

# Marconi Data Display Series X2000

The Marconi X2000 series are used with the Myriad or other computer and combines tabular and versatile graphical facilities with a choice of input techniques designed primarily to give the operator a means of communicating with the computer using his hands in a natural way.

This system is designed for high-speed data output from Myriad or other computers with particular emphasis on picture quality, versatility of operation and flexible input techniques.

The equipment consists of one or two control units (and an optional buffer store which may be shared) fitted in a two bay cabinet and a number of display units. The 8½ in., 11 in., 14 in. or 17 in. displays are normally supplied self-contained as shown but can be fitted with cladding removed in racks or consoles.

## FEATURES

Very high definition using a Monocon tube. This improves clarity and enables more data to be presented.

Tabular operation with alpha-numeric character generation rates up to 100,000 per second. The system provides flexibility in number of lines, number of columns and format.

Graphical displays are created by vectors drawn between points on a 1024×1024 matrix. Auxiliary deflection channels for rapid drawing of characters and symbols generated either by hardware or software.

Optional 4K buffer store to relieve computer loading.

Sub-routine mode enabling software characters, symbols or sub pictures to be called up from store locations by programme.

All the modes of operation may be combined to provide tabular and graphical information in the most efficient way.

The choice of Light Pens, Touch Wires and Tracker Balls makes it possible for the operator to communicate with the computer in a direct and convenient way.

### Typical Applications

The Marconi X2000 Display System provides a positive contribution in the growing use of high speed digital computers. It provides a precise, unambiguous read out method, and is particularly suitable for use in the fields of civil and military aviation, science, industry and commerce.

### Computer Graphics

The advent of advanced graphical display facilities enable engineers and scientists to communicate with a computer without any programming expertise. Problems may be stated by drawing on a cathode ray tube using a light pen, touch wire or tracker ball, the solutions being similarly displayed. Pictures drawn on the screen may be altered, enlarged, reduced, rotated, given dimensions, added to or stored.

### Power Generation and Distribution :

Data presented in graphical or tabular form, can achieve remarkable improvements in system flexibility over conventional instrumentation. Complete system monitoring, presentation of alarm states, display of plant data and distribution networks, may be achieved easily and simultaneously.

### Steel Mills :

Information relating to vital decisions such as temperature, composition and other current process control data which govern the efficiency of a steel mill may be quickly presented at strategic control points. The loading and procedure of transferring hot steel ingots from soaking pits to the slabbing mill, transfer of ingots from one vehicle to another, coiling, slab shearing, rolling faults, run out, and cutting lengths can rigidly be supervised and controlled.

### Message Switching :

In automatic relay systems correct message routing can be achieved by computer, the X2000 Display enables mutilated messages to be displayed silently, resolved by the operator and inserted into the normal relay traffic system.

### Meteorological Data Handling :

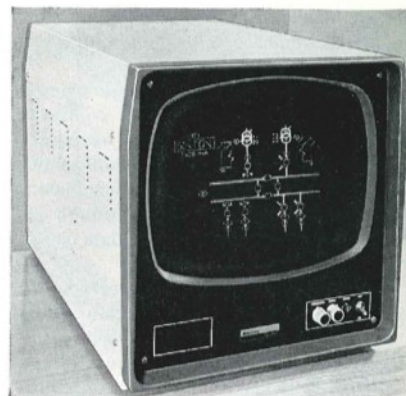
Graphical illustrations of the latest meteorological conditions can be displayed and additional information may be added by meteorologists using a light pen.

### Banking and Business Data Handling :

The Display System can be integrated into commercial information distribution systems. It will provide simultaneous information from the computer to those needing it in order to initiate vital commercial dealings. Rapid and often temporary access is required to large amounts of information held in long term storage which influence amounts of information held in long term storage which influence commercial decisions. This information is readily made available using the X2000 Display Systems.

### Air Traffic Control :

In the field of aviation the capacity of this



X1001

display system for speed and precision is of great significance. The problem presented to Air Traffic Control Centres by increased air speeds and traffic density, can be diminished by the instantaneous presentation of relevant information which can be updated with minimum delay. A significant contribution towards improved data handling in civil aviation can be achieved by using this system for the display of such information as:

Details of air traffic situations to controllers on a sector or airline basis. All data held in store on particular aircraft as demanded by the controller. Incoming messages from high speed data links.

Air passenger bookings and freight reservation availability.

The graphical facilities enable such information as 'aircraft on conflicting paths' to be presented. A synthetic radar picture may be shown, complete with video map and aircraft plots.

## General Description

The Marconi X2000 Data Display System has been designed as a high-speed read-out for digital data handling systems and to provide a considerable advance in man-machine communication. In order to achieve a wide range of system performance the equipment has been designed in modular form and a number of the facilities available are therefore optional.

The display system consists in its simplest form of a control unit and one cathode ray tube display driven directly from a computer. This allows the presentation of data in the form of dots on a 1024×1024 matrix. The computer will, however, have to send the data and instructions to the control unit so



that the displayed picture is refreshed at a rate greater than 16 cycles per second to avoid undesirable flicker.

Where more complex formats are being displayed the loading on the computer becomes considerable and it is necessary to fit a ferrite core store which buffers the computer from this load. The display system will then automatically cycle through its own buffer store and refresh the data on the displays at a suitable rate.

Where it is required to draw vectors it is necessary to add the vector generator which is a plug-in option to the Control Unit. This allows straight lines to be drawn between points at any angle. By appropriate instructions a picture may be built up from a sequence of vectors. Limited amounts of tabulated data may be dealt with by drawing each character as a sequence of vectors.

The display units are equipped with two deflection systems, a main deflection, and a very high speed auxiliary deflection system. The operation of the position and vector generators, as described above, utilize the slower main deflection system. Two further options are, however, available which use the high speed auxiliary writing channel, these being the symbol and character generators.

To show a very large amount of tabulated data on a number of displays, a character generator may be required since this allows a character to be written in about 10 microseconds. Characters are drawn as a pre-set sequence of small vectors which join adjacent points on a 5x5 matrix. A control word brings into operation this character generator and subsequent words are taken as containing characters until a different mode of operation is detected. The beam of the cathode ray tube is automatically moved to the next character position whilst in this mode. If it is required a Parity Check board may also be included, this checks for parity when reading characters from the store. If a parity failure is detected a special symbol is generated and an alarm set.

If the volume of tabulated data is such that a longer character writing time can be tolerated, then software character generation may be used. This allows the program to link to a set of character or symbol writing instructions which are stored in the core store. These instructions consist of the series of vectors required to draw the character or symbol, they are completely under program control. Thus the program is read from the store and if character A is read then the program automatically links

to the appropriate store location. The character or symbol is then drawn, and at the end of the character a return is made to the main program. The software character generator uses the Subroutine Mode and Symbol Generator.

The Subroutine Mode can also be used to link to sub-pictures, which may be symbols or a frequently displayed component part of a picture. These are then only stored once and may be referred to at any time in the program.

At the present time four display units of 8½ in., 11 in., 14, and 17 in. sizes are available, these are likely to be augmented by a larger display of 21 in. or 24 in. size. The units are of rugged construction and are designed for the fastest possible speed of operation.

Being developed with the actual Display equipment is a comprehensive range of Computer Graphic Software which will be available for Myriad computer users. These facilities enable geometric pictures to be displayed which can be altered, enlarged, reduced, rotated, dimensioned, added to or stored.

Two smaller but essential developments in the range are the Light Pen and Touch Wire Units. The Light Pen enables an operator to input data to the computer and apparently draw lines on the display screen. It is an option on the larger Display Units. The Touch Wire module consists of a matrix of 4x8 contacts in a clear mask on the front of the display screen. By presenting data as labels above each contact the screen becomes an infinitely variable keyboard. An additional input device is the Tracker Ball which allows easy movements of an electronic marker about the display screen.

## DATA SUMMARY

### Display Control Cabinet

**Logic elements:** Microminiature logic throughout.

**Store capacity:** 1024 or 4,096 words, 24 bits.

**Store cycle time:** 1.8 microseconds (full cycle).

**Data code:** Marconi Display Code in Subroutine Mode ISO 8 in Character Generator.

**Display outlets:** 6 plug-in, more by addition of extra frame.

**Number of lines:** Flexible, typically 64.

**Number of characters per line:** Flexible, typically 64.

**Number of characters:** 64.

**Ambient temperature range:** 0-40°C.

**Relative humidity:** 90%.

**Mains supply:** 110 or 230 volts a.c. ±10%. 250 to 1,250 watts according to configuration.

### Dimensions:

Height: 6 ft 2½ in. (189.2 cm)

Width: 3 ft 11½ in. (120 cm)

Depth: 2 ft 4 in. (71.1 cm) incl. doors

**Ventilation:** The equipment can be operated without air conditioning equipment in the temperature range 0 to 45°C with 90% humidity. Air is drawn in through a filter at the front of the cabinet and is expelled through vents at the top. The cabinet can also be connected to an external forced air blowing system where this is available.

### Display Units

#### Sizes:

8½ in. (X2004) 11 in. (X2001) 14 in. (X2005) and 17 in. (X2000).

**Front panel controls and indicators:** On/Off, Focus, Brilliance and mains indicator.

**Logic elements:** Silicon semi-conductors are used throughout (including e.h.t.).

**Ambient temperature range:** Main and Auxiliary deflection systems 0-45°C.

**Relative humidity:** 90%.

**Power supplies:** Integral.

**Mains supplies:** 110 or 230 volts ±10%. 150-500 watts per unit.

**Ventilation:** Self blown.

#### Dimensions:

X2001 (with covers)

Height 13.5 in. (34.3 cm)

Depth 27 in. (68.6 cm)

Width 13 in. (33 cm)

(without covers)

Height 11.75 in. (29.8 cm)

Depth 24 in. (61 cm)

Width 12 in. (30.5 cm)

X2000 (with covers)

Height 18.5 in. (46.9 cm)

Depth 29 in. (73.7 cm)

Width 18 in. (45.7 cm)

(without covers)

Height 17 in. (43.2 cm)

Depth 26 in. (66 cm)

Width 17 in. (43.2 cm)

## THE MARCONI COMPANY LIMITED

Automation Division

Great Baddow, Chelmsford, Essex  
Telephone: Chelmsford 53255. Telex: 99201  
Telegrams: Expanse Chelmsford Telex