POLY
SYSTEMS
SPECIFICATIONS

ISSUE 2.1

POLYCORP

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POLYCORP

New Zealand Limited

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C O N T E N T S

CHAPTER ONE: INTRODUCING THE POLYCORP ORGANISATION

1.1 BACKGROUND

Since the early 1970's, educationalists have appreciated the need
to introduce appropriate computer systems to meet the universal
demand for new workers able to cope with new computer-related
technologies at even basic levels within the employment sector.

For New Zealand to achieve required rates of economic growth
through constantly growing export returns and internal production
efficiency, our future workforce must receive training in computer-
related practises, while at school.

This student resource must become increasingly capable of accepting
the demands of later work with - and through - computers, to
enhance productivity. The application of computer science into all
facets of everyday life will re-direct the career paths of all
New Zealanders. The need for such change in accepted careers, plus
the creation of new levels of specialisation, is well recognised.
The new role the education service must play in equipping the
population for the challenges of new technology is now being
formalised.

The same educationalists who foresaw the need to educate students
in computer-related technologies were quick to also perceive the
creative scope of micro-computer equipment itself as an aid to
teaching a broad range of general subject matter. Their
recognition stems from an awareness that the use of computer
technology as an aid to teaching and learning will affect every
subject across the entire secondary school curriculum.

1.2   ORIGIN OF POLYCORP

During 1980 staff at the Wellington Polytechnic School of Physics, Electronics and Telecommunications Engineering (P.E.T.E.) completed development of a basic monochrome micro-computer system to support the teaching of specific courses within their curriculum.

Having dedicated nearly three years' effort in reaching that stage, the potential for widespread application of the system within New Zealand's overall education service had received in-depth consideration by those involved in the project.

It was clear that the successful application of computer aided learning in schools would be particularly dependent on national co-ordination and standardisation of equipment.

Both the Minister of Education, Honourable M.L. Wellington, and the Department of Education were encouraged by the approach to computer aided learning being taken by the Wellington Polytechnic staff, and arranged for a further evaluation of the Polytechnic concept to be undertaken. This evaluation was particularly influenced by the Department of Education's stated desire to introduce comprehensive computer study and awareness courses, and to bring computer learning aids into the field of general subject instruction across the entire secondary curriculum.

As a consequence of these events, the Development Finance Corporation of New Zealand (DFC) - a government owned organisation founded to encourage and promote New Zealand's economic development - undertook to fund and manage a public-private sector partnership to design, develop manufacture and market a system based on the early concept.

1.3   POLYCORP NEW ZEALAND LIMITED

Polycorp has been established as the organisation responsible for the manufacture, marketing and future development of the POLY classroom learning system.

Development Finance Corporation of New Zealand (DFC), representing government interests, holds majority shareholding. The other major shareholder is Progeni Systems of Lower Hutt.

DFC is New Zealand's industrial development bank, established by Act of Parliament. Progeni Systems Ltd is New Zealand's largest software company, exporting services to many countries throughout the world.

Represented on the Board of Directors of Polycorp are the Wellington Polytechnic Council, educational interests, the New Zealand professional electronics manufacturing sector, Progeni and DFC.

Polycorp management personnel have extensive experience in all aspects of the electronic industry from specilaised computer hardware development to international marketing of New Zealand sourced high technology products.

All POLY hardware production is sub-contracted to those New Zealand professional electronics manufacturers who have proven performance meeting the highest international standards of manufacture and quality control.

All POLY education software programs have been created by New Zealand teachers _for_ teachers everywhere. This material is packaged into a "library" of programs for use with the micro-computer units. In working with this library material, teachers can themselves augment and adapt the pre-set programs to suit their individual class requirements.

Polycorp provides two levels of system maintenance and support in the field - through locally based trained agents in addition to centralised full support facilities in Wellington, New Zealand. Full support facilities are also established in each country outside New Zealand, as required.

CHAPTER 2 : THE POLY MICRO-COMPUTER LEARNING SYSTEM

2.1 SYSTEM CONCEPT

Overseas experience confirms that computerised learning systems can
make a significant contribution to learning. Excellent results are
achieved when the equipment employs fully-relevant curriculum
support material, and is available to all teachers and students in
the portable, compact desk-top form adopted for POLY.

Polycorp believes that micro-computer learning systems should fulfil
two major roles in schools

    A.   To help students adapt to an increasing computer-
        oriented workplace.

    B.   To offer a teacher-support tool, providing
        additional motivational force for the learning
        process across a broad range of subject material.

While all micro-computer devices have an inherent ability to enhance
the learning process, it is the quality, scope and local suitability
of the teaching content of their programs that finally determines
relevance to everyday classroom situations.

The POLY micro-computer learning system has been developed as an
integrated package comprising:

    A.   Individual, desk-top microprocessor learning units;

    B.   A teacher-oriented operating system;

    C.   A wide range of application packages covering
        many sections of the New Zealand school curriculum
        not simply such 'traditional' computer preserves as
        Maths and Physics. Many of these curriculum subjects
        are believed to be relevant to overseas schools.

The POLY system permits the use of 1 to 16 separate console units connected in a loop to a single disk unit and a hard copy printer. Each console unit has direct access to the disk and printer unit as required.

A small initial classroom set of say four console units can be readily expanded to meet lower student/machine ratios simply by adding POLY units to the network. No additional disk or printer units are required nor are any changes to the operating system needed.

Teachers may use the unique broadcast mode to rapidly distribute particular subject modules to each console unit.

Students have the flexibility to call up and store locally any of the wide range of learning and computer programming modules.

Each POLY unit is equipped with a 35 cm (14 inch) colour video screen capable of reproducing material in up to seven colours. The resulting image gives extremely high clarity and sharp graphics definition.

The actual desk-top classroom units created for the POLY System are of extremely robust design, suited to the sometimes harsh environment of the classroom.

2.2 POLY SPECIFICATIONS

2.2.1 SYSTEM OVERVIEW

The POLY System may be set up either as independent POLY units or as
a system with all the units connected to a shared disk.

POLY is operated either in Standalone mode or in System mode.

(1) Standalone Mode

In STANDALONE MODE, the POLY is not connected with other
units or any disk Unit. Only a restricted POLYBASIC is
available. This contains most of the commands available
in the full POLYBASIC but all disk handling and a few
other commands are omitted. Those commands not available
in the Standalone Mode are clearly indicated in the
POLYBASIC Manual. In this mode, Tape cassettes are used
for storing programs.

(2) System Mode

In SYSTEM MODE. each of the POLY units is connected via a
communications line to a central disk unit on which all
programs are stored. Tape cassettes may also be used.
All commands and statements are available in System Mode,

2.2.2 OPERATING SOFTWARE

The POLY system software has been especially developed to support the
POLY System as a teaching aid in the classroom. Just as the hardware
has been developed for simplicity of use by people not trained in
computer operation, so features have been selected and added that
make for simple operation of the system. The system software features
efficient and fast communication with the disk unit, automatic loading
of system software, complete disk interfacing and management of
comprehensive and simple programming languages.

Communication System (POLYNET)

POLYNET is a communication system which has been especially developed
to handle the interface between the POLY console units and the system
control unit. The System is a simplified polling system which determines
the source of a message by the time it takes to send it. This requires
the minimum of interaction and interruption to processing taking place
in the POLY console units. Response time is minimal. The communications
system automatically determines when units are switched on and off and
adds or deletes them from the system. This feature allows the POLY
console units to be either removed from the system or added to the
system at any time, without affecting the operation of other units.

Operating System (POLYSYS)

The POLYSYS operating system controls the communications system, the
management of the control unit, and carries out a number of other system
functions. When a POLY unit is switched on, POLYSYS determines whether
or not it is linked to the control unit. If it is, then the disk
interfacing sections of the operating systems are automatically loaded
from the disk and the MENU is displayed on the POLY console units.
If the link is not present, the unit is put into STANDALONE BASIC
programming mode. From this point onwards, the operating system is
not visible to the user but carries out its functions simply and
efficiently. The usual situation in a classroom is that all units
require the same courseware at the start of a lesson and the pupils
then proceed at their own speed through the module. The BROADCAST
feature allows all units to be loaded with the required courseware
within 1 minute of switching the system on.

POLYSYS manages all disk accesses and the placement of files on the
disks. This complete handling gives security of data and simplicity
in file handling by programmers.

The operating system is supported by a number of utilities' which
allows users to COPY files, COPY disks, PRINT files, interrogate the
disk directories and LIST files on the POLY units.

POLYSYS is arranged so that it cannot be corrupted by programmers from their programs.

Programming Software

The POLY System supports four main programming languages.

(1) POLYBASIC, a proprietary extended
     BASIC interpreter embodying all standard
     BASIC commands with powerful extensions
     for screen handling and graphics, POLYBASIC
     is ROM based and includes a compilation
     option

(2) PASCAL. Omegasoft PASCAL, stored on disk.
     The PASCAL compiler produces machine code
     which results in the fast operation of
     programs

(3) PILOT, a simple user language which allows
     teachers to write their own interactive CAI
     programs

(4) ASSEMBLER. Omegasoft ASSEMBLER for 6809
     code on the POLY System

2.2.3   THE POLY SCREENS

The POLY System has the unique feature of multiple screens. These
may be compared to a series of transparencies one behind the other.
These screens consist of two text screens, two graphics screens
and a half intensity background screen. The individual screens may
be switched ON or OFF as required.

The programmer may determine when particular screens are to be displayed and to which one data and graphics are to be written. If two or more screens are displayed simultaneously, individual dots or pixels on the screen may either be displayed on a priority basis or the colour elements from each screen combined to form a composite colour. This allows screens which contain both text and graphics to be displayed simultaneously, and to superimpose text and graphics without removing the original.

The five screens are available for display in the following order of overlay priority:

1. Text 1
2. Graphics 1 (240 pixels across)
3. Text 2
4. Graphics 2 (240 pixels across)
5. Background

The use of SELECT and DISPLAY functions allows screens to be used when they are not displayed. Each new screen to be displayed can thus be built up prior to being switched on to the video. This facility provides for very effective animation by rapidly switching the video from one screen to the other.

FINE GRAPHICS is achieved by combining GRAPHICS 1 and GRAPHICS 2 screen and gives a pixel definition of 204 rows of 480 pixels.

1. Text Screens

The POLY computer uses teletext for the specification of data on the TEXT screens. Teletext allows:

- upper and lower case
- seven colours
- reverse video
- two types of "chunky" graphics (72 lines of 80 pixels)
- flashing fields.
- non displayed fields
- background for characters
- ASCII control codes for cursor control
- double height characters.

The text screens contain 24 rows of 40 characters.
Colour on the text screens is selected by printing
a colour control character before the data. Individual
characters are prescribed for each of the seven text
colours available.

2. Graphics Screens

The programmer is provided with many special features on
the system to facilitate the easy development of screen
formats. These features include:

- specification of individual pixels
- specification of graphics as either:
(i)   line descriptions
(ii)   boundary descriptions
(iii)   a screen dump of the actual memory
            representing the screen
- displaying of any of the above forms anywhere on the
  screen as required, independent of their original
  definition position
- filling of the area within a defined boundary with
  any regular pattern of pixels.

Each graphics screen is designed to display 4 colours at
a time. These are either:

	Red	Blue	Green	White
or	Red	Magenta	Yellow	White
or	Magenta	Blue	Cyan	White
or	Yellow	Cyan	Green	White

These are set using the COLOUR and MIX commands.

All seven colours may be obtained by mixing together either
the two graphics screens or one graphics screen together
with the Text 2 screen.

FINE GRAPHICS is achieved by selecting screen 5. This uses
the graphics screens 2 and 4 and gives a pixel definition
of 204 rows of 280 pixels. Any of the 4 colour sets given
above are available. The 480 graphics screen has a priority
similar to screen 2.

2.2   POLY SPECIFICATIONS

2.2.4   EDUCATION COURSEWARE

Polycorp has prepared an extensive library of education software
programs that specifically meet the Department of Education
requirements. This library is continuously augmented with new
material to meet projected requirements.

Many of the education program modules are supported by comprehensive
manuals for background and supplementary reading, teachers guides,
student guides and worksheets. It is this combination of program
modules and supporting material that is designated "Education Courseware".

The courseware available sets new standards for courseware on computers.
It is designed for simplicity of use, robustness, and through a
combination of colour, diagrams and animation, provides a valuable
aid to the teacher which is stimulating, visually attractive and
educational to the pupils. Throughout all courseware consistent
presentation standards are maintained. This has been achieved through
the use of powerful aids for the generation of programs. All
courseware embodies the highest professional software standards.

The courseware has been designed to include:

- drill exercises
- simulations
- computer aided learning
- computer aided instruction
- student evaluation
- games

The identification of the topic/subject areas was undertaken by a
committee of officers of the Department of Education. Further, the
choice of software authors has also been made by the appropriate
Curriculum Development Officer responsible for the corresponding
subject area.

The level at which the authors interface with the POLY units is specified by the Polycorp Software Supervisor in conjunction with the programming team. The authors are not required to have any programming knowledge, although on average approximately one half have some exposure to a computer at a programming level.

Following full specification of each program module by the teacher authors the Polycorp organisation provides all programming resources to complete the module for use in the classroom.

The Polycorp courseware libraries developed to help students adapt to an increasingly orientated workplace are contained within two courses:

(1) Computer Awareness
(2) Keyboard Skills

Other courseware libraries have been prepared to meet the specialised requirements of New Zealand schools. They are used as a teacher-support tool by providing additional motivational force for the learning process. These libraries include:

(3) Physics - projectile motion
(4) Geography
(5) Farming Simulations
(6) Recreational Games

When operating the POLY System as a teaching aid in the classroom the operating software is completely invisible to the user. Interaction with the education program libraries is via MENU driven screen. When a user "logs on" to a POLY, a MENU is displayed that lists the subjects that are available on the particular flexible disk in use. The user selects the appropriate subject by moving a flashing cursor into a selector box on the screen, using coloured and clearly marked cursor keys. After a subject has been selected a new menu appears listing the modules that are available for that subject. Again, the selection is made by moving the cursor to the appropriate selector

box. Responses within the courseware are made by menu, by cursor movements or by typing answers to questions given in English text. At all times, the user is led through the material with appropriate cues and prompting messages. All exits from the courseware take the user back to the subject menu. An exit to menu happens automatically at the end of a module but as well, it will occur if a software fault is detected or if the user aborts a programme by pressing the "EXIT" key.

Use of the POLY units for normal programming purposes is achieved by selecting the particular language required from the MENU in the normal way.

Limited access to the operating system is provided for the user when the system is being used in Programming mode. All education programs in the Polycorp libraries have been written using POLYBASIC as provided on each POLY computer system. This powerful language plus the additional flexibility of having PASCAL, PILOT and ASSEMBLER also available makes the preparation of high quality programs within the capability of each school.

Polycorp can provide training and programming support to those individual schools and education groups who wish to prepare their own courseware.

All Polycorp education programs are supplied on 8" flexible disks in compiled form. Source code for these programs is not available.

A summary listing of the Polycorp Education Courseware libraries is included in the publication entitled "Summary of Polycorp Education Courseware".

2.2   POLY SPECIFICATIONS

2.2.5   SYSTEM HARDWARE

The Poly System has been specifically designed and tested to meet
the rugged operating environment often encountered in schools.

The physical setting up of a POLY System is very straight-forward.
Each POLY unit has a network socket and an attached network cable.
The computers are placed in a convenient arrangement and then the
cable from each unit is connected to the socket on its nearest
neighbour. The cable from the last computer goes to the socket on
the disk storage unit. Once the physical connections have been
made the electrical establishment and maintenance of the network
is fully automatic. Polling is used to identify each POLY and to
determine whether there are any data transactions to be performed.

Each POLY computer is brought into the network when a user "logs on"
and is removed from the network when the user "logs off" or if the
POLY is switched off. Extensive error detection and recovery are
provided to make sure that information is not lost because of
disturbances caused by action such as turning off a POLY in the
middle of a data transfer.

Although it appears to be connected as a daisy chain the network is
actually a closed ring carrying synchronous serial-data. A 4 wire
cable carries outgoing data, return data, clock and signal earth.
The last POLY unit on the network automatically connects outgoing
data and return data lines together to complete the ring.

The network may have from 1 to 16 POLY Computer units connected to
a single Disk Storage Unit.

POLY 1 Console Computer

The hardware features unique cabinet design, robust construction, simple cabling, a minimum of switches and controls and carrying handles on each unit for easy movement.

The POLY computer unit incorporates into one case, the main processor, keyboard and video display.

Processor Features:

- latest micro-computer technology using Motorola 6809 8 bit processor with 16 bit arithmetic;
- 64 kbytes dynamic memory
- 2 kbytes static memory
- 4 kbytes system prom
- 16 kbytes BASIC prom
- built-in speaker for sound
- user interface, incorporating tape cassette port
- programmable timer and memory management unit
- network interface

Keyboard

- full ASCII keyboard, upper and lower case types
- four cursor control keys
- numeric keypad
- editing keys
- calculator/help key
- NEXT, BACK and REPEAT keys for CAL modules

Video Display

- full 35cm (14 inch) colour video screen capable of reproducing image material in up to 7 colours plus texturing
- range of screen formats

        dual 40 column by 24 line text   - 7 colour
        single 80 column by 20 line text - 7 colour
        single 480 x 240 pixel graphics - 7 colour
        dual 240 x 204 pixel graphics   - 7 colour

screens may be displayed singly or in a range of combinations using mixing or overlaying.

Communications

- Network - fully automatic serial ring using HDLC format
- User Port - serial, bidirectional link using optical isolation
  This port is also available as a tape cassette port.

Cabinet

- Two piece moulded fibreglass.
- Ventilation holes are concealed to minimise ingress of dust and other extraneous matter. Cooling is by natural convection.

Power Supply

- Input 230 $\pm$ 10% volts AC 50Hz

Temperature Range

- $0^{o}C$ to $40^{o}C$ ambient

POLY 1 - DISK CONTROL UNIT

The Disk Control Unit is used for:

(i) storage of programs and data for the Poly computer units.

(2) connection of any printer, terminal, modem or other computer system to the POLY 1 network via RS232C port.

(3) operation as the network controller on a system comprising from one to sixteen POLY computer units.

Each Disk Control Unit features

- 8" flexible disk drive, formatted to store 600 kybtes per disk

- extension facilities for additional disk capacity (up to three extensions, each of 600 kybtes are possible)

- internal Motorola 6809 processor for control of operating
  and communications system

- up to 56 kybtes of RAM storage to facilitate rapid data access

POLY 1 - DISK EXTENSION

To allow for extensive data and program storage, disk extension units
are available to expand the disk storage capacity from 600 Kbytes
(control unit) to 2.4 Mbytes (control unit plus three extensions).

The Disk Extension units are identical in appearance to the Disk
Control Unit but do not incorporate the computer and disk interface
circuit boards used in the control unit.

The POLY micro-computer units, control unit and communications
network have been designed as an integrated system, specifically
for application in the educational environment. These items may
not be interchanged with equipment produced by another manufacturer.

Printer

The POLY System is designed to use any commercially available printer
that can provide a standard RS232 serial interface.

For the school environment the Epson MX-80 and MX-100 models have
been found to perform satisfactorily. The C.Itoh model 8510 is also
of a comparable standard.

Quotations for the supply of printers for use on the POLY System
are provided in consultation and evaluation of the clients particular
needs. Alternatively the client may freely elect to obtain printers
from any preferred source.

CHAPTER 3:   THE POLYCORP PROPOSALS

3.1 OVERVIEW OF PROPOSALS

The POLY System has been developed to meet the needs of the secondary & tertiary educational sectors. Specifications for equipment were prepared following extensive reviews of school and Governing Board experiences both in New Zealand and in many other countries.

Over the years there has been extensive discussion on the relative merits of mainframe computer systems vis-a-vis the individual micro-computer and more recently the full micro-computer system of multiple computers.

Opinions expressed by educationalists with first hand experience of computer aided learning suggest that the use of centralised mainframe computer installations communicating to remote terminals may not yield the advantages sought in the classroom.

Individual micro-computer systems designed specifically to meet educational needs offer significant advantages in the school environment:

- by eliminating the overhead of personnel for system management which would be a requirement for any mainframe computer operating in the circumstances specified;

- by increasing reliability and availability through having an in-house, interactive micro based system in each school;

- by eliminating varying mainframe access priorities that cause significant difficulties at the teaching interface.

3.2   MODES OF OPERATION

Polycorp has the range of products to meet the Institute's requirement for computing in schools. Our systems are designed to perform in two distinct locations on the school campus:

- a stand-alone system in the office or classroom
- a multiple computer system in the classroom.

For the standalone system, three operating modes are foreseen:

- the maintenance of student records, scaling of marks, internal assessment, timetabling and inventory functions;
- individual application for student programming, vocational guidance and recreational use both during and after school hours;

- use by teachers for the preparation of their own programs and teaching material.

For the classroom the computer will also be used primarily in three modes:

- as a device to teach computer programming in any of the four languages provided.

- as a device to assist slow learners and to motivate disruptive students. In this mode, 1 to 1 access is normally required for drill and practice exercises;

- in a computer assisted learning mode across the entire school curriculum. In this mode simulation capability and high resolution colour graphics are desirable features. A student/machine ratio of two or three to one has been found to be acceptable in these activities.

The desirable number of console units per school and the location of those units will normally be determined by each school role, class sizes and courses being offered. For example, computer studies and computer awareness courses demand greater usage of machine time than other general subjects in the school curriculum.

Combination Mode

A single POLY System can be readily configured to meet both administration and school programming needs. Two POLY console computers may be located one in the administration office and one in a nearby classroom. Both POLY units are linked to a single disk control unit.

In normal circumstances this configuration would preferably also include one disk extension to provide for additional storage and disk copying facilities. However a POLY utility is provided to allow for limited copying of files from one disk to another on a single disk drive by utilising the computer memory.

Education Courseware Security

One of the important features of the POLY System is that all education courseware, whether prepared by each individual school or provided by Polycorp, can be protected from copying or running by unauthorised organisations. In this way the investment made in courseware can be protected.

3.3   ALTERNATIVE EQUIPMENT CONFIGURATIONS

Many schools will wish to consider the initial purchase of a small "starter" set, perhaps with the view of expanding the system with additional POLY console units as usage requires.

Our proposed configurations for such starter sets cover a single unit standalone system that may be used either in the classroom or in the school administration office.

Recommendation however for the schoolroom is for a 2 unit starter set that utilises a single control unit. Either system can be expanded merely by the addition of POLY units without the need to increase the number of disk drives or printer facilities.

3.3 ALTERNATIVE EQUIPMENT CONFIGURATIONS

(A) Starter Set for the School Classroom

POLY 1 Console Unit : 2 off, each containing full 36cm (14")
colour monitor, 64 kbytes of RAM storage
and 20 Kbytes of ROM, cassette user port.

Keyboard : Built into POLY Console Unit, incorporating
full 71 keys, upper and lower case
characters, numeric keypad and 4 cursor
controls.

Master Disk Unit : 1 off, containing 1 x 8 inch floppy disk
drive, 600 kbytes of storage, extension
facilities for additional disk capacity,
internal 6809 processor for control of
communication network and standard RS232C
interface port.

Operating System : POLYSYS Custom, including multiple screen
colour text and graphics software.

Communication System : POLYNET Custom, fully automatic with
broadcast facilities.

Languages 1. POLYBASIC, a proprietary extended BASIC
interpreter embodying all standard BASIC
commands with powerful extensions for
screen handling and graphics. POLYBASIC
is ROM based and includes a compilation
option   (Included)

2. PASCAL. Omegasoft PASCAL, stored on disk
The PASCAL compiler produces machine code
which results in the fast operation of
programs.   (Included)

3. PILOT, a simple user language which allows teachers to write their own interactive CAI programs   (Included)

4. ASSEMBLER. Omegasoft ASSEMBLER for 6809 code on the POLY System   (Included)

Printer   : Epson MX-80 high speed general purpose printer, including RS232C serial interface module. Alternative printers are available by negotiation to meet the specific requirements of the uses.

Three models, the Epson MX-80 and MX-100 and the C. Itoh model 8510 have been tested and found satisfactory in the school environment.

3.3   ALTERNATIVE EQUIPMENT CONFIGURATIONS

(B)   Standalone Set for the Administration Office

POLY 1 Console Unit : 1 off, containing full 36cm (14") colour monitor, 64 kbytes of RAM storage, and 20 kbytes of ROM, cassette user port.

Keyboard : Built into POLY Console Unit, incorporating full 71 keys, upper and lower case characters, numeric keypad and 4 cursor controls.

Master Disk Unit : 1 off, containing 1 x 8 inch floppy disk drive, 600 kbytes of storage, estension facilities for additional disk capacity, internal 6809 processor for control of communication network and standard RS232C interface port.

Disk Extension : 1 off, containing 1 x 8 inch floppy disk drive with 600 kbytes of storage capacity, giving a total storage capacity, including Master Disk Unit, of 1200 kbytes.

Operating System : POLYSYS Custom including complete disk interfacing and management of comprehensive languages, security of data, simplicity of file handling and a number of utilities ot assist in the efficient management of databases.

Communication System : POLYNET Custom, fully automatic with broadcast facilities.

Languages   1. POLYBASIC, a proprietary extended BASIC
                 interpreter embodying all standard BASIC
                 commands with powerful extensions for
                 screen handling and graphics. POLYBASIC
                 is ROM based and includes a compilalation
                 option.   (Included)

             2. PASCAL. Omegasoft PASCAL, stored on disk.
                 The PASCAL compiler produces machine code
                 which results in the fast operation of
                 programs   (Included)

             3. PILOT, a simple user language which allows
                 teachers to write their own interactive CAI
                 programs   (Included)

             4. ASSEMBLER. Omegasoft ASSEMBLER for 6809
                 code on the POLY System   (Included)

Printer   : The POLY System is designed to use any
             commercially available printer that can
             provide a standard RS232 serial interface
             Three models, the Epson MX-80 and MX-100
             and C. Itoh model 8510 have been tested
             and found in the school environment.
             Quotations may be made for the supply of
             printers for use on the POLY System.
             Alternatively, the client may elect to
             obtain printers from any prefered source.

A significant advantage of this configuration is that the
administration control unit is interchangeable with the
classroom system control unit. The availability of the
classroon systems are thus enhanced by the dual capability
of the control units.

3.3   ALTERNATIVE EQUIPMENT CONFIGURATIONS

(C)   <u>Set of Capable of Expansion</u>

POLY 1 Console Unit	:	6 off, each containing full 36cm (14") colour monitor, 64 kbytes of RAM storage, and 20 kbytes of ROM, cassette user port.
Keyboard	:	Built into POLY Console Unit, incorporating full 71 keys, upper and lower case characters, numeric keypad and 4 cursor controls.
Master Disk Unit	:	1 off, containing 1 x 8 inch floppy disk drive, 600 kbytes of storage, extension facilities for additional disk capacity, internal 6809 processor for control of communication network and standard RS232C interface port.
Disk Extension	:	1 off, containing 1 x 8 inch floppy disk drive with 600 kbytes of storage capacity, giving a total storage capacity, including Master Disk Unit, of 1200 kbytes. Up to 3 disk extensions possible.
Operating System	:	POLYSYS Custom, including multiple screen colour text and graphics software.
Communication System	:	POLYNET Custom, fully automatic with broadcast facilities.
Languages	1.	POLYBASIC, a proprietary extended BASIC interpreter embodying all standard BASIC commands with

powerful extensions for screen handling
and graphics. POLYBASIC is ROM based and
includes a compilation option   (Included)

2. PASCAL. Omegasoft PASCAL, stored on disk.
The PASCAL compiler produces machine code
which results in the fast operation of
programs   (Included)

3. PILOT, a simple user language which allows
teachers to write their own interactive CAI
programs   (Included)

4. ASSEMBER. Omegasoft ASSEMBLER for 6809 code
on the POLY System   (Included)

Printer : The POLY System is designed to use any
commercially available printer that can
provide a standard RS232 serial interface.
Three Models, the Epson MZ-80 and MX-100
and the C. Itoh model 8510 have been tested
and found in the school environment.
Quotations may be made for the supply of
printers for use on the POLY System.
Alternatively, the client may elect to obtain
printers from any prefered source.

(C)   cont'd

This configuration may be extended by the addition of further
POLY 1 units, without modifications to the control unit or
communication system. Should a second system of say 10 POLY
units plus control unit be purchased then the school would be
well placed to meet both the 1 to 1 needs of computer programming
and remedial activities as well as the general curriculum require-
ments where a student/machine ratio of 2 to 1 or 3 to 1 will be
satisfactory.

Up to 16 POLY 1 Console Units can be run from a single Master
Disk Unit without the need for a Disk Extension.

CHAPTER 4 : QUESTIONS AND ANSWERS

1. *Has the system the ability to expand from say an initial starter set to a bigger system with no degradation of response times?*

1.1 Each POLY system of micro-computer units can be expanded without limitation. However our recommendation is for each school system to be limited to 16 console units to ensure that no unacceptable delays are experienced when loading education modules from the control disk storage.

1.2 Expansion of the POLY system to 16 POLY console units may be executed without replacement or modification of the control unit or printer.

1.3 Polycorp policy is directed to maintaining compatibility and interchangeability of hardware and operating software over the life of the equipment.

2. *What is the user response time?*

2.1 The POLY system provides direct interation at each user console unit. Normal program module loading from disk to user console is activated by the teacher using the unique POLY broadcast mode. Individual accessing and module loading from disk depends on the amount of traffic on the network. Practical usage suggests that the number of POLY units on a single network should not exceed sixteen.

3. *Has the POLY system been evaluated for continuous usability and availability?*

3.1 The performance of the two POLY systems that have been on trial and evaluation at Tawa College in Wellington and Queen Elizabeth College in Palmerston North confirms our belief that the POLY system meets the highest standards of availability.

3.2 The POLY system was first released for use in schools in May 1981. In-house operation of the POLY system under development evaluation conditions preceded the trials at Tawa College and Queen Elizabeth College.

4. *Will the vendor and subsequent maintenance contractor for the equipment and the operating system software be adequately represented in New Zealand at a high level to ensure that a continuous competent service is available for the life of the equipment?*

4.1 Polycorp is a New Zealand owned organisation. All development and manufacture of the POLY equipment and operating system is undertaken in New Zealand, thus ensuring full support for the life of the equipment.

4.2 All systems and software offered are Polycorp products, developed and manufactured in New Zealand.

5. *Will a high level of engineering maintenance support be provided with a proper and adequate level of locally held spare parts? Is there a timely and adequate back-up support capable of rapidly filling any need not met by the local spare part holdings?*

5.1 Polycorp will ensure that a fully trained local maintenance and replacement service agent is available for normal week-day call-out support.

5.2 The full resources of the Polycorp organisation will be available to support the local service agent. These back-up resources are based in Wellington, New Zealand.

6. *Is the equipment offered manufactured by the parent company?*

6.1 All systems and software offered are Polycorp products, developed and manufactured in New Zealand.

7. *Is the POLY system a standard mainframe system?*

7.1 The POLY system for installation in each individual school is offered as an alternative to a central mainframe. All POLY systems include a standard RS232C interface port for access to other computer systems.

8.   *What Acceptance Procedures are proposed?*

8.1   Polycorp proposes that an appropriate installation and warranty procedure for commissioning of the POLY systems is negotiated.

8.2   Under Polycorp normal procedures, a system is not declared operational and released to the client until all prescribed activities have been run successfully. The client then has a standard 90 day warranty period within which to identify and report any failure of the system.

8.3   Should any item of equipment fail to operate satisfactorily during this warranty period the item concerned will be repaired or replaced at Polycorp's option at no charge.

8.4   Polycorp will guarantee to maintain the proposed equipment and provide spare parts and documentation for the life of the equipment. This includes timely incorporation of all appropriate engineering changes.

8.5   For these purposes, life of equipment shall be defined as nominally five years.

8.6   Polycorp will be pleased to negotiate any extended warranty period or maintenance contract to meet requirements.

8.7   Polycorp will provide regular visits by a client liaison executive as part of a normal field maintenance contract.

9.   *Does the POLY system comply with any accepted standards?*

9.1   All POLY system components comply with the following NZ Standards:

(a)   NZ Wiring Regulations 1976.

(b)   NZSS 1300 : 1965   Regulations for Electrical Appliances and Accessories.

(c)   NZSS 1678 : 1962   Safety Requirements for Radio and Electronic Equipment.

(d)   Radio Interference Regulations : 1958.

9.2   All Polycorp products are manufactured and subjected to stringent testing and quality control.

9.3 All printed circuit board assemblies meet accepted international standards for computer equipment.

9.4 All other manufactured items meet the high commercial standards expected in the computer industry.

10. *Does the equipment need to be provided with air conditioning?*

10.1 The POLY system operates normally in working conditions that are acceptable to the user.

11. *Do the dust levels usually experienced in a normal office and school environment have an adverse effect on the equipment?*

11.1 Normal dust levels are acceptable. However it is advisable that the classroom control unit and the printer be located at least 3 metres from any chalk blackboard.

12. *Is the heat generation of the equipment such that the equipment needs special cooling or ventilation arrangements in order to operate continuously?*

12.1 No special cooling or ventilation arrangements are required.

12.2 The POLY system is located in the user environment and will operate satisfactorily in all conditions acceptable to the user.

13. *Is the equipment adversely affected by shock and vibration?*

13.1 The POLY system components have been specially designed and tested to meet the rugged conditions of the school environment.

13.2 Unique carrying handles and unit bumpers have been incorporated into the POLY unit case to assist in the moving of these units.

13.3 The internal chassis carrying all computer and video components is mounted on rubber to isolate these sensitive items from shock and vibration.

14. *Can the POLY units be moved easily?*

14.1 Each POLY unit and corresponding control unit and printer have been designed to be easily carried by one adult and to sit on an average school desk top.