly.

Appendix A - Schematic Diagram



NOTES:
1. Track segments shown between two dotted lines must have 1.5mm creepage & clearance distance.
2. Creepage and clearance distance between circuit sections to be 1.5mm.
3. Circuit section isolating resistors (R2 and R8) to have 1.5mm creepage distance between pads.
4. Current Limiting resistors, R1, R7 and R12 to have 1.5mm creepage and clearance distance around both ends.
5. Y1-3 should be placed as a 80thou round pad with a 40thou hole.
6. Crowcon PCB Number = PC2129.

Appendix B - Parts List

This appendix gives the parts list for the GasmanII Vibrating Pager Unit. For each circuit reference a description of the component is given and, where appropriate, its case style is listed. The Farnell order codes are given such that should any further information or clarification be required it may be obtained from them.

Circuit Ref.	Component Description	Case Style	Farnell Code
C1	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C2	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C3	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C4	470nF 25V X7R Multi-layer Ceramic	1206	499-705
C5	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C6	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C7	1uF 16V X7R Multi-layer Ceramic	1206	499-717
C8	100nF 25V X7R Multi-layer Ceramic	1206	644-316
C9	100nF 25V X7R Multi-layer Ceramic	1206	644-316
C10	100nF 25V X7R Multi-layer Ceramic	1206	644-316
C11	100nF 25V X7R Multi-layer Ceramic	1206	644-316
D1	BAV99	SOT23	517-021
M1	Sanyo CO613CL-01L Vibrator Motor	N/A	N/A
Q1	PZT2222A NPN 40V 1.0A	SOT223	932-875
R1	62R 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-098
R2	0R 0.25W 2% 200ppm Nickel Barrier Resistor	1206	419-898
R3	24k 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-712
R4	1M 0.25W 2% 200ppm Nickel Barrier Resistor	1206	421-108
R5	220k 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-943
R6	470k 0.25W 2% 200ppm Nickel Barrier Resistor	1206	421-029
R7	62R 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-098
R8	270R 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-244
R9	15k 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-669
R10	24k 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-712
R11	62R 0.25W 2% 200ppm Nickel Barrier Resistor	1206	420-098
R12	15R 2.W 5% 250ppm Metal Film Resistor	PR02	550-073
SW1	Push Switch Omron B3F-3100	N/A	959-704
U1	RX1300 ASH Receiver Module	SM-10	N/A
U2	LMC555CM CMOS Timer	SO8	705-068
U3	ZR431LF02 Voltage Regulator	SOT23	302-3904
Y1-Y3	PCB Pads 80thou with 40thou hole	N/A	N/A