

O.M.I. ANNOUNCES A NEW HIGH-PERFORMANCE,
LOW-COST ANALYTICAL STEREOPLOTTER,
THE AP5 - "BRAVO".

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ABSTRACT

A new high-performance, cost-effective Analytical Stereoplotter System in the 4 μ m precision range, is presented.

O.M.I. introduces this product as an extremely interesting working tool for all those applications in data acquisition where the extreme precision and some of the costly features of higher class stereoplotters are not requested, but where the operating capabilities, with special regard to the present and future needs for numerical data collection, data-file and intelligent plotting, compatible with state-of-the-art photogrammetric processing are offered.

INTRODUCTION

The Analytical Stereoplotter has been an everyday fact for many years, and we can now affirm that the impact of its introduction as a key element into the process of producing data for the map-making community and any type of data for any end-use requiring a better and faster metric and thematic knowledge of the surface of not only this planet, was dramatic.

Not to mention the new ways opened for the generally called terrestrial photogrammetry and for the numberless special applications, limited only by imagination.

Very few or no doubts are left about the effectiveness of the analytical machine, the concerns about reliability are vanished by facts, the demon of "all those transistors and wires" was tamed.

One aspect that deserves more and more attention by the manufacturers and that gives present and potential users legitimate reasons for new expectations is the search for better solutions to the performance-to-cost ratio.

It is a known fact that for many years the manufacturers have considered the Analytical Plotter principle as a wonderful way of realizing very highly precise and universal stereoplotters without having to struggle with the very costly and complex opto-mechanical solutions of the analogue devices. In other words, the Analytical machine was seen, in the beginning, as the technological transposition of the analogue machine.

As a direct consequence of this, the users have seen the Analytical Plotter as a costly answer to the requirements of very high precision, of compilation at exceptional scales, of special production needs. Simple and easy to use but still heavy on budgets.

But it was evident to all that the performance-to-cost equation had more than one solution, that the Analytical principle could and had to be used for more economic although more performing machines.

O.M.I., among others, gives its contribution to this concept by introducing its new Analytical Stereoplotter, the AP5.

THE AP5

The AP-5 System, nicknamed "BRAVO", was conceived and designed within the frame of the general considerations made above.

The most important novelty of the AP-5 System, when comparing it to the previous O.M.I. Analytical Stereoplotters, lies in the totally new design of the stereocomparator unit.

A light-alloy boxed frame houses the mechanics and the optics of the two-stage unit, still structured in principle according to the mainlines of the well-proven O.M.I. tradition (mechanically separate X and Y movements) but particularly compact, easy to adjust and to service.

Four hollow columns support the self-contained stereocomparator above a specially designed table, leaving ample space on its top for the operation of a free-hand control, an operator's control panel and a keyboard video terminal, the most important man/machine interface device.

The free-hand control is the prime X,Y,Z input control, but traditional handwheels and footwheel are available as plug-in options. In the latter case, the free-hand control remains fully operational as a planimetric input in conjunction with the handwheels, whereas its thumbwheel Z input can be enabled or disabled as an alternative to the footwheel at the flip of a switch.

Two discrete magnification values, by substitution of the eyepieces, an easy-to-the-eye light mark, dove prism image rotation, Base-in/Base-out switching, a large eye relief and an optimal 1ppmm.resolution count give the AP5 the optical performance of much higher cost competitors.

The x, y photo stage movements are implemented according to the long-time tested O.M.I. design where the two axes of each stage are mechanically independent, and the feedback signals are provided by high resolution linear encoders. Lead-screw and DC motor drives complete the structure of each 9in x 9in stage.

A very efficient, user-friendly Software is the heart of the AP-5 System.

Running on the latest Micro PDP 11 computer that features a 256-KByte CPU memory expandable to 4 MBytes, a 10 MByte Winchester mass storage, two Floppy disk drives and four standard serial ports, the AP-5 Software includes the on-line and off-line programs that characterise much higher-cost analytical systems.

Particular care was devoted to the numerical data acquisition, storage and editing, to make the system optimally oriented to the most modern criteria of photogrammetric information and data processing.

DTM, cross-sectioning, distance and area calculations, strip and block adjustment and close-range model processing are all available features.

For those users requiring line plotting, a flat-bed intelligent table featuring a high degree of automation is optionally available.

Short term new developments include graphic CRT management and more advanced terrestrial and close-range programs.

THE AP5 SOFTWARE

System Concept

The functional and operational characteristics of an Analytical Plotter are more and more conditioned by the requirements of the environment within which the system is to operate.

This environment, that typically but not exclusively is that of all the disciplines related to the knowledge of the territory and of its changes caused by the action of man and of nature, becomes more and more complex and demanding.

Necessarily, the trend is towards a systemistic approach to the solution of the problems, through the process of more extensive automation and integration (informatic orientation) of the operational tools and methods. The use and the extent of diffusion of the Analytical Plotter within this environment is a function of its capacity of integration at a systemistic level.

From this point of view the most critical element is the software, certainly not in terms of quantity, but in terms of its practical usefulness to the goal of integration.

To this respect we must admit, after years of experience in the field, that the traditional software implementation of the basic Analytical Plotter concept as the analytical emulation of analogue instruments and methods, has caused the freezing of the enormous potentiality of the concept into procedure-oriented rather than purpose-oriented software structures.

The AP5 software structure was designed with the goal of overcoming the constraints of a conventional implementation and of giving an answer to the needs of integration with pre-existing or locally contingent systems and procedures.

Structure Concept

The basic fundament departs from the concept of PHOTOGRAMMETRIC WORKSTATION (PW). A PW represents the logical interface between the APPLICATION SOFTWARE and the PHYSICAL DEVICE (PD) consisting of the Analytical Plotter hardware.

The software structure (see diagram at next page) develops itself around the central PD core along homogeneous functional layers.

The REAL-TIME (RT) layer implements the basic algorithms of the Analytical Plotter, as well as several control and communication tasks. It is heavily device-oriented and it therefore represents a specific responsibility of the manufacturer.

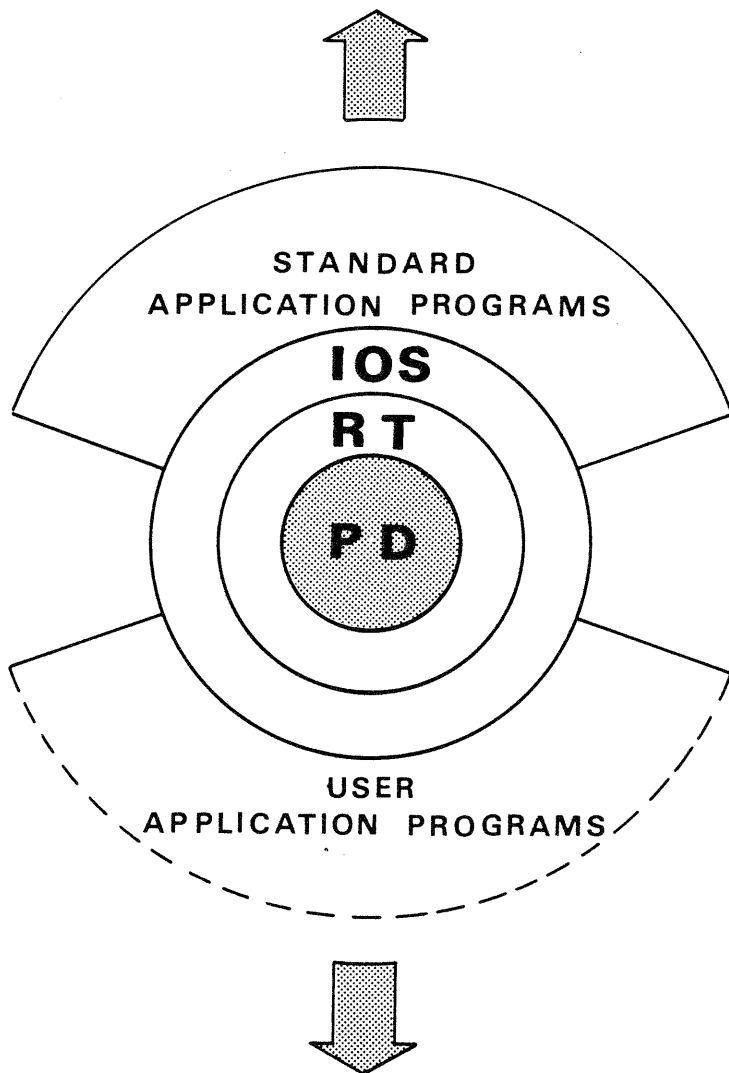
The IOS layer (INPUT/OUTPUT SYSTEM) consists of a package of subroutines interfacing the application software to the real-time software.

The primitives of the IOS define the PW and actually make the hardware transparent to the outermost software layers.

Making the IOS more and more available to the users who intend to program their own user-oriented applications (USER & SYSTEM INTEGRATION) is a policy of this Company.

The outermost software layer shown in the diagram represents the STANDARD APPLICATION PROGRAMS, that is those programs that implement the manufacturer's standard photogrammetric procedures.

STANDARD DEVELOPMENT



PD=PHYSICAL DEVICE
RT=REAL TIME
IOS=INPUT/OUTPUT SYSTEM
IOS+RT = PW (PHOTOGRAM_ METRIC WORKSTATION)

USER & SYSTEM INTEGRATION

AP5 - SOFTWARE STRUCTURE

In the case of the AP5 this package ensures the functionality and the user-interface typical of the APC4 software, a reference to which can be made for more details.

Concluding Remarks

The AP5 software was conceived for a new generation of modular systems, the configuration of which can be designed to suit the specific requirements of the user.

The minimum configuration can be seen as a one-to-one substitution for the analogue instrument, with the advantage of the possibility of upgrading to higher-level configurations featuring full I/O system compatibility.

HARDWARE SPECIFICATIONS

The Stereocomparator

- Two-stage, 9" x 9" format
- +/- 4 μ m RMSE per axis
- Linear encoders, 1 μ m resolution
- Light marks, 40 μ m dia.
- Slewing speed up to 50 mm/sec per axis
- Overall magnification 9X or 13.5X by substitution of the eyepieces
- Observed field 23mm at 9X 15mm at 13.5X
- Base-in/Base-out switching
- Dove rotation, individual, +/- 20 degrees
- Resolution 80l/mm at 9X, on axis
- Individual vertical and horizontal squint adjustment
- Eyepiece focussing and eyebase adjustment
- Standard free-hand control for X,Y and Z input
- Video terminal keyboard and operator's console
- Optional Handwheels and Footwheel

Computer and Peripherals

- PDP 11C23 (Micro PDP)
- 256 KBytes, memory can be expanded to 4MByte
- 2 Floppy disks (400 + 400 KBytes)
- Winchester Disk mass memory, 10 MBytes
- VT-240 Video Terminal and Keyboard (graphic and colour options)
- IA 100 Table-top Printer
- RT-11-V5.0 Operating System

Interface

- Physically housed into the stereocomparator-supporting table
- Modular construction, only four different PC boards
- Microprocessor-controlled
- DMA mode of operation
- Operates in the Interrupt mode, the Interrupt request rate is software-set

Plotter

- Data Technology Mod.3554, flat-bed, tiltable from vertical to horizontal
 - Interfaced via an EIA-RS 232C standard port, it is a plug-in option and it is functionally seen as any of the computer peripherals
 - Back illumination or electrostatic holddown
 - Two or optionally four-pen holder
 - 34" x 54" (860mm x 1360mm) plot area
 - 16 in/sec (400 mm/sec) axial speed
 - 0.0025 in (0,0625mm) resolution
 - +/- 0.0025 in (+/-0,0625mm) repeatability
 - +/- 0.004 in (+/-0,1mm) absolute accuracy
 - Intelligent Plotter Controller, standard
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