

# MARCONI ELLIOTT AVIONICS

## Digital Air Data Computer



## Introduction

Marconi-Elliott Avionic Systems Limited has been a leading supplier of air data computers for both civil and military aircraft since 1957. A range of analogue machines has been produced for such aircraft as the Buccaneer, Lightning, Nimrod, Jaguar, BAC

1-11, BAC VC10, and the Lockheed C-5A Galaxy. The Company has also developed many digital computers since 1959 which has enabled it to maintain comparable experience in digital technology. It was this combined expertise which gave it an unrivalled capability for the development of digital air data computers. During the 1970s

several such computers have been produced, having a variety of digital and analogue interfaces which enable a wide range of customer requirements to be accommodated. This leaflet contains a brief description of a civil version of one of these machines, a more detailed presentation of a military counterpart and some brief particulars of the technology common to both types.

## General Purpose Civil (ARINC) Digital Air Data Computer

The illustration shows the Marconi-Elliott Digital Air Data Computer, Type 50-019-01, which is based on ARINC specification 575. This unit was the first DADC to be developed in the UK and has both digital and analogue interfaces for the full range of the principal air data parameters indicated below, each of which is computed from inputs of static, and pitot-static air pressures and temperature, derived from the appropriate aircraft probes.



- 4 channels of digital data transmission (all parameters including status indications)

- 2 simulated synchro outputs (Mach number and Altitude)

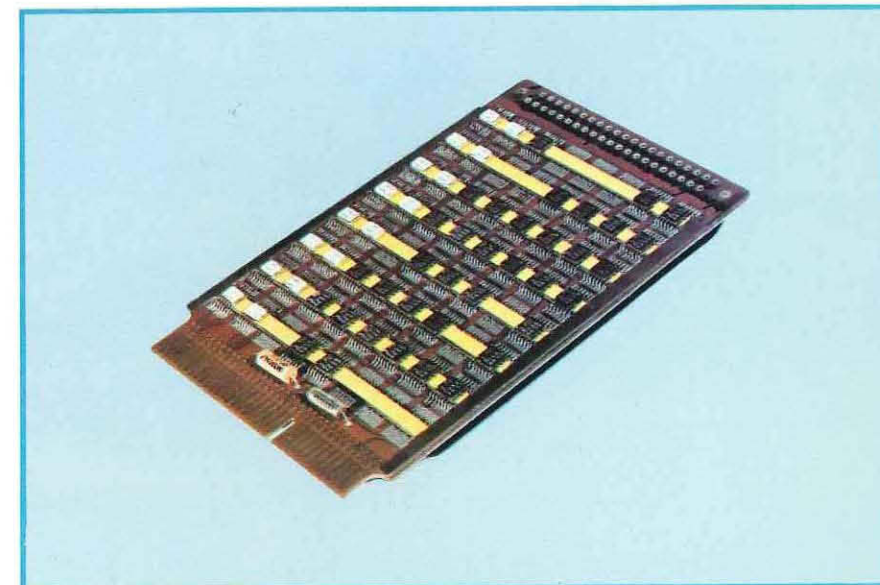
- Failure warning discrete outputs

- 5 channels of analogue outputs (including "HOLD" functions)

- 1 set of parallel transponder outputs

## Modularisation

The computer uses TTL technology, which combines high operational speed with high reliability. The machine contains fully interchangeable, functional modules each of which is kept cool to further enhance reliability. The majority of the modules are printed circuits cards similar to that illustrated here. Cooling is achieved using "cold plate cooling" which ensures that the air-flow does not contaminate either the components or the module connectors.

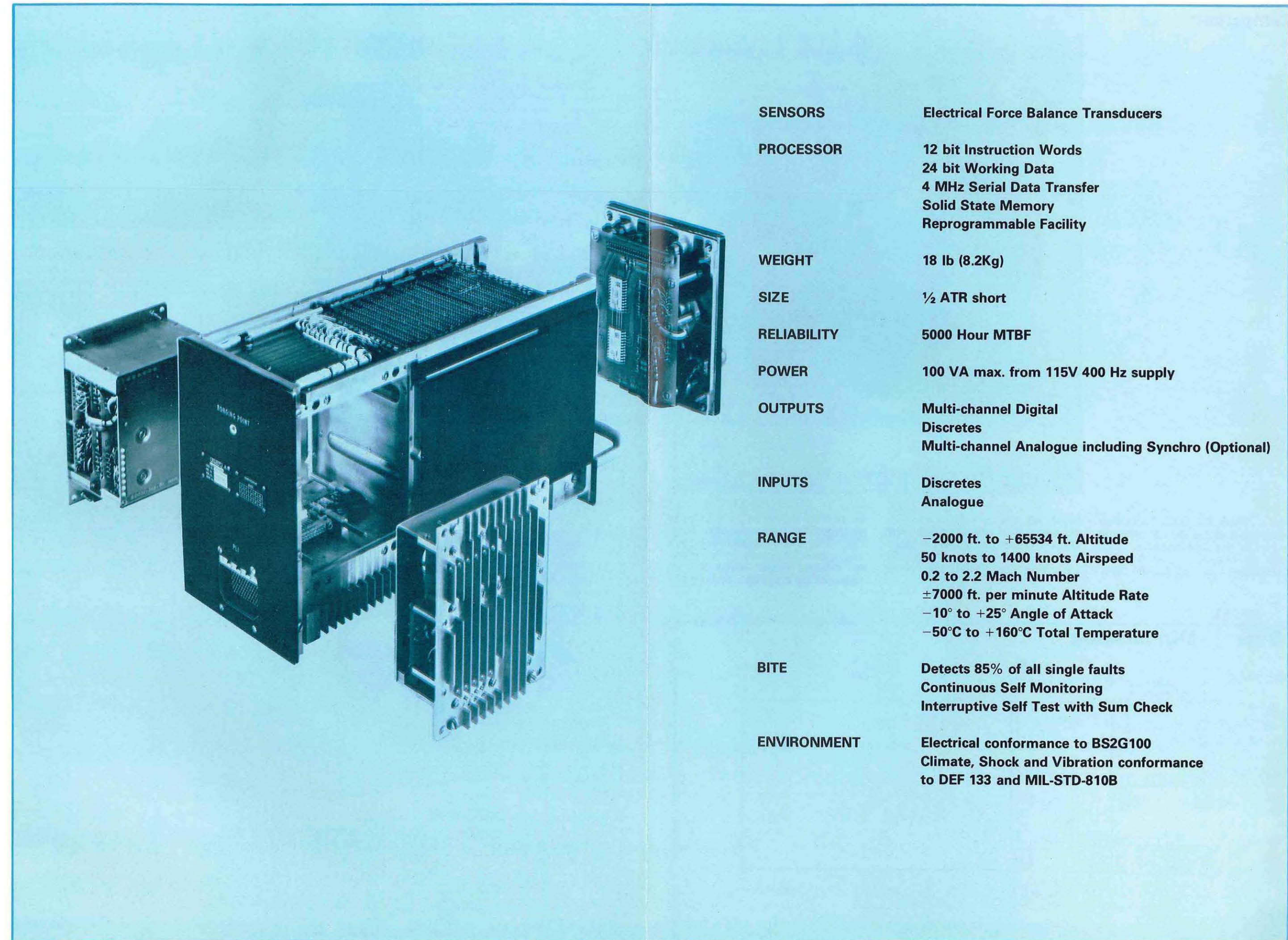


The heat generated by the components is transferred to the cold wall at the sides of the computer chassis using a thermal ladder to which each component is bonded. The ladder achieves intimate contact with the cold wall when the card is inserted into the unit.

Maintenance access is from the underside of the unit, the card connectors being inverted in normal use, to prevent dirt and moisture reducing the connector reliability.

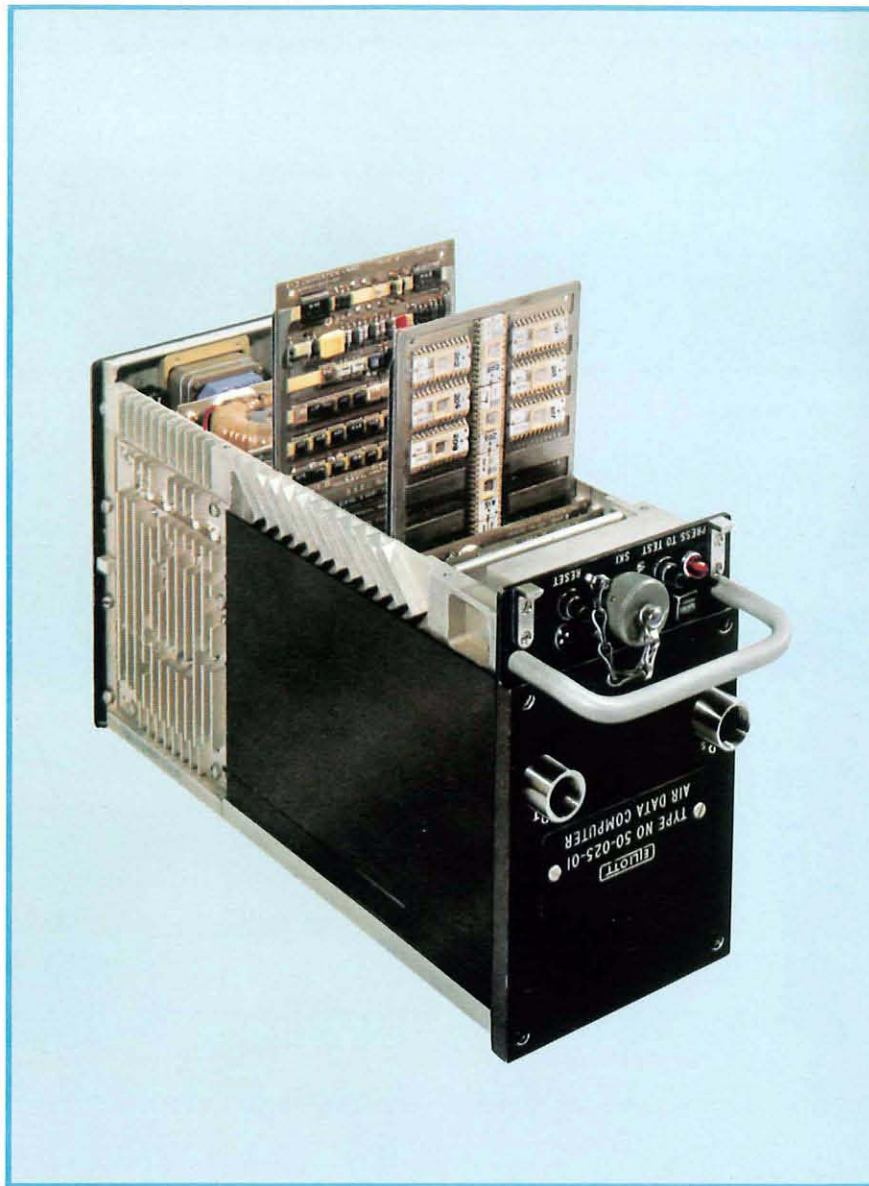
All modules including the power supply unit and the transducer assemblies are of the plug-in type:

## Digital Air Data Computer 50-025-01 Technical Details



<b>SENSORS</b>	<b>Electrical Force Balance Transducers</b>
<b>PROCESSOR</b>	<b>12 bit Instruction Words 24 bit Working Data 4 MHz Serial Data Transfer Solid State Memory Reprogrammable Facility</b>
<b>WEIGHT</b>	<b>18 lb (8.2Kg)</b>
<b>SIZE</b>	<b>½ ATR short</b>
<b>RELIABILITY</b>	<b>5000 Hour MTBF</b>
<b>POWER</b>	<b>100 VA max. from 115V 400 Hz supply</b>
<b>OUTPUTS</b>	<b>Multi-channel Digital Discretes Multi-channel Analogue including Synchro (Optional)</b>
<b>INPUTS</b>	<b>Discretes Analogue</b>
<b>RANGE</b>	<b>-2000 ft. to +65534 ft. Altitude 50 knots to 1400 knots Airspeed 0.2 to 2.2 Mach Number ±7000 ft. per minute Altitude Rate -10° to +25° Angle of Attack -50°C to +160°C Total Temperature</b>
<b>BITE</b>	<b>Detects 85% of all single faults Continuous Self Monitoring Interruptive Self Test with Sum Check</b>
<b>ENVIRONMENT</b>	<b>Electrical conformance to BS2G100 Climate, Shock and Vibration conformance to DEF 133 and MIL-STD-810B</b>

# General Purpose Military Digital Air Data Computer

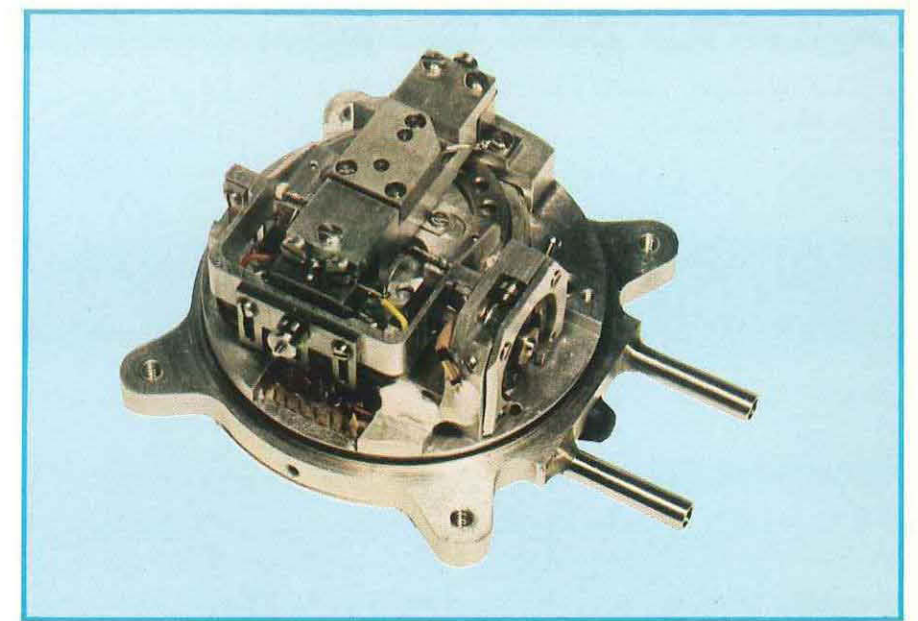


The Military Air Data Computer uses much of the technology and many of the components common to the ARINC units. The computer Type 50-025-01 pro-

vides all the principal air data parameters in digital form. The output data signal format is available in a number of options including the ARINC two wire,

three level signal and a four wire symmetrical data pair and clock pair. The design allows for several repeat channels of this data to diverse user systems, as required by a specific customer.

# Pressure Sensor



The Marconi-Elliott Avionics range of digital air data computers all employ Marconi-Elliott Avionics electrical force balance pressure sensors.

The sensor is available in two forms, one measuring differential pressure, and the other absolute pressure. The accuracy of these sensors is better than 0.45 millibars (0.015 inches Hg) and includes all sources of error over the environmental range specified in MIL-STD-810.

The principle element of the sensor is a miniature thin walled bellows with an extremely low spring rate operating against the

force produced by a current in the coil of a force motor.

A pressure variation across the bellows produces an instant differential between the forces exerted by the bellows and the force motor, resulting in a movement of the bellows. This movement is sensed by an inductive pick-off, the pick-off signal is then converted into digital form and added by a digital integrator to obtain a digital output representation of pressure.

The digital output is used by the air data computer to generate the various air data outputs and is also converted into an analogue

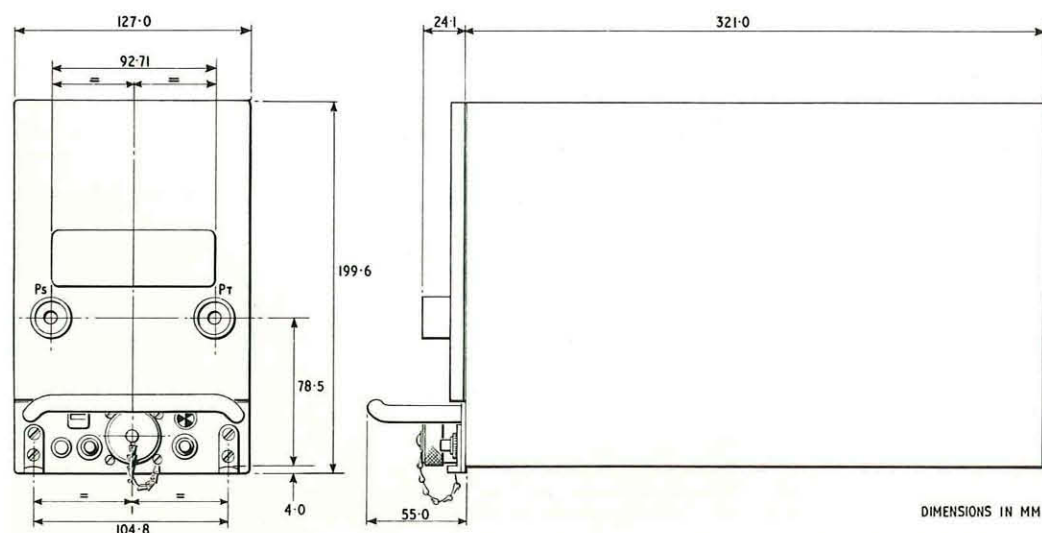
current for feedback to the force motor which restores the balance between the bellows force and the motor force and in so doing returns the pick-off to its null position.

Hysteresis is negligible due to the extremely small movement of the bellows required to produce an equal and opposite force from the force motor.

Full scale pressure changes produce full scale output responses in less than 2 seconds.

The pressure sensor is protected against reverse and over pressure by limit stops. The electrical interfaces have short circuit protection.

## Overall Dimensions



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Pub. No. 260/603/15/H06

Printed in England

**MARCONI-ELLIOTT AVIONICS**

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