

THE BRAZILIAN E. B. 4 ECHO-SOUNDING MACHINE (ECOBATIMETRO EB-4)

—

The International Hydrographic Bureau has received from the Directorate of Hydrography and Navigation of Brazil its publication entitled « Instruções para o Ecobatimetro E.B-4 fabricado por Imbelsa, S. Paulo » (Instructions for the E.B-4 Echo-sounding Machine constructed by « Imbelsa », S. Paulo), from which we give the following extracts containing a general description of this instrument.

—

DESCRIPTION OF EQUIPMENT

Introduction

The echo-sounder model E.B.-4 is designed to be operated by a 117-V, 60-cycle A.C. generator powered by the ship's 110 or 220-V.D.C. mains.

The equipment can also be operated directly by any monophase 117-V.A.C., with a strictly adjusted frequency of 60 cycles.

The apparatus measures and records ocean depths in metres, producing ultrasonic signals in the water and measuring the time interval between the transmission and the return after the echo arrives on the ocean-bottom.

The exciter supplies the electric power necessary to produce the vibrations in the water. This power is converted into mechanical vibrations by the oscillator-transmitter. The oscillator-receiver transforms the echo-vibrations into electric power which is amplified by the amplifier to the proper value for working the indicator and the recorder.

EXCITER

The exciter includes a high-tension rectifying circuit for charging an escape condenser (C. 404). This condenser discharges through an oscillator-transmitter at regular intervals for as long as the keying contacts carried by the indicator-recorder maintain an electronic relay circuit in the exciter.

A special discharge argon valve (V. 405) placed in the relay circuit, allows the discharge current of the escape condenser to pass when the valve is ionized by the circuit of a high-tension coil governed by the keying contacts. At each discharge the valve produces a very intense blue flash. The exciter box is provided with windows through which the flashes can be seen and consequently the working of the exciter unit checked.

The apparatus is fitted with two safety switches (S. 401 and S. 402) so that, when the cover is removed, the current is cut off and the condensers are discharged.

OSCILLATORS

The oscillators are of the magnetostriction type, each consisting essentially of a group of nickel stampings and an electric coil.

The transmitter discharge passes through the oscillator-transmitter coil, causing the stampings to vibrate at their proper frequency - approximately 21.6 K.C. The vibration of the sheets is transmitted to the sea-water through a liquid enclosed in the compartment. The lower face of this compartment serves as a container for the liquid but does not appreciably diminish the intensity of the sound impulses.

Conversely, the echo causes the sheet nickel of the oscillator-receiver to vibrate at the same frequency. These vibrations induce tension in the coil; this tension is applied to the amplifier.

AMPLIFIER

The amplifier consists of two amplification stages (V. 101 and V. 102) tuned to the frequency of the oscillators, a detector (V. 103) and an escape stage (V. 104). A milli-ammeter (M. 101), located on the front part of the amplifier, indicates the anodic current of the escape valve; in this way the operation of this unit may be checked.

A polarization adjustment (R. 109), operated by a special key, checks the polarization of the detector and consequently the lower level of the signal.

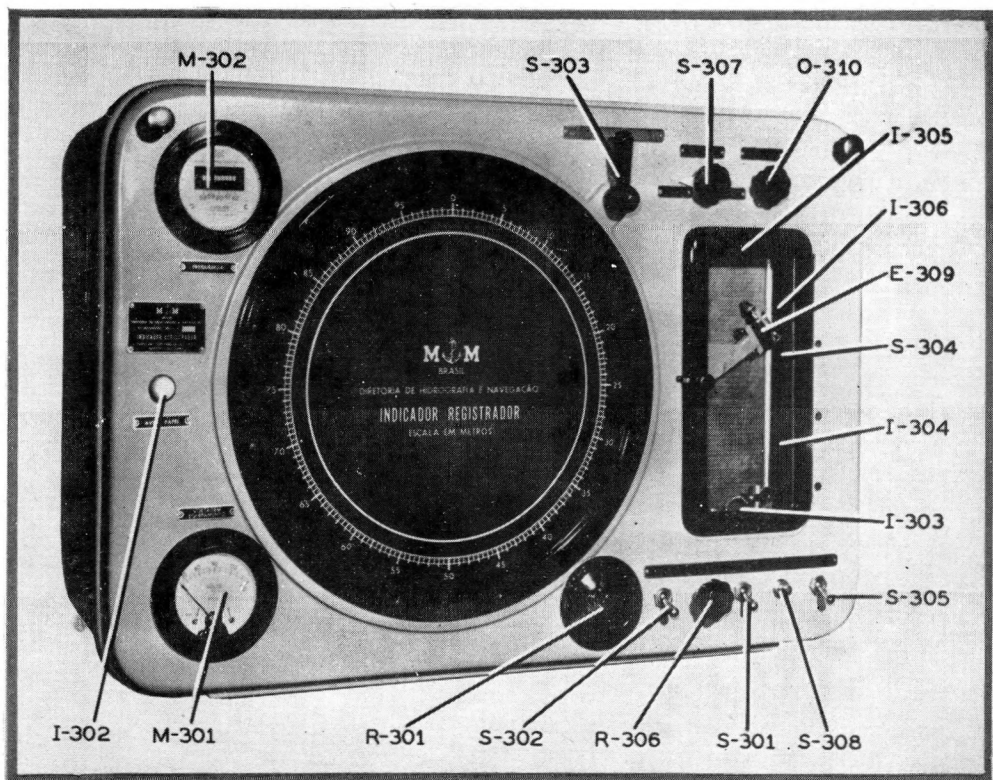
A rectifying valve and filter system supplies the D.C. tensions to the amplifier and the A.C. tension to the valve filaments.

INDICATOR-RECORDER

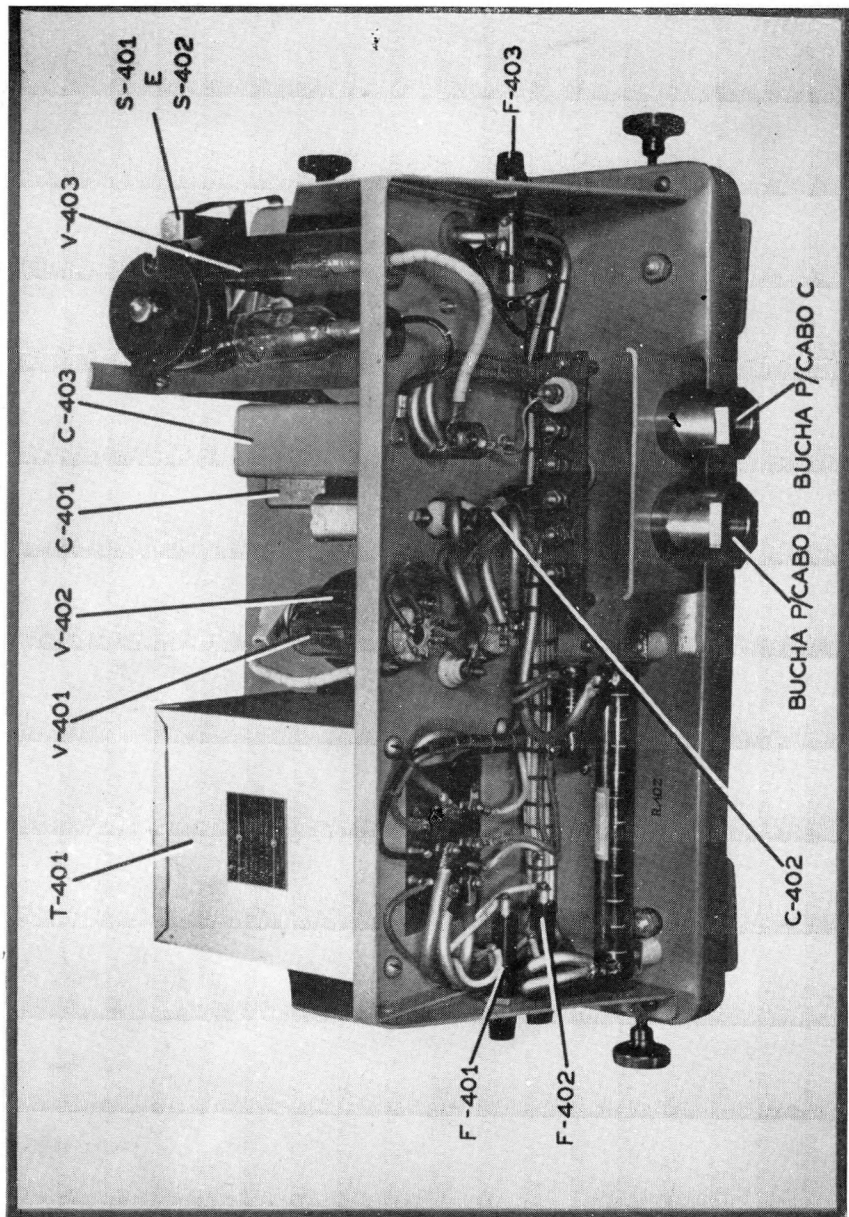
The indicator-recorder unit is composed of a disk through which appear the indicator flashes of the red valve, and a device for making permanent records of the soundings.

A neon valve (1-301) is fitted behind a radial aperture near the edge of the disk. Also near the edge of the disk is a fixed calibrated scale. A motor (B-301) causes the disk to revolve and the transmitter is keyed by contacts actuated by cams carried on the axis of the disk in such a way as to transmit a signal at the moment when the aperture passes the zero of the scale. The oscillator-receiver immediately picks up enough of the transmitted signal to flash the red valve at zero. The echo flashes the valve a second time after a certain interval depending upon the depth of the water. The position of this second flash on the calibrated scale gives directly in metres the depth under the oscillator.

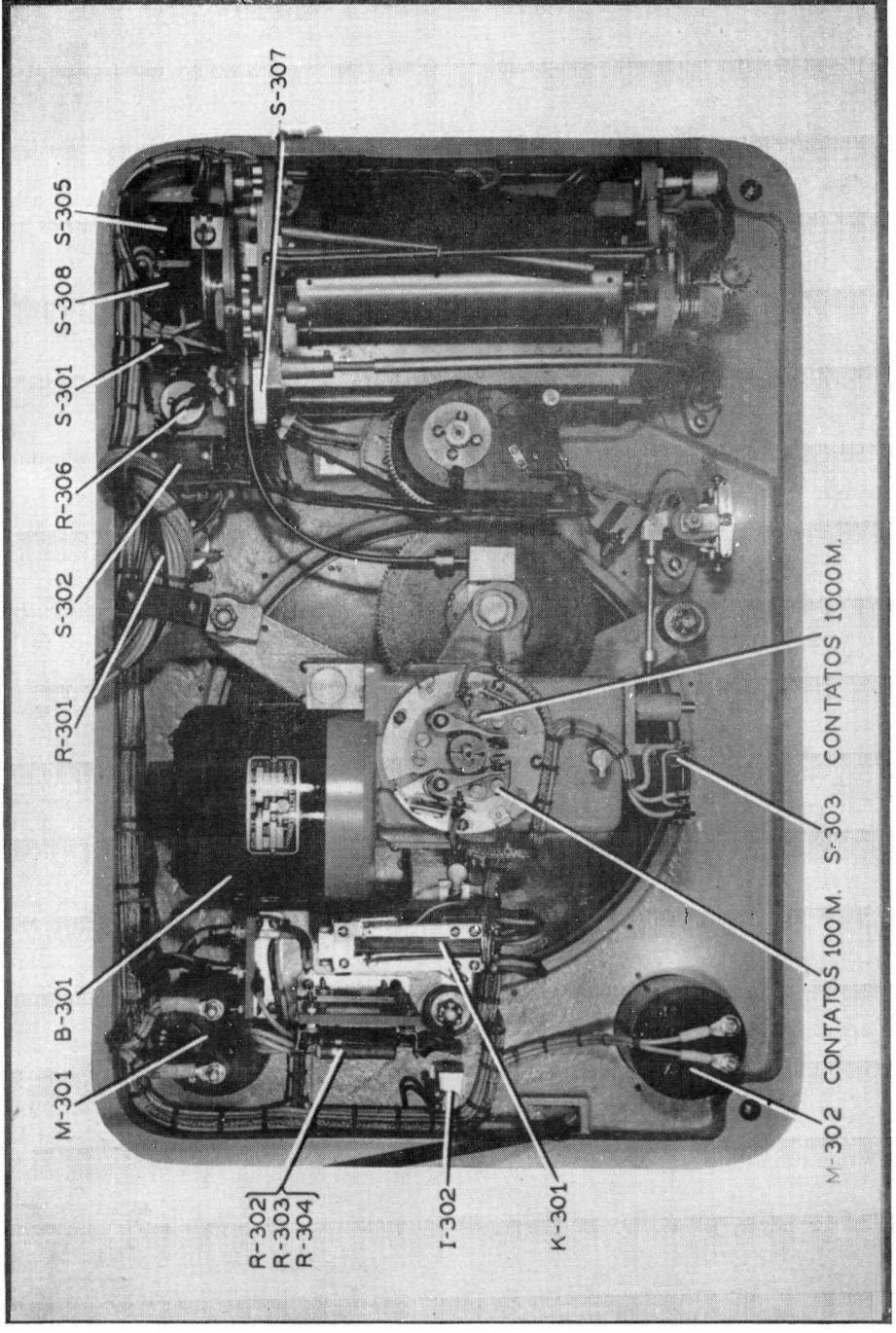
The window of the recorder graph located to the right of the indicator panel can be opened to give access to the graph and to the styluses. With the opening of this window a switch (S.-306) is actuated which stops the motor and consequently the disk, the styluses and the run of the paper. The permanent sounding records are obtained by revolving the shaft which carries the two styluses at half the speed of the disk and actuating the transmitter so as to transmit a signal at the moment when each stylus crosses the zero line of the graph (which corresponds exactly to the zero mark in the calibration of the disk). The stylus produces a mark on the graph at this spot and another mark, immediately on reception of the echo, at a spot corresponding to the depth of the water. Each stylus crosses the graph in a quarter-revolution, which corresponds to half a complete revolution of the disk;



Ecobatímetro EB-4.



Ecobatimetro EB-4, Excitador.



Ecobatimetro EB-4, Indicator-Registrador.

so that measurements are recorded only on the first half of the disk. By means of special contacts, the styluses are grounded when not on the graph or on the plate carrying it.

When the *Aviso Papel* lamp (1--302) lights up, this indicates that the supply of paper must be renewed immediately. An *Iluminação Registrador* (S-305) switch governs the lamps which light up the graph. By means of the *Ajuste Papel* apparatus (0-310) the paper may be run by hand. The paper is automatically unwound at the speed of 165 centimetres an hour (65 polegadas) to operate with the 100-metre scale and 16.5 centimetres an hour to operate with the 1.000-metre scale.

The graphs are approximately 22 metres in length (72 - 75 feet). The time lines are spaced in such a way that it requires 26.58 seconds for the graph to unwind one interval between two lines when the 100-m. scale is operated.

The « off » and « on » positions of the recorder are governed by a switch, the *Registrador* (S-307). When the switch is in the « On » (Liga) position, the gears operating the graph are coupled and the styluses are connected to the power supply. When the switch is in the « Off » position (Desliga) the styluses are electrically grounded and the graph gears are uncoupled; the visual indications, however, continue without interruption. A change of gear arrangement, or « 100-1 000 metres control » allows selection of gear relationship appropriate to depth measurement at 100 or 1.000 metres with a single scale. At that moment the relay (K-301) is operated and selects the appropriate keying cam for feeding the auxiliary stylus which produces an identification mark on the lower part of the graph when the scale is of 1.000 metres.

The *Gerador* switch (S-302) works a magnetic control relay which connects it to the generator. An instrument called the « *Voltagem Equipamento* (M-302) » indicates the value of tension supplied by the generator. The *Equipamento* switch (S-301) applies this tension to the different units. Adjustment of the volume-control is by the *Sensib* control (R-301). The *Frequencia* accessory (M-302) indicates the tension frequency of the supply.

MAGNETIC CONTROL

The magnetic control is composed of a relay (K-201) which, when actuated, applies the power supply of the ship's mains to the generator. The circuits of the generator are fitted with fuses. Condensers are included to prevent interference with the ship's radio installation.