Biomedical engineering from a private industry perspective

Dr. Andrew Ward, Engineering Manager and Director, IntelliDesign

How I entered the bioengineering field

- 1975: Started MBBS at UQ. Left after one semester to take up a scholarship at Harvard College.
- 1979: AB *magna cum laude* Engineering Sciences, Harvard
- 1987: PhD Engineering Sciences, Harvard
- 1987: Resumed MBBS at UQ.
- 1989: While studying part-time, put together a proposal for a novel anaesthetic delivery machine and succeeded in obtaining funding from Cook Australia to support a small group to work on the project at the Royal Brisbane Hospital campus.
- 1990: Withdrew from MBBS to work full time for Cook designing embedded devices targeting vital signs monitoring, IVF procedures and laparoscopic surgery.

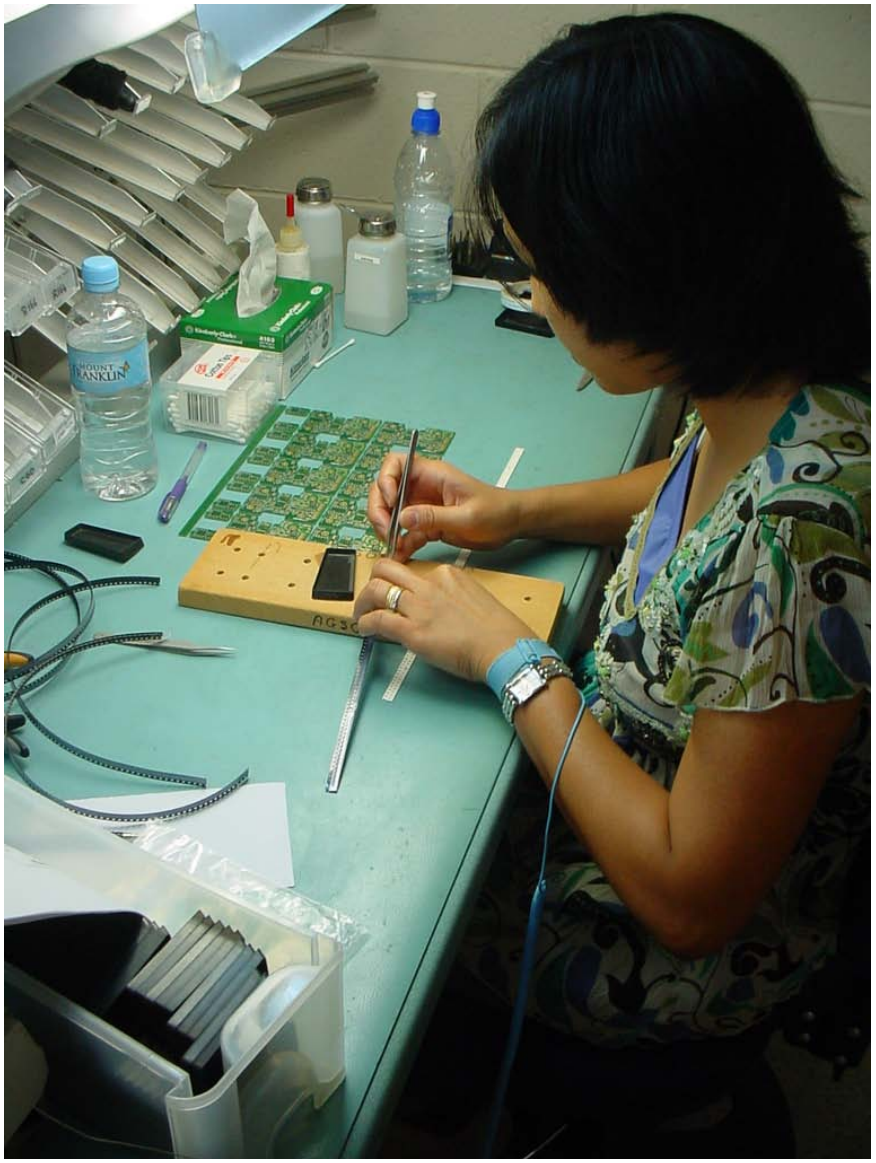
And how I left bioengineering…

- 1997: Started IntelliMed. First projects were a printer interface for MicroMedical's ECG monitor and a handheld ECG event recorder for use in cardiology suites.
- 1999: Cashflow imperatives forced us to broaden our focus. Our embedded PC/104 CPU card attracted the attention of Rio Tinto Aluminium and we were chosen to design the electronics for Rio's Australasian smelters.
- 2000: Moved to our present premises in Ashgrove.
- 2008-2009: Turnover approx. $5.5m with annual growth of around 20% per annum. 34 employees.

IntelliDesign: Who are we? What do we do?

- ISO9001 certified original equipment design and manufacture (ODM) company with:
  - 10 electronics engineers
  - 1 mechanical engineer
  - 4 industrial designers
  - 1 production engineer
  - 12 production staff
  - 6 administrative staff

- Manufacturing capability includes
  - PCB assembly
  - Cable and harness assembly
  - End-product assembly
  - Disposable tube set assembly
  - Testing and repair
  - Environmental testing




DIMA


BREEZE
DIMA
CODAN


ERSA


SPEEDLINE
MPM | ULTRAPRINT 100


NETGEAR

Intelli**Design Pty Ltd**

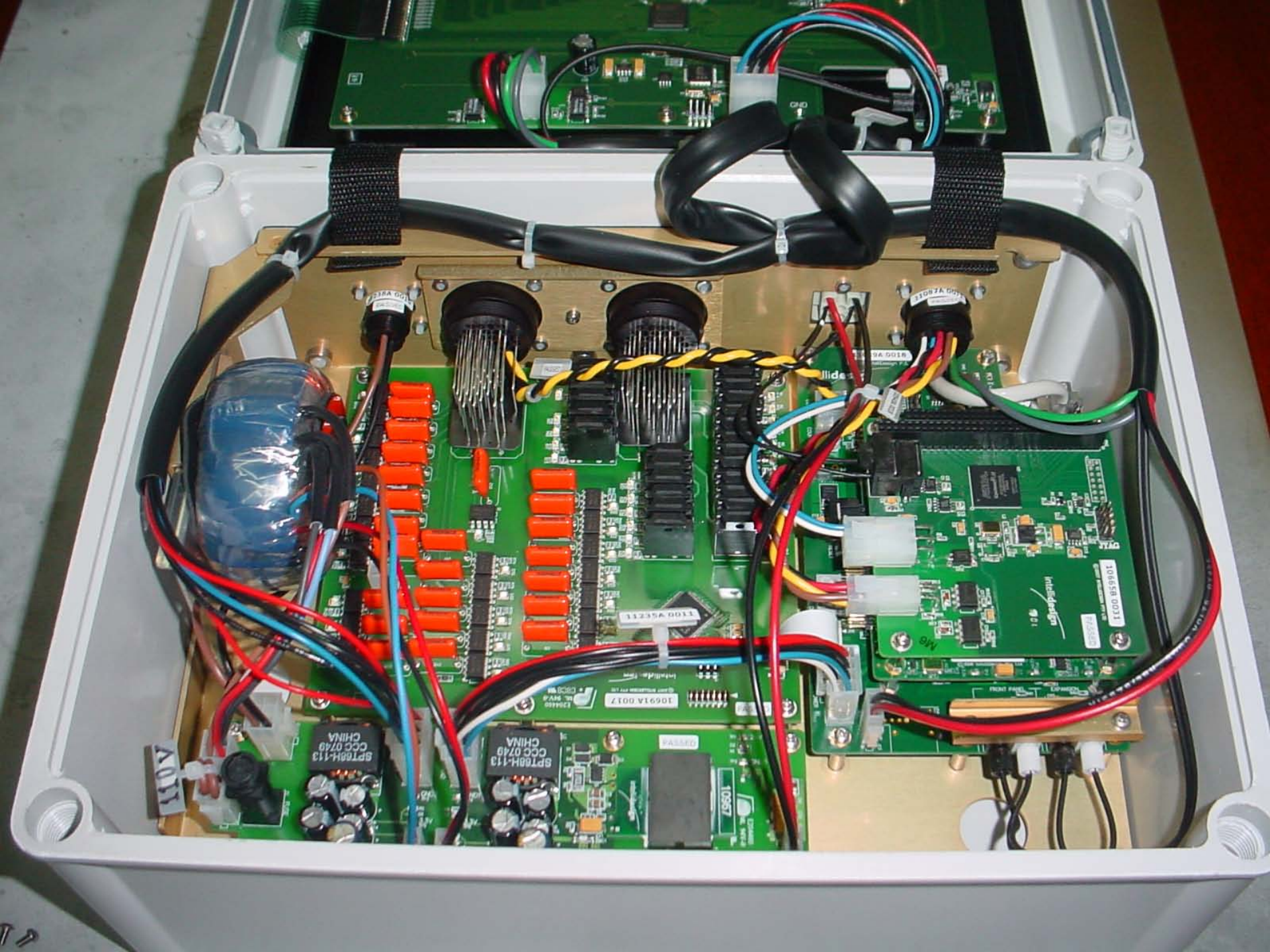
c-core PC/104 CPU module

- PC/104 CPU module
- 32-bit AMD Elan SC520
- 32Mb SDRAM
- Dual UARTs
- 16Mb NOR FLASH
- RTC
- Embedded BIOS

Rio Tinto Aluminium

Cell control unit


COMALCO
ComPASS CCU
HELP
EMERGENCY USE ONLY
FEED FL
FEED BATH
FEED TE
FEED TC
FEED DC
FEED DE
TAP
BEAM RAISE
MENU
LAMP TEST
STOP FEED
ENTER
ACK
MEASURE
ANODE SET
STATUS
OK WHEN FLASHING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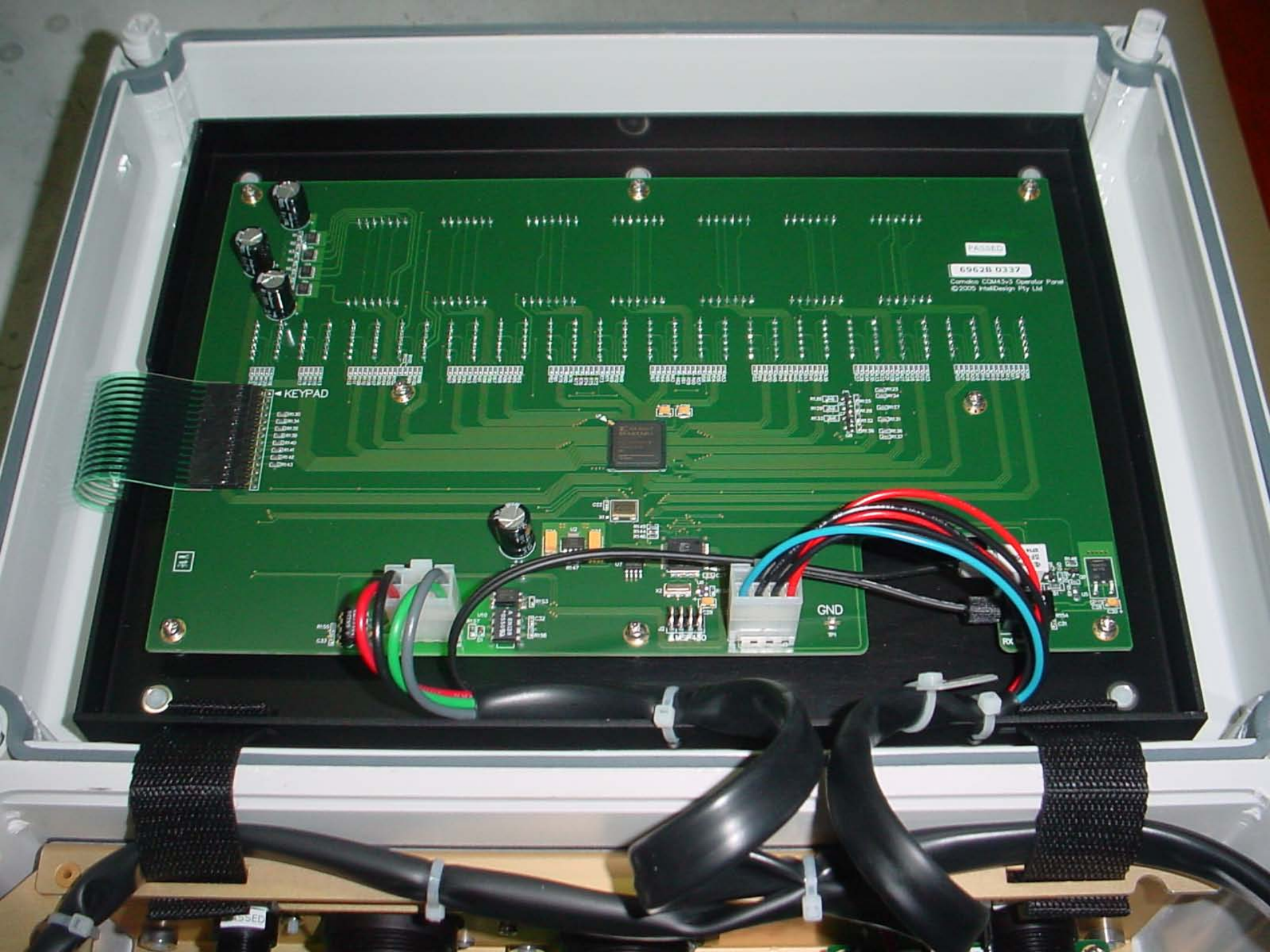
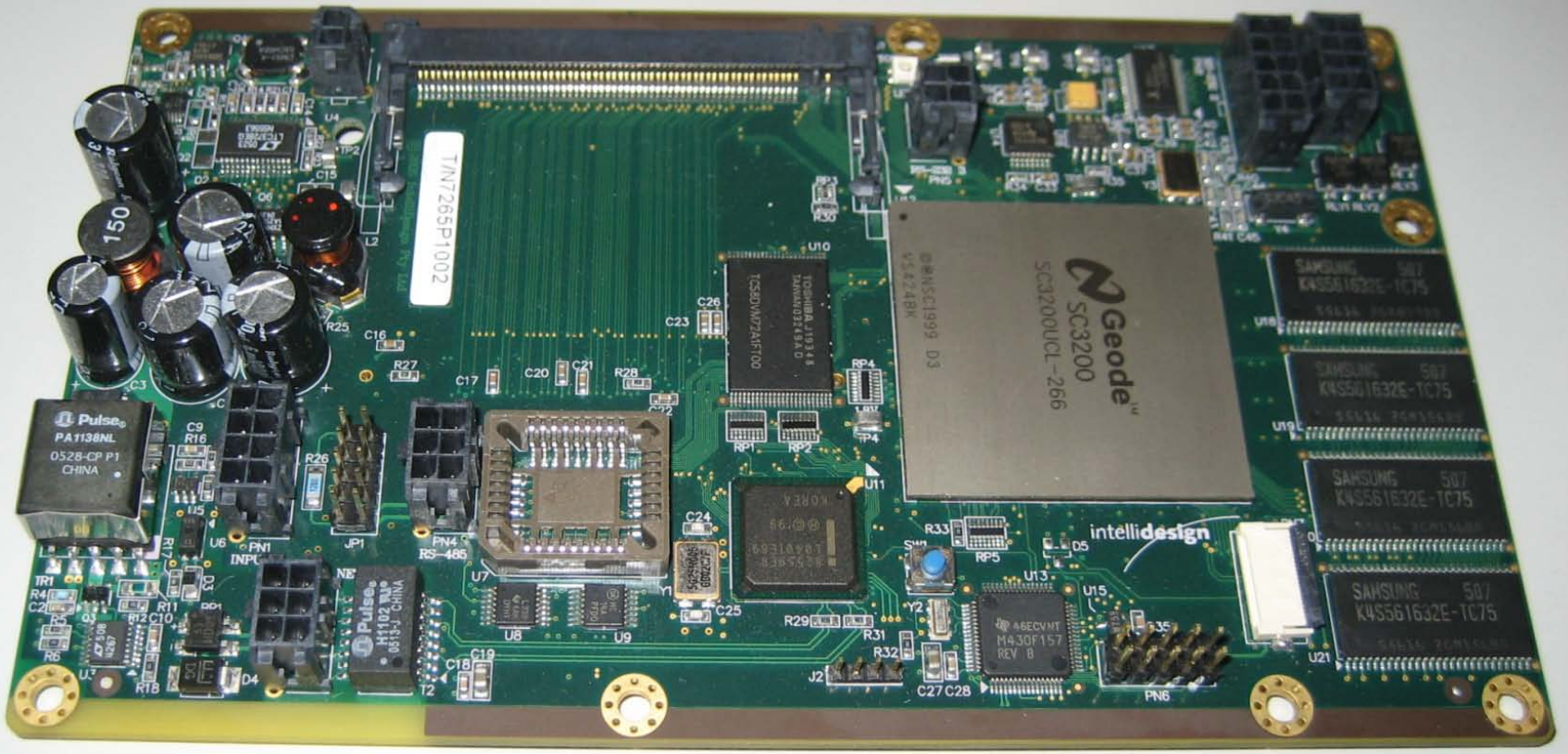
CHINA
10957

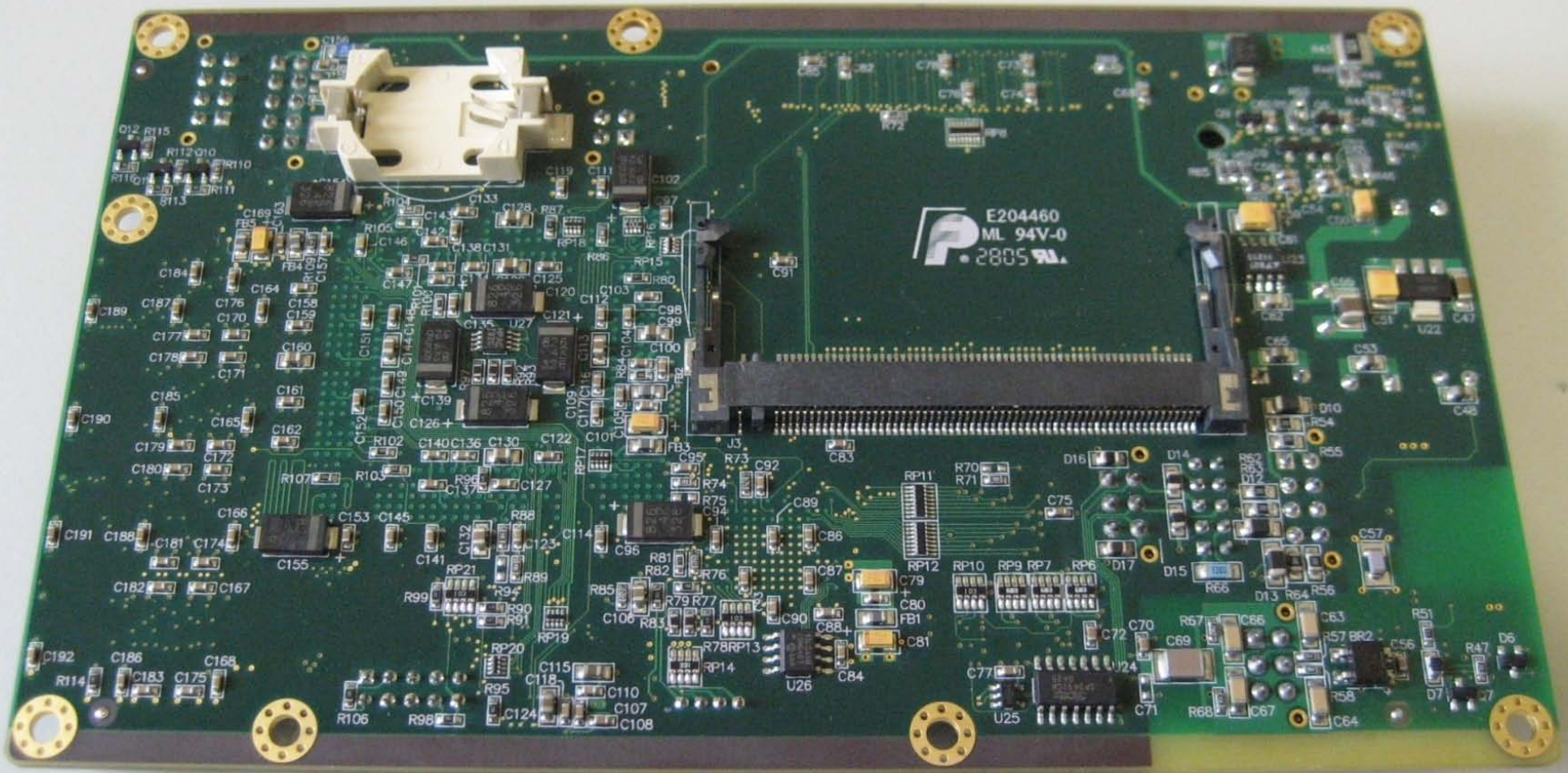

KEYPAD
GND


intellidesign
M6
10011A 0034

iVolve Pty Ltd

Nexis wireless router


Geode™
SC3200
SC3200UCL-266
intellidesign
Pulse
PA1138NL
0528-CP P1
CHINA
SAMSUNG
K4S561632E-TC75
A6ECVMT
M430F157
REV B

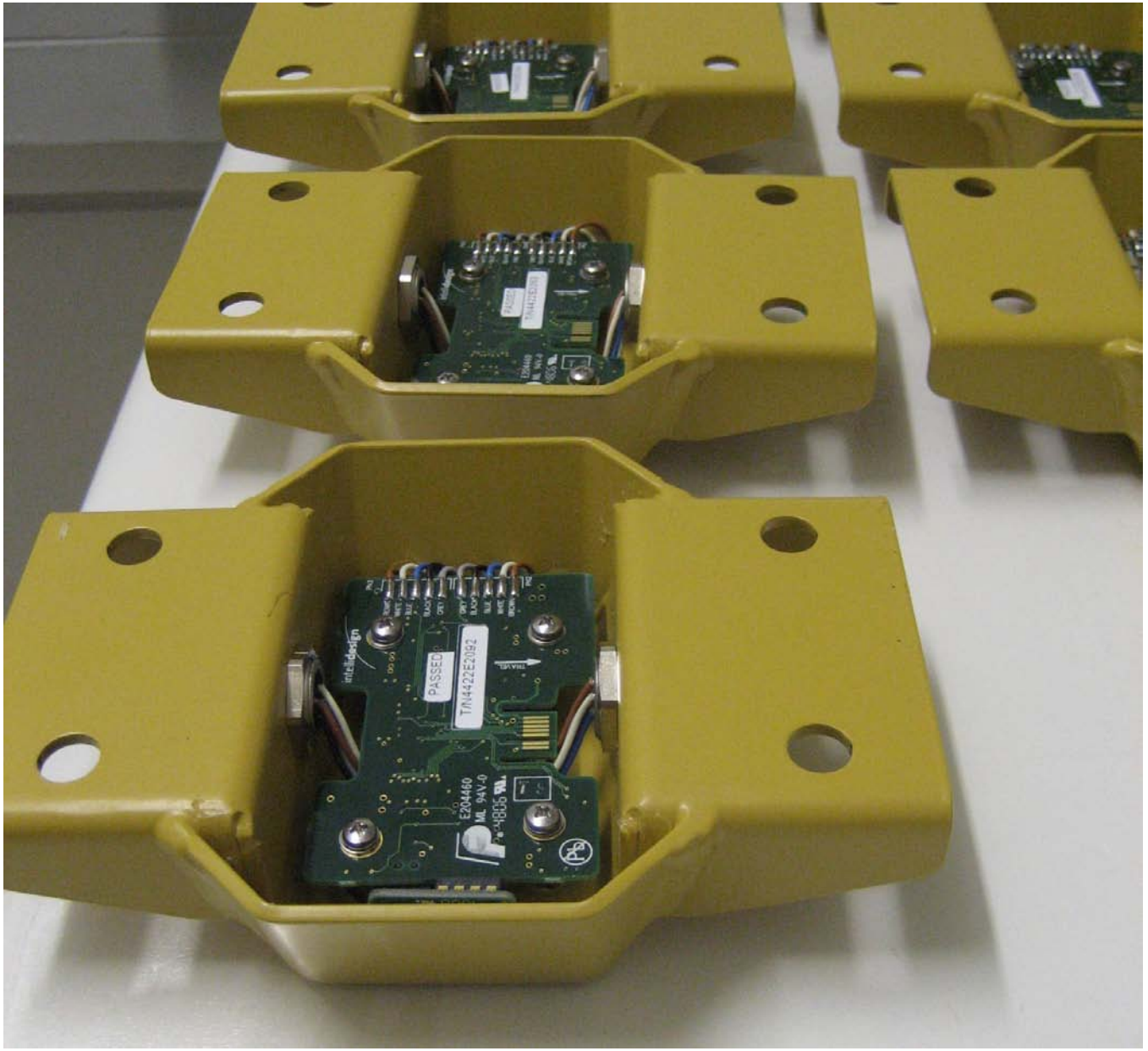

E204460
ML 94V-0
2805

Automated Positioning Systems Topcon

Two-axis precision tilt sensor


TS-1
TILT SENSOR
PART NUMBER
9174-0000
SERIAL
386-5849
Product of Australia


intellidesign
C22
C5
U5
R3
U8 C12
C16
C15
U9
U10
C18
FB1
C21
U12
C17
C14
X1
R7R8
C20
U13
PN5
C1
C3
R2
U2
R4R5
C10
U4
C2
D3
C4
D2
D1
R1
M1
U1
EMC1
T1
MCP2515
M430F147
REV S
8B6M000C

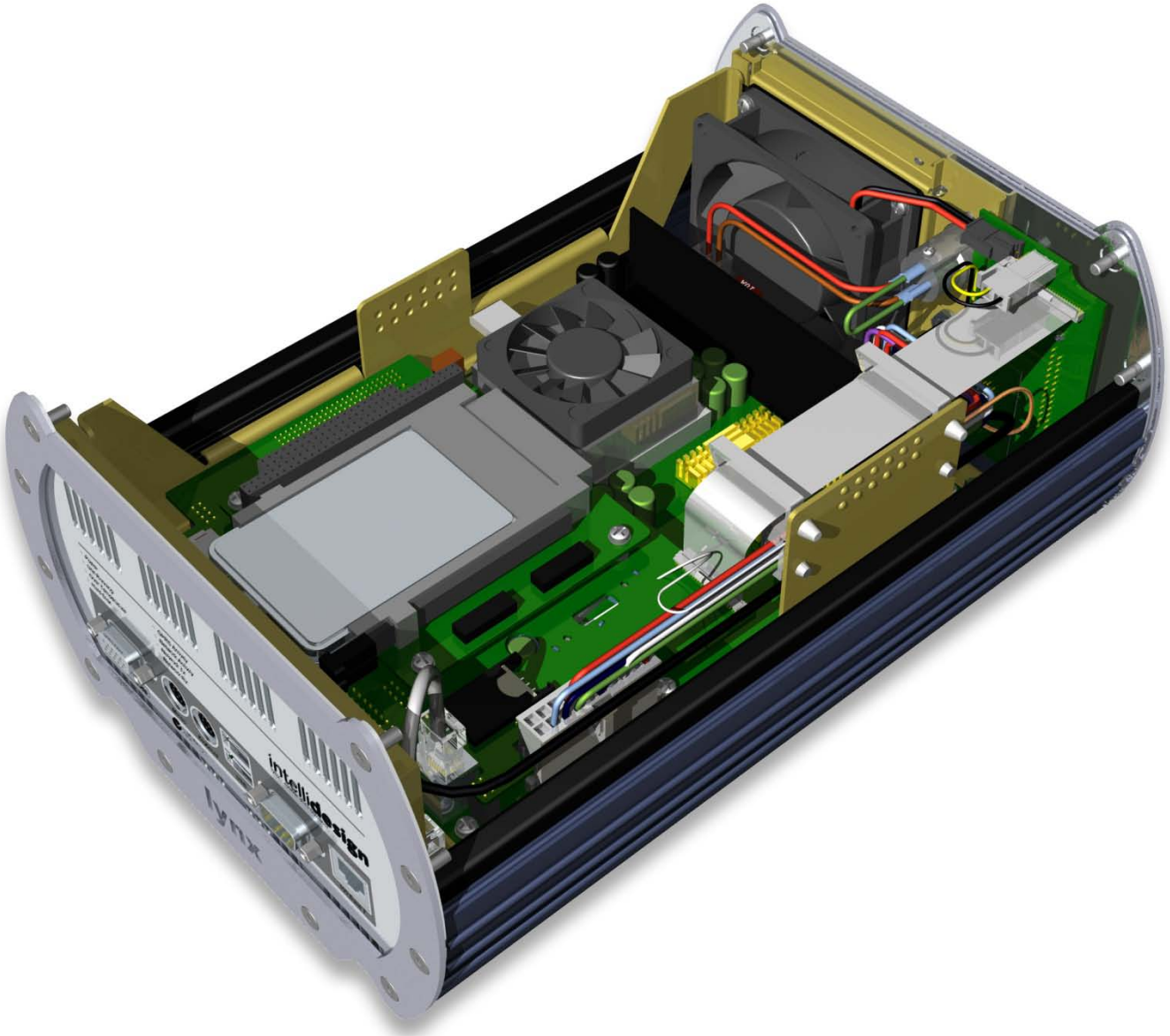

PASSED
E204460
94V-0

Queensland Transport
Queensland Police

Lynx mobile data unit


GOLF COURSE
Clubhouse
Driving Range
Practice Range
R.F.C.
Pitch
MASON DRIVE
HOUNSLOW
RICHMOND UPON THAMES
MORTLAKE HIGH ST
A3003
THE TERRACE
CHARLES ST
THORNE ST
ARCHWAY
WESTFIELDS
RAILWAY SIDE
BARNES HOSP
intellidesign


Power
Unit Running
Over Temperature
Hard Disk
GPRS Activity
Network Activity
Network Tx
Network Rx
intellidesign
CRT Monitor
Mouse
Keyboard
USB
Serial
10C Base T
lynx


intellidesign
lynx

Sigtec Pty Ltd

SmartBus Bus Driver Console

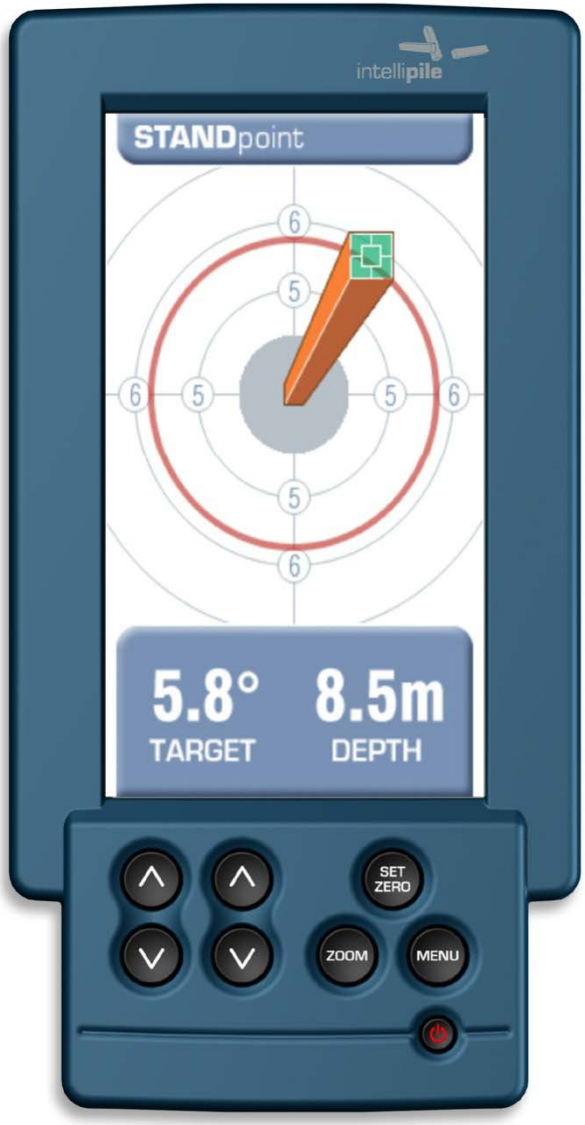

SMITH ST
DRIVER ID MODE

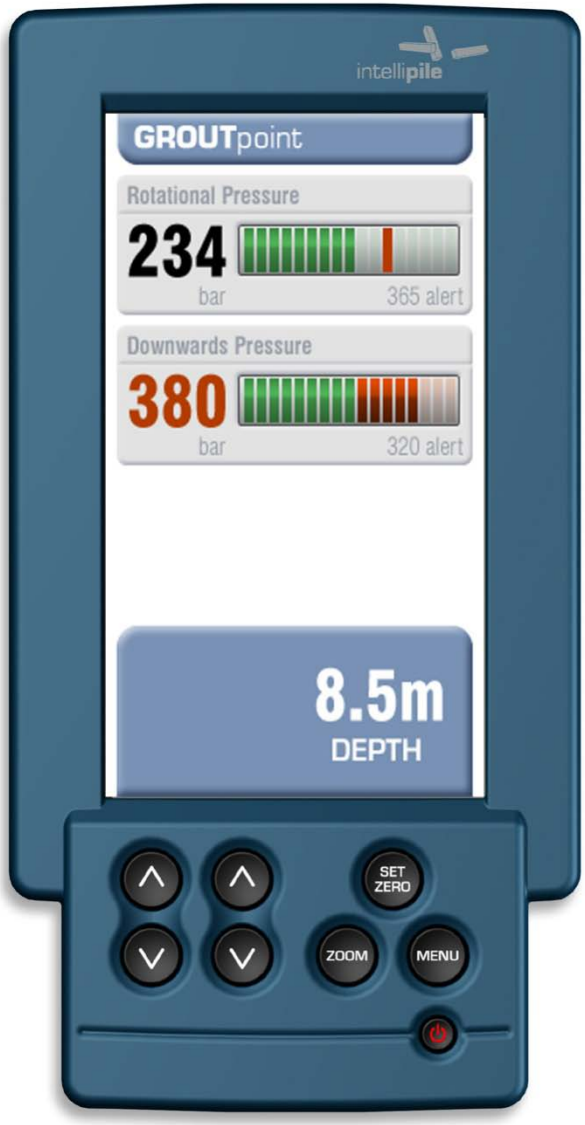

sigtec
DRIVERCONSOLE
Model
9500A
Serial
0668
Designed & Manufactured in Australia
by IntelliDesign Pty Ltd for Sigtec
1 +5~24V BN
2 Tx WH
3 GND BU
4 Rx BK
5 GND GN

Intelli**Design—StandPoint**


STANDpoint
intellipile
5.8°
TARGET
8.5m
DEPTH
ZOOM
SET ZERO
MENU
DEPTH SENSOR
intellipile
up
ANGLE SENSOR
intellipile


intellipile
SET ZERO
ZOOM
MENU

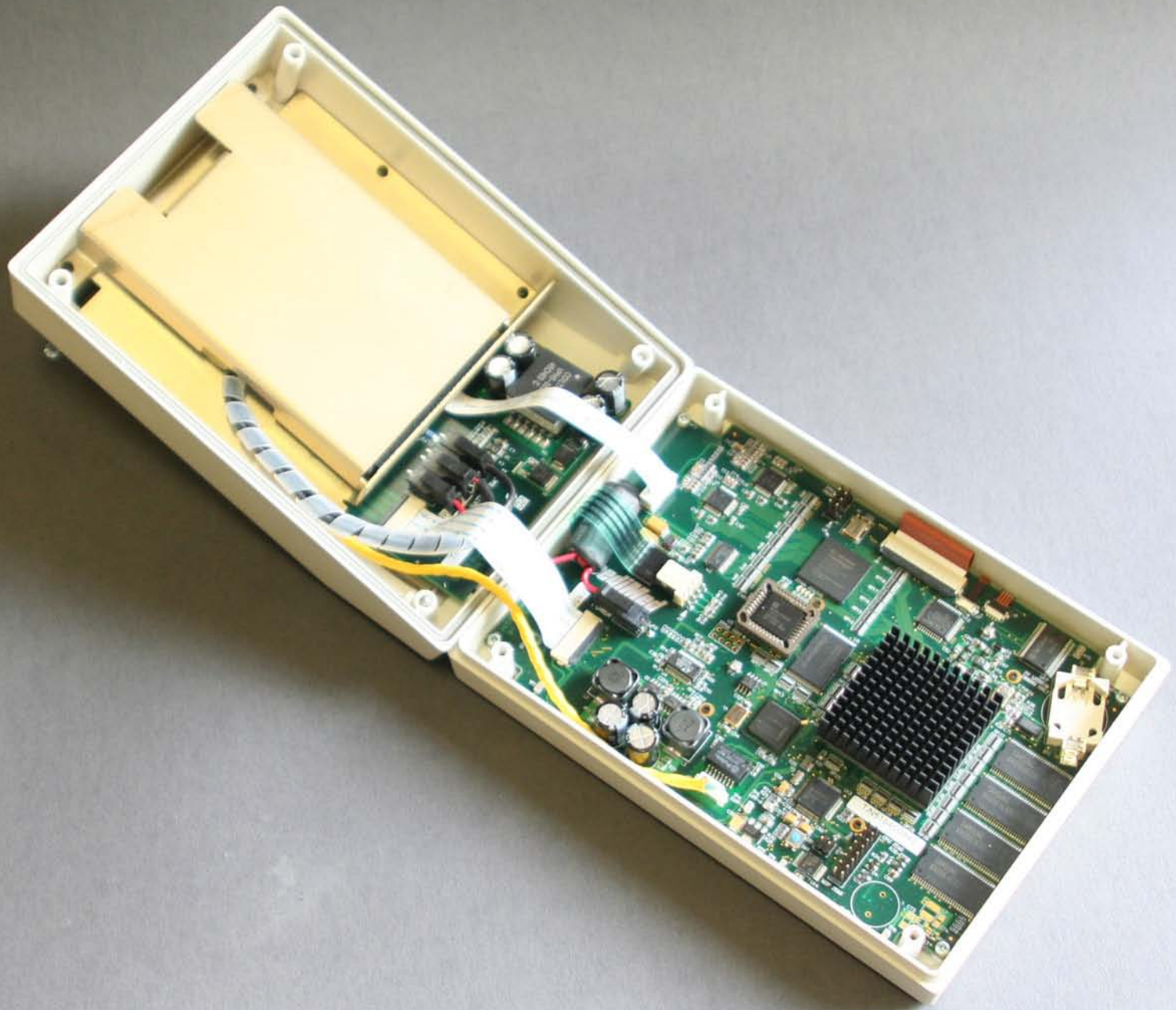

intellipile
STANDpoint
6
5
6
5
5
6
5
6
5.8°
TARGET
8.5m
DEPTH
SET ZERO
ZOOM
MENU


intellipile
GROUTpoint
Rotational Pressure
234
bar
365 alert
Downwards Pressure
380
bar
320 alert
8.5m
DEPTH
SET ZERO
ZOOM
MENU

Impedimed Pty Ltd

SFB7 bioimpedance analyzer


ImpediMed
Back
More...
Imp SFB7
Multi Frequency Body Composition Analysis

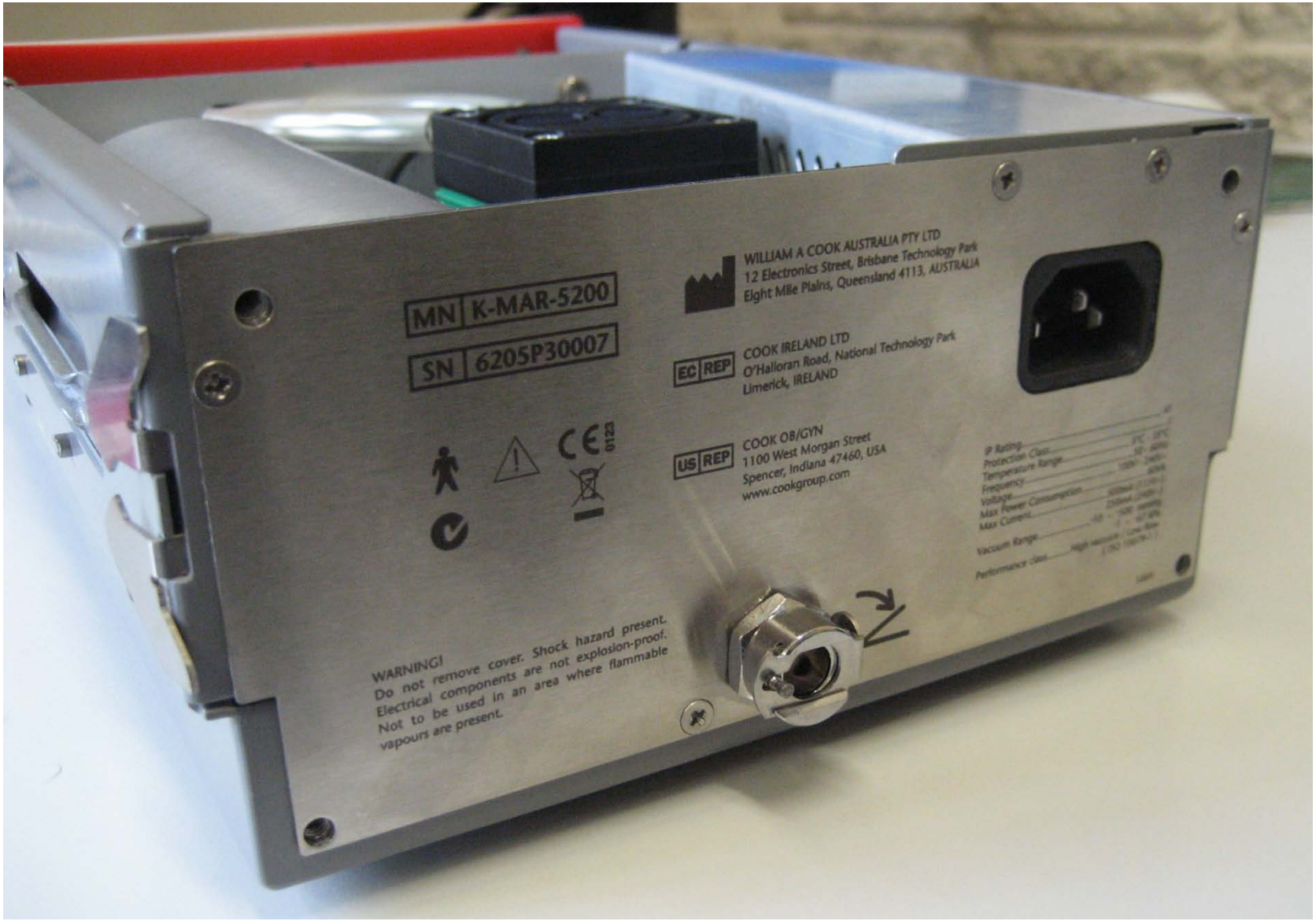


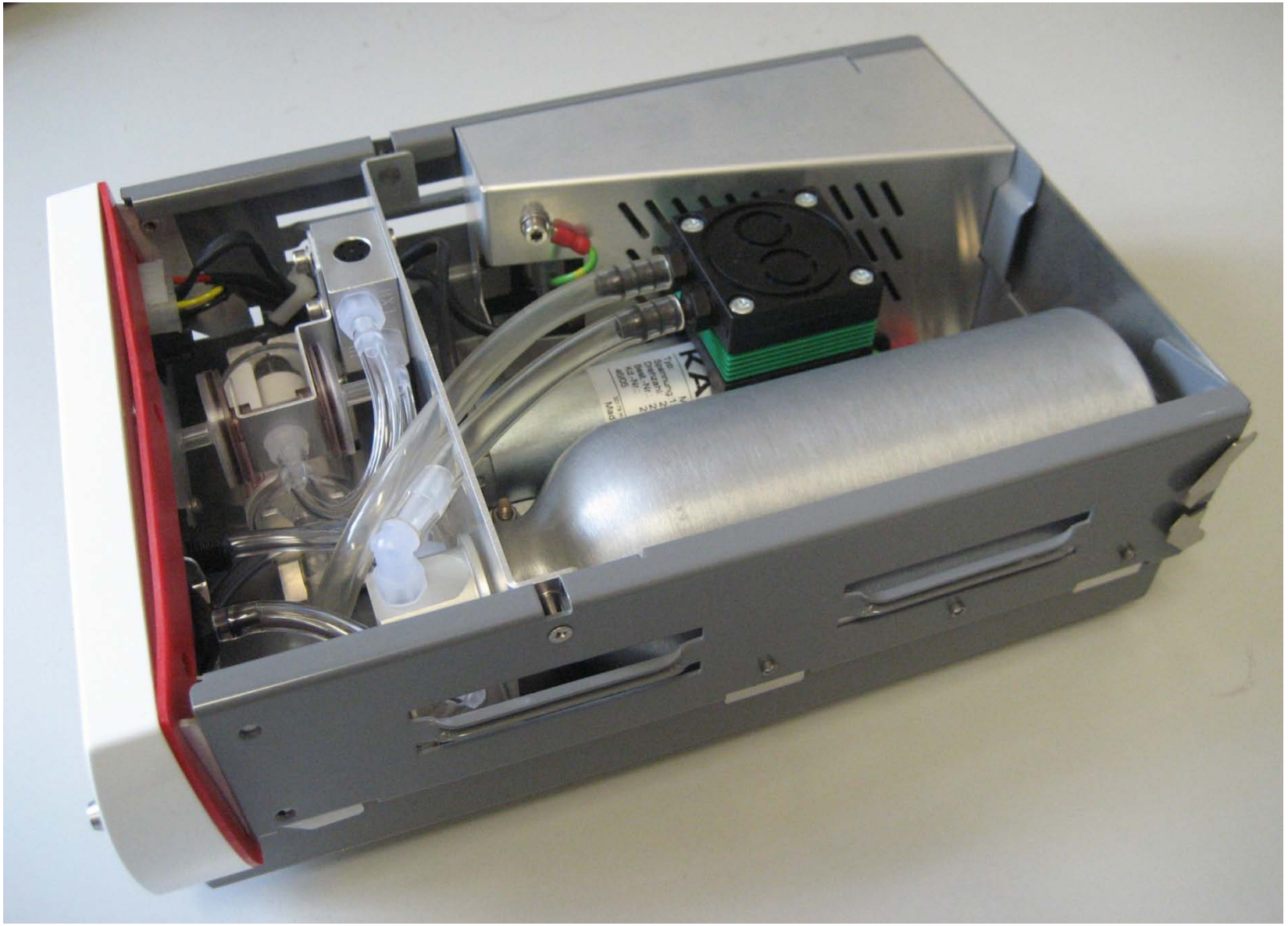
Cook Australia Pty Ltd

K-MAR-5200 vacuum pump


Serial Number
Model Number
K-MAR-5200
COOK
-359
mmHg
500mmHg

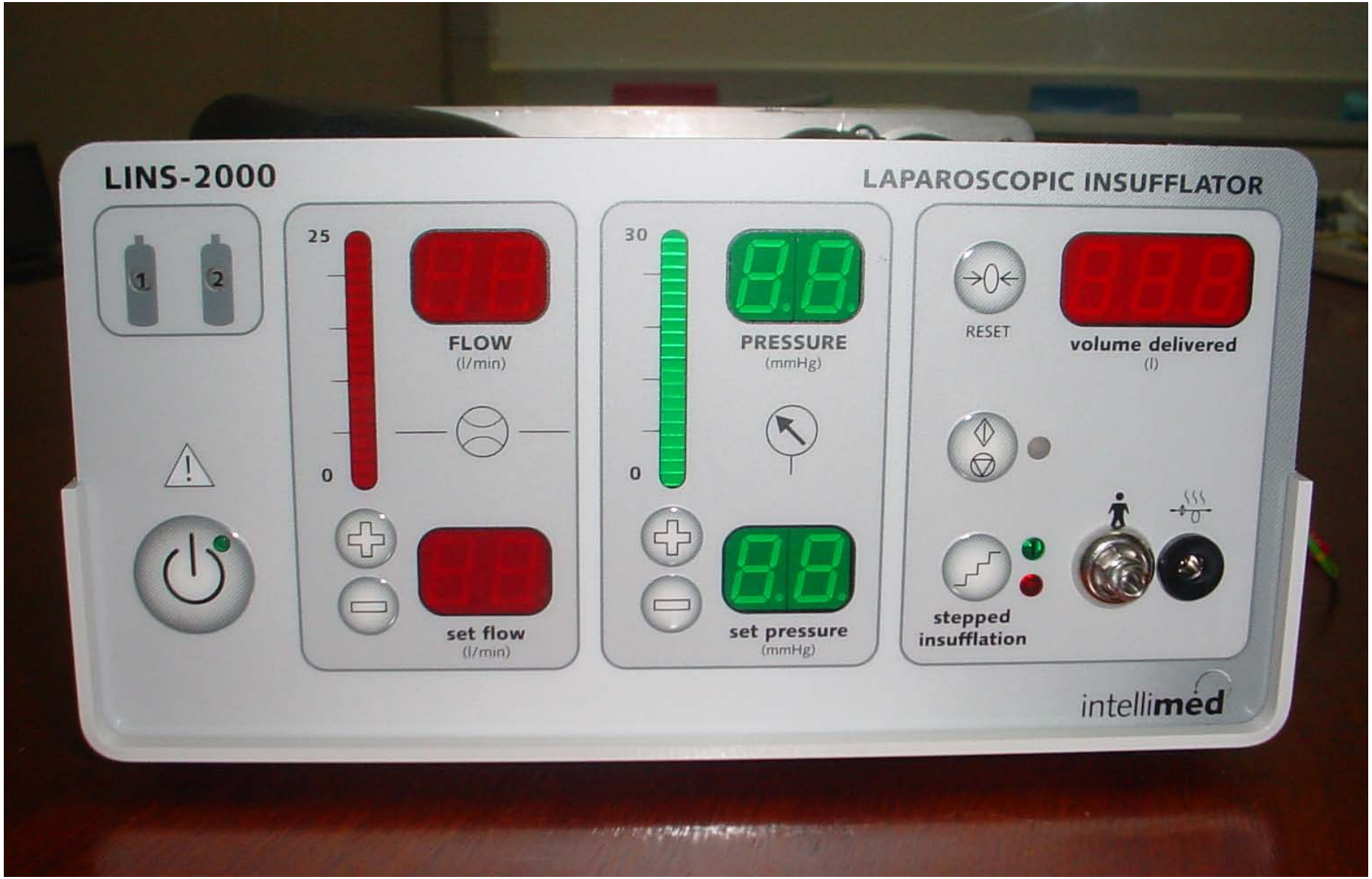

COOK
VACUUM PUMP
-10 – -500 mmHg
-1 – -67 kPa

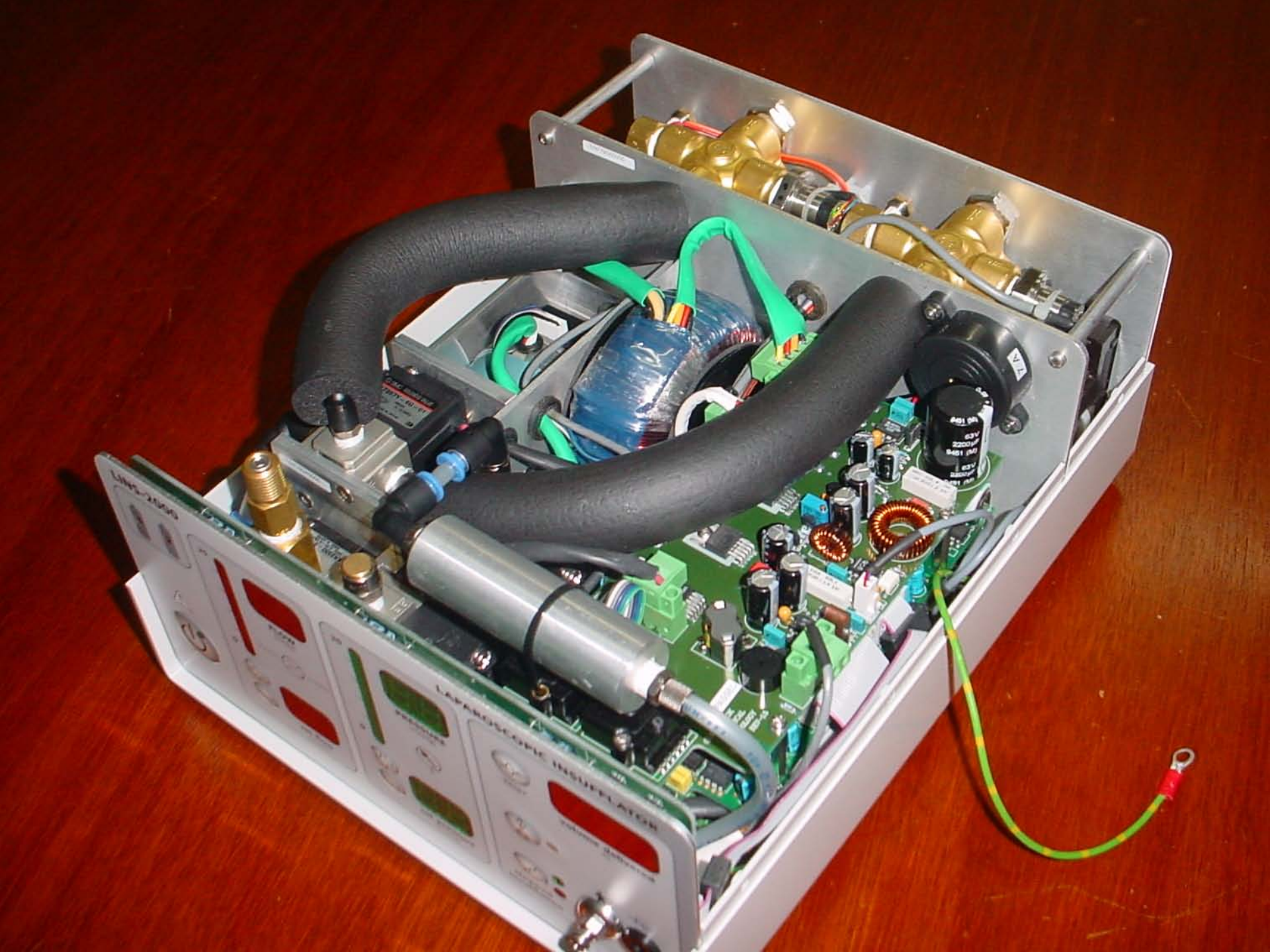

MN K-MAR-5200
SN 6205P30007
WILLIAM A COOK AUSTRALIA PTY LTD
12 Electronics Street, Brisbane Technology Park
Eight Mile Plains, Queensland 4113, AUSTRALIA
EC REP
COOK IRELAND LTD
O'Halloran Road, National Technology Park
Limerick, IRELAND
US REP
COOK OB/GYN
1100 West Morgan Street
Spencer, Indiana 47460, USA
www.cookgroup.com
CE 0123
WARNING!
Do not remove cover. Shock hazard present.
Electrical components are not explosion-proof.
Not to be used in an area where flammable
vapours are present.



IntelliMed Pty Ltd

Laparoscopic insufflator

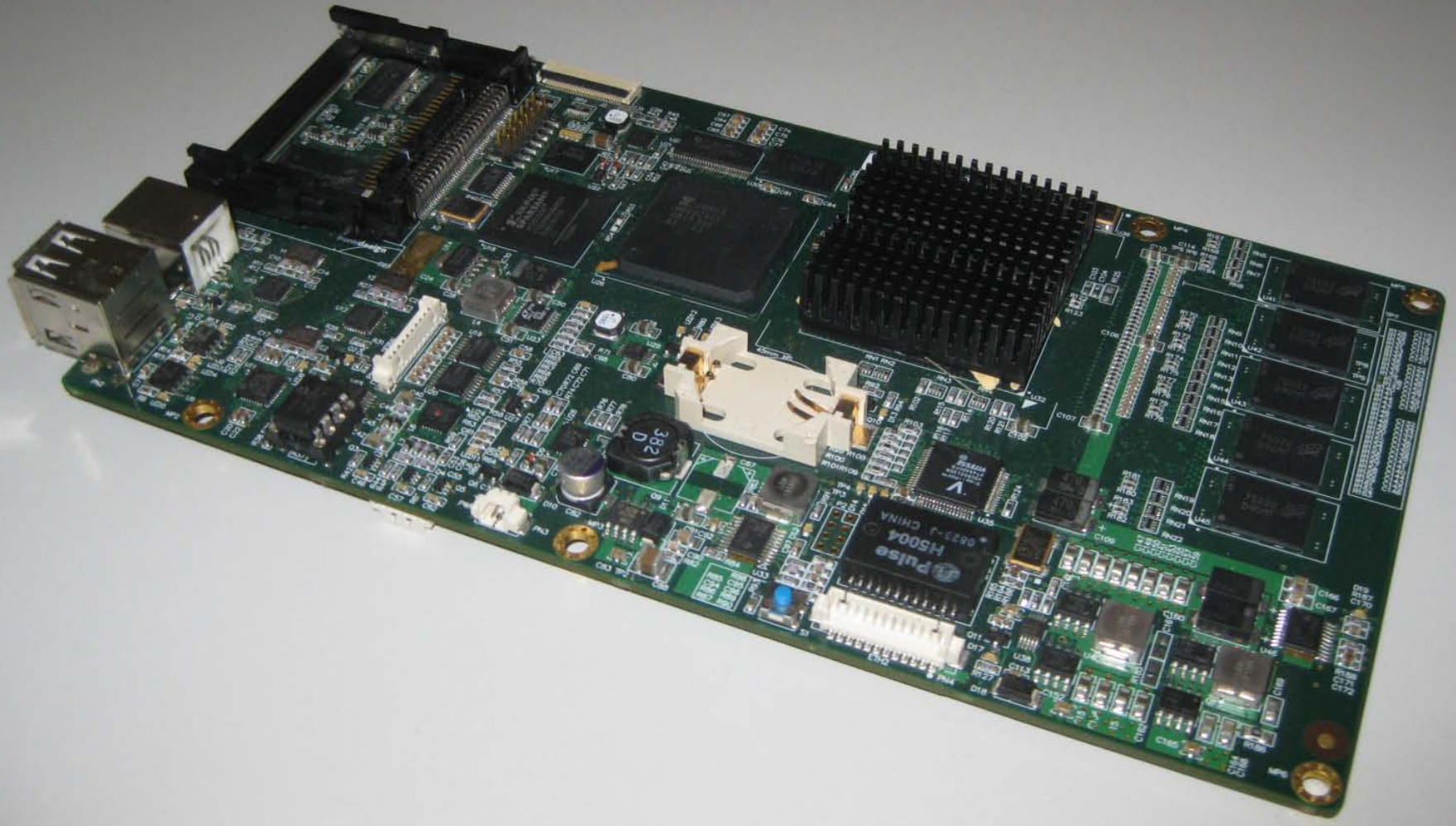

LINS-2000
LAPAROSCOPIC INSUFFLATOR
1
2
25
0
FLOW
(l/min)
set flow
(l/min)
30
0
PRESSURE
(mmHg)
set pressure
(mmHg)
RESET
volume delivered
(l)
stepped
insufflation
intellimed

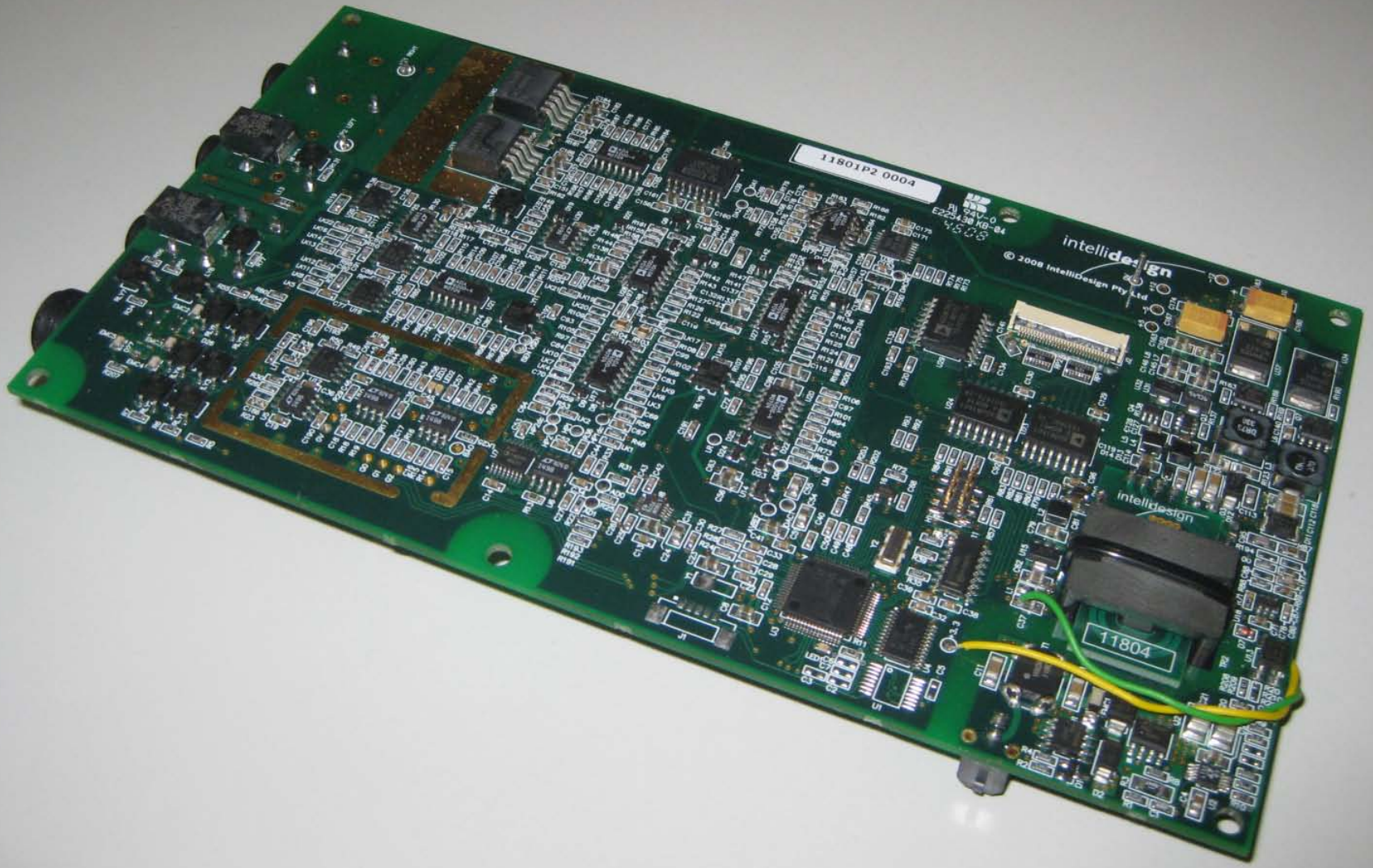

LAPAROSCOPIC INSUFFLATOR

Ausonex Pty Ltd

Auditory Brainstem Response Audiometer


ausonex


Pulse
H5004
CHINA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intellidesign
© 2008 IntelliDesign Pty Ltd
intellidesign
11804

IntelliDesign in 2009

- Medical devices account for 10–15% of our business.
- We are working to establish a subsidiary company, IntelliMed, with an ISO 13485 quality system in place.
- IntelliMed will specify and market new medical devices, using IntelliDesign as a designer and a manufacturer. This approach has been taken to avoid complicating IntelliDesign's non-medical activities with ISO 13485 quality management system compliance requirements.

IntelliDesign in 2009

- IntelliMed's first product is a new laparascopic insufflator, loosely based on Cook's original device, the design of which we have licensed.

- We are currently conducting a literature review centered around laparoscopic insufflator technology using a bioengineer/medical student.

Reflections on where we are going…

- To survive, we have strayed a long way from our original mission.
- We have mastered a range of core technologies (electronics, industrial design, production, quality management) which will allow us to successfully tackle sophisticated medical devices.
- We are no longer at the bioengineering coalface. This means adopting one of the following models in order to grow:
  - Contract development (our present model);
  - Work with clinical partners to fund/develop new technologies;
  - Start with low-risk devices and establish a customer base to provide feedback and new product ideas (the Cook model).

…and on the role of bioengineers

- As we shift from contract development to in-house product development, we will begin to employ bioengineers.

- Primary roles will be:
  - regulatory compliance activities;
  - product verification and validation;
  - clinical support;
  - new product development in conjunction with IntelliDesign R&D staff.

Things to keep in mind when speaking with prospective employers

- Key competencies:
  - Ability to recognise and develop potential clinical applications;
  - Understanding of quality systems and in particular ISO 13485;
  - Ability to read and understand clinical literature;
  - Broad familiarity with sensor technologies;
  - Broad exposure to electronics and embedded firmware.

- Common perceptions:
  - Lack of depth in electronics and firmware design;
  - Difficult to fully engage a bioengineer’s broad interests.