

QASAR DUAL PROCESSOR O.E.M. MICROCOMPUTER SYSTEM



Already a generation ahead
of the 'third'

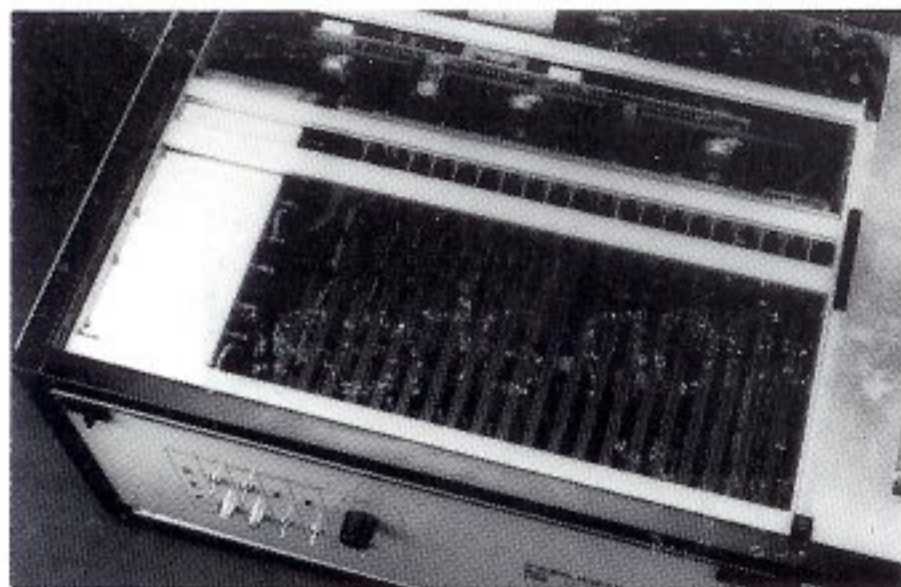
The QASAR range of microcomputer products was conceived with the intention of providing a choice of hardware configurations to satisfy a wide range of users of microprocessor systems who have had to choose between the one board computer systems and full development systems to achieve their requirements. The one board computers often do not support disk drives or other peripherals found on development systems required for non-trivial applications. Until now development systems have been locked into Software conventions prohibiting the addition of even the simplest real time enhancements.

The QASAR system overcomes these limitations by its unique usage of two microprocessors and high speed memory. One processor provides the normal processing environment while the other supports enhanced I/O and real time facilities. The high speed memory allows both processors to run at their maximum speed, still having access to common buffers and programmes.

When the QASAR is configured as a simple development system the I/O processor provides keyboard queueing and printer spooling. The printer spooling allows the programmer to proceed with editing and assembling while the printer is occupied with lengthy outputs, essential when slow printers are used. With large memory and fast printer the I/O processor buffers floppy disk transfers and spools printer output on disk, giving throughput to rival minicomputers with rigid disks.

When used in commercial processing the I/O processor provides "fill in the blanks" interactive processing on the VDU and queues printer, display and keyboard operations, so that the operator can work at a comfortable pace without continually having to pause for the system to catch up. On simpler systems breaking the rhythm of the operator can cause fatigue and dissatisfaction.

Another example of the exploitation of the dual-processor philosophy is the Fairlight C.M.I. (Computer Musical Instrument) in which the I/O processor provides the critical real time computing support for the voice generators, while the other processor performs interaction with the musician, disk accessing and all support functions. The C.M.I. supports 8 separate voices concurrently allowing the musician to dynamically specify individual harmonic content of each sound. The extreme demands made on the available computing facilities could not be satisfied by more conventional systems.



The Fairlight C.M.I. (Computer Musical Instrument) card chassis contains up to 20 circuit boards on a special higher density motherboard. The modules shown are (from left to right) — C.M.I. Master Voice Module, Eight Voice Modules, Light Pen Controller Module, three RAM Cards, Processor Control Module, Dual Processor Module, Floppy Controller Module, Graphics Controller Module and 128 Kilobit Graphics RAM Module. The Standard C.M.I. contains 208 Kilobytes of RAM. The system allows expansion to hard disc and doubling of RAM.

DUAL 6800 C.P.U. CARD

The heart of the system is a Dual Processor Module which uses a pair of M6800 processors talking to a common bus. Both run at their maximum rated clock speed of 1 MHz, resulting in a 2 MHz bus. All system timing signals are derived from a 40 MHz crystal clock on the Dual Processor card and are driven into the 120 ohm transmission-line bus. These signals provide reference phases for each individual processor as well as strobes for dynamic R.A.M. timing.

The provision of these signals on the bus makes it possible for other modules to be accessed by either or both processors so that the system's address space may be partitioned into blocks which are common to both processors or unique to each processor although they are accessed at the same address.

This technique provides a very high speed means of inter-processor communication by means of common areas of R.A.M.

DUAL 6809/6800 C.P.U. CARD

A dual processor module containing M6800 C.P.U. and a M6809 C.P.U. is available as an option. This module provides all the features of the dual M6800 C.P.U. but has the advantage that even higher performance may be achieved by utilising the advanced features of the M6809 C.P.U. chip.

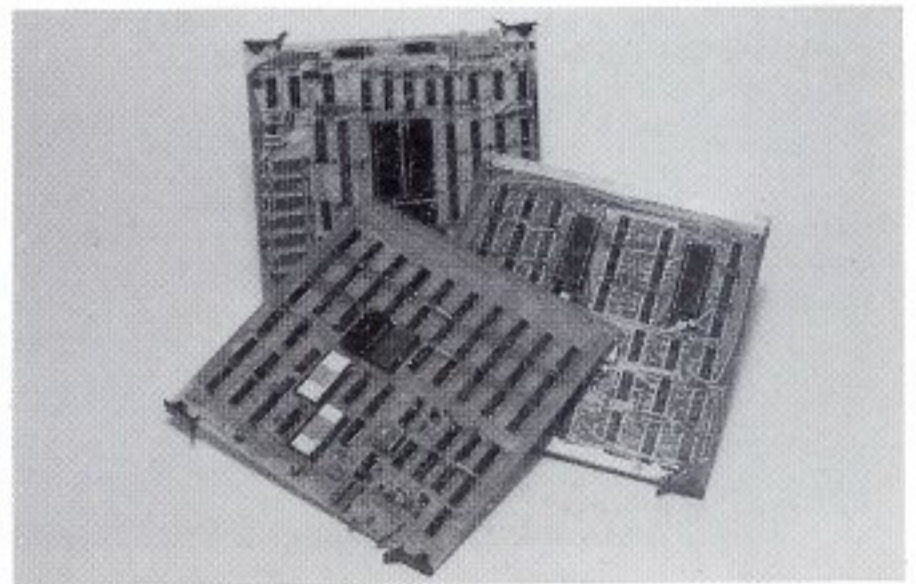
The combination of the two processors allows either 6800 or 6809 software to be run, protecting the investment in existing software while allowing development of new 6809 based software. This feature is used in the QASAR System II development system which can be used for both 6800 and 6809 software development without changing any boards or R.O.M.S.

PROCESSOR CONTROL CARD

This in conjunction with the Dual Processor card implements all the control functions of a microcomputer system. It has 1K of static R.A.M. which is logically mapped into 512 bytes common to both processors and 256 bytes unique to each processor. 4K of R.O.M. is accommodated, mapping as 2K common to both processors and 1K unique to each processor.

Serial communication is supported by two A.C.I.A.'s allowing dual option RS-232 interfacing.

Eight level priority interrupt controllers are provided for each processor as well as a common P.I.A. for use as a general-purpose parallel port.



RANDOM ACCESS MEMORY

The QASAR ram cards employ dynamic MOS chips. The cycle time is 500 ns (required for dual processor access at 1 MHz) making it suitable as a dual port memory for applicators such as C.R.T. graphics display Video.R.A.M. Refresh is achieved by a global refresh system on the processor control card.

A "bank select" input to the R.A.M. is provided to facilitate common/shared architecture and memory mapping to extend the total memory beyond 64K.

R.A.M. cards are available in 16K and 64K versions allowing easy and economical system configuration.

FLOPPY DISC CONTROLLER

Built around the Western Digital L.S.I. chip, the QASAR Floppy Disc Controller makes driving floppy disc as fast and reliable as possible. Data is transferred between R.A.M. and the controller by D.M.A. during the processor #2 phase so that processor #1 can continue functioning normally. Once a data transfer is set up and the command is issued to the controller processor #2 can continue processing other tasks. When the transfer is complete the controller issues an interrupt to processor #2 to signal "command done". While transfer is actually in progress, the D.M.A. cycles stolen from processor #1 only consume about 3% of its time, since all data transfer control functions are handled locally by the floppy disc controller.

Hardware is provided for high-speed disc-to-memory verification. In the normal read mode, data is read from disc into a block of R.A.M., but in this special verify mode the data read is compared to a block of R.A.M. rather than written into it. This technique is far superior to simple C.R.C. readback checks for verifying that a write to disc has been executed successfully. Up to four single or double sided drives may be controlled.

DUAL T.V.T. INTERFACE

This card generates two raster-type C.R.T. displays of 25 lines of 80 characters. Video output is a standard 1 volt composite-synch signal designed to drive 75 ohms. The normal A.S.C.I.I. character set including single-character representations of control characters is

supplied as standard, but custom characters can be easily programmed.

The character R.A.M. is accessed directly as memory locations. By using the processor #2 phase to read the R.A.M. for displaying as characters, processor #1 can write (and read) the same R.A.M. simultaneously without contention.

The direct-access feature makes it possible to use special display modes which are impossible to achieve using a conventional serial communication type of "glass teletype". For example the QASAR system with T.V.T. can be used to provide simultaneous scrolling and protected-field data display. Under programme control, a number of lines at the bottom of the display can be designated as the "system message" area which behaves as a scrolling display, while the upper part of the screen provides a formatted display with random access to protected fields for inputting or outputting.

HIGH RESOLUTION GRAPHICS

The QASAR Graphics Display Controller generates a raster-type video graphics display signal which displays 16K bytes of R.A.M. as an array of dots in a 512 x 256 format. It is used in conjunction with the standard 16K dynamic R.A.M. card to provide a high resolution graphics system suitable for displaying data in many different forms. The usual speed problem encountered when using microprocessors to drive V.R.A.M. graphics display is overcome in the QASAR by provision of special hardware for fast vectoring. Logic within the controller provides a series of memory locations which cause X and Y co-ordinates of the point being written to be post incremented or decremented as points are written to the display. Other control functions permit writing either a byte or a bit at a time.

Further speed advantage is gained by using a "scroll latch" location which defines the starting line number for the display. This makes it possible to roll the display up or down an arbitrary number of lines in a few microseconds.

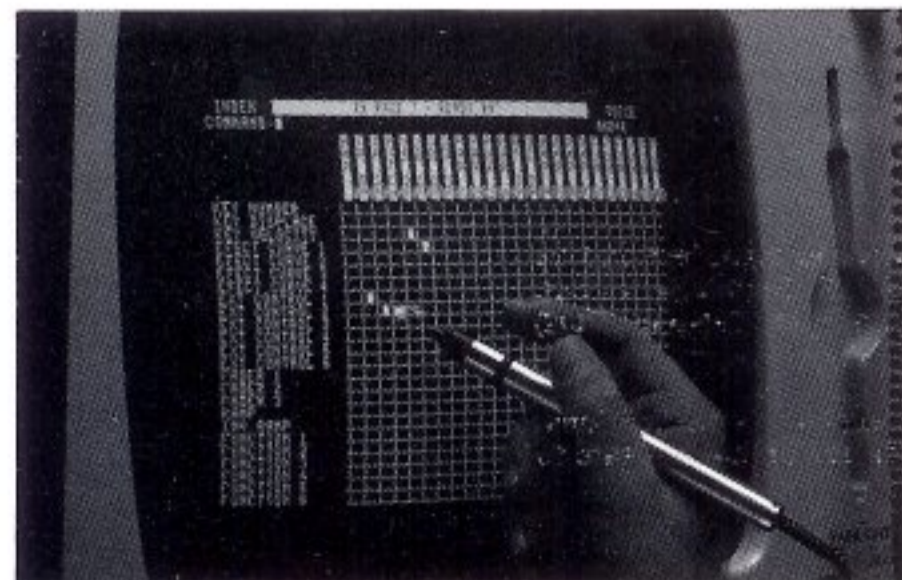
The end result is a graphics display system which can refresh complex displays at a very impressive speed. For example, the Fairlight C.M.I. System uses displays with a mixture of alphanumeric characters, bar graphs and piecewise-linear plot. A typical display page takes about 400 milliseconds to build.

LIGHT PEN FACILITIES

Designed for use in conjunction with the Graphics Display Controller, the QASAR Light Pen provides a simple means of interactive input of data in many different display formats.

An interface is provided which derives positioning information from the Graphics Controller card and produces data in X and Y form which can be read by the processor system. Light Pen activation signals from the touch switch on the Light Pen Head can be detected by polling the Interface, or alternatively the Interface can be configured to generate an interrupt when a Light Pen activation signal is received. The Interface also generates a cursor which is displayed on the screen at the point "seen" by the Light Pen.

The Light Pen System can be used for drawing graphs, operating "pseudo slidepots" (Displayed on the screen), cursoring particular characters or words on a displayed page or any other data input technique where the convenience of direct interaction with visual data is advantageous.



Pointing the light pen at a box on this display places a "connection" between the outputs of controlling sources (such as pedals, joysticks etc) and voice parameter inputs of the C.M.I. This is conceptually equivalent to the familiar hard wire patchboard used in specialized control applications. Pointing the light-pen at a box already patched removes the "connection".

INTELLIGENT KEYBOARD

The QASAR alpha-numeric keyboard uses an array of 64 Hall Effect switches to ensure highly reliable switching. The switch modules have tri-state outputs and are arranged in matrix which is addressed by a 6802 Microprocessor on the circuit board. Each key function is individually defined by a P.R.O.M. programme so that key functions and codes can be easily customised. A separate numeric keypad is provided for fast entry of numeric data. Output from the keyboard is in serial RS-232 form. Dual-in-line option switches select BAUD rates from 110 to 9600 and parity options.

The "Intelligence" of the keyboard arises from the on-card microprocessor which executes a programme from P.R.O.M. Special functions, such as character string generation from single key strokes can be easily implemented. Daisy-chaining facilities are provided to allow master-slave keyboard configurations in multi-user applications. The numeric pad keys are also programmable.

PROVEN RELIABILITY

The Dual-Processor system is a proven design which has been used since 1977 for business systems, industrial control, telecommunications monitoring, data concentratoes, security monitoring, and education.

Although the system already incorporates the latest innovations in many technologies, a major design consideration has been to enable low cost future expandability and enhancement as materials and techniques are developed.

The system is convection cooled to minimise dust accumulation and noise. Modular construction allows easy access (however rarely it may be required). A fourteen slot motherboard and 250 Watt (useable) power supply in the standard configuration allows extensive future expansion.

The system mainframe is housed in a standard 19" rack frame which may be configured as a free standing unit as shown (cover) or in rack mount configuration. Disc drives are also available in rack, mount (2 drives are mounted horizontally).

Each plug-in module in the C.M.I. is temperature tested from 0°C to 70°C while diagnostic tests are being made. This causes most latently suspect components to fail before the system leaves the factory, dramatically improving field reliability.

SUPPORT SOFTWARE

Because Fairlight Instruments actually manufacture a range of complete microcomputer products based on QASAR modules, a wide range of support software is available for all the hardware and this library is continually expanding. Support ranges from driver packages for the individual modules, such as disc driver, graphics display controller and light pen system, to sophisticated floppy disc operating system, assemblers and compilers. High level languages include BASIC interpreter, BASIC compiler, FORTRAN compiler and COBOL compiler. The BASIC compiler was designed to make use of the QASAR system's features, primarily in commercial data processing applications. Being a compiler rather than interpreter, application programmes are smaller and execute much faster. The other salient features are decimal arithmetic accuracy of 9 digits minimum, "PRINT USING" for formatted output, flexible disc I/O using ASCII or Binary with sequential, random or indexed sequential access. The Index Sequential access facility is supported by a powerful SORT utility which provides simple file to file copying to rearrange data fields within the records being copied, the ability to sort these re-formatted files and index-building using any fields as the access key.

A TYPICAL SYSTEM

For use as a general purpose software development system the following configuration is typical of those sold by Fairlight Instruments:

1. QASAR Dual Processor Microcomputer with 48K R.A.M., two Shugart 801 Floppy Disc Drives, Dual T.V.T. Interface, QASAR Intelligent Keyboard and Video Monitor
2. High Speed Line Printer (RS232 — such as Teletype Model 40, 300 lines per minute)
3. Software package including QDOS Disc Operating System, Text Editor, Relocating Macro Assembler

The QASAR Dual Processor System is manufactured by Fairlight Instruments Pty. Limited, 15 Boundary Street, Rushcutters Bay, Sydney, AUSTRALIA 2011. Telephone (02) 335 222 — Telex AA27998.

For further details regarding system specifications, operating instructions and options, please do not hesitate to contact your local representative.

NOTICE:

The System incorporates the QASAR (T.M.) — Dual Processor System. Copyright is held by Fairlight Instruments and Creative Strategies Pty. Limited from whom licence is granted for the manufacture of some components.

Specifications are subject to continuous change and Fairlight reserve the right to alter specifications without notice.