

***ANEXO II: CATALOGOS DE ALGUNAS COMPAÑIAS
ESPAÑOLAS***



MDU MODULAR DIGITAL UNIT



INTRODUCTION:

The Modular Digital Unit has formed the basis of BPB's Worldwide Slimhole Logging Service during recent years, achieving a proven record of reliability under the most difficult conditions. The separate panel philosophy and modular design provide a high degree of flexibility, facilitating both maintenance and backup. Experience shows such considerations to be of prime importance in attaining reliable, and hence cost effective operations, particularly in the more remote areas.

The unit may be expanded from its basic form into a comprehensive system capable of:

- Operating the full suite of BPB Slimline sondes (as described in Subsurface leaflets).
- Recording all log data simultaneously in both DIGITAL form on magnetic tape cassettes, and as CHART records with flexibility of presentation format for immediate field use.
- Various log processing and analysis options.

The basic and additional items of hardware associated with these capabilities are illustrated in Fig. 1, and described more fully overleaf.

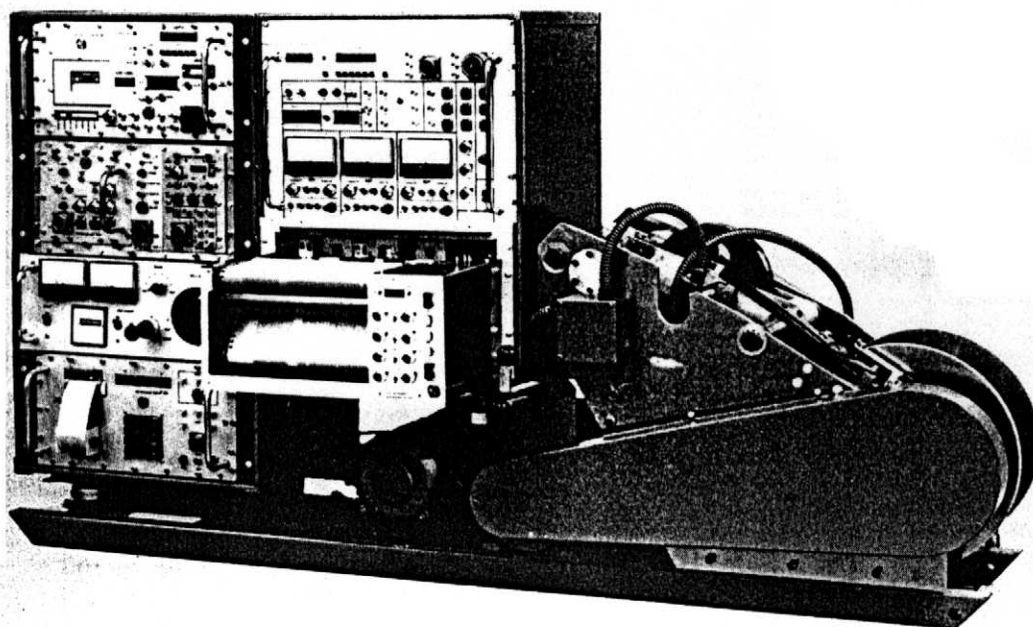


Fig. 1. MDU Mounted here with a 'B' type winch on a general purpose skid.

Individual functions are, in each of the panels, contained on either plug in modules or easily replaced circuit cards; most major functions being at least duplicated to ensure the ability to continue operations in the event of partial failure.

The panels and cabinet which make up the MDU may be assembled with the winch in a skid arrangement, as illustrated. Alternative mounting systems are created to suit winch type and/or specific transport or installation requirements.

GENERAL SPECIFICATIONS:

MDU Cabinet with panels:
(as illustrated in figs. 1 and 2)

Length: — 101 cm (40")
Height: — 90 cm (35")
Depth: — 72 cm (28.5")
Weight: — 133 kg

MDU interfaced with 'B'
type winch:
(as in Fig. 1)

Length: — 187 cm (74")
Height: — 100 cm (39.5")
Depth: — 79 cm (31")
Weight: — 323 kg
(with 750 m 1/8" cable)

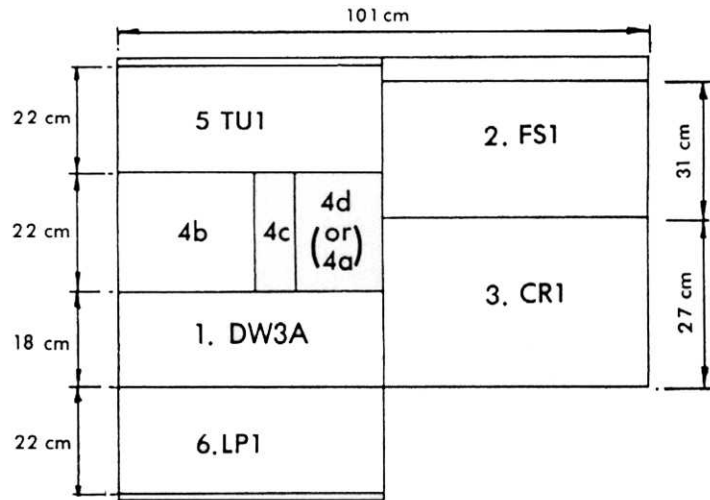


Fig. 2. Panel reference schematic.

Power requirement:

240/120V transformable, 50-60Hz, 250VA (MDU panels only).

Operating Temperature Range:

—10°C to +45°C (15 to 115°F) without heating or cooling.

Depth Capability:

As per winch in operation, see Surface Leaflet No. 2.

Transportation Facilities:

The ability to separate the electronics and winch units assists both vehicular installation and transportation. In particular the MDU, in combination with the 'B' type winch (in most common worldwide use), is well suited for installation in: dog boxes, small pick-up trucks, more specialist 4-wheel drive or tracked vehicles or even by helicopter. Fig. 3.

BASIC EQUIPMENT:

In its basic form the MDU includes the following panels, (see Fig. 2):

- (1) DW3A — Draw Works Control
- (2) FS1 — Function Selector
- (3) CR1 — Chart Recorder
- (4a) D4C — 4 Channel Decoder

In such form the unit allows recording of chart logs, with total flexibility of format on metric or imperial depth scales, and enables the following BPB Sondes to be operated:

- DD1 — Dual Density, Gamma Ray, Caliper Sonde (and earlier single function Gamma Ray and Density Sondes)
- MS1 — Multichannel Sonic Sonde (and the earlier single channel sonic sonde)
- DR1 — Density, Resistivity, Gamma Ray, Caliper Sonde
- DD2 — Dual Density, Gamma Ray Sonde
- NO1 — Neutron Sonde
- CO1 — Caliper Sonde
- RS1 — Resistance, SP Sonde
- NN1 — Dual Neutron, Gamma Ray Sonde

- (1) The DW3A — DRAW WORKS CONTROL panel monitors the incoming electrical supply to both Winch and Electronics Units and provides winch control in terms of:

- Sonde depth and direction of motion
- Precise logging speed
- Electronic braking

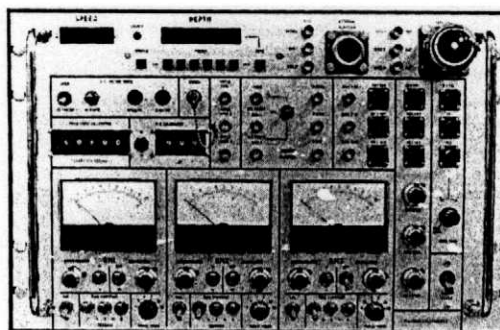
The DW4 is an upgraded version for use with the larger winches.



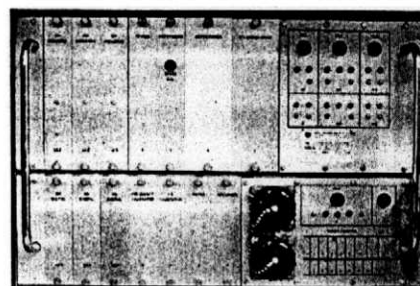
DW3A Panel
weight 12 kg

(2) The FS1 — FUNCTION SELECTOR panel is the heart of the MDU, providing:

- Downhole AC and DC power as required, both for measurement and caliper arm control.
- Signal processing through three 6 range ratemeters.
- Digital depth and speed displays in either Metres or Feet resolved to 0.01 of a depth unit, with battery back-up to retain depth information in the event of generator failure.
- Plug in modular design to facilitate trouble shooting.



FS1 Panel — Front
weight 22 kg



— Rear

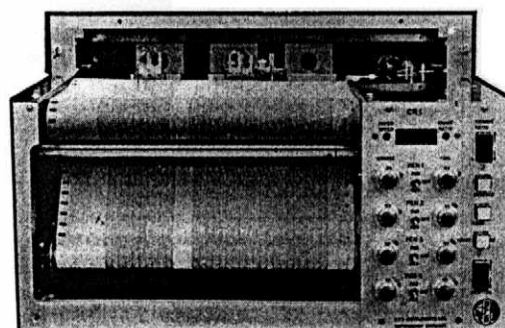
(3) The CR1 — CHART RECORDER panel, available in either 3 or 4 pen versions, features:

- A bi-directional digital chart drive system with precise positional control for accurate pen and depth alignment.
- Metric or imperial availability with depth and time based drive ratios, the standard depth ratios being:

Metric 1:10,20,40,50,100,200,400,500
Imperial 1:12,24,48,60,120,240,480,600

Other ratios can be considered and the unit can be set up for North American Metric logging if required.

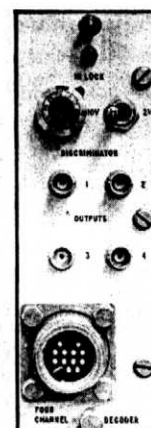
- A full flexibility of horizontal scales on all pens allowing composite logs to be assembled as required.
- A variety of API linear, API linear/logarithmic or full width laboratory chart paper options.



CR1 Panel
weight 26 kg

(4a) The D4C — 4 CHANNEL DECODER sub panel is used to decode the multiplexed signals transmitted from DD1, MS1, DR1, DD2 and NN1 combination sondes, although it does become redundant if a Dipmeter Decoder sub-panel is available. Like other sub-panels it is housed in an 'external functions' box which provides additional space for expansion of the basic MDU system.

D4C Sub Panel
weight 1 kg

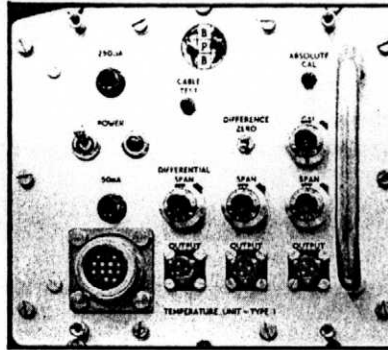


ADDITIONAL EQUIPMENT:

The following panels expand the capabilities of the basic unit in terms of:

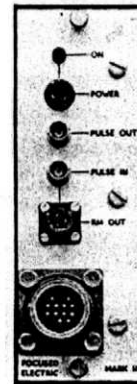
- Operation of additional sondes: (4b), (4c), and (4d) Sub Panels
- Magnetic tape recording: (5) TU1 — Tape Unit
- Data processing: (6) LP1 — Log Processor

(4b) The TEMP sub panel is required for the operation of the TT1 Temperature sonde.



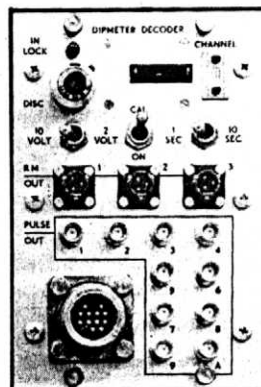
TEMP Sub Panel
weight 5 kg

(4c) The FE sub panel is required for the operation of the RO1 Focussed Electric sonde.



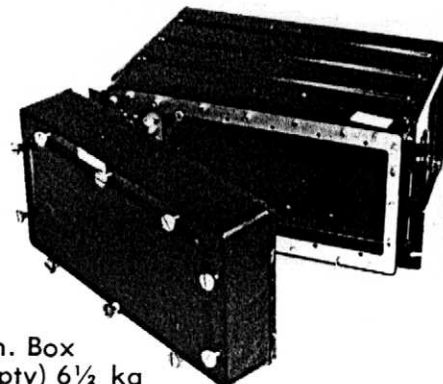
FE Sub Panel
weight 1½ kg

(4d) The DIP sub panel is required for the operation of VO1/2 Verticality and DV1/2 Dipmeter sondes.



DIP Sub Panel
weight 4kg

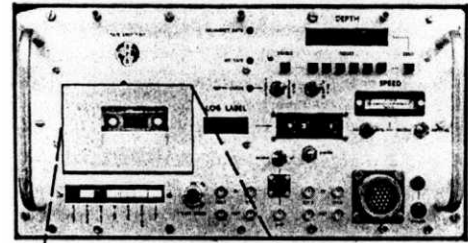
NOTE: The 'External Function' box provides mounting space for all sub panels.



Ext. Fn. Box
weight (empty) 6½ kg

(5) The TU1 — TAPE UNIT panel (Reference 1) provides 4 channel digital recording of sonde output, together with depth, on easily available and inexpensive C120 magnetic tape cassettes. The system includes several important features:

- 0.1 second time based sampling implies an infinitely variable depth sample interval controlled by the logging speed. This depth increment is standardly:
1.5 cm at 9m/m 'general' logging, and 0.375 cm at 2.25m/m 'detail' logging speed.
- These high sampling rates ensure no compromise in the quality of data recorded from high resolution sondes.
- The ability to handle metric or imperial depth measurement with a resolution of 0.01 of a depth unit.
- An expansion facility, through a further sub-multiplexing option, to provide 9 channel capability for recording more complex sonde outputs.



TU1 Panel weight 21 kg

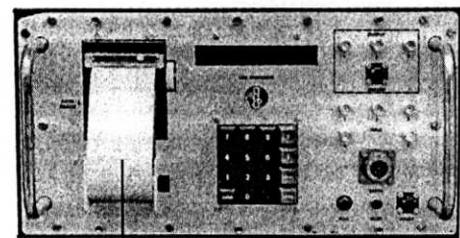
Magnetic tape recording of logs with the TU1 system offers two major advantages:

- Raw sonde output may be re-read from the cassette at any time on or off site and represented with new scales, formats or even with updated log calibration data. Most commonly this leads to a significant reduction in operating time as 'detail' scale logs may be readily replayed from a single 'general' scale logging run.
- The cassette data is available for transcription to 9-track tape at any time, forming a data base for log analysis by computer.

(6) The LP1 — LOG PROCESSOR panel (Reference 2) extends the capability of the Modular Digital Unit to include on site computation. The LP1 depth matches up to 5 logs, input either direct from the sonde or from the TU1 panel, and processes according to the software option selected. Options currently include:

- Verticality and Hole Position from VO1/2 or DV1/2 sondes.
- Density Linearization, Correction, Compensation and Deconvolution from the DD1 and DR1 sondes.
- Neutron Ratio Porosity from the NN1 sonde.
- Linear and Corrected Formation Resistivity from the RO1 sonde.

Output is available from the CR1 Chart Recorder and/or the built-in Line Printer, according to the individual program option.



LP1 Panel weight 12 kg

DEPTH	1600	90
TILT	290	11.0
BEARING	290	11.0
DEPTH	1670	90
TILT	290	11.0
BEARING	290	11.0
DEPTH	1700	90
TILT	262	11.0
BEARING	262	11.0
DEPTH	1760	90
TILT	290	11.0
BEARING	290	11.0

TRANSPORTATION:

The MDU Electronics, together with a Winch Unit and the range of downhole Sondes, forms a powerful, comprehensive and proven Slimhole Logging System. Flexibility, afforded by modular options, extends further to the method of site transportation, which is selected according to climate and location to suit each particular project. Some examples taken from BPB's worldwide service operations are illustrated in Fig. 3.



Fig. 3. Logging Unit Transportation examples (clockwise from upper left):

*Pick-up mounted dogbox,
Tracked Vehicle,*

*Specialist 4-wheel drive truck,
Helicopter operation*

REFERENCES:

Further details of some of the above equipment may be obtained in the following BPB publications, available on request:

- (1) A Digital Cassette System for Recording Coal and Other Logs — M A Cherrie.
- (2) In-Truck Data Processing Techniques Applied to Slimline Logging — R W Wroot.

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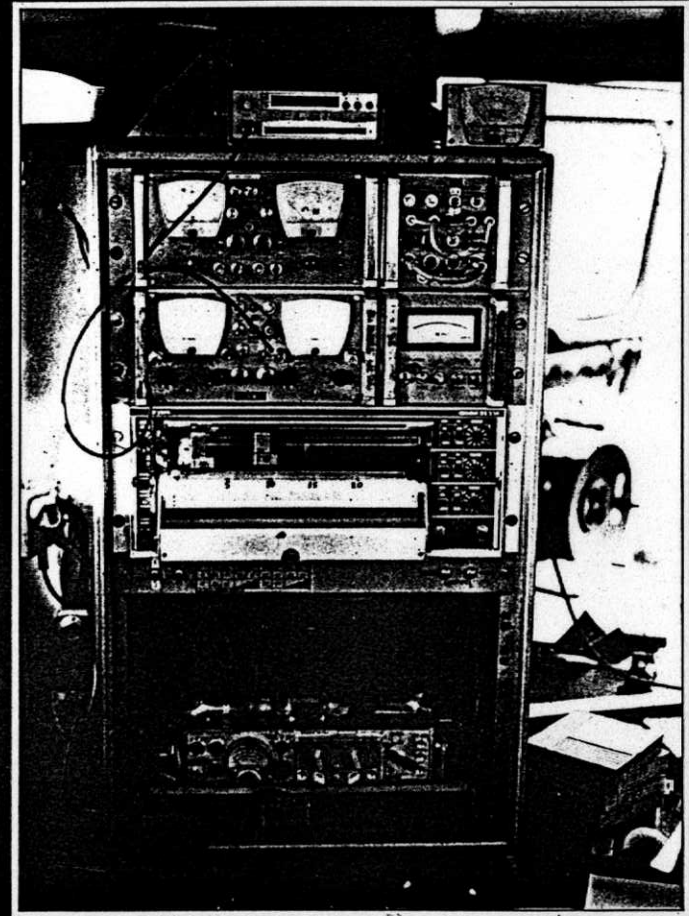


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