Digital Mapping System —PADMS—

Toshihide Nakamura and Hideyuki Miyoshi

Abstract

The photagrammetric Digital Mapping System or PADMS was developed by Pasco Corporation backed by its wealth of experience in mapping. Equipped with plotting as well as editing acpabilities, PADMS combines with various types of analog photogrammetric plotting instruments to perform digital mapping at low costs.

Its major features include the following.

(1) In order to facilitate real-time contral for high-speed operation, the graphic control unit is equipped with its own CPU in additon to the main CPU as part of efforts to multiply and imporove processing functions.

(2) By using two graphic displays, plotting and editing can be done simultaneously.

(3) In is flexible enough to allow later expansin of the system to accommodate additional date input, graphic output, and date base construction.

Introduction

Pasco Corporaion was established in 1953 as a company specialized in the aerial photographic survey and has been making map covering all over the area of the country with a specific purpose and use for the various businesses.

Realization of high utilization system coupled with a technical know-how from the various fields is highly expected at the time of welcoming a high information age with floods of information into our life.

In order to cope with this new trend of floods, Pasco is developing the following items based on our owns and the advanced computer technics.

1) Digitizing of map information
2) Developement of geographic information system
3) Developement of the vasious application system
4) Research and developement of the access machines and apparatuses to geopraphic information system

Fig. 1 shows a flow of Pasco computer mapping system.

PADMS presented in this paper is a system for digital mapping to be connected with the various analog pletters for photographic surveying developed under our long experiences and technics of aerial photographic surveuys.
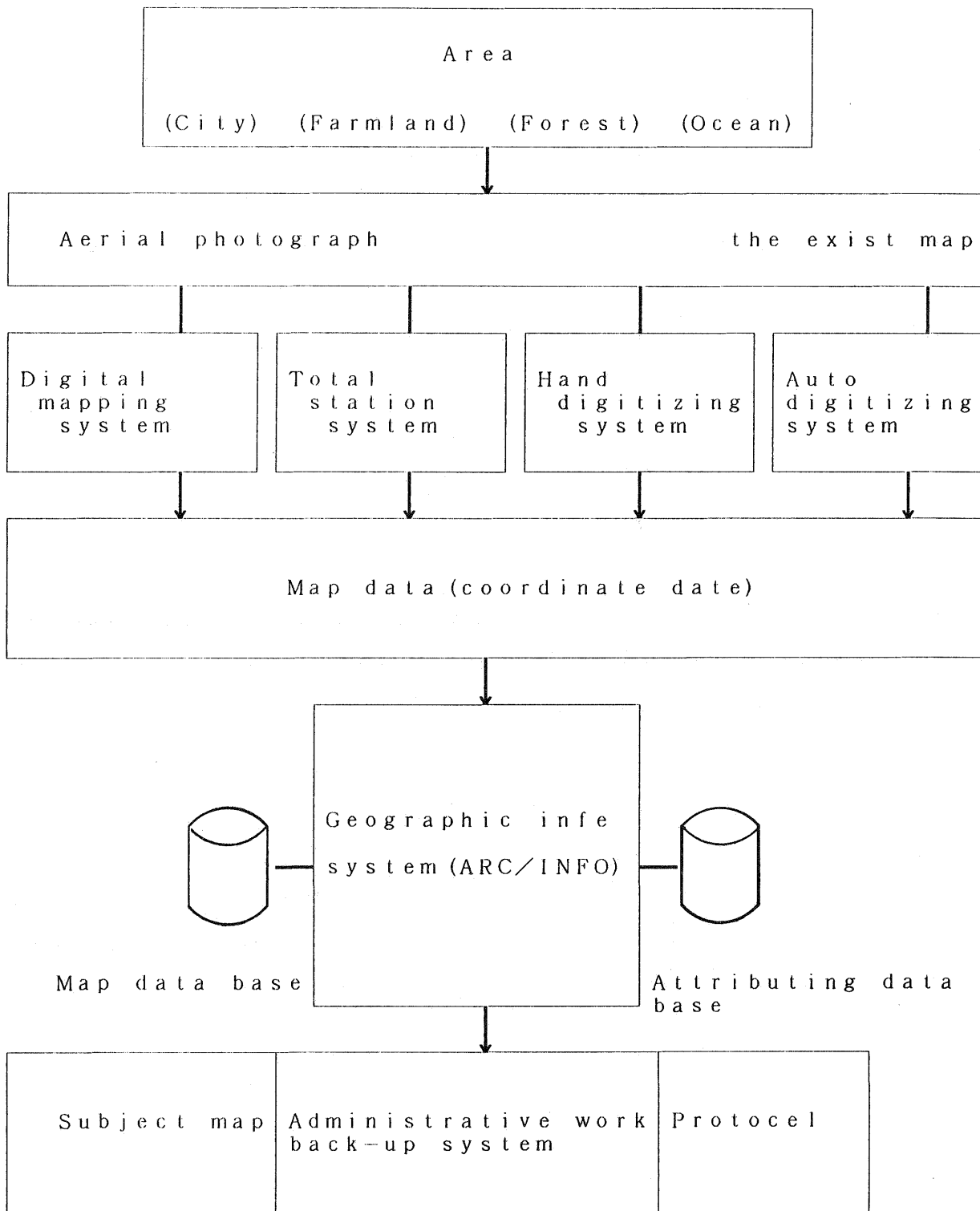
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┌─────────────────────────────────────────────────────────────┐
│                          Area                                │
│                                                              │
│      (City)   (Farmland)   (Forest)   (Ocean)                │
└─────────────────────────────────────────────────────────────┘
                              ↓
┌─────────────────────────────────────────────────────────────┐
│  Aerial  photograph                        the  exist  map   │
└─────────────────────────────────────────────────────────────┘
      │                 │                 │                 │
┌───────────┐   ┌───────────┐   ┌───────────┐   ┌───────────┐
│ Digital   │   │ Total     │   │ Hand      │   │ Auto      │
│ mapping   │   │ station   │   │ digitizing│   │ digitizing│
│ system    │   │ system    │   │ system    │   │ system    │
└───────────┘   └───────────┘   └───────────┘   └───────────┘
      ↓                 ↓                 ↓                 ↓
┌─────────────────────────────────────────────────────────────┐
│                                                              │
│           Map  data (coordinate  date)                       │
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              ┌──────────────────────────────┐
     ┌──┐     │  Geographic  infe            │     ┌──┐
     │  │─────│  system (ARC／INFO)          │─────│  │
     └──┘     │                              │     └──┘
  Map data base                               Attributing data
              └──────────────────────────────┘   base
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│              │                          │                  │
│ Subject map  │ Administrative  work     │ Protocel         │
│              │ back－up  system         │                  │
│              │                          │                  │
└──────────────┴──────────────────────────┴──────────────────┘
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Fig. 1 PASCO MAPPING

SYSTEM

Features of hardware

Fig. 2 shows the structual diagram of hardware.
As shown in the diagram, in order to lessen the main CPU lead and maintain high speed processing, PADMS uses the Motorola, MC68000 for the main CPU and the graphic controls, and then the Zirog Z80, for the digital counter and operation board.

And PADMS has two buses. To high speed bus (VME bus), memory disk and two graphics are connected. To low speed bus, digital counter, RS232C and sentronic are connected.

Graphic controller controls character and graphic picturs and is able to execute simaltaneously the both controls at back-ground even if either one of then is displayed.

As mentioned above, PADMS hardware is designed weighing on easy handling by operater.
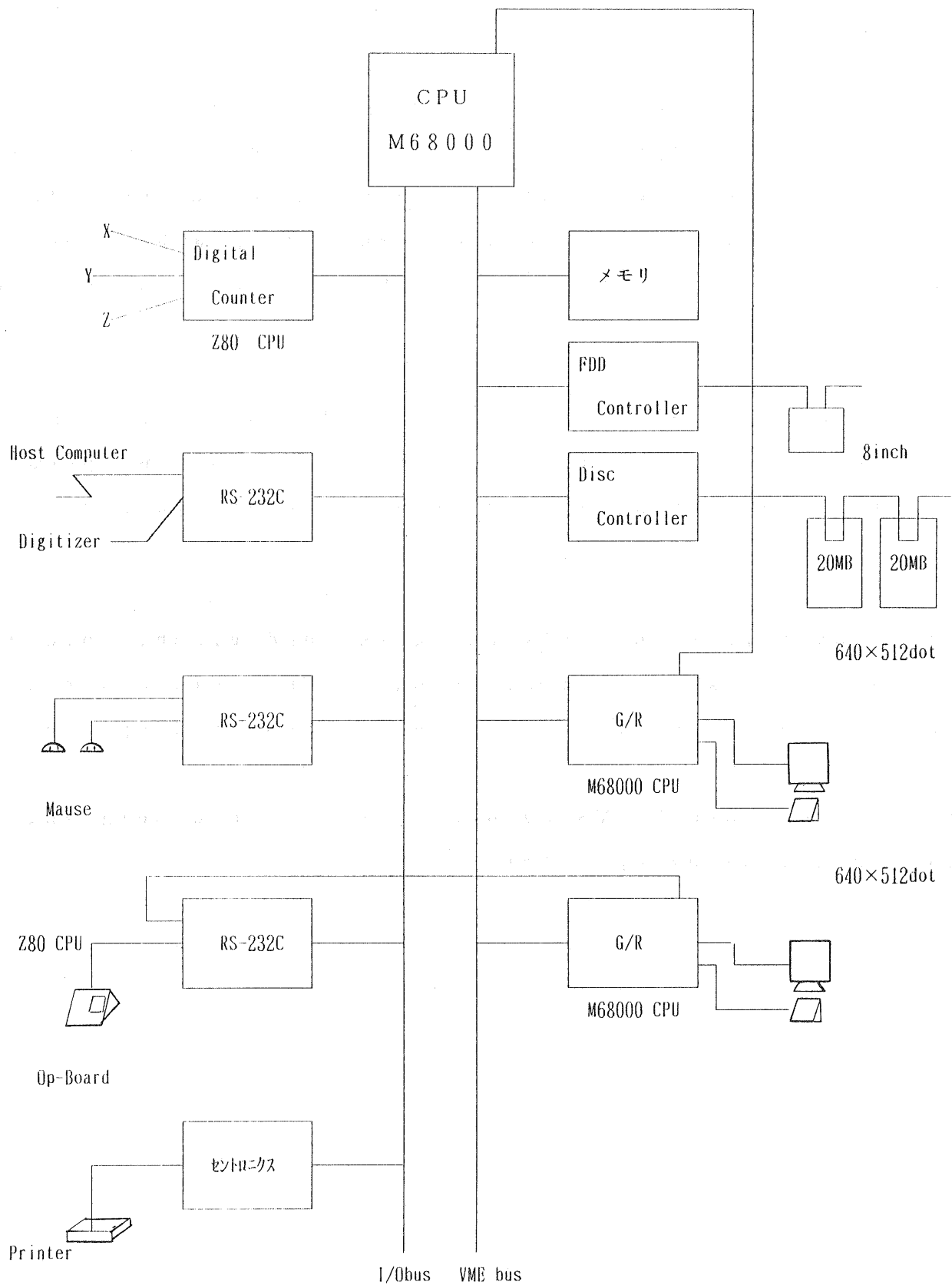
Figure2 Hardware

Functional outline

Fig. 3 shows the functional outline of PADMS.
As shown in this figure, PADMS consists of the following
three functions:

     1) Real part

     2) Editer part

     3) Plot part

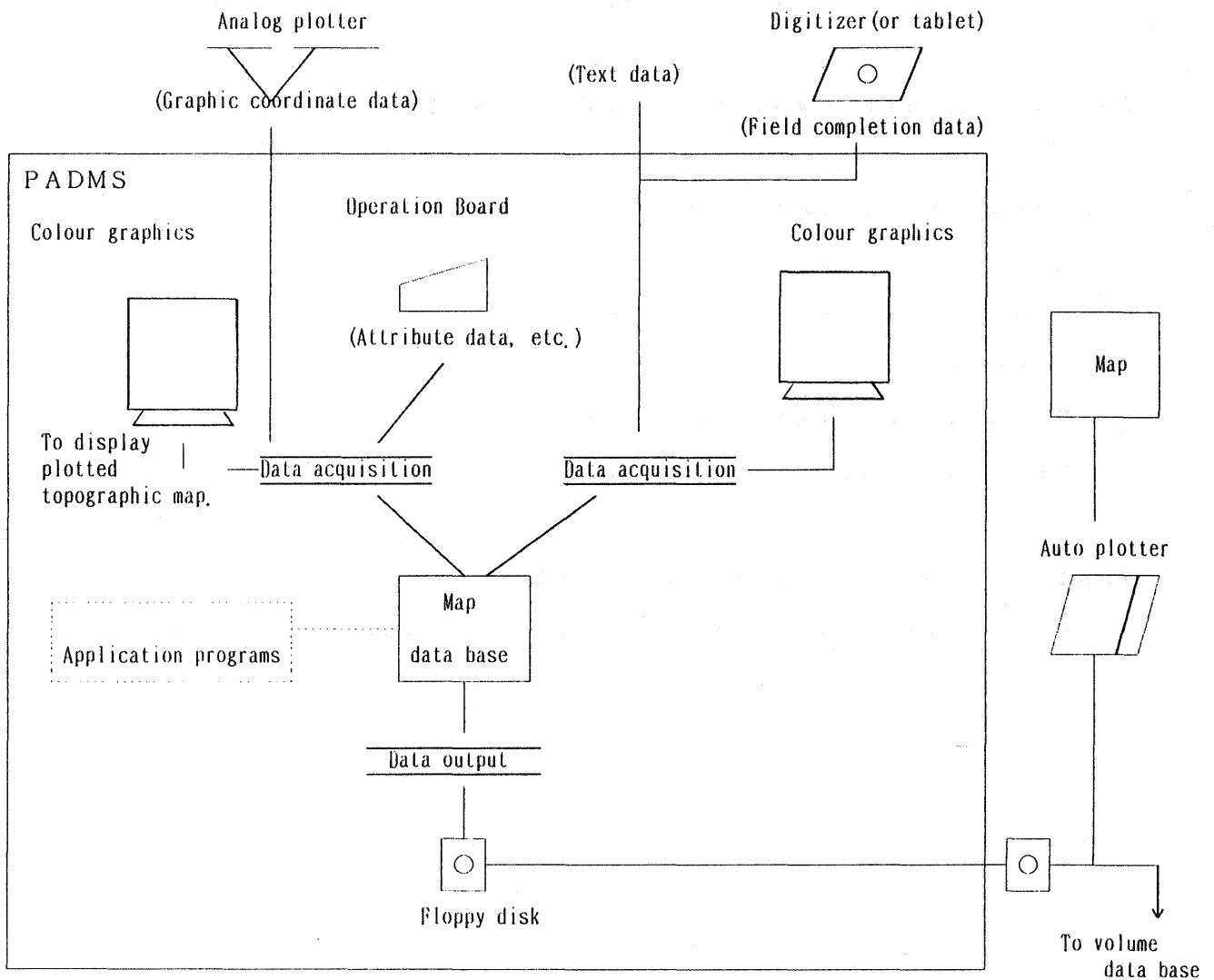Each function is described as follows:

Figure3 Function Outline

1. Real part

This part takes care of plotting from an aerial photo-
graphs.

We are researching a simplification, efficiency and accu-
racy of operion based on our experiences paticipating an
operator in our developement stuff.

PADMS is able to store X, Y and Z data output from pletter
with 1/2 second (50 ms) of high speed and at the same time
able to output in graphic for making it contain.

The following are typical functions of real part.

Coordinate Conversion
- Automatic checking of computation results
- Display of excluded points in coordinate
  conversion
- Display of residual vectors
- Printout of computation results

Restitution and Data Acquision
- Real time display on colour graphic screen
- High speed computation and display of geodetic
  coordinates
- Display of measuring marks
- Display of remaining file capacity
- Correction of elevation values
- Automatic generation of parallel lines
- Operatability of the operation board
  - Function key x 18 pos
 - Object key   x 70 pos

2. Editor part

This part takes care of editing the data from real part.

And PADMS faciliates the multi-task processing with two graphic terminals worked simultaneously editing with plotting, which is one of the main features it has.

Typical functions of editor part are as follows;—

> **Interactive Processing**
> - Additional graphics
> - Deletion — Graphic segment
>   Line segment
> - Correction
>   * Changing of codes and road widths
>   * Reversing of directions
>   * Normal correction of closures
>   * Relocation
>   * Graphic split/merge
> - Enlargement/Reduction
> - Grid cells

> **Batch Processing**
> - Housing closure processing
> - Normal correction
> - Window merge
> - Parallel line processing

3. Plot part

This part transforms the output data to the MUTCH format data.

Typical functional features are as follows:

Cenversational processing:
- Output per grade
- Graphic alternation
- Medification, grid or not, etc.

Conclusion

(1) In orde to facilicate real-time control for high-speed operation, the graphic control unit is equipped with its own CPU in addition to the main CPU as part of efforts to multiply and improve processing functions.

(2) By using two graphic displays, plotting and editing can be done simultaneously.

(3) It is flexible enough to allow later expansion of the system to accommodate additional data input, graphic output, and data base construction.
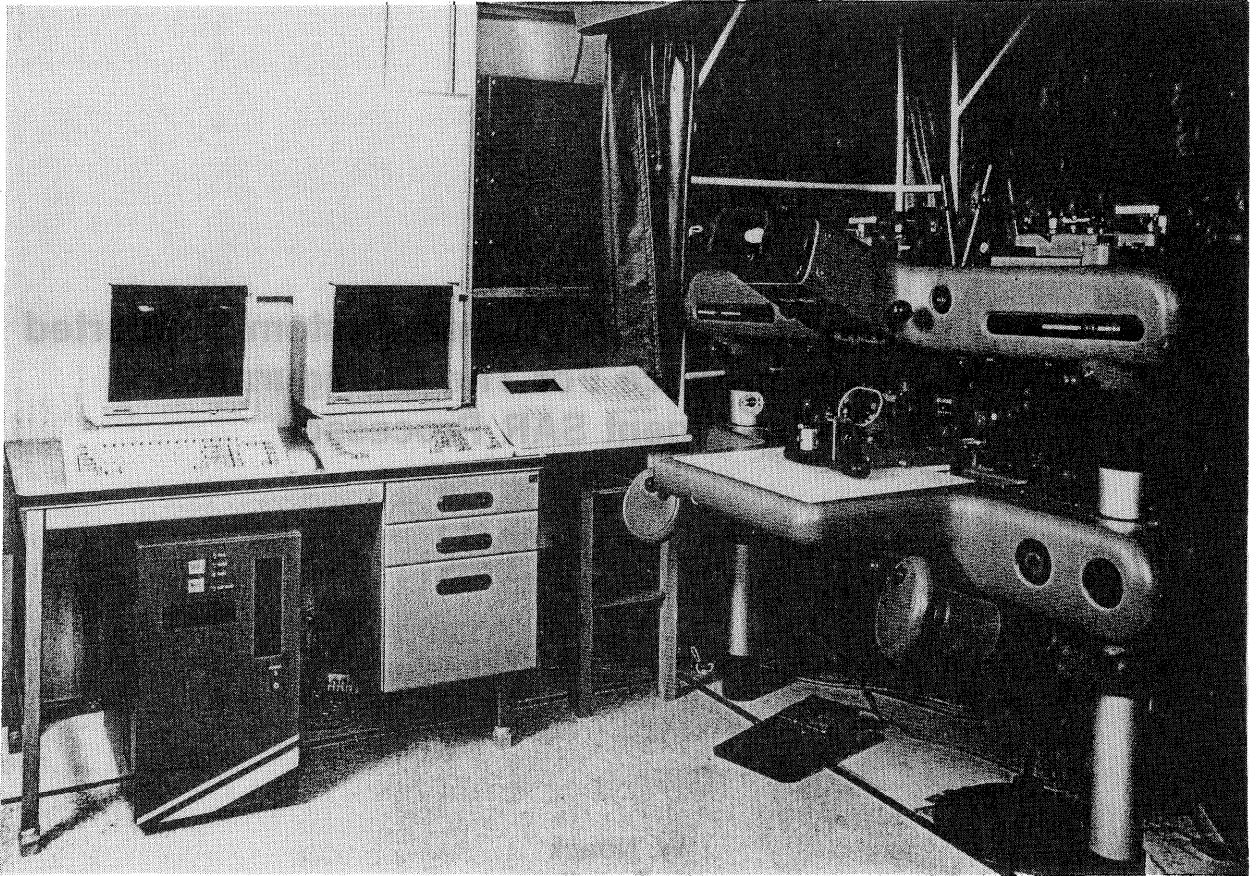
Picture 1 Photogrammetric Digital Mapping System (PADMS/AMH)
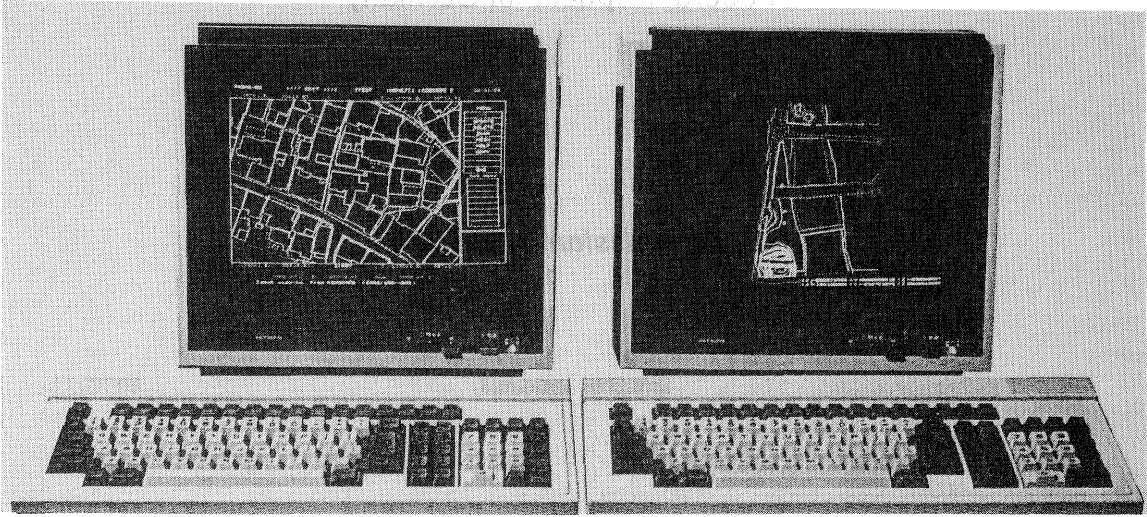
Picture 2 Colour Graphic Display