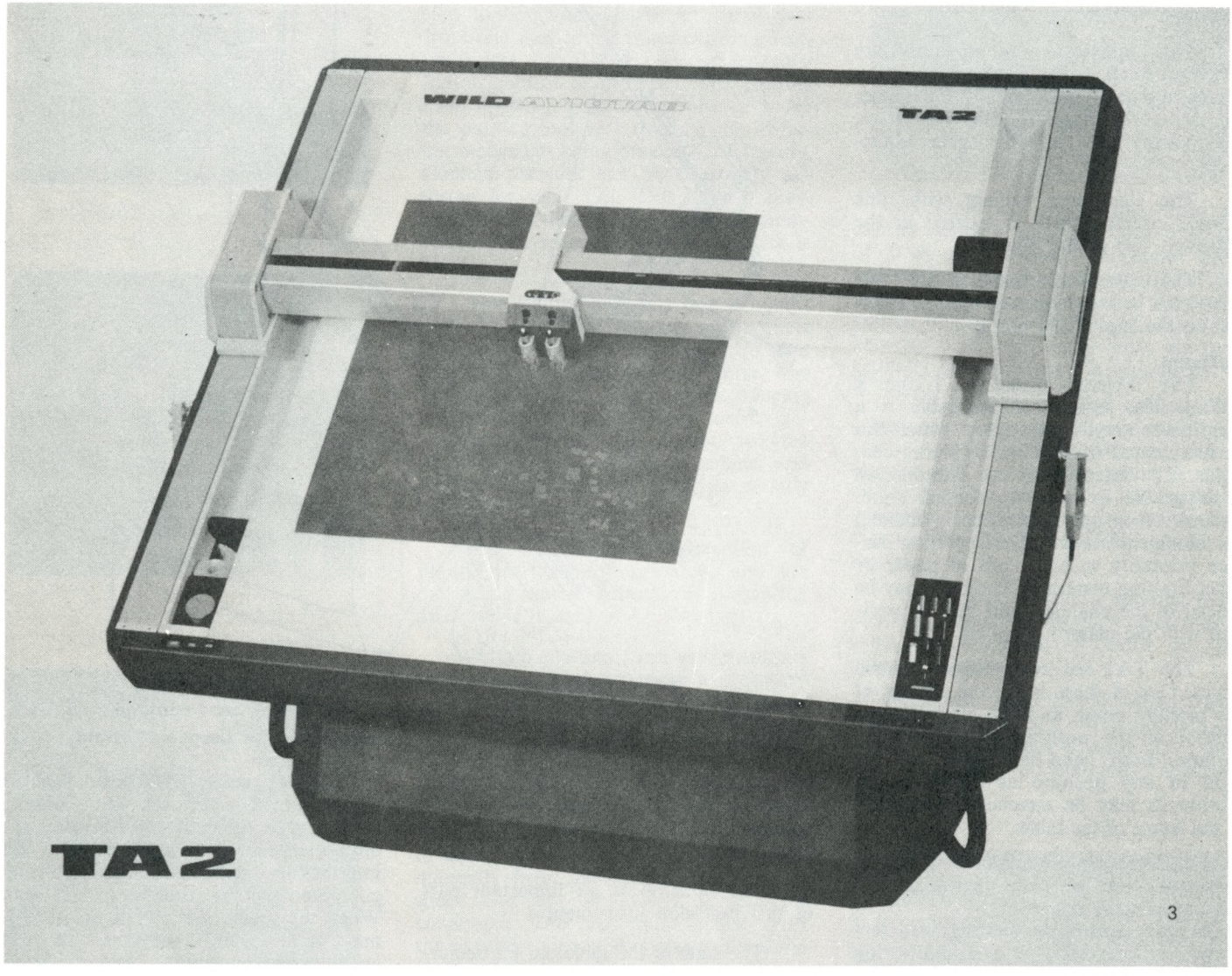
TECHNICAL REPORT *BY T. P. JONES*

The Wild Aviotab TA2



The computer controlled Aviotab plotting table is made by Wild Heerbrugg, and is distributed in this country by Wild Leitz Canada, Ltd.

The whole machine weighs 420 kg, and has maximum dimensions of 1.81m wide, 1.69m deep and 2.08m high, depending upon the tilt of the table and the height adjustment.

The TA2 is a digital flat bed type plotting table that has been developed in accordance with the latest technology, using the most modern mechanical and electronic components. As a graphical plotting station linked with an electronic computer, it is used both for on-line and off-line mapping. The plotter's functions are supported by an extensive tri-axis basic plot software, driven by any compatible computer through an RS232 interface.

When connected with the Wild Aviolyt AC1 computer, a special keyboard is used for computer assisted plotting. The programmed functions, together with up to ten symbols, line types, plotting speeds and plotting tools can be selected at the press of a button.

The Aviotab can be operated in the following modes:- synchronous operation for the plotting of contours and natural features;

computer aided plotting of man-made objects such as buildings, roads, embankments;

writing of texts and automatic plotting of spot heights;

digitizing of points for the orientation of the plotting sheet, layout of lettering; and off-line plotting of stored data - control points, co-ordinate grids, profiles, contours, digital drawings etc.

Various parameters such as text size and angle, as well as the text itself, can be entered and changed interactively via the alphanumeric terminal and keyboard of the AC1.

The main mechanical components of the machine are the solid base, or plinth, the adjustable table top, a horizontal beam with the plotting head carriage, and a dual plotting head for various plotting tools.

The base of the TA2 consists of the plinth and the mechanism for raising and lowering the tabletop.

The functional components are accommodated in the right-hand portion of the plinth. Within this is the power supply for the motors for the XY drive, the plotting head and the table adjustment.

The electronics cabinet with nine printed circuit boards is located in the left-hand side of the plinth.

The vertical movement of the table is assisted by two hydraulic springs situated on the top of the plinth.

Tabletop

The tabletop measures 1.20m x 1.20m. The surface of the table is a translucent acrylic glass panel which can be illuminated from below by fluorescent lights. The intensity of the illumination is adjustable by a rotary control knob. As noted from the illustration, a channel lies along both sides of the plotting surface primarily to hold rolls of paper or other drafting materials. The rolls may be placed in the channels and held in position with the clamps supplied.

The TA2 has two manual control boxes. One of these is for the control of the plotting point, and the other for the control of the position of the plotting surface. Both hand-held units can be used in any position as required and afterwards may be attached by magnets to the frame of the table.

The following functions of the plotting point can be controlled from the manual control box:-

the movement of the plotting head carriage in X and Y; raising and lowering of the plotting point:
recording of the table co-ordinates.

If one of the directional keys is touched very briefly, the plotting point can be moved in the incredibly small incremental steps of 0.02mm.

The Window key on the keyboard of the table is used by the operator to define the usable plotting area for any particular project. This is done by registering the bottom left and top right corner of the area. The manual control box is used for travelling to the two corners of the window. At each corner the Window key is depressed to register the positional information.

A window should always be set for the area covered by the manuscript sheet, to ensure that the lowered plotting tool will not touch and damage the acrylic glass panel.

The tabletop is an important part of this precision instrument.

The state of the tabletop, particularly its flatness, is of special importance in maintaining plotting quality.

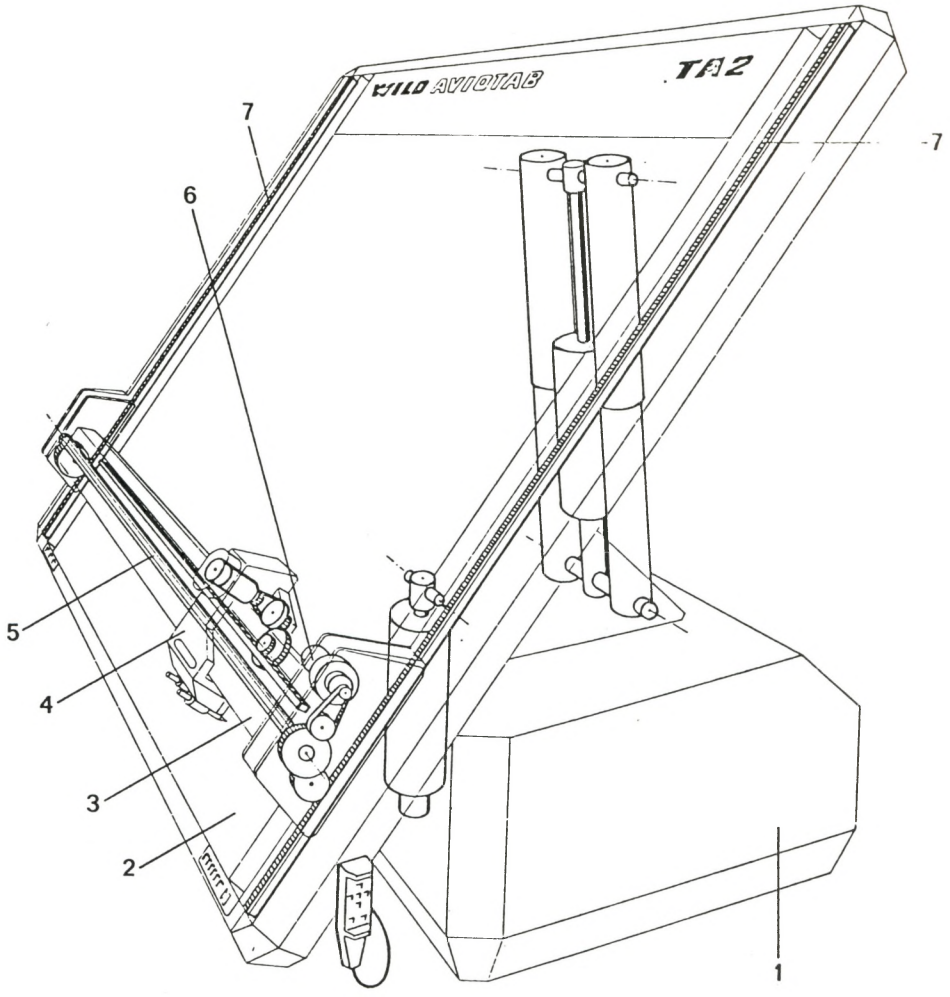


Fig. 1. Diagrammatic sketch of mechanical system of TA2
1. Plinth 2. Tabletop 3. Horizontal beam with plotting head carriage 4. Dual plotting head 5. Connecting shaft 6. Drive motor for beam 7. Rack.

Beam

The transverse position of the beam provides an unimpeded view of plotting in progress. It also makes the plotting surface readily accessible for manual tasks.

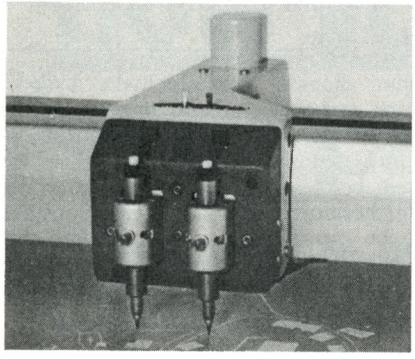
A light-barrier immediately stops the movement of the beam when an obstacle, such as an operator's hand, gets in the way. The Company warns, however, that because of the powerful, rapid acceleration drive motors, and in spite of the built-in safety features, carelessness while operating the table may result in injury.

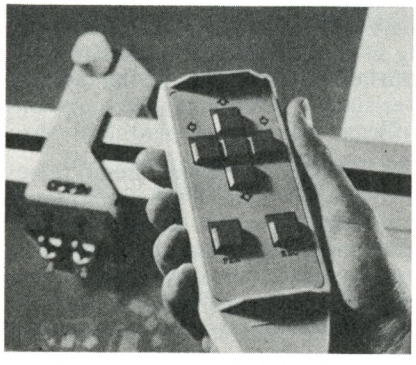
The extremely rigid beam is driven by the motor via a rack and pinion. A rigid connecting shaft and a further rack on the left side of the table, together with interlocking gearwheels on both sides guarantee accurate tracking of the beam. When the tabletop is tilted, the effective mass of the beam is reduced by a mechanical counterweight.

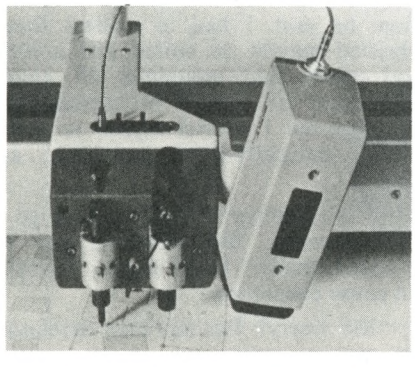
The light-weight plotting-head carriage runs on this beam; it is also driven by rack and pinion. The accurately machined racks and rotary encoders placed directly on the motor axis ensure high positional accuracy and the line quality of the table.

The servo systems for the X and Y movements have a positional and a speed adjustment. The positional adjustment is digital. For each axis, XY and, the rotary tool, the speed and the position is also measured and fed back as an analog signal to a regulating system placed below it. The servo systems for rotating the plotting tools also operates by means of feedback of the rotation measured.

The resolution of the measuring system is 10 microns, and of the positioning system is 20 microns.







Plotting Carriage

Two different plotting tools can be fitted simultaneously to the plotting carriage. The range of plotting tools includes pencil leads, ballpoint, pen with ink cartridge, scribing tool, magnifier and measuring mark projector.

The plotting head holds two plotting tools 53mm apart. A change-over from one tool to the other can be effective in less than 0.4 of a second by push-button control or program. The plotting head makes it possible to raise or lower the plotting tool very quickly, the lowering movement being braked considerably. Contact pressure can be separately adjusted for each tool. This contact pressure ensures that the line quality is maintained even when the plotting surface is tilted.

The plotting-head carriage is equipped with additional switches and sockets to provide for the power supply to, and the transmission of signals from, the optional television camera, for changing the acceleration of a plotting tool to obtain a better plotting quality, for the illumination of the plotting surface, and for the connection of the tangentially controlled plotting tool.

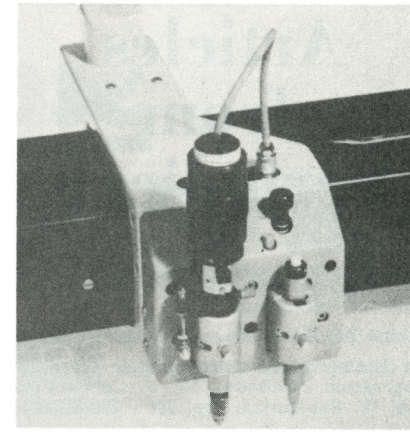
For the accurate orientation of points on the plotting table, and for measuring small offsets, a measuring microscope is used.

Certain plotting tools and materials used as plotting sheets make it necessary to limit the acceleration and the travelling speed of the tool in order to obtain the best possible quality.

The maximum plotting speed with the point lowered can be set between 8mm per second and 296mm per second in eight increments. This can be done manually from the control panel or the speed can be limited via a software command. The maximum speed with the plotting tool raised is always the same at 296mm/s.

A glimpse of the built-in sophistication of this instrument can be obtained when it is realised that both X and Y motors are slowed down proportionally when the plotting tool is working diagonally across the table, so that the 'resultant' speed will not exceed the predetermined limit.

The quality of the final drawing depends not only upon the plotting tool selected, but also upon other parameters. The condition of the tool, the contact pressure set, and other table parameters such as lowering time, acceleration, travelling speed and lifting height are all of importance.



Scribing in coated film can be carried out to a maximum line thickness of 0.18 mm without tangential control of the scribing cutter. Quality of the work is improved by reducing the acceleration of the scriber. For line thickness between 0.18 mm and 1.0mm the tangentially controlled tool is necessary.

This tool is used for scribing, for cutting multi-layer sheets and for plotting with a rotating ball-point cartridge. For scribing and cutting, the cutter is controlled in such a way that its cutting edges are always vertical and parallel to the direction in which the plotting head is moving.

When plotting with a rotating ball-point, the rotary movement executed prevents the formation of blobs on the point of the pen.

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