



BELLINGER INSTRUMENTS PTY LTD.

DESIGN, DEVELOPMENT, CALIBRATION, REPAIR, OVERHAUL, MAINTENANCE...

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Capabilities

System design, manufacture and installation

Repair & Overhaul, Calibration, Measurement & Testing

Introduction

This information will seek to provide a basic understanding of the scope of work able to be performed by Bellinger Instruments P/L.

By no means is this a complete listing.

Company Profile

A high technology company that has been delivering professional services to the defence industry for over 37 years, this Australian organisation specialises in the provision of resources to meet any challenge. The significant investment in design, manufacture, repair, overhaul and calibration facilities results in a world class level of capabilities in a variety of fields. Design and Development of various electronic and communications projects is ongoing and we are currently leaders in the field of maritime Link16 design and integration.

Extensive experience to both systems and component level enables us to deliver a complete solution to the client with workshop and field resources available to ensure an exemplary level of service. Certification of works to a variety of standards is offered with extensive ISO9001 and CASA registrations held. Active participation in business and regulatory bodies ensures a current view of industry expectations.

Bellinger Instruments is able to provide a total solution to our clients needs.

Quality Accreditation

Bellinger Instruments Pty Ltd. has been accredited to quality assurance level **AS/NZS ISO 9001** by NCS International, and previously by Defence Quality Assurance Organisation since September 1988.

Bellinger Instruments Pty Ltd offers traceable calibration, dc to 40GHz in accordance with ISO/IEC 17025.

Bellinger Instruments Pty Ltd. holds a **Civil Aviation Safety Authority (CASA)**, certificate of approval for the overhaul of: aircraft instruments, power generation systems, gyroscopes and all radio and radar systems and indicators.

DESIGN AND MANUFACTURE.

Bellinger have the capabilities to design and manufacture both complete systems and system components. These capabilities primarily cover the fields of Command, Control, Communications and Computing. Recent projects have involved the design and integration of Wide Area Differential GPS systems and interfacing for the Naval survey vessels and Mine hunters. Bellinger have also designed, installed and tested a Link 16 system onboard HMAS ANZAC and a development system in the SAAB test site in Adelaide. These systems not only give LINK16 Situational awareness, but allow for Link16 tracks to be forwarded to the Link 11 net and interface with the ship's C2 system.

A specialised information storage system has also been developed allowing not only time, but also GPS position, receiver configuration, user data, and other serial or Ethernet data to be stored on the voice tracks of a wideband tape or digital media recorder. This allows unprecedented evaluation capability for post mission analysis.

Design and manufacture are completed In-house including PCB design, AutoCAD work and prototyping.

REPAIR CAPABILITIES

Assessment of Ability to Supply

Bellinger Instruments Pty Ltd. ability to supply is best demonstrated by the fact that we have been successful in repairing, overhauling and calibrating many and varied items for the Defence Dept and establishments and in fact have rarely been unable to repair any item due to lack of technical ability or testing facilities.

As an example of our expertise, a non-definitive list of our testing capabilities and, current and previous work for the Defence Dept, follows:

- AC Current supply and measurement to 10,000A, 45 - 500Hz.
- AC Power Supply available on premises, 72 KVA, 45 Hz - 500Hz, 3-phase Delta or Wye and single phase, 0 - 480 V continuously variable.
- Accelerometers.
- Actuators, electrical, hydraulic and pneumatic.
- Air data test sets/calibrators/sensors.
- Anemometers.
- Antennas including: Radar, Communications, Countermeasures, Direction Finding, HF, VHF, UHF and IFF.
- Automatic Voltage Regulators.
- Autopilots.
- Barometers.

- Computers including: Fire Control & Sonar, both digital & analog.
- Communications switches. Red and Black. In particular DRS Shincom 3100 switch. Bellinger are the sole in country support agents for this equipment.
- DC Current supply and measurement to 1,000A.
- Diver Communications including: Diver to Diver and Diver to Ship.
- Dynamic Balancing.
- Electronic Countermeasure Systems including AN/SLQ-32.
- Engine Control and Monitoring Systems.
- Fire Control Systems including gun and missile.
- Flight Director Systems.
- Flow Measurement: Water and Air.
- Ground Support Equipment.
- Gyros including: Rate, Displacement, Stabilizing, Vertical, Directional and Azimuth.
(Clean room on premises)
- IFF Systems including: AN/APX-72 and AN/UPM-137.
- Infra Red, NVG and Light Enhancement equipment.
- Internal Communication Systems including: Public Address, Intercom, and Emergency Broadcast.
- Lighting including: NVIS, Floodlights, Emergency lights, Signaling lamps and Divers lights.
- Link 11 & Link16 systems design, integration and maintenance.
- Microwave Surveillance Receivers including: Falcon RX740 Series.
NB. Bellinger Instruments P/L is the sole Australian Agent for **Synectic Systems** (formerly **Falcon Equipment and Systems Ltd.**); in-country support and training courses are available.
www.synecticsystems.com
- Motors, small to medium sized, including: Servomotors AC & DC, Motor generators, Tacho generators, Stepper Motors, and Amplidyne.(In-house balancing of small to medium sized rotating parts)
- NVG & NVIS conversions. Sole in-country sales design and support for **Consolite Technology Limited**.www.consolite.co.uk

-Oxygen gauges.

-Pitot Static systems.

-Power Supplies and Converters including: Radar Power supplies to 40 kV, Battery Chargers, DC to Single and Three Phase Inverters and Solid State Power Supplies. (Many solid state inverting power supplies repaired when no schematics etc held)

-Phase noise measurement to 40GHz.

-Pressure Gauges and Transducers. (from 0 psia to 10,000 psig)

-Radar Systems and modules.

-Recording Systems: Wide Band, Flight, Instrumentation, Analog, Digital, MIL-1553, SIGINT, CEPT1 & 2 & etc. **NB.** Bellinger Instruments P/L is the authorised Australian Service Agent for **Sypris Data Systems Inc.** previously **Metrum-Datatape Inc.**; in-country support is available for all products and training courses are available for DTR-6, DTR-8 & 8E & MARS-II Recorders.

-RF Communication Systems including: HF, VHF, UHF and SATCOM. Also MiniDAMA, WSK-3 and URT-23. Spectrum, Vector, Power, Frequency and Phase Noise measurement is available to 40GHz.

-UHF Multicouplers including RF Products 800525 multicouplers. Bellinger are the sole Australian support agents for RF Products.

-Satellite Navigation Systems.

-Sensors including: Vibration, Temperature, Pressure, Icing, Waterflow, Airflow, Humidity, Rotational Speed, Infrared and Light.

-Ship Logs including: FFG & DDG Log Probes, Submarine Log Probes, MK6 Log and EM Logs and repeaters.

-Sonar Systems and modules including: Mulloka, AN/SQS-56, AN/UQN-4, AN/BQG and Side Scan Sonar.

-Submarine fitted equipment eg. Inverters, Sonars, Displays, Valves, Actuators, Servos, EM Logs & probes.

-Synchros including: CT, CDX, TX, TDX, TR, Resolvers and Repeaters.

-Tacan including: Test Sets and Simulators, ILS and VOR.

-Test Equipment

-Torpedo Countermeasures including: 182 Towed Decoy & AN/SLQ-25.

-TV Cameras and Monitors including: Director Aim and Gun Barrel Cameras.

- Valves and regulators including: Air, Hydraulic, Water, Fuel; Manual and Solenoid operated.
- Water Pressure Testing to 700 psi for external to hull Submarine equipment.
- Waveguide repair including: all bands and Rotating Joints.
- Weatherfaxes including: Taiyo fax.

Security

Bellinger Instruments Pty Ltd. has been cleared for security sensitive work to “Secret” level.

Type of Service Offered

Bellinger Instruments Pty Ltd. offers a design, manufacture, Integration service for communications systems, Tactical Data links, NVG systems and general C2 components as well as a repair, overhaul, testing and calibration service for the majority of systems and test equipment used by the Department of Defence and related industries.

In-country support, including operator and maintenance training courses, is offered for the products of Sypris Data Systems (USA), Falcon Equipment and Systems Ltd. of the UK, Consolite Technologies UK, DRS-C (USA) and RF Products USA.

For further information please feel free to contact

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please visit us at www.bellinger.com.au.

MEASUREMENT and CALIBRATION CAPABILITIES

NB. All calibrations are directly traceable to NMI standards.

ELECTRICAL MEASUREMENTS

1. VOLTAGE

1.1 AC VOLTAGE

1.1.1 SUPPLY

10 μ V to 1 mV @ 40 Hz to 10 kHz
1 mV to 19.9999 V @ 50 Hz to 50 kHz
20 V to 110 V @ 50 Hz to 20 kHz
110 V to 1100 V @ 50 Hz to 1 kHz
300 μ V to 3 V @ 10 Hz to 100 MHz

1.1.2 MEASURE

1mV to 500mV @ 10Hz to 1MHz
250mV to 10V @ 5Hz to 10MHz
10V to 50V @ 5Hz to 500KHz
50V to 1000V @ 5Hz to 100KHz
0.2V to 3V @ 100KHz to 100MHz
1000V to 20kV @ 50Hz to 5KHz

1.2 DC VOLTAGE

1.2.1 SUPPLY

1 and 10 V DC Reference Standards.
1 Microvolt to 1100 Volt D.C.
0 to 40kV

1.2.2 MEASURE

1 μ V to 40kV

2 CURRENT

2.1 AC CURRENT

2.1.1 SUPPLY

10 μ A to 19.999A @ 50Hz to 5KHz
20A to 10,000A @ 40Hz to 500Hz

2.1.2 MEASURE

10 μ A to 19.999A @ 10Hz to 10KHz
20A to 1,000A @ 40Hz to 400Hz
1000A to 10,000A @ 50Hz to 60Hz

2.2 DC CURRENT

7.1 SIGNAL SOURCES

7.1.1 FREQUENCY DRIFT

<2 Part in 10^{12} Per Day

7.1.2 OUTPUT CHARACTERISTICS

1 μ V to 1 V @ 20KHz to 100MHz
20 mV to 3 V @ 1 MHz to 100MHz
10 pW to 100 mW @ 100KHz to 40 GHz

7.1.3 MODULATION CHARACTERISTICS

PULSE: 100 kHz to 40 GHz
AM: 100 kHz to 40 GHz
FM: 150 kHz to 40 GHz
PHASE MOD: 150 kHz to 40 GHz

7.1.4 SPECTRAL PURITY

SSB Phase Noise down to -170 dBc/Hz
@ 1 MHz to 40 GHz
Distortion 20KHz to 40 GHz

7.2 POWER

7.2.1 MEASUREMENT

Up to 2.5KW @ 1MHz to 40MHz
Up to 1KW @ 40MHz to 1GHz
Up to 50W @ 1GHz to 18GHz
-70 dBm to + 20 dBm @ 1GHz to 50GHz

7.2.2 SUPPLY

Up to 200 Watts @ 10 kHz to 1000 MHz
Up to 1100 Watts @ 2 MHz to 30 MHz
Up to 1 Watt @ 1 GHz to 20 GHz
Up to 0.5 Watts @ 20 GHz to 26 GHz
Up to 100mW @ 26 GHz to 50 GHz

7.3 ATTENUATION

0 to 110 dB @ DC to 26.5 GHz in 0.005 dB steps
0 to 70 dB @ 26.5 GHz to 40 GHz.

7.4 VSWR

- 7.4.1 **COAXIAL**
100 kHz to 40 GHz (SMA, Type N, APC 3.5,
APC 7, 2.4mm and 2.92mm)
- 7.4.2 **WAVEGUIDE**
3.95 GHz to 5.85 GHz
7.05 GHz to 10.0 GHz
8.6 GHz to 12.4 GHz
12.4 GHz to 18.0 GHz
18 GHz to 26.5 GHz
- 7.5 **PHASE DIFFERENCE**
20 Hz to 1000 MHz
- 7.6 **WAVEFORM MEASURING INSTRUMENTS**
Instruments can be calibrated for their
FREQUENCY, INPUT, TIMING and SWEEP
characteristics.
- 7.7 **RADIATION CHARACTERISTICS**
Radiation monitoring probes
1.7 GHz to 40 GHz
8. **AUDIO FREQUENCY**
- 8.1 **LEVEL MEASUREMENT**
300 μ V to 100 V rms
-92 dB to +42 dB @ 10 Hz to 150 kHz
- 8.2 **WOW and FLUTTER MEASUREMENT**
0.03% to 10% FSD @ 3150 and 3000 Hz
Input level range 50 mV to 5 V rms
- 8.3 **DISTORTION MEASUREMENT**
0.03 to 100 %
At 20 Hz to 30 kHz
- 8.4 **POWER**
1 nW to 1kW @ 10 Hz to 150 kHz
- 8.5 **PHASE MEASUREMENT**
 \pm 180 degrees
- 8.6 **RUMBLE**
-92 dB to +42 dB

PHYSICAL MEASUREMENTS

9 **PRESSURE**

9.1 **LOW AND HIGH PRESSURE**

0.2Pa abs to 70,000KPa

9.2 **SOUND PRESSURE (ACOUSTICS)**

Calibration of Microphones and sound level meters using a standard Pistonphone.

Sound Pressure level produced at nominal ambient pressure of 1013 mbar:

124.0 dB re. 2×10^{-5} Pa
Frequency : 250 Hz

10 **TEMPERATURE AND HUMIDITY**

10.1 **TEMPERATURE**

10.1.1 **THERMOMETRY, SUPPLY AND MEASURE**

-70°C to 200°C

10.1.2 **PYROMETRY, SUPPLY & MEASURE**

-20°C to 1,200°C

10.2 **HUMIDITY**

0 to 100%RH

11 **WEIGHT**

To 75Kg

12 **LENGTH**

Micrometers & verniers to 36" imperial
to 900mm metric

13 **ANGLE**

13.1 **INCLINATION**

0 to 90° within 100 sec of arc

13.2 **ROTATION**

0 to 360° within 60 sec of arc

14 **LIGHT**

23 **MATERIAL TEST**

Oil dielectric breakdown Voltage
Up to 1000 kV eff

Appendix A

INTERNAL REFERENCE STANDARDS

In-house calibrations are derived from the following equipment:

1 **VOLTAGE**

AC

Thermal Transfer Standard

DC

1.0 and 10.0V DC Reference Standards.
Kelvin Varley Dividers.
Reference Divider.

2 **CURRENT**

AC

Thermal Transfer Standard to 20A
and Current Transformers to 10,000A.
Ratio Transformers.

DC

DC Reference Standards, Standard Resistors to 10A and DC Shunts to 1000A.
Kelvin Varley Dividers.

3 **RESISTANCE**

STANDARD RESISTORS

Decade steps from 0.01 ohms to 1,000,000 M ohms

DECADE RESISTANCE BOXES

0.01 ohms to 100 M ohms

4 **CAPACITANCE**

STANDARD CAPACITOR

1,000pF, 0.01 μ F, 0.1 μ F & 1.0 μ F

DECADE CAPACITANCE BOXES

100pF to 11 μ F

VARIABLE CAPACITANCE

35pF to 1150pF

5 **INDUCTANCE**

STANDARD INDUCTORS

100 μ H to 1.0H in 1,2,3 & 5 steps.

6 **FREQUENCY AND TIME**

Cesium Beam Frequency Standard

7 **RF MEASUREMENTS**

POWER

RF Power Sensors

ATTENUATION

Fixed and Variable Attenuators

REFLECTION

Air Lines

RADIATION

Standard Gain Horns

8 **AUDIO**

All Audio measurements are derived from previously referenced measurements, except sound pressure; see under Pressure.

9 **PRESSURE**

LOW PRESSURE

0 to 30psia Quartz Crystal Resonator

HIGH PRESSURE

0 to 10,000psig Dead Weight Tester(Imperial)

0 to 70,000kPa Dead Weight Tester(Metric)

SOUND PRESSURE

Pistonphone

10 **TEMPERATURE AND HUMIDITY**

TEMPERATURE

Platinum Resistance Bulb

HUMIDITY

Wet and Dry Aspirated Psychrometer.

- 11 **WEIGHT**
Imperial weight standards from 1/4oz.to 57.5 lb.
Metric weight standards from 5g to 75kg
- 12 **LENGTH**
MICROMETER SETTING GAUGES
Imperial length standards 1" to 36"
Metric length standards 10 mm to 900 mm
- 13 **ANGLES**
Watts Inclinometer and vernier dials.
- 14 **LIGHT**
LUMINANCE
Calibrated Tungsten Light Source.
COLOUR
Ceramic Colour Standards.
- 15 **AIRFLOW**
Variable area flowmeters.
- 16 **WATERFLOW**
Variable area flowmeters.
- 17 **MAGNETISM**
First principles.
- 18 **ROTATION**
As per frequency.
- 19 **SYNCHROS**
Vernier dial and Electrical measurements.
- 20 **VIBRATION**
Calibrated sensor.
- 21 **ENVIRONMENTAL CHAMBER**
As per temperature & humidity
- 22 **WATER PRESSURE (INGRESS)**
Pressure testing chamber and as per Pressure for gauges.
- 23 **MATERIAL TEST**
HV Insulating Oil Test Set.