**Robert Cavendish**

**Electronic Design Engineer**

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**Summary**

I am an electronic design engineer, very experienced and capable in all aspects of electronic design both at the systems level and the component level. I am experienced in commercial/military analogue and digital radio communications in general. Most of my early career was spent in the field of RF and microwave design. Recent design expertise extends to microcontrollers and associated hardware.

Digital design expertise includes: PIC18F4580 with CAN Bus, PIC12F675, PIC16F873A, PIC16LF1619, PIC18F6520, PIC24F256,

Cypress CY7C68016A USB microcontroller, Atmel ATxmega64A3.

Software programming in C using MPLAB, Hi-Tech compiler, Keil uVision 3,

Atmel AVR Studio 6 and IAR Embedded Workbench.

Programming in C++ using Microsoft Visual Studio.

RF and microwave design expertise include general terrestrial and satellite communications transmitter and receiver design, LNA design, Fractional-N synthesizer design, antenna design, power amplifier design, design for wireless communications products, DAB radio, GPS, CATV, and radar.

Very knowledgeable on Switch Mode Power Supply design.

Schematic entry and PCB design using Altium and OrCAD.

Circuit simulation using Microwave office and Simetrix.

I graduated with a degree in Electrical and Electronic Engineering in 1979 and took up permanent employment that same year. Since 1987 to the present day I have been employed on a contract basis for my design expertise.

I have SC clearance until 2023.

Reference information is on the final page.

**Contract employment in reverse order**

**Thales Ltd.** Cheadle. From 05-18 to 05-19

Underwater communications requiring knowledge of UW transducers, hydrophones, sonar, Class D amplifiers, Link Budget, PLCs, 3 phase power systems. Project documentation. LVD. Atlassian Jira and Confluence management tools. ATDM Allegro schematic entry, Selecta library tool.

**Helical Technology Ltd.** Lytham. From 02-18 to 04-18

Circuit and PCB design of a Labview FPGA cRIO custom module for a production test application. Knowledge of Labview FPGA and its Graphical Programming Environment.

**Cyanconnode Ltd.** Cambridge. From 04-17 to 10-17

Electronic Engineering requiring a knowledge of wireless mesh networking. Circuit design and Altium layout of an RF mesh network node based on the Si Labs EMR32 Flex Gegko SoC. Circuit design and Altium layout of a jig to simultaneously program and test 32 panel mesh network node PCBs. PCB design and manufacture using Altium 17. RF design to 1GHz to pass international radio standards. Knowledge of Linux and openOCD.

**Brooks Life Science Systems Ltd.** Irlam. From 06-16 to 10-16

PCB design using Altium 16. Documentation using Agile PLM. Knowledge of brushless servomotors, hall sensors, rotary encoders, actuators and CANopen.

**Adey Ltd.** Cheltenham. From 02-16 to 05-16

Electronic Engineering requiring knowledge of microcontrollers, I2C bus, stepper motors, raspberry pi, linux and python scripting. Hardware design and C programming using a PIC16LF1619. Python scripting using tkinter and matplotlib modules. PCB layout using Protel. Evaluation of the Silicon Labs sleepy bee microcontroller and the Simplicity Studio IDE.

**BAE Systems Ltd.** Warton. From 10-13 to 12-14

Member of Flight Test Instrumentation Group requiring knowledge of aircraft telemetry receiving systems and ground station design. Link budget calculations, radio regulation using IRIG specifications, G/T calculations and measurements, PCM/FM and SOQPSK modulation, LDPC encoding, Doppler effects, microwave propagation over sea, multipath effects, diversity methods, knowledge of microwave receiver design, RF to optical fiber communications, CONSCAN and ESCAN tracking techniques. ITAR and EAR regulations.

**Aero Engine Controls Ltd.**  Hall Green, Birmingham. From 1-13 to 07-13

Electronic Engineering involving the Electronic Engine Controller on the Trent XWB turbofan engine used to power the Airbus A350. Knowledge of Full Authority Digital Engine Control. Inductive and capacitive measuring methods. Strain gauge pressure sensors. Thermocouple temperature measuring with resistive temperature device cold junction compensation. Mass flow sensing. Proximity switches. Switch Mode Power Supplies. Avionics Full Duplex and CAN bus communication. Lightning strike protection. Environmental testing. Airbus standards. IBM Rational DOORS. Allegro 16.6 schematic entry. Simetrix circuit simulation.

**Mira Showers Ltd.** Cheltenham. From 5-12 to 12-12

Electronic Engineering involving digitally controlled shower units. Design of a 40W Off-Line Switcher based around the TOP258. Hardware design using the Atmel ATxmega64A3 microcontroller and Allegro A3982 stepper motor driver requiring a knowledge of bipolar stepper motors and microstepping. Software programming in C using the Atmel AVR Studio 6 and IAR Embedded Workbench programming environments. PCB design using OrCad Capture CIS and OrCad Layout.

**Intelligent Energy Ltd.** Loughborough. From 10-11 to 02-12

Electronic Engineering involving Fuel Cells. General analogue and digital design involving the PIC24F250 with USB. Knowledge of Fuel Cells and the USB standard. PCB layout using Altium 2010.

**Com Dev Ltd.** Aylesbury. From 8-11 to 10-11

Electronic engineering involving L-band fractional-n synthesizers for a satellite communications payload. Schematic entry using OrCad. Circuit simulation using Microwave Office.

**MIRA Ltd.** Nuneaton. From 6-10 to 06-11

Electronic Engineering involving motor vehicles. Hardware design and software programming in C involving the PIC18F4580 with CAN Bus. General analogue and digital design. Knowledge of the CAN bus protocol. PCB layout using Altium 2010.

**Thales Ltd.** Crawley.From 7-09 to 10-09

Employed to clear engineering backlog. Electronic engineering involving 1KW and 5KW HF power amplifiers. Mains interference testing. Microwave measurements. Circuit simulation using Microwave Office. Schematic entry using OrCad.

**Draeger Safey Ltd.** Blyth.From 3-08 to 4-09

Electronic engineering involving intrinsic safety equipment. Electronic design to intrinsic safety ATEX standards. Hardware design involving PIC microcontrollers PIC12F615, PIC12F675, PIC16F873A, PIC18F6520. Software design in assembler and ANSI C using the Hi-Tech compiler. PCB layout using Protel.

**Paradise Datacom Ltd.** Witham.From 6-07 to 12-07

Electronic design involving satellite ground station modems. Wideband transmitter and receiver design, 50MHz to 180MHz and 950MHz to 2.05GHz, to meet U.S. defence certification standard. PCB layout using Protel to build 4 prototype PCBs. Digital communications measurements, microwave measurements, test equipment configuration using Matlab.

**Dyson Ltd.** Malmesbury,From 8-06 to 5-07

Electronic engineering involving vacuum cleaner electronics. Design of 315MHz and 434MHz small signal ASK transmitters controlled by a PIC 10F200. Design for very large-scale mass production. RF design to meet Japanese, European and American EMC standards. EMC and environmental testing. Writing of design and test specifications. Design of a production programming jig using the Pro Mate II and PR3.

**Philips Research Ltd.** Redhill.From 1-06 to 7-06

Hardware and software design of a USB dongle with GPS store and forward later capability. RF design at 1.5GHz. Digital design using the Cypress CY7C68016A USB microcontroller with 8051 core and Nand Flash memory. 8051 C programming using Keil uVision 3. Consol application programming in C++ using Microsoft Visual Studio. Schematic entry and 6-layer PCB design and layout using the Cadence Allegro PCB design suite.

**Frontier-Silicon Ltd.** Cambridge.From 3-05 to 9-05

Electronic engineering involving automotive DAB radio. Requiring a detailed knowledge of OFDM for DAB application. RF design to 1.5GHz. Mechanical design using IntelliCAD. DAB measurements, environmental and EMC testing to automotive standards. Writing DFMEA and Reliability documents to automotive standards.

**Triteq Ltd.,** Hungerford. From 11-04 to 3-05

Hardware design involving a Mode S aircraft transponder. RF receiver design including LNA design, filter design, and log IF amplifiers. Design of a 1.09GHz 7dBm SAW oscillator. Design of a 1.09GHz, 100W power amplifier with 2Mb/s pulse position modulation capability. Design of a transmit receive switch with 100W capability at 1.09GHz. PCB layout using Protel.

**Maxon Sewen Ltd.,** Hemel Hempstead. From 08-02 to 03-03

Complete design of a 400MHz to 460 MHz GMSK Mobitex transceiver. Involving a detailed knowledge of dual conversion receiver design, synthesizer design, and a 5W maximum variable output transmit section.

**Rofin Sinar Ltd.,** Hull. From 08-01 to 10-01

Electronic engineering involving multi-kilowatt RF generator design at 81MHz to stimulate Carbon Dioxide Lasers.

**Tality Ltd.,** Cowely Road,Cambridge. From 01-01 to 6-01

Electronic engineering involving GSM/EDGE base station transmitter design to 2GHz. RF circuit simulation using ADS.

**Securicor Wireless Technology Ltd.,** Midsomer Norton. From 10-00 to 12-00

Electronic engineering involving Power Amplifier design to 1GHz. Polar loop and Cartesian loop amplifiers for TETRA application.

**IPWireless Ltd.,** Bumpers Farm Ind. Est., Chippenham. From 08-00 to 10-00

Electronic engineering involving G3 UMTS TD-CDMA base station.

**PSMC Ltd. and N-Sine Ltd.,** Apex Plaza, Reading. From 09-99 to 08-00

Computer networking via mains power lines. ASK, FSK and BPSK transmitter and receiver design to 30MHz for power-line communications. Design and build of PCBs using Protel for schematic and PCB layout. Circuit simulation using Eagleware.

**Airtech Ltd.,** Coldharbour Way, Aylesbury, Bucks. From 07-98 to 5-99

Electronic engineering to 2GHz. Microwave simulation using Super Compact. Low noise amplifier design and production build for GSM and PCS masthead amplifiers. Design of a 1W pre-amplifier with variable gain for PCS base station application through to production build. Design of a TETRA antenna multicoupler.

Use of PADS Powerlogic and PowerPCB. Reliability analysis. Writing of requirement, test and production specifications.

Minor involvement writing of a hardware and software future product specification involving Visual Basic and the Intel 87C51 microcontroller with DAC, ADC, external RAM and controlling a BPSK data link.

Minor involvement with switch mode power supply design for base station masthead amplifier application. Minor involvement with GSM and PCS LDMOS and GaAs power amplifier design.

**Chase Communications Ltd.,** Mortlake, London. From 02-98 to 05-98

Electronic engineering to 2GHz including Receiver design, 2GHz frequency synthesizers, Direct Digital Synthesizers, RF measurements, liaison with manufacturers and suppliers, SAW filter specification.

**Ionica Ltd.,** Cambridge. From 01-97 to 12-97

Electronic engineering involving wireless local loop radio telephone communications systems requiring a knowledge of cellular telecommunications systems and a detailed knowledge of the Ionica radio system. Writing of test specifications to evaluate the Ionica radio system. Writing of test scripts to run on the Ameritec bulk call generator and voice/data test set. Modem communications.

**Siemens Plessey Systems Ltd.,** Ilford, Essex. From 08-96 to 01-97

RF design involving military radio communications systems. Design of a 2MHz to 50MHz 50W VFET RF power amplifier. MoD Report writing.

**Carlton Cabletime Ltd.,** Newbury, Berks. From 04-96 to 08-96

RF design to 900MHz involving cable TV systems. General video measurements.

**Roke Manor Research Ltd.**, Romsey, Hants. From 10-95 to 03-96

CDMA receiver and transmitter design. Systems design requiring a detailed knowledge of QPSK for CDMA application. RF circuit design at 2GHz involving balanced low noise amplifiers and a 2W power amplifier. General microwave measurements. Circuit simulation using Mathcad, Eagleware and J-Omega on the SUN workstation.

**Maxon Europe Ltd.**, Hemel Hempstead, Herts. From 04-95 to 09-95

Computer programming in Microsoft Basic. 500 MHz PLL synthesizer design and evaluation including modular-2 and fractional-N synthesizers**.** Design of a band switched oscillator to operate off 5V and to cover the range 355MHz to 470MHz for hand held communications transceivers. Frequency synthesizer and oscillator design covering the range 355MHz to 470MHz and modulated with GMSK data for a digital radio modem. Design of a 10W VFET power amplifier covering the range 400MHz to 470MHz.

**Plextek Ltd.** Gt. Chesterford, Essex. From 11-94 to 04-95.

RF circuit design of a GSM mobile telephone involving RF circuit design from DC to 1.5GHz using surface mount technology.

From 01-92 to 10-94.

I was self-employed operating my own mobile TV and video repair business.

**Matra-Marconi Space Systems Ltd.** Watford, Herts. From 05-90 to 10-91

General microwave measurements. L-Band solid state power amplifier design (20W at 1.5GHz) involving microwave bipolar transistors and bias circuitry, Lange couplers, and isolators including a study of reliability and degradation effects of the space environment requiring a detailed knowledge of semiconductor physics. VHF and UHF filter design and simulation using CAD packages Touchstone and Academy on the SUN workstation. Design and build of a QPSK 1GHz to 2GHz transmitter and quadrature demodulator involving the design and layout of a rubylith using CAD package MICAD to finally etch a circuit layout onto a duroid substrate. Mathematical analysis of a general direct demodulation receiver for the reception of QPSK involving Laplace transforms and loop dynamics. HEMT low noise amplifier design and biasing involving simulation using CAD package and a good knowledge of semiconductor physics.

**Kelvin Hughes Ltd.** New North Road, Hainault, Essex. From 12-88 to 11-89

Design and development of a dual-band linear swept gain receiver and sensitivity time control circuitry for an up-mast river radar. Microwave measurements involving magnetrons, limiters, rotating joints, and slotted wave guide antennae. Noise figure calculations and measurements. Switch mode power supply design, log receiver design, radar displays, and radar in general.

**Target Technology Electronics Ltd.** Ashford, Kent. From 10-87 to 01-88.

Hardware and software programming using the 8051 Microcontroller. Design of a 460MHz 2W FSK transmitter and receiver for 1200 baud telemetry link.

**Permanent employment**

**Racal SES Ltd.** Newtown, Tewkesbury, Gloucestershire. From 1979 to 1986

Switch mode power supply design, RF communications receiver design, filter design, PLL frequency synthesizer design, DF systems, antenna design, RF power amplifier design, jammers, communications systems design, coding and cryptography, vehicle installation. 6805, 6502, and NSC800 microprocessor design and assembly language programming. Electronic designing to commercial and military design specifications. Writing of design, test, production, software requirement, design and maintenance specifications. Project documentation, proposals, design studies, project management, costing estimation and time scaling. All projects were of a military nature and were accordingly classified. A training scheme was undertaken and successfully completed after the first three years.

**Student experience**

**Marconi Space and Defense Systems Ltd.**  Stanmore, Middlesex. From 06-78 to 12-78.

Employed as a student engineer on the Stingray torpedo project. Design of test equipment involving analogue and digital circuit design.

**International Electronics,** Haslingden, Lancashire. From 06-77 to 10-77.

Electronic weighing equipment. Testing and experimentation. Digital and analogue circuit design.

**Telepage Ltd.,** Southport, Merseyside. From 06-76 to 10-76.

Closed circuit TV. Production wiring and construction of CCTV switching units. Test engineering repairing CCTV cameras, monitors, and switching units. Quality control of CCTV equipment.

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**Reference Information**

References can be obtained from the agencies below.

**Thales Ltd.** Cheadle Heath

Morson

Darwen House   
37 Liverpool Road

Irlam   
M44 6EB

Manchester

Tel. 0161 7071516

**Helical Technology Ltd.** Lytham

GPW Recruitment

Worsley House

North Road

St Helens

WA10 2BL

Tel: 01744 454 300

**Cyanconnode Ltd** Cambridge

Redline Group Ltd

230 The Village, Butterfield, Gt Marlings

Luton

Bedfordshire

LU2 8DL

Tel: 01582 450054

**Brooks Life Science Systems Ltd** Irlam

JAM Recruitment Limited

Marsland House

Marsland Road

Sale

M33 3AQ

Tel: 0845 658 0416

**Adey Ltd**. Cheltenham

Experis Limited

1st Floor St John’s House

Barrington Road

Altrincham

WA14 1JY

T: 0161 924 3900

**BAE Systems Ltd.** Warton

Morson

Darwen House   
37 Liverpool Road

Irlam   
M44 6EB

Manchester

Tel. 0161 7071516

**Aero Engine Controls Ltd.**  Hall Green, Birmingham.

Volt Europe Ltd  
Betchworth House

57-65 Station Road

Redhill

Surrey

RH1 1DL

Tel. 01737 774100

**Mira Showers Ltd.** Cheltenham.

JAM Recruitment Ltd  
Marsland House,

Marsland Road,

Sale, Cheshire

M33 3AQ

Tel. 0161 9057921

**Intelligent Energy Ltd.** Loughborough.

P-TEC Technical Recruitment Ltd  
Hopton Industrial Estate   
London Road   
Devizes

Wiltshire  
SN10 2EU

Tel. 0247 6608520

**Com Dev Ltd.** Aylesbury

James Joyce  
Human Resources Consultant

COM DEV Europe  
07811 955127