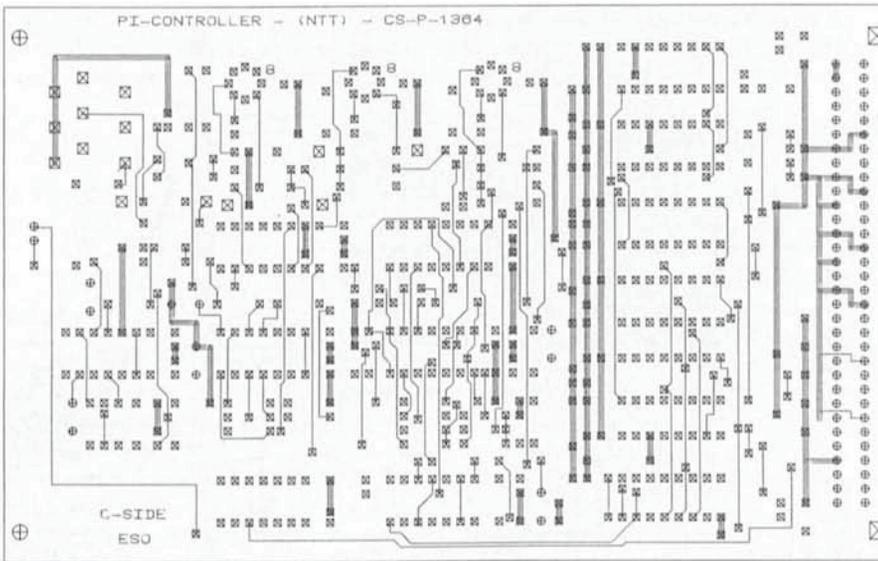


BESTUECKUNGS-PLAN
PI-CONTROLLER - (NTT) - CS-P-1304



BAUTEILE-SEITE
PI-CONTROLLER - (NTT) - CS-P-1304

Figure 2: Example of PCB board design for the PI controller at the NTT. The board measures 100 x 160 mm (Europe size) and contains 82 components with 316 connections; component-to-board ratio is 45 per cent. Upper: Placement of components. Lower: Wiring diagram on component side.

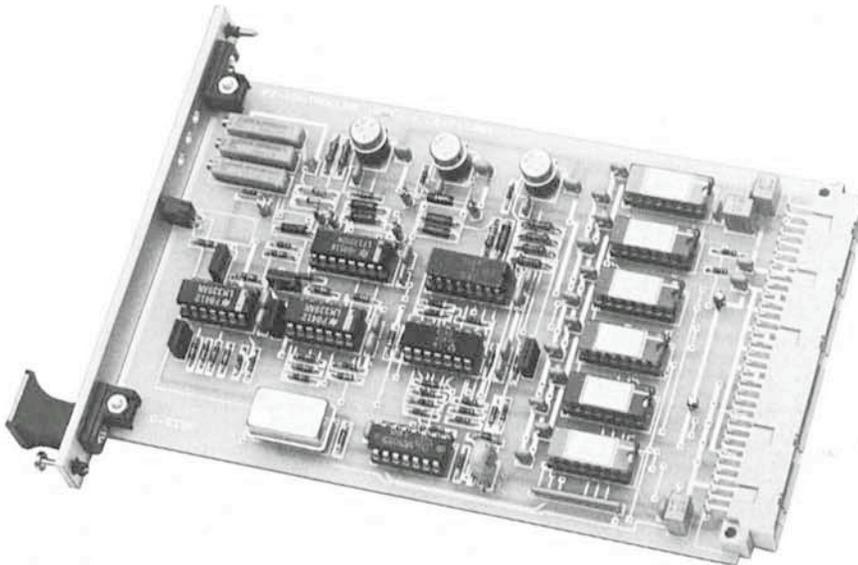


Figure 3: Photo of board for which the design is shown in Figure 2.

GRADO-CV-Configuration at ESO

1. CPU: Prime-Computer 2250 (32 Bit)
Memory - 0.5 MB Autoboard
- 1.0 MB Autoplan + Autoboard
Disk - 60 MB
2. Peripherals: System console, printer, tape drive
3. Graphic workstation: Ramtek-Colar-display, Summagraphic Tablet, Alphanumeric Terminal
4. Hardcopy: Facit printer
5. Plotter: Penplotter BENSON, Photo-plotter (Quest) GQ-40 (external). All data storage is brought on a magnetic tape-cassette.

ratio; normally around 50 per cent. Then follows the crucial operation: the automatic process to determine the optimal routing of connections (Autorouter). The two algorithms from Stitching and Lee are used. The problem reminds us of the classical one known as the "travelling astronomer" (what is the shortest route, if he has to visit x observatories?).

For a dense PCB, the Autorouter routine can take up to 16-24 hours. Therefore, we normally run these programmes overnight or during weekends. Even then, a few connections are sometimes not found. Then an iterative, interactive process is needed. Once the operator is satisfied, detailed drawings of the PCB design are output, including all layers of the board, which are needed for the fabrication. This entire procedure also guarantees full correspondence between the PCB and its documentation, a fact that greatly facilitates maintenance. Moreover, the software automatically rejects "errors", which might otherwise have gone undetected until the board had already been produced.

The work as PCB-designer has changed drastically with the introduction of CAD at ESO. In less time, we can produce more and better boards and on top of it, it is also interesting to use modern techniques.

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