CAMAC
bulletin

A publication
of the
ESONE Committee

ISSUE No. 13
September 1975

PREPARATION OF CONTRIBUTIONS

Authors are requested to follow these instructions when submitting contributions for the Bulletin. Failure to do so may result in contributions being returned to the author for re-submission in a modified form, and may delay publication.

1. *English is the preferred language. Contributions in other languages are equally welcome but only the summary will be translated.*
2. *Authors should state their name, business affiliation and postal address on a separate sheet if not included in the contribution.*
3. *The style, layout, use of bibliographic references and so on should follow as closely as possible the appropriate contents of this Bulletin.*
4. *For contributions to the New Products Section, each product description should be on a separate sheet and* ***any one description must not exceed 250 words or 1/3 Bulletin-page, including illustrations.***
5. *For contributed articles, 1 200-1 600 words are preferred.* ***They must not exceed 2 000 words or 3 Bulletin-pages, including illustrations.*** *They should be accompanied by a summary (abstract) suitable for translation into other languages and preferably not exceeding 50 words.*
6. *Manuscripts should be typed on alternate lines on only one side of the page.*
7. *Drawings and photographs should be included if they are relevant to the text. Original ink (not pencil) drawings and semi-mat prints of photographs, at least twice the final size, should be submitted. The author's name and the figure number should be written, lightly, in pencil on the back of each illustration. A list of all figure numbers and captions should be included on a separate sheet, even if these are given in the text or on the illustrations themselves.*
8. *Articles which are shortened, or adapted from, original papers should identify the original in the references.*
9. ***Authors must submit contributions before the closing dates*** *announced elsewhere in this Bulletin.*
10. *Reprints can be ordered at any time, but authors who are likely to require reprints in bulk should request these when submitting a contribution.*

PRINCIPAL CONTENTS OF THE PREVIOUS CAMAC BULLETIN ISSUE

CONTRIBUTIONS TO FUTURE ISSUES

of the Bulletin should be sent to the following members of the Editorial Working Group:

Articles:	Dr. W. Attwenger, SGAE, A-1082 Wien VIII, Lenaugasse 10, Austria.
News and New Products of Manufacturers:	Dr. H. Meyer, CBNM EURATOM, Steenweg naar Retie, B-2440 Geel, Belgium.
Product Guide (Hardware, Software):	Mr. O. Ph. Nicolaysen, N.P. Division, CERN, CH-1211 Geneva 23, Switzerland.
News:	Mr. Palle Christensen, Research Establishment, AEK Risø DK-4000 Roskilde, Denmark.
Bibliography:	Dr. H.J. Stuckenberg, DESY Hamburg, Notkestieg 1 D-2 Hamburg – Gr. Flottbeck 1, Germany.

On the cover: Air view of the Centre of Warsaw. The Annual General Assembly of the ESONE Committee and a CAMAC Exhibition took place in the Hotel Forum in Warsaw, in September 1974.

CAMAC

bulletin

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CONTENTS OF ISSUE No. 13

NEWS

EUROPEAN CAMAC ASSOCIATION

CAMAC SURVEY 1974

This survey of the use of CAMAC in 1974 has continued to steadily acquire data and, at June 1st, 104 respondents had supplied details about 295 systems applications on returned CAMAC SURVEY 1974 proforma. An interim analysis of this data will be supplied to these respondents only, and to encourage other CAMAC Users/Suppliers to respond, the following is one aspect of the analysis.

The total value of CAMAC equipment in the 295 systems was $7.4M equivalent and was distributed in the following fields of application in order of rank:

Physics, Medicine, Space/Astronomy, Instrument Engineering, Fission, Engineering, Fusion, Environment, Chemistry, Energy, Product processing, Education, Public Utilities.

Of the total systems, 33% were unlikely to be expanded in the next 2 years, however for the 48% that were definitely scheduled for expansion their expansion in CAMAC equipment would be by 36%, on average, the highest expansion being in Engineering applications (automatic testing, avionics, automotive, mining).

Anyone requiring a Survey Form should contact Mr. H. Bisby, AERE Harwell, OX11 ORA, England (Telex: 83135) who is acquiring the database under conditions of strict confidentiality.

CAMAC IN STRESA

The 2nd Ispra Nuclear Electronics Symposium took place on May 20–23, 1975 in Stresa. Some 250 participants were present. Among the many interesting sessions a whole one was devoted to CAMAC and including 17 papers on quite different topics.

The first paper, an invited one, 'Applications and Development of CAMAC in North America' by D.A. Mack and L.J. Wagner, LBL, Berkeley, U.S.A., gave a broad review of recent CAMAC applications in this area. It demonstrated a great interest in CAMAC serial systems. The mentioning of a serial system including optical transmission by means of laser light attracted special attention.

Several papers treated the use of microcomputers in connection with CAMAC. Speakers from both CEN, Saclay, and JRC, Ispra, presented papers on autonomous crate controllers using the INTEL 8080 microprocessor.

At the accompanying exhibition several CAMAC manufacturers showed their products.

1975 NUCLEAR SCIENCE SYMPOSIUM

The 1975 NUCLEAR SCIENCE SYMPOSIUM, to be held in San Francisco, November 19–21, 1975, at the Sheraton Palace Hotel, has recently issued a Call for Papers. The symposium will feature papers on recent developments in nuclear detectors, circuits, instrumentation systems, novel applications in experimental and space physics including CAMAC and computer systems, energy conversion, nuclear medicine, environmental measurements, and reactor instrumentation. Program Chairman is Dick A. Mack, Lawrence Berkeley Laboratory, University of California at Berkeley. The conference, which will run concurrently with the 1975 Nuclear Power Systems Symposium, will feature invited Plenary Sessions on important current issues in nuclear science, invited technical papers, panel discussions, as well as concurrent poster sessions. Detailed program information can be obtained by calling or writing:

R. Hamman — Publicity Chairman NSS
Stanford Linear Accelerator Center
P.O. Box 4349
Stanford, California 94305, USA.

CAMAC COURSES AT HARWELL

The next, and 16th two-day course on CAMAC at the Harwell Education and Training Centre will be held on 21–22 October 1975. It is intended for users of CAMAC, rather than for equipment designers, and deals with the CAMAC specifications covering all the aspects of the Dataway, Parallel Branch and Serial Highways and IML. The lecturing panel contains, among others, Messers H. Bisby, R.C.M. Barnes, I.N. Hooton and A. Lewis and the possibilities are being explored of this course being run in conjunction with the activities of the UK CAMAC Association.

The course fee is £40, (exclusive of VAT and accomodation), and application forms are obtainable through the Education and Training Centre, AERE Harwell, Oxfordshire OX11 OQJ Telex 83135. Early application is advisable because attendance at the course is restricted to 30 places.

APPLICATION NOTES

1

AN OPTIMIZED ARCHITECTURE FOR A MULTICHANNEL PULSE HEIGHT ANALYSER

by

R. M. Keyser and R. H. Baldry
ORTEC Incorporated, Oak Ridge, Tennessee, USA

Received in revised form, 13th January 1975

SUMMARY The architecture of multichannel analysers (MCA) has progressed from hardwired analysers to computer-based analysers. An architecture for the next generation MCA is based on a computer with CAMAC and a high-level interactive language.

The multichannel pulse-height analyzer (MCA) has been recognized as a valuable tool in many scientific disciplines during its relatively brief existence. Beginning as a group of single channel analyzers and counters that responded to adjacent and sequential amplitude ranges, it has been developed into a hardwired MCA with simplified controls such as the system shown in Fig. 1. The

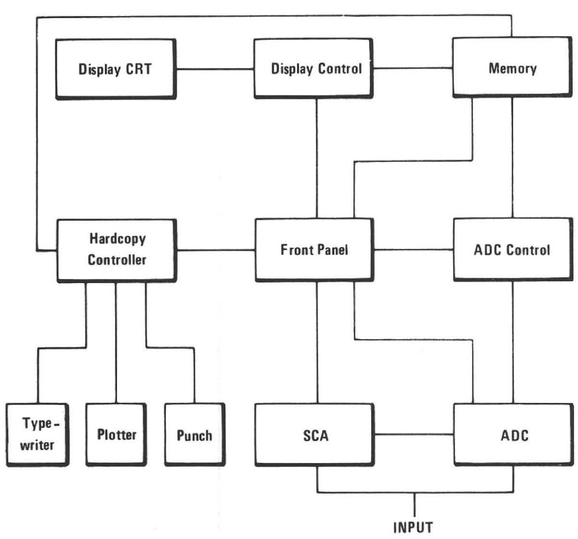

Fig. 1 Block Diagram of Modern MCA

input amplitude is measured by an ADC to select a memory channel for each pulse, and storage is conditioned by Single Channel Analyzer (SCA)

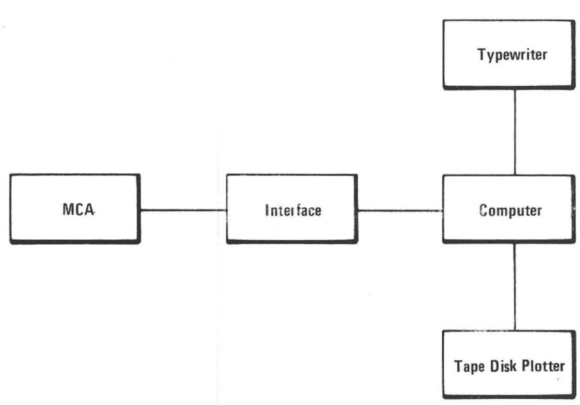

Fig. 2 Block Diagram of a Computerized MCA

recognition. Modifications of the original concept expanded the memory size and provided multi-detector storage and multiparameter operation for newer techniques.

Recording and storage capabilities limited advancement until minicomputers were interfaced with MCAs, and they also provided some on-line analysis using the system of Fig. 2. This trend has now led to the next generation which is the computer-based MCA shown in Fig. 3. Advantages of the new

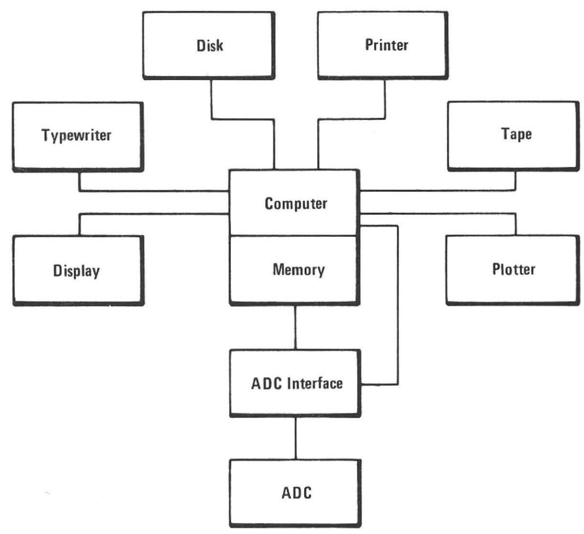

Fig. 3 Block Diagram of Computer-based MCA

system include ease of reconfiguration, output flexibility, more adequate displays, and easy expansion. The disadvantage is that the central processing unit and memory must be shared in time for storage, display, and data manipulation.

AN OPTIMUM ARCHITECTURE

With the advantages and disadvantages of these systems in mind, we have developed an architecture for a computer-based MCA system that attempts to retain the advantages of both the computer-based MCA and the hardwired MCA. Achievement of this goal required the following:

- high-performance (low dead time) data acquisition in several modes from more than one data source;
- flexible data manipulation between data storage areas, displays, and other peripherals;
- convenient operating conditions from a user-oriented control panel;
- powerful computation facilities for on-line/off-line data reduction;

- flexibility of hardware configuration to match the experimenter's needs and his pocket; allowance for expansion;
- powerful but convenient program generation capability to match the overall system performance and flexibility.

The first step in this development was to divide the tasks associated with an MCA into those done best or fastest by hardware and those done best by software.

The hardware tasks consisted of:

- storing ADC data in a memory dedicated to that task;
- monitoring overflows, error conditions, and regions of interest in the data;
- transforming computer code into characters, vectors, and logarithms for display;
- encoding the control panel functions to minimize software decoding time;
- storing or refreshing the current display image.

The software tasks involve:

- generating display data, titles, and scale factors;
- manipulating data, transfer to other modes, etc;
- controlling the MCA by responding to encoded control-panel functions and executing the requested function;
- supplying on-line reduction of data;
- controlling data and program storage peripherals.

A block diagram of this system appears in Fig. 4. Parallel to the development of the architecture an operating system was developed to communicate with the user through the typewriter keyboard and control panel. Because this operating system has other applications it must have the following characteristics:

- support a high-level FORTRAN-like language;
- support any mixture of computer hardware including CAMAC;
- be able to respond to CAMAC interrupts by executing high-level language routines.

The architecture shown in Fig. 4 has been implemented with CAMAC modules, a PDP-11/05® computer, a removable-media disk, a storage-display

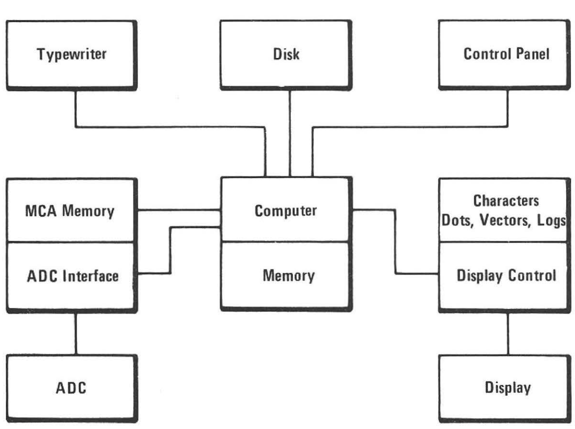

Fig. 4 Block Diagram of Hybrid Architecture

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unit, and the language/operating system ORACL®; see Fig. 5.

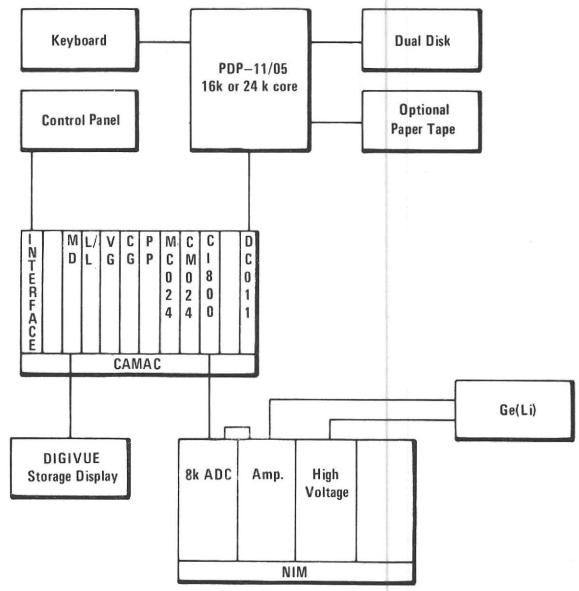

Fig. 5 Module Diagram of Fig. 4

THE SYSTEM AND ITS IMPLEMENTATION

The advantages of the system developed at ORTEC are many:

- The high data rate of a hardwired analyzer is achieved. The CAMAC-based ADC interface contains a live-time correction circuit so that proper dead times are accounted for.
- The addition of extra detectors does not affect system dead time. Other detectors can be added by simply adding the ADC, ADC controller, and CAMAC memory.
- The display functions are fast and the display itself can be quite complex with text, axes, and data shown, without flicker or distortion.
- Disks, magnetic tapes, paper tapes, plotters, etc., are readily available and easy to add in both software and hardware.
- The control of experimental parameters such as counting time, position of stepping motors, detector voltage, and others is easily achieved with standard CAMAC modules and high-level control subroutines.
- Other parameters, not usually recorded, can easily be entered via CAMAC modules.
- System checkout, maintenance, and downtime are significantly reduced by the combination of modular hardware and the high-level control language.

System Features

The avantages cited above are achieved by using the following system features:

- ORACL, which was developed by ORTEC for the purpose of creating interactive data collection systems, allows the user to communicate with CAMAC modules in a high-level FORTRAN-like language. The system also responds to CAMAC

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LAMs (flags) and allows the user to create (in high-level language) the program to be executed when the LAM occurs.

• The memory used for data acquisition is separate from the program and computation memory of the PDP-11/05; in addition the ADC-to-memory data path is not time-shared with the CAMAC or computer buses. Once initialized and enabled, the ADC and the memory will acquire data independently of the system until a preset condition is met or a command to stop is received. The system generally accesses this memory only for display or data transfer (for computation or input/output); these functions are all performed infrequently. The modularity of this section readily permits expansion of one data channel or expansion to multiple data channels.

• The use of a storage type of display means that rapid refreshing of the screen image does not have to be used to maintain a high quality flicker-free display of large amounts of data and/or text. Nor are a display-refresh memory (or D/A channel) and associated hardware necessary for constraining the display image. A storage display reduces time loading of the CPU and memory bus, as the image is usually updated no more than three times per second during data acquisition and at intervals of seconds during analysis. Activity of these units is limited to the few milliseconds required to update the data display.

The aesthetic and technical limitations of a conventional bistable-storage cathode-ray tube are overcome by using a DIGIVUE® gasplasma storage display. This new device allows:

- permanent image retention without degradation;
- long life time;
- fast total-erase (0.5 millisecond);
- selective write or erase of any of 512 by 512 points on the screen;
- no image drift or distortion.

The system control panel contains a variable-sized matrix of pushbuttons interfaced to a CAMAC module. When pressed, each button generates a unique binary code and a LAM. The system responds to the LAM and executes the ORACL program associated with that button. This allows the user to specify exactly what each button should do.

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A typewriter-like keyboard incorporated in the control panel is combined with the powerful text feature of the display to provide a high-performance silent computer terminal, in addition to its normal data display capability.

A removable-media dual disk drive is used as an economic program, data, and overlay storage

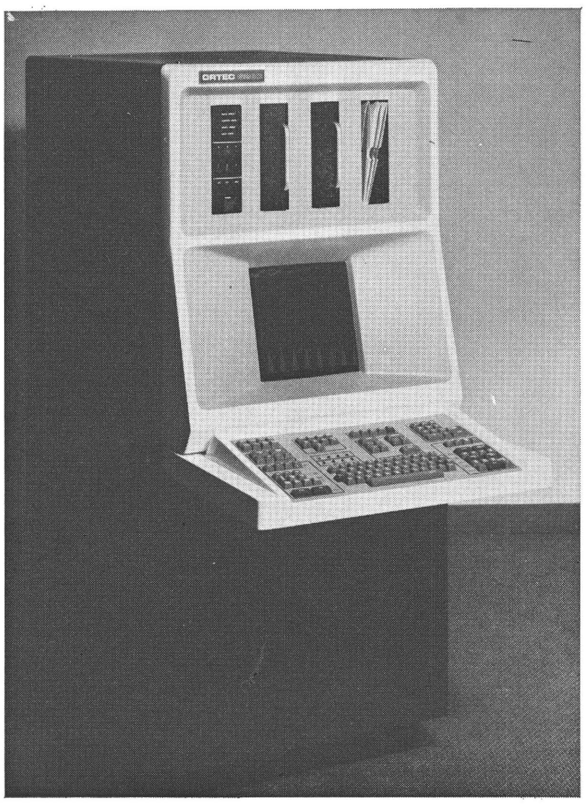


Fig. 6 Implemented System

device for the system. Fig. 6 shows the system as implemented.

In summary, the system architecture and high-level software language described above provide the user with a powerful tool-kit for easily and quickly configuring and programming a multichannel analyzer to match his needs. In addition, the use of a standard interfacing structure, CAMAC, readily allows the user to implement control and instrumentation features outside the range of an MCA or computer.

NEWS

COMPEC EUROPE, BRUSSELS MAY 18, 19, 20, 1976

The organizers of the well known COMPEC exhibition and conference in England are announcing a COMPEC EUROPE at the Manhattan Centre in Brussels on May 18, 19, 20, 1976. COMPEC EUROPE will follow the pattern from COMPEC UK; it concentrates on small computers, computer peripherals, and systems.

The European CAMAC Association has been invited by the organizers, Trident Conferences and Exhibitions Limited, to participate in both the exhibition and the conference in the same way as the UK CAMAC Association did in the COMPEC UK, where they took a 'CAMAC area' in the exhibition and took part in the organizing of a CAMAC session at the conference.

2

MICROCOMPUTER CONTROLLED RANDOM DATA ACQUISITION SYSTEM

by

J. Lecoq, H. Tedjini, P. L. Wendel, and G. Metzger

Laboratoire d'Electronique et d'Instrumentation Nucléaire, CUHR Mulhouse :
Laboratoire des Applications Electroniques, ULP, Strasbourg, France.

Received 30th January 1975

SUMMARY This CAMAC system for data acquisition and manipulation is controlled in an interactive way by an operator through a microcomputer. The system, built around an Intel 8008 chip, includes a magnetic tape unit, a CRT display, an XY recorder, a fast analogue-to-digital converter, and a CAMAC I/O register.

INTRODUCTION

The system described here is intended for data acquisition and manipulation (Fig. 1). The main features include:

- Interactive control with the operator through a Teletype
- Versatility (programmed system)
- Use of the Camac standard for most I/0 devices (easy expansion)[5].
- Inclusion of a Magnetic Tape Unit.

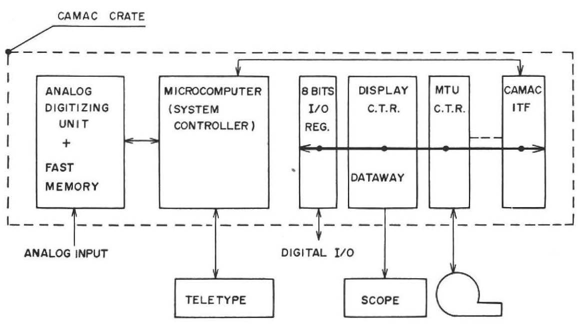


Fig. 1 System Structure

These features distinguish this system from many others of similar purpose[1,2,3]. It is typically used in processing pictures such as aerial photographs, or photographs of blood cells. The first step is to digitize the video signal from T.V. camera and store this data on a magnetic tape which is then processed by a UNIVAC 1108 computer. The second step is to read the processed picture-data from magnetic tape and present it on a CRT display, for example.

The reaction time of the system is not critical, because it is controlled by a man, and its computing power and memory requirements are not large. Therefore we chose a microcomputer rather than a minicomputer, since it fulfils our requirements without great expense.

HARDWARE

Microprocessor

This complete microcomputer is built around the INTEL 8008 chip (Ref. 4) and is composed of:

- Memory: 2.2k × 8-bits PROM and 2k × 8-bits RAM
- Control-Timing hardware (clocks, state decoders, registers)
- I/O hardware (multiplexers for input, registers for output).

The memory is divided into two main areas:

- 2.2k PROM are used by the operating system to ensure that the user cannot destroy it
- 2k RAM are used as scratch-pad and channel (DMA) areas.

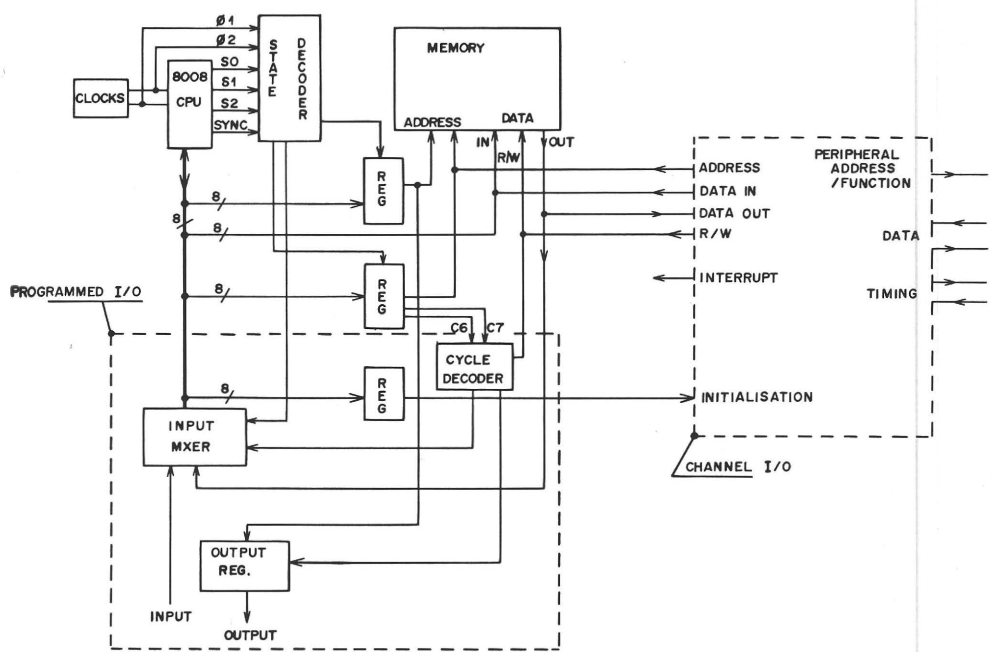


Fig. 2 Channel I/O Structure

The I/O system is subdivided into Programmed I/O and Automatic Block Transfer I/O channel (DMA), because of the slow speed of programmed transfer (8 bits in 80 µsec), (Fig. 2).

The DMA channel works in the classical way: the first step is to establish the peripheral device address and function code, and to initiate the channel, the second is to transfer data autonomously between the peripheral device and RAM channel area (786 × 8-bit words max.). The CPU is stopped during a transfer, and the channel restarts it with an interrupt at the end of the transfer. This is peculiar to our system and means that the channel does not free the CPU from tedious I/O operations but makes 'high' speed transfers possible (8 bits in 4 µsec).

I/O Interfaces

They are divided into general-purpose and special interfaces. The general purpose interfaces are naturally built in the CAMAC standard, so that we can use any of the numerous commercial CAMAC modules. The special interfaces are the TTY interface and the digitizing unit interface. The teletype is directly linked to input/output ports and has a 'programmed interface' (the hardware includes only three transistors, and it does not need an elaborate interface. The TTY is the only I/O device communicating with the operator in this conversational system.

General Purpose Interfaces

Digitizing Unit: This module contains an ADC converter (10 MHz, 8 bits) and a fast RAM memory (512 × 8 bits, 50 ns access time). It converts analog data and stores it. Then the digitized data can be read by the microcomputer and transferred into the main memory.

Display CTR: This is a somewhat modified S.A.I.P. display-driver CAMAC module for controlling an XY recorder or a CRT.

We use it to display signals as functions of time X(t) or of another signal Y(X), and also to display pictures. For this latter mode Z modulation is obtained by addition of an amplitude-to-time converter. For example a true picture can be recorded in about one minute (512 × 512 × 8 bits) through a Tektronix 604 scope, onto a Polaroid film.

Magnetic tape controller: This module (6) is a laboratory-constructed CAMAC module to control a PEC 9-track 800 bpi 25 ips tape driver and formatter in both read and write mode. It includes some complex commands such as 'Write Forward a block of indefinite length and write an End of Block if no more data is available', to simplify programming of the microcomputer.

Digital I/O controller: This is also a laboratory-constructed module to match another equipment[7]) and to allow its connection to the microcomputer system.

SOFTWARE

General organisation

Our software system is built around two main principles:

- It must be possible for different and non-specialized physicists to use it.
- System operation must be fully interactive with the operator on a conversional mode through the TTY.

Thus it was necessary to provide a true small operating system, based on a TTY monitor, including service routines and library. All the programs can be written in Assembler: a Univac 1108 Cross Assembler, specially written, provides the binary object code on magnetic tape ready to be loaded into our microcomputer[8]).

Operating system

Operator communication package: This includes a TTY Driver, character identification program, error print, message writer and the main loop. The microcomputer is in the halt state at rest, and is started only by the TTY interrupt. After completion, it returns to the halt state.

The operator interacts at four levels:

- System call by control code 'ACQ' or 'TRF'
- Input or output call
- Typing an I/O Device call
- Typing an I/O presentation call.

Table 1 Command Mnemonics.

STR	STORE COMMAND
LSB	BINARY LISTING COMMAND
LSD	DECIMAL LISTING COMMAND
JMP	JUMP TO ADDRESS COMMAND
TRF	TRANSFER COMMAND
AVF	FORWARD N FILES COMMAND
AVB	FORWARD N BLOCKS COMMAND
PSF	FILE NUMBER QUESTION
RWD	REWIND COMMAND
FMK	FILE MARK COMMAND
IPL	LINK TO PROGRAM AT ADDRESS... COMMAND
ECT	WRITE COMMAND
LEC	READ COMMAND
MGN	MAGNETIC TAPE ACTIVATION
SCP	SCOPE ACTIVATION
TRC	RECORDER ACTIVATION
REG	I/O REGISTER ACTIVATION
X/Y	X/Y MODE OF PRESENTATION COMMAND
Y/T	Y/T MODE OF PRESENTATION COMMAND
PR 1	PROVISIONAL USER PROGRAM COMMANDS
.	
.	
.	
PR 7	

Program/Machine Housekeeping subsystem: The loaders are all binary; either manual from TTY keyboard or automatic from paper tape (Intel code) and from magnetic tape. The Editors are provided in binary or decimal code on the TTY printer or on the paper tape. Relocation and linking programs relocate and execute parts of programs loaded from the magnetic tape in an overlap mode. Some of these routine make use of a 122-word RAM area to store parameters. There is also a small library.

I/O Package: These subroutines are written to give a general form to all peripheral drivers using CAMAC and the channel. Special drivers for the others peripherals are provided. The first 128 words of the channel memory area are used to store labels which are written at the beginning of each block on the magnetic tape. The number of parameters and the block length are automatically updated. All device drivers are of classical form, except the MTU Driver which is expanded to allow easy tape manipulation by the users (see table 1).

CONCLUSION

A microcomputer-controlled system has been constructed for data acquisition, storage and display. Its primary goal has been far exceeded; this has been possible because of the hardware and software structure, which includes a microcomputer with CAMAC interface and a small operating system. This allows easy use of the system by non-specialists for different purposes, such as picture processing. Easy system expansion is guaranteed through the use of the CAMAC standard for most I/O connections.

ACKNOWLEDGEMENTS

We are very grateful to Dr. J. Meyer Maître-Assistant, who gave the principal guidelines to the software structure, especially concerning the Operating System. The many discussions we had saved us much time and effort.

REFERENCES

1. 'New ways to see fast transients' TEKTRONIX Inc. 1974.
2. 'Oszillostore Siemens' Study by P. Klein Siemens, Karlsruhe 1973.
3. 'Digital processing oscilloscope' TEKTRONIX Inc. 1973.
4. '8008 Parallel CPU' and 'MPS 07 Programmer' by INTEL Corp. June 1972.
5. EUR 4100e Euratom Report March 1969.
6. Tedjini, H. and Lecoq, J., Thèses de 3[e] Cycle, Université Louis Pasteur, Strasbourg, décembre 1973.
7. 'Column video digitizer and display unit for digital image processing' by P. L. Wendel et al. submitted to Rev. Sci. Instr. December 1973.
8. '8008-UNIVAC 1108 Cross Assembler' by B. Colin and P. Keith. Internal Report, Laboratoire d'Applications Electroniques Strasbourg, September 1973.

NEWS

FIRST GENERAL ASSEMBLY OF THE EUROPEAN CAMAC ASSOCIATION

The General Assembly of the ECA will be held on Friday, 17th October, at the Sheraton Hotel, Brussels following on from the 2nd International Symposium on CAMAC in Computer Applications. Everyone, interested in any way with the use of the CAMAC Standards, is invited to attend this FIRST, and inaugural, Assembly of the Association since its foundation in May 1974.

The agenda includes acceptance of the Statutes and Standing Orders, drafted by the Interim Council of the Association, for regulating the affairs of the Association. Reports of the year's activities of the Management Board, the Interim Council and the two Working Groups (Industrial and Medical applications) will lead on to a discussion of proposals for a further programme to pursue the Objects of the Association, which are: 'To undertake and investigate methods that will lead to the expansion and use of the CAMAC Standards in new areas of application, ensure the widest possible dissemination of knowledge of these Standards and encourage the use of CAMAC on a multi-national basis with a view to advancing and supporting the technology of automation'.

Application forms for membership of the ECA will be available from a sent to all those who announced their interest in ECA already. Further application forms are available from the ECA Secretariat (provisional address, Dr. H. Meyer, c/o Commission of the European Communities, C.R.C.-CBMN, Steenweg naar Retie, B-2440, GEEL, Belgium), and at the Registration Desk of the 2nd International Symposium on CAMAC in Computer Applications (October, 14–16, 1975, Hotel, Manhattan Center, Brussels).

CERN 'CAMAC NEWS'

Issue No. 5 (April '75) of the CERN 'CAMAC NEWS' contains a report by Fred Iselin dealing with, among other things, interfacing CAMAC to NORD-10 computers and a CAMAC Pulse Amplitude Analysis System based on a Hewlett Packard HP 2100 computer. The NEWS also presents a survey of companies who manufacture or supply CAMAC equipment or components. Several new facilities in the range of CAMAC modules are described.

Distribution of the 'CAMAC NEWS' is handled by J. Halon, NP Division, CERN, 1211 Geneva 23, Switzerland.

3

CAMAC EQUIPMENT FOR MONITORING A TELECONTROL SYSTEM

by

H. Mayer

Österreichische Draukraftwerke Aktiengesellschaft, Klagenfurt, Austria

Received 13th February 1975

SUMMARY CAMAC equipment and a minicomputer are used to monitor a large telecontrol system for a group of hydro-electric stations. This monitoring equipment attempts to solve the problem of trouble-shooting sporadic faults in the telecontrol system.

INTRODUCTION

A chain of three hydro-electric power plants is supervised from a central control room with the aid of a computer. One power plant, with its two kaplan turbines of 40 Megawatts each and the associated gates, is supervised directly from the central control room, which is situated near this plant. The other two (later-on three) plants are supervised by additional telecontrol systems. The telecontrol systems generate various signals when an internal fault occurs. These signals have to be collected in order to monitor the telecontrol equipment. Approximately 100 different signals may be generated by each telecontrolled power plant.

The telecontrol equipments themselves have a good reliability. In addition, a suitable configuration was chosen so that internal faults do not affect the ability to supervise the power plant. The telecontrol equipments work on the basis of pulse-time modulation, in which the message (information) is transmitted by a sequence of pulses and intervals. In this case the information is conveyed by the duration of the pulses and intervals. An additional transmission of paritymarks enables the receiver to recognize errors on the transmission line.

The task of the monitoring equipment, described here, is to gather the internal signals and print a short text of approximately 15 characters, together with the time. Such an output from the central processor is of no use to the shiftman in the central control room, but it is of value to the electronic service-man who is responsible for maintenance of the telecontrol equipment. If necessary, he can use the monitoring equipment to test the faulty telecontrol system. The tests may last for several days or weeks in the case of an intermittent fault.

SOLUTION

The requirement for generating a printed text when an internal signal occurs is easy to fulfill by a minicomputer and a teletype.

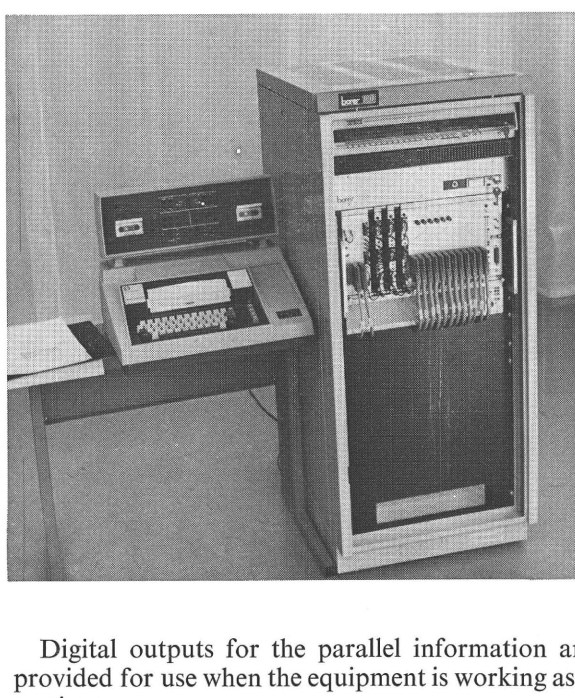
But how to monitor a telecontrol system in the best manner? The message (the block of pulses and intervals) has to be checked. The information block might be checked at the transmitting line, after the voice frequency equipment, and after the message has been assembled within the receiver. Naturally this kind of check is valid mainly for the receiver. By making observations at various points it is possible to locate the faulty part of the equipment. For example if it is confirmed that an incorrect message was received, it is easy to decide whether the sender or the transmitting channel is defective.

For monitoring a sender, which is also possible, a similar checking routine is necessary. If the defect sender is situated in a controlled plant, the monitoring system, which is very compact, is transferred to the relevant location. The parallel output of the receiver is also brought to the monitoring system. The monitoring system itself transforms the message-block into parallel information and compares both. In this way the whole receiver unit is checked. As the result of its monitoring function the system described here can be used as a general stand-by receiver. In addition, periodical monitoring to obtain statistical information is possible at any time.

HARDWARE CONFIGURATION

The line signals, as well as the parallel output from the receiver are collected by digital inputs.

The checking of the duration of pulses and intervals is carried out by counting a clock frequency of 100 or 10 kHz, generated by the monitoring equipment. The input to this counter is controlled by the signal to be checked. The signal transition which stops the counting also gives an interrupt to the system, which then stores the content of the relevant counter.



Digital outputs for the parallel information are provided for use when the equipment is working as a receiver.

For the text output a silent teletype with a speed of 30 ch/s has been chosen. It is combined with two built-in magnetic cassettes, and is very useful for editing and debugging programs because of its fast data transfer speed. The cassette equipment is not primarily intended for this purpose, but by using a little ingenuity it can be used.

A fast paper tape reader enables all the manufacturer's programs to be used. Finally, there is a minicomputer with 16-bit word-length, and as a result of the selected configuration there is only 8k of core memory.

SUMMARY OF HARDWARE

1 Minicomputer 8k, 16 bit
1 clock
24 interrupts
346 digital inputs
64 digital outputs
48 digital pulse outputs
10 counters
1 Teletype with 2 cassettes
1 paper tape reader 150 ch/s

NEWS

CONFERENCE ON TRENDS IN ON-LINE COMPUTER CONTROL SYSTEMS

This conference, at Sheffield on 21–24 April 1975, was organised by the UK Institution of Electrical Engineers and attracted over 200 delegates, of whom nearly a quarter were from overseas. The developments in the CAMAC standard since the previous Sheffield conference in 1972 were summarised in a paper by Barnes, et al.[1]. Other papers described major control systems using CAMAC. The control system for the ISR at CERN, with a capability of eight parallel and eight Serial Highways, was described by Verelst[2]. The computer networks at the Daresbury Laboratory, for controlling the NINA electron accelerator and the proposed Synchrotron Radiation source, were described by Atkins et al.[3]. The control system for the CERN 400 GeV accelerator, described by Crowley-Milling[4] has 25 minicomputers, many of them interfaced to the accelerator through CAMAC.

The conference indicated a marked trend towards multi-processor systems. The low costs of minicomputers and micro-computers now favours taking the processing power to the controlled plant, rather than transmitting the process variables to a central computer. The CAMAC Serial Highway is obviously relevant to this situation.

There were interesting comparisons between CAMAC and other standards.A paper by Benson et al.[5] of ICI Petrochemicals Division, described experience with some of the 30 systems based on the MEDIA interface system and the RTL-2 real-time language, both developed as proprietary standards by ICI. Several delegates took up the comment by Verelst that the name CAMAC does not guarantee the quality of the products. In this respect it was relevant to compare the case of CAMAC, as an international standard without direct financial support, and the UK national and military computer language, CORAL 66 which receives government support for product-testing and promotional activities (described in a paper by Neve of the Royal Radar Establishment). Many existing users of CAMAC would surely challenge the claim made in a review of computer-based laboratory automation, by Sawyer et al.[6] of the University of Bath, that undesirable factors of CAMAC result in system costs some two to three times those of other, proprietary, systems.

References

1. CAMAC — A Review and Status Report, Barnes R.C.M., Bisby H., Hooton I.N., Lewis A., UKAEA, Harwell, U.K.
2. Experience with CAMAC Standard for Control of a large Nuclear Facility, Verelst H., CERN, Switzerland.
3. Computer Control Systems for Electron Accelerators at the Daresbury Laboratory of the Science Research Council, Atkins V.R., Hopkins J.C., Hughes E.A., Poole D.E., Tyson B.E., Daresbury Laboratory, S.R.C., U.K.
4. The Multi-Computer Control System for the CERN 400 GeV Accelerator, Crowley-Milling M.C., Hyman J.T., Shering G.C., CERN, Switzerland.
5. Experience with a MEDIA/RTL-2 Process Control System, Benson R.S., Gladders M.J., ICI Ltd. U.K. Niblett J.D. GEC-Elliot Process Instruments Ltd., U.K.
6. Some Trends in Computer-Based Laboratory Automation, Sawyer P.E., Lockett A.D., Thompson J.W., University of Bath, U.K.

ANNOUNCEMENTS BY CAMAC MANUFACTURERS

KINETIC SYSTEMS CORPORATION, USA has established a representation in Europe:

Kinetic Systems International S.A.
2/6 Chemin de Tavernay
CH-1218 Grand-Saconnex, Geneva

that will be exclusively concerned with CAMAC.

Serial CAMAC systems and over 50 different units are available from stock or on 4/6 weeks delivery.

Kinetic Systems International also offer:

Design assistance for systems at short notice and for any application.

Installation assistance for purchased equipment.

Maintenance by a 24 hours per day module replacement service and modern test facilities.

Ref. No. 13.0001

DEVELOPMENT ACTIVITIES

1

AN INTERFACE BETWEEN CAMAC AND THE DIGICO MICRO-16V COMPUTER

by

H. D. Blake and D. J. Folwell
Cranfield Institute of Technology, Bedford, England

Received 27th January 1975

SUMMARY A CAMAC interface unit has been developed to allow a Digico Micro-16V computer to be used with a GEC-Elliott Executive System.

M16V COMPUTER

The DIGICO M16V is a 16-bit digital computer with a 950 nsec core cycle. The core memory is expandable in 4k modules up to 64k.

It has a Medium Speed Interface (MSI) for peripheral data transfers and also a Direct Memory Access (DMA) facility.

A Multi Level Interrupt (MLI) option is also included, providing 16 levels of priority interrupts from the peripheral channels. Three of these levels are used for this interface.

GENERAL DESCRIPTION

It was decided that transfers between the M16V and CAMAC should be of two types: Program Transfers and Block Transfers, each using a separate DMA channel but both controlled from one MSI peripheral channel.

To make the interface compatible with the 24-bit word size of CAMAC, it was arranged that word transfers could be 24-bit or 16-bit as required. Twenty-four bit words are handled in two bytes, one of 8 bits and one of 16 bits.

For data transfers to take place, Control and Status information is required. This is held in two registers in the Interface Unit: Control and Status Register High (CSR H, 10 bits) and Control and Status Register Low (CSR L, 16 bits). The bit allocation is as follows:

CSR H		
BITS 0-2	CR	Crate Code
BITS 3-5	BR	Branch Code
BIT 6	CaR	Crate Address Register
BIT 7	Sr	Stock Register
BIT 8	P	}Q Status bits
BIT 9	R	}(Block Transfers)
CSR L		
BITS 0-4	N	Station Code
BITS 5-8	A	Sub Address
BITS 9-13	F	Function
BIT 14	L or Q	L Trigger or Q Response
BIT 15	WS	Word Size 1 = 24-bit transfer 0 = 16-bit transfer.

This information is decoded and gated onto the CAMAC Dataway to enable the correct operation to be performed.

Similarly Data words are held in two registers in the interface; Data Buffer High (DBH, 8 bits) and Data Buffer Low (DBL, 16 bits). Figs. 1 and 2 show the order in which data are held in core.

The interface also contains an Address Register, which at the start of a transfer will contain the intial core address, and a Word Count register which is used to control the number of word transfers in a Block.

The Q Response to a particular transfer is tested and, depending upon the Q status bits in the CSR registers and the type of transfer (Program or Block), appropriate action is taken within the interface.

Extra hardware is included within the interface to handle any Look-at-Me that might occur. A Grant Graded-L operation (REF 1, 2) is automatically performed.

PROGRAM TRANSFERS

A Program Transfer (Fig. 1) is a single CAMAC operation initiated by a specific computer instruction The instruction is decoded, and initial core address transferred, by way of the computer's Medium Speed Interface.

Initially, two consecutive DMA cycles transfer control and status information to the interface.

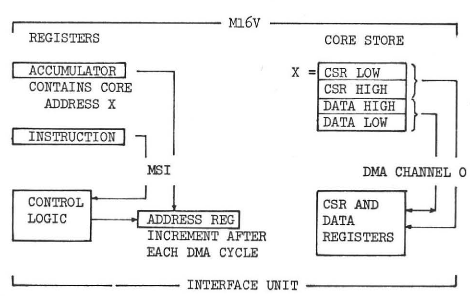


Fig. 1 Program Transfers

To transfer data, a further one or two DMA cycles follow, depending upon the word size selected (CSR L, bit 15).

For a 'data-less' operation, only control and status information transfer is necessary.

A Program Transfer, therefore, requires a maximum of four store locations. Figure 1 shows how the status information and data are arranged in core.

As a result of a CAMAC operation, the addressed module may generate a Q response signal. The response is compared, in the interface, with the Q status bit in the CSR L register. If the value is the same no action results, but if the values differ a computer interrupt is generated on a particular priority level to enable appropriate software action to be taken.

BLOCK TRANSFERS

Block Transfers (Fig. 2) as implied, enable consecutive data words to be transferred.

In addition to the Control and Status information, a Block Count and Data Start Address are required in the interface. This information is held in 4 consecutive store locations as a Control Block.

On initiation of a Block Transfer, four D.M.A. cycles transfer control information to the interface.

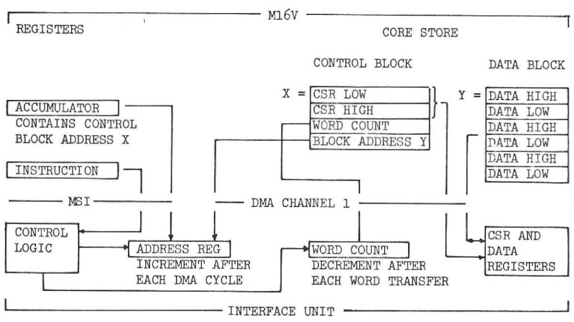


Fig. 2 Block Transfers

Data transfers will now commence, but can either be in Normal or L-Triggered mode, according to the significance of the L bit contained in CSR L.

In Normal mode, data transfers continue until 'end of block' is reached.

The 'end of block' depends upon the Q response and the significance of the Q status bits, P and R, in the CSR H register. These status bits are arranged to enable the following four types of Block Transfer to be performed

$P=0, R=0$	Q suppressed
$P=0, R=1$	Repeat
$P=1, R=0$	Stop
$P=1, R=1$	Address Scan.

Two levels of interrupts are used to inform the computer of 'end of block' or of a malfunction that may occur.

In L-Trigger mode, data transfers are delayed until a chosen module generates a Look-at-Me (LAM). Any LAM may be assigned for L-Trigger purposes by hardware patching but, to ensure immediate response, it should have the highest possible priority.

Block length is controlled by the Q response as for Normal mode.

AUTOMATIC GRANT GRADED L (Auto GGL)

The AUTO GGL part of the interface can be enabled and disabled by specific computer instructions.

When enabled a Grant Graded-L operation is performed in response to a Demand signal presented by the Executive Controller (Ref. 1). The Demand is the result of any LAM in the system.

The pattern of LAMs is read, and placed on the Dataway R lines by the Executive Controller. They are priority sorted within the interface and the highest, together with the corresponding Branch Code, is formed into an 8-bit priority vector.

This vector, which can be read by the M16V, is also used in conjunction with a Re-Entrancy Trap Store within the interface, to prevent re-entering of service routines until they have been completed.

A third level of interrupts is used specifically for this facility.

CONCLUSION

A four-station prototype unit has been used successfully for developing test programs and operational software.

Commercially available modules are used for test purposes and for access to a Digital Differential Analyser.

REFERENCES

1. G.E.C. Executive Suite Handbook.
2. The CAMAC System of Data Handling (Smith, Drury and Troy, G.E.C. Ltd.).

NEWS

UNITED KINGDOM CAMAC ASSOCIATION (UKCA)

Since its formation, the UKCA has published two News Letters, participated in COMPEC '74 and held two seminars at which the attendance was restricted in order to enable a meaningful forum for discussion.

The 2nd News Letter is double the size of the 1st and is packed tightly with interesting items concerned with reviews of ECA, UKCA, ESONE and NIM activities together with details of forthcoming events. The UKCA is planning to participate again in COMPEC '75 because of the successful reaction to that of last year.

The Association was encouraged to mount a second Seminar in March by the favourable reaction from the 1st Seminar in February. An attendance of about 35 people heard and exposure of the various ways in which BASIC has been extended to incorporate CAMAC operations, presented by Francis Golding on behalf of Ian Pyle who was not able to be present. The same speaker discussed CATY and the reasons for this specific implementation of a BASIC-based CAMAC language. A lively forum started up as participants revealed and discussed their attitudes toward, and problems with, CAMAC software. In the afternoon, Peter Clout (Daresbury Lab) talked on LAM-handling and there followed an informative tour of the extensive use of CAMAC in the host Laboratory at Daresbury.

2

AN ALPHA-NUMERIC AND GRAPHICAL DISPLAY DRIVER IN CAMAC

by

N. V. Toy

GEC-Elliott Process Automation Ltd. Leicester, England

Received 7th February 1975

SUMMARY This micro-programmed CAMAC module provides comprehensive facilities for displaying alphanumerics and graphics on an oscilloscope. The display can be refreshed from a local memory. Operational modes such as character size, generation of single vectors and sequences of vectors, and the choice of intensity, style of lines, and blink mode are selected by ASCII codes.

INTRODUCTION

The alpha-numeric and graphical display—both informative and interactive—is now accepted as a growth market and much equipment is becoming available to the user in the form of V24 remote terminals, or various formate using in-house standards.

The display presentations are usually based on closed-circuit television techniques, refreshed displays, or storage tubes. However TV-style displays are poor where graphics are concerned and storage displays are generally used in this market area. Refresh techniques usually place a burden on store access.

New integrated-circuit technology now allows the addition of a local memory to refresh a fast display generator. This can then draw complex pictures of mixed alpha-numeric and graphic formats, with better contrast and definition than is possible with storage tubes. Local memory improves the refresh rate and reduces the data traffic on the peripheral highway; however, it is obviously important to employ an internal command set that allows the memory to be used efficiently.

The design of the CAMAC Display Driver DD1603 currently under development by GEC-Elliott Process Automation illustrates some of the above points. It is intended to be most effective when used in conjunction with the Hewlett Packard HP1300 Series Display Oscilloscopes and a local storage memory module.

DISPLAY DRIVER DD1603

A particular feature of the Display Driver DD1603 is the provision of a small internal memory (32 × 16-bit words) which is used for communication between the Display and the host computer. It is also used to store a pre-programmed cursor symbol —usually as a string of short vectors. This internal memory is separate from the private local memory. In fact the DD1603 may be used without the local memory in systems where computer—updating is not a penalty.

Apart from the definition of 128 alpha-numeric characters (including lower case, mathematical and Greek symbols) a sub-set of ASCII codes is used to control the Display Driver, switching it between operational modes or changing operating parameters, some of which are listed:

- Short vector mode (one word per vector)
- Long vector mode (two words per vector)
- Histogram mode (automatic X increment)
- Point-plot mode (two words per point)
- Group operation (see later)
- Store Pointer word (see later)
- Vector line type (dash-dotted-solid)
- Character size (×1, ×2, ×3 or ×4)
- Blink ON/OFF (causes display to flash)
- Intensity (3 levels)
- Spot check (see later)

A mode or parameter remains as set until cancelled or changed.

All vectors are expressed as signed deviations from the current spot position; circles may be drawn by a small modification to the vector algorithm. Short vectors are 2 × 7-bit words and long vectors 2 × 11-bit words. Arcs require 3 × × 12-bit words.

Group operation is analogous to a Jump-to-Subroutine call whereby a common complex symbol or figure may be formed from a string of suitable short vectors and called from any number of places in the main command sequence. A corresponding 'Return' command is placed at the end of

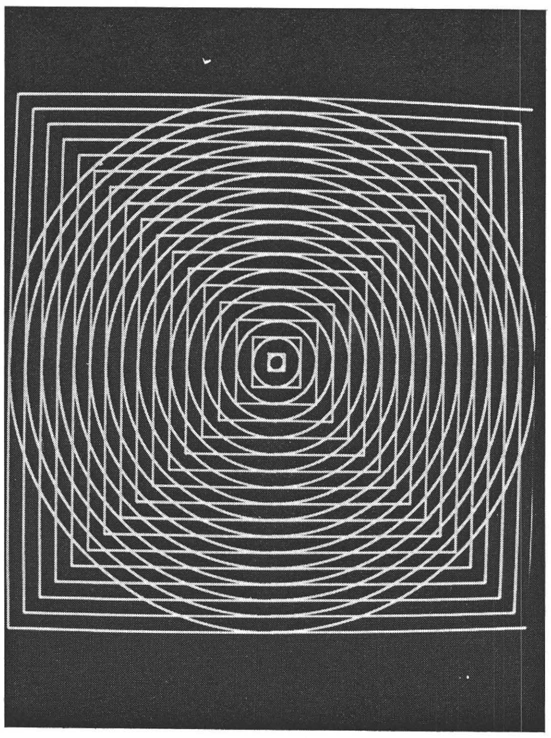


Fig. 1 Test Pattern for Vector and Arc Modes on the Display Driver DD1603

the group string. Thus, for example, such symbols as logic gates and circuit devices in computer-aided design work way be defined once with precision and used many times in a command sequence.

Light pens are used, in the main, for either selection of a matrix position defined by the X–Y co-ordinates or for 'menu-picking' where one of a number of alternative routines is selected by placing the pen over the symbol or word corresponding to the required routine. In this latter case the X–Y co-ordinates of the selected symbol are of no immediate value since they cover a range of values depending on which portion of the symbol activated the pen. These co-ordinates must then be related to the required routine probably by means of a jump table In the DD1603 'menu picking' is facilitated by the use of Pointer words.

During the display sequence a Pointer word may be transferred into a temporary location of the internal memory before each menu symbol is described. If the light pen is activated by the symbol, the Pointer word is automatically transferred from the temporary location into a specific communications location to be read by the computer.

The Pointer word may be any 16-bit word suitable to the program, e.g. a direct pointer to the selected routine. The Light Pen action will, of course, also cause the X and Y co-ordinates of the screen spot to be transferred to a specific pair of locations in the internal communications memory, so that both the absolute position and the Pointer word are available to the software, to be used as convenient.

Separate on and off blink control commands may be used to cause any combination of lines and text defined between them to flash at a nominal rate.

As a spot check facility the X–Y co-ordinates may be stored at any time in a pair of specific locations in the internal memory and compared by program with the computed spot position.

The accompanying illustration (Fig. 1) shows one of the test patterns employed to check the vector and arc modes of operation.

CONCLUSION

No doubt some of the facilities described above appear to some users to be over-complex and unnecessary for their own requirements—but CAMAC equipment is finding use in a wide range of applications and what to one user is a redundant feature is essential to another. Since the design technique of the module is based on micro-programming techniques, once the basic data paths and memory storage have been established the extra facilities are not much more than extra ROM sequences. It is therefore more economic to design one module to cover a wide market need.

3

CAMAC INTERFACE FOR A BUFFERED CARD READER

by

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Received 17th February 1975

SUMMARY This CAMAC module is an interface for a buffered card reader. Special hardware features include character decoding, packing characters into the computer's internal format, and detection of end-of-file cards.

A CAMAC module has been built to interface a Mohawk Data Sciences card reader (Model 6042, 400 card/min) to a Digital Equipment PDP-15 computer. CAMAC interfacing was chosen for the reader so that it could be switched easily between a pair of identical PDP-15's comprising the K.V.I. nuclear data acquisition system (DAS); each machine has a CAMAC branch driver (DEC model CA-15).

The CAMAC module has several special features, including hardware for (i) Hollerith character decoding, (ii) packing of characters into PDP-15 internal code, (iii) detection of end-of-file cards, and (iv) skipping to next card.

Since the computers are used in a real-time data-acquisition system, interrupt servicing could not be guaranteed within the column-to-column motion interval (about lms) as a card is processed. Therefore card-image buffering was required; such a buffer was purchased from the manufacturer of the reader and installed in the reader itself.

With the hardware architecture of Fig. 1, three data modes were implemented: binary (12 bits, 1 card column, per CAMAC transfer), 'image' ASCII (one 7-bit hardware-decoded right-justified character per CAMAC transfer), and the more efficient PDP-15 standard '5/7' ASCII (five 7-bit ASCII characters packed into two consecutive 18-bit memory locations, with 1 bit unused).

When the reader is turned on it automatically reads a card into its internal buffer, and then signals the CAMAC module that it is ready. The module sequentially reads the reader buffer, generating a

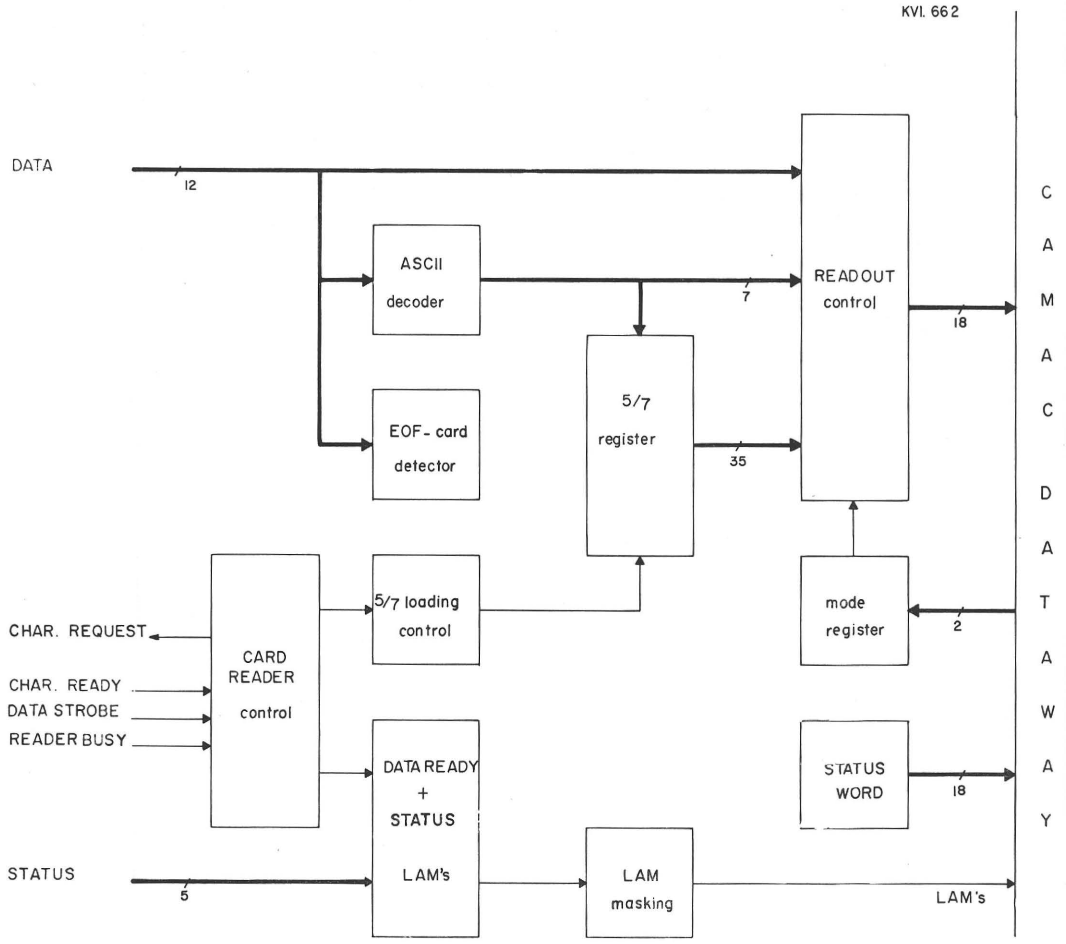

Fig. 1 Block Diagram of CAMAC Card Reader Interface

LAM for each card column in binary and image modes, and for each five columns in '5/7' mode. The reader automatically reads the next card when (and only when) its buffer is empty, setting a 'busy' line until it is ready again. If the CAMAC module detects a 12-11-0-1 or 7-9-8 punch in card column one, an end-of-file condition is generated; a 'skip card' function can then empty the reader buffer (by simply reading and ignoring the data) to proceed to the next card. To use the present module with an unbuffered reader, a provision must be added for initiating a read operation explicitly.

The module is built using wire-wrap techniques with 88 integrated circuits, and occupies two CAMAC stations. One of the two available LAMs is used for announcing error and status conditions; the other is a 'data-ready' signal wired to GL24 for PDP-15 CAMAC data-channel transfers. An 18-bit status word containing detailed information about both the reader and CAMAC module is available through a 'read status' function. The hardware character decoding was done with field-programable read-only memories.

A software handler for the reader is operated under the standard PDP-15 single-user operating system. The hardware decoding and packing allows considerable reduction in handler size, though the card buffering requires somewhat complicated error and status processing.

The module was constructed by K. Nauta. Part of this work was performed within the research program of the 'Stichting voor Fundamenteel Onderzoek der Materie' (F.O.M.) with financial support from the 'Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek' (Z.W.O.).

4

CAMAC INTERFACE MODULE FOR THE BIOMATION TRANSIENT RECORDER TYPE 8100

by

I. Török

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(on leave from the Institute of Nuclear Research of the Hungarian Academy of Sciences, Debrecen, Hungary)

Received 3rd October 1974

SUMMARY A single-width CAMAC module has been developed for control and read-out of a single Biomation Type 8100 transient recorder. The module performs programmed data transfers.

A single-width CAMAC module has been developed for control and read out of a single Biomation Type 8100 transient recorder. The transient recorder can be 'programmed' through the module by sending appropriate control words to its digital inputs. Almost all the front panel settings can be controlled through this interface.

The memory content of the transient recorder can be read out using two different methods. One of them is a Stop mode programmed block transfer, which uses the Q response for detecting the end of the block, and can be interrupted using a special LAM when the transient recorder is not ready for the next transfer. (This is the case when a refresh-cycle has been started in its MOS memory). Another LAM warns when the 8100 is ready again.

The other method, a little slower, is to test the flag of the 8100 before every read out CAMAC command, and to test afterwards that the command was acknowledged by the 8100. The relatively high data-word rate of the 8100 makes it possible to transfer two 8-bit words from the transient recorder to the memory of the controlling computer in one Dataway cycle.

A LAM signal is generated from the trailing edge of the record signal of the 8100, which is at logic '1' during the recording time. This LAM starts the read out subprogram.

The module uses 19 CAMAC commands.

The X response signal is used to detect if the 8100 is not powered, simply AND-ing the X and the +5 V of the 8100. If the 8100 is not powered, all CAMAC instructions sent to the module will give an X = 0 response.

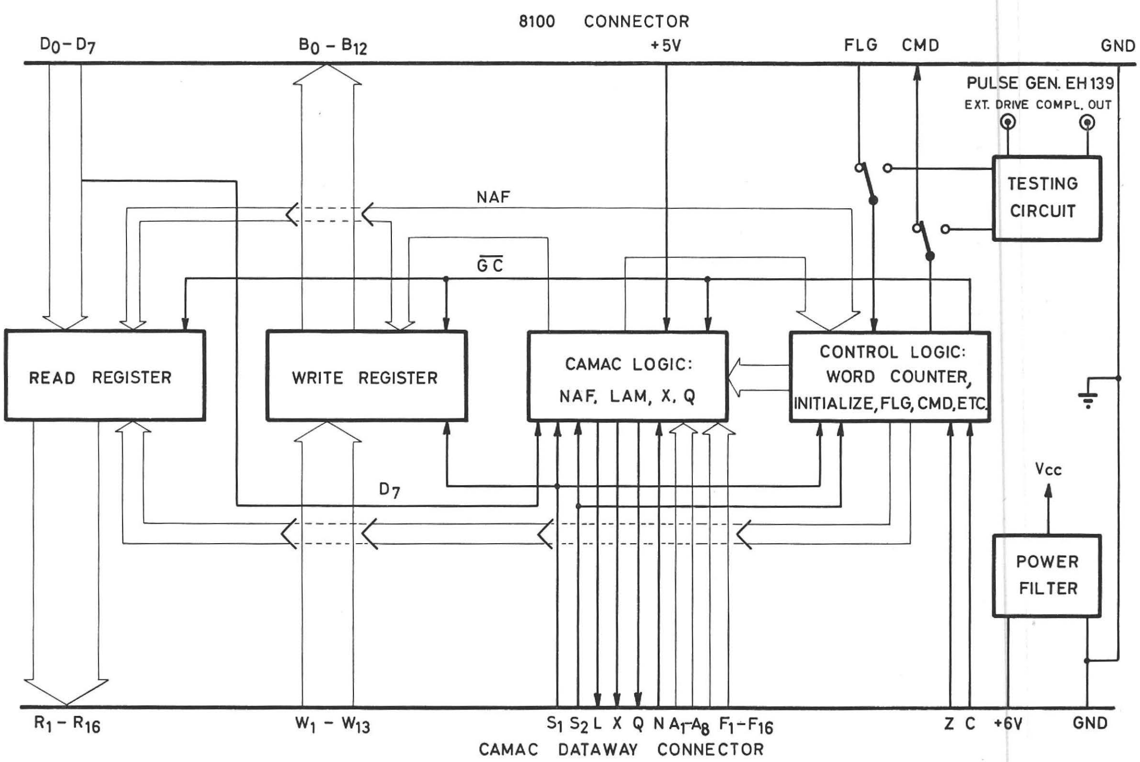

Fig. 1 Simplified Block Diagram of Interface Module for Biomation Transient Recorder Type 8100

Some built-in circuits are provided for testing the module without the 8100, using a pulse generator (e.g. EH139) to imitate the varying width flag pulse of the 8100.

A simplified block diagram of the module is shown in Fig. 1.

The module will be used in a LIDAR system, for measuring air pollutants. The system uses a PDP-11 computer to control CAMAC equipment through a BORER 1533A dedicated crate controller.

SOFTWARE

1

MACRO-IML IMPLEMENTATIONS FOR THE PDP-11 COMPUTER

(A language for use in CAMAC systems)

by

M. Kubitz and R. Kind

Hahn-Meitner Institut für Kernforschung Berlin GmbH, Germany

Received 15th January 1975

SUMMARY IML has been implemented for the DEC PDP-11 computer with the DEC CA-11A CAMAC branch controller and the Borer 1533A single-crate controller, and with the DEC operating systems DOS, VO8/VO9 and RSX-11D (and in future with RSX-11M). The implementations follow the macro-syntax given as an appendix to the definition of IML.

INTRODUCTION

These IML implementations follow the macro-syntax as given in appendix A of the document "CAMAC—the definition of IML" (A language for use in CAMAC-systems)[1]. This document has been adopted as a description by ESONE and US NIM in August/September 74. They implement IML for the DEC PDP-11 computer[2] with the CAMAC branch controller DEC CA-11A[3] and the single crate controller BORER type 1533a[4]. For both DEC operating systems DOS VØ8/VØ9 and RSX-11D a full set of macros has been implemented, except block transfer on special LAM, X-error control statements and the subscript mode. Transfer modes not implemented by the hardware of the CA-11A are simulated by software.

DESCRIPTION OF THE IMPLEMENTATIONS

The following fundamental conditions have been satisfied in the IML-implementations:

• IML is made available for all DEC PDP-11 computers.

This has been obtained by writing the macro expansions in Macro Assembler of DEC PDP-11[5] and by using only those instructions which are implemented by hardware in all computers of the PDP-11 family.

• The macros can be executed under the DEC operating systems DOS VØ8/VØ9 and RSX-11D respectively, and in the future RSX-11M. All input/output (I/O) transfers are handled directly by MOV-INSTRUCTIONS in the appropriate IML statement. By embedding the I/O into the macros the need to write a CAMAC I/O handler for the particular DEC operating system has been avoided. A program running under RSX-11D has to be a privileged task to have access to the device register addresses. This method also allows the rapid implementation of IML for other operating systems, e.g. RSX-11M. Only the LAM handling part of the implementation requires redesigning if other operating systems are to be used.

• Short execution time of CAMAC I/O in action statements at runtime.

Because of address calculations at assembly time and the use of conditional assembly directives the macro expansions require little core memory at runtime and give an optimum execution time. On average, a single action statement (READ or WRITE) consists of five to six assembler instructions, depending on the controller. At assembly time, the core memory requirement is determined by the operating system and the macro assembler with its symbol table, and amounts to 24 K words (16 K for the IML subset) under DOS and 52 K words (44 K for IML subset) under RSX-11D. The high core memory requirement at assembly time is a consequence of the conditional assembly directives. It is expected that the core memory requirements for PSX-11M are similar to the DOS-system.

• Reservation of core in declaration statements as in high level languages. In the declaration statements of IML all decisions about the type of declaration and the type of parameters are made by direct assignments. Therefore declaration statements only require core memory at runtime in case of hardware or software variables because of the reservation of core memory. This kind of implementation offers the advantage of not requiring core memory reservation for variables in the host language.

• Detailed error checking at assembly time in order to protect a non-experienced user from non-recoverable errors at runtime. A very detailed error check is made to detect syntactical and semantic errors—as far as possible within assembly time. The assembler error directive with error messages has been applied within conditional assemblies.

• Modular programming for easy portability of IML to other CAMAC controllers.

The modular programming provides an easy portability of IML to other CAMAC controllers. Only some of the modules related to the hardware of the appropriate controller have to be changed, e.g. the address calculation.

LAM-HANDLING

The same LAM handling has been chosen for the two controllers:

Under the DOS operating system a LAM is decoded to a corresponding station number (N), and a branch to the appropriate interrupt service routine is performed. The assignment of a LAM to a station number is done by hardware in the BORER type 1533A controller and by software if the DEC CA-11A controller is used.

Under the operating system RSX-11D the LAM handling is performed as a separate task. In the event of a LAM the CPU traps into this separate task, which in case of the CA-11A controller assigns the LAM to a corresponding station number. A significant event is indicated by coded system eventflags. The user program must contain for each LAM a program sequence (e.g. a task) which is in a waiting condition for a significant event.

CONCLUDING REMARKS

The use of IML statements is not only restricted to assembler programs. For problems which can be solved by FORTRAN, the linkage from FORTRAN to assembler programs can be performed via the FORTRAN subroutine call. The implemented IML macros form a macro library which has to be declared in the command input string of the PDP-11 macro assembler[5]; this means that the whole IML program using assembler as host language is translated into object code in one step by the PDP-11 macro assembler.

A subset of IML can be easily achieved by eliminating from the macro library those macros which are not required by a specific application. The first implementation for the DEC CA-11A controller was completed by two men within four months. Due to the above mentioned features of the implementation the same two persons were able to implement Macro-IML for the BORER type 1533A controller within two weeks.

A manual describing the implementations more in detail is in preparation[6].

REFERENCES

1. CAMAC. — The Definition of IML (A Language For Use In CAMAC Systems) ESONE/IML/01, October 1974, published by the ESONE Committee.
2. PDP-11 Processor Handbook 11/20, 11/40/11/45.
3. DEC CA-11A Controller Manual, Reading, England.
4. PDP-11/CAMAC Crate Controller Type 1533A, BORER Electronics AG, Solothurn 2, Switzerland.
5. DEC PDP-11 MACRO Assembler Manual.
   DOS: DEC-11-OMACA-BrC.
   RSX: DEC-11-OXDMA-A-D.
6. Macro-IML Manual for DEC PDP-11 Computer with Controllers, DEC CA 11-A/BORER Type 1533A, M. Kubitz, R. Kind, HMI-B168, March 1975 Hahn Meitner Institut für Kernforschung Berlin GmbH.

2

CAMAC WITH FORTRAN ON A CDC 3100
an approach based on IML

by

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Received 27th February 1975

SUMMARY This paper describes a straight-forward approach for using CAMAC with FORTRAN on a CDC 3100 computer. The solution is based on IML and consists of only four assembler subroutines and a LAM handler. It can be regarded as a high level expansion of an earlier implementation of IML in an assembler language environment.

INTRODUCTION

Since a language like FORTRAN is mainly intended for arithmetical operations, some problems arise when FORTRAN is used in a real-time environment like CAMAC. However, FORTRAN is widely known and used; therefore it is desirable to have tools in FORTRAN for handling CAMAC at this language level.

How to solve the various problems depends strongly on the facilities of the FORTRAN in use. An implementation of CAMAC in FORTRAN can be solved very conveniently by subroutines or function calls[4,5].

THE MAIN PROBLEM

One of the main characteristics of FORTRAN is that its level is very far from that of the machine language. The reason for this is to reduce error possibilities. In assembly-language the programmer controls the flow of the program directly by 'labeling' the statements, and has tools to transfer labels from one subroutine to another. Moreover it is possible to return directly from subroutines to these labels.

Two typical examples of this problem in CAMAC are the Q-response and LAM-handling. These can be described in terms of IML[1]:

Q-response:

SJQ READ MODUL DATA YLABEL
SJNQ READ MODUL DATA NLABEL

LAM-handling:

ENL ALAM IRSERV
UBL READ MODUL BUFFER
CHANNEL BLAM

The meaning in the first case is that, depending on the state of Q, control goes either to the statement labeled by the jump address (to YLABEL if $Q=1$ for SJQ and to NLABEL if $Q=0$ for SJNQ), or to the statement following the SJQ or SJNQ. In the second case, the ENL statement establishes a connection between a GL-number defined by a LAM declaration and an interrupt service routine (IRSERV).

A LAM is declared by using names. A LAM-name has an associated GL-number. CAMAC operations can be triggered by a LAM, and the CAMAC operations are performed, for example, by an interrupt service routine. Therefore for proper execution the GL-number must be connected to an interrupt service routine. This can be done at programming time by linking a LAM to an interrupt service routine. In the UBL instruction it is recommended that this connection is done implicitly. This means that the UBL instruction involves a special interrupt service routine, e.g. one single CAMAC operation.

These tools are normally not available in FORTRAN because it merely contains the various GOTO's, the CALL SUBROUTINE and the RETURN for controlling the program flow. In various FORTRAN implementations it is not possible to transfer 'statement numbers' (the 'labels' and their runtime representation, an address) or at least to load the runtime representation of statement numbers into a FORTRAN variable and to transfer them into the subroutine. This is also true for the FORTRAN available on the CDC 3100[3].

SUBROUTINES AND FUNCTIONS FOR CAMAC

On the basis of IML, a straightforward solution for using CAMAC in FORTRAN has been implemented for the IAK II Cyclotron, using a CDC 3100 computer. We have implemented the Q-response as an integer variable holding the state of Q, and the interrupt service routine as an external subroutine address variable. The mnemonics of these routines are similar to the IML keywords used in the assembler implementation[2], since our users are quite familiar with these names.
The four basic subroutines are:

- *Declare a CAMAC address*
  FUNCTION LOCD(C,N,A)
  e.g.: MODUL=LOCD(1,15,0)
- *Perform a single CAMAC Operation*
  SUBROUTINE SA(F,MODUL,⟦IDATA⟧,⟦IQ⟧)
  e.g.: CALL SA(0,MODUL,ID,IQ)
  IF(IQ.EQ.1)GOTO 100
- *Declare a LAM*
  FUNCTION LOCLA(C,N,A,⟦GL⟧)
  FUNCTION LOCLI(C,N,BIT,⟦GL⟧)
  e.g.: ALAM=LOCLA(1,15,0,1)
  ALAM=LOCLI(1,15,8,1)
- *Link LAM to subroutine*
  SUBROUTINE LINK(LAM, SUBROUTINE)
  e.g.: EXTERNAL IRSERV
  CALL LINK(ALAM, IRSERV)

Parameters

C,N,A	– integer constants or variables containing the C,N,A-values.
MODUL	– name of the station declared by LOCD.
IDATA	– internal computer reference address for data.
IQ	– integer variable for Q-response.
GL	– integer variable for GL-number.
BIT	– integer constant or variable for the bitposition[1].
ALAM	– real variable for the LAM-declarations.
IRSERV	– subroutine where the control has to go when a ALAM arises.
⟦ ⟧	– denotes optional parameters.

LAM HANDLING

There are three steps involved in LAM handling: declaring a LAM, enabling/disabling a LAM, and linking a LAM to an interrupt service routine.

Declaration

A LAM is declared by one of the LAM declaration functions which defines its hardware reference. In the case of LAM-A the subaddress A is given, in the LAM-I case the bit-position of the LAM mask is given. The reference of the GL number depends strongly on the LAM grader in use. In our case the GL number causing interrupts is identical with the crate number. Therefore these GL numbers need not be specified. The remaining GLs must be indicated in the calls because they are hardwired for handling autonomous transfers.

Enable/Disable

This is a single CAMAC operation which can be done by a call to SA. In Fig. 1 an example is given for declaring and enabling a LAM of LAM-I type

```
INTEGER ILAM(2)
REAL LAM
EXTERNAL IRSERV
EQUIVALENCE (ILAM(1),LAM)
      .
LAM=LOCLI(1,15,8)
      .
CALL LINK(LAM,IRSERV)
CALL SA( 19,ILAM( 1),ILAM( 2),IQ)
      .
RETURN
END


SUBROUTINE IRSERV
      .
CALL SA( ...)
      .
RETURN
END
```

Fig. 1 Example of LAM-Handling in FORTRAN with LOCLI and LINK

with C=1, N=15, A=13 and BIT=8 (the mask bit for bit 8 of the LAM status register). ILAM(1) represents the LAM address and ILAM(2) its LAM mask.

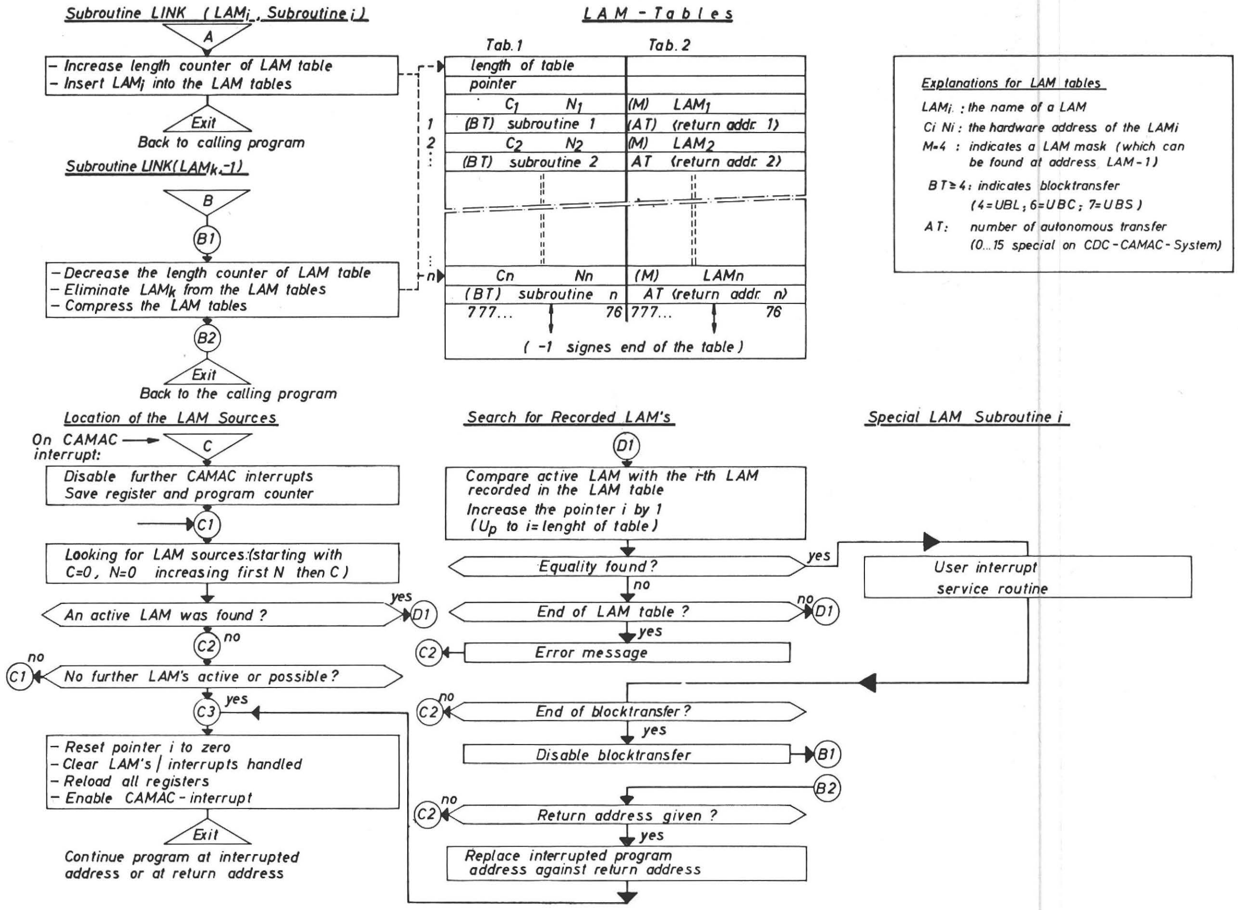

Fig. 2 Block Diagram of the LAM Handler for a Control Data 3100 Computer

Linking a LAM

The subroutine LINK enters all the relevant items into the LAM table of the LAM handler (Fig. 2). In the normal case these are the LAM address and the address of the subroutine to be linked to: whereas, for example for the LAM-I type additional information for the LAM mask is made available to the LAM handler via the LOCLI function. Since the length of the table of active LAMs is fixed, provisions have been made to dislink a LAM by a special call (CALL LINK(ALAM, – 1)). The dislink call results in removing the LAM name and compressing the LAM table.

LAM handler

The LAM handler (Fig. 2) was designed for IML-assembler level[2] and therefore contains some additional facilities which are not used in this implementation. The LAM handler consists of three parts connected by the LAM table. These are the 'link- and dislink subroutine', the 'location subroutine' and the 'search subroutine', The location part traces the CAMAC interrupt back to the LAM source. The detection of each LAM source leads then to the search part where the linked LAM subroutine should be found and entered. The exit from this user—subroutine must always return the same way that the subroutine was entered. The LAM service is done in LIFO manner (last in first out).

CONCLUSIONS

The main features of this approach are ease of learning and ease of implementation. Moreover, no change in the former assembler implementation was necessary. Also it can be understood as an alternative to a complex cross-referenced subroutine system[5]. The time to implement these subroutines was only a few days, inclusive of testing and documentation.

The authors are indebted to the ESONE SWG Group for the 'Definition of IML' [1] which is an excellent implementation guide describing all features of the CAMAC System from the software point of view.

REFERENCES

1. CAMAC. The Definition of IML. A Language for Use in CAMAC Systems. ESONE Committee, ESONE/IML/01 (1974).
2. Kneis, W., 'Implementation of CAMAC IML in an Assembler Language Environment', *CAMAC Bulletin*, 10 (1974).
3. FORTRAN Reference Manual, CDC, No. 60058100.
4. Michelson, J., 'Procedure calls—a pragmatic approach', Proc. First International Symposium on CAMAC in Real-Time Computer Applications, Luxembourg (1973).
5. Thomas, R.F. Jr., 'Specifications for Standard CAMAC Subroutines *CAMAC Bulletin*, 7 (1973).

IDEAS AND TECHNIQUES

1

FASTER ADDRESS-SCAN BY READING ONLY NON-ZERO DATA

by

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Joint Institute for Nuclear Research, Dubna, USSR

Received 4th April 1975

SUMMARY A 'floating sub-address' technique is suggested. This speeds up the address scan mode by reading only the non-zero data registers in CAMAC modules. Implementations are described for modules with less than 16, and 16 or more, data registers.

In address scan mode the CAMAC address of each register is calculated on a cycle-by-cycle basis, depending on the Q-response of the previous cycle. The registers accessed sequentially within the module must have consecutive sub-addresses starting with A(0), and the module must generate the appropriate Q responses.

In some applications a significant time-saving is possible by reading only those registers that have been filled with data, and ignoring those that contain zero data. The following solution is proposed to achieve this. Every data register in the module has a corresponding LAM-trigger (Fig. 1), where $LAM_i = 1$ indicates that register i contains non-zero data. All these LAM requests are ORed to the L-line. During the address scan the module responds first to the command N.A(0).F(Read) by setting $Q=1$ if $L=1$, and by transferring via the R-lines a demand-status word indicating the pattern of LAM requests in the module. Then, in response to subsequent commands N[A(1)+A(2)+...A(K)].F(Read), where $K \leqslant 15$, the module sets $Q=1$ if $L=1$ and transfers data from a non-zero register i to the R-lines. During this cycle the LAM_i trigger is reset. The controller increments the sub-address, but the next cycle reads the next non-zero register j, irrespective of its actual sub-address. Finally, when all the LAM triggers have been cleared and $L=0$, the

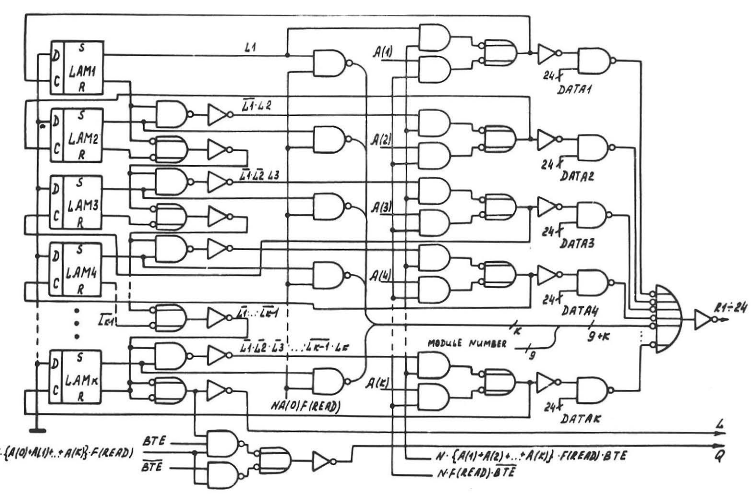

Fig. 1 The floating Sub-Address Logic in the Module with the Number of Sub-Addresses ⩽15

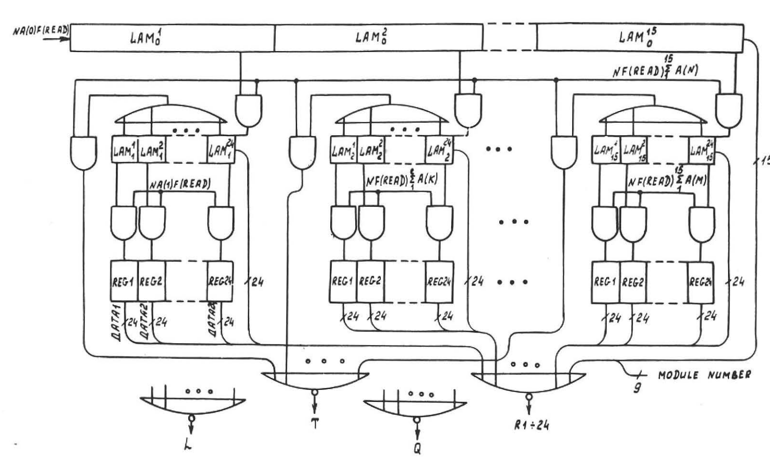

Fig. 2 The floating Sub-Address Logic in the Module with the Number of Sub-Addresses ⩾16

module responds to the next command with Q=0 and the address scan within the module terminates in the usual way.

Although the controller generates the usual sequence of consecutive sub-addresses, the registers in the module are not accessed at fixed sub-addresses. This is why the method is described as using 'floating sub-addresses'. The demand-status word provides the link between the data words and the true sub-addresses of the registers, and also includes a previously-assigned module number. The solution in this form does not allow a module to have more than 15 registers.

One can see from Fig. 1 that normal programmed access to a register is possible by changing the state of the trigger BTE.

By using a special signal (let us call it T) transmitted via one of the Free-Use Dataway bus-lines to the controller it is possible to extend the solution to a module containing 360 registers, arranged as 15 groups of 24 registers. The block diagram of such a module is shown in Fig. 2.

Each group of 24 registers has a 24-bit demand-status register LAM_i, indicating the state of the registers in the group. There is also a 15-bit overall demand-status register LAM_0 indicating the state of the 15 groups.

When reading the data registers within a group the T-signal inhibits the incrementing of the sub-address if $A<15$ and $Q=1$.

During the first cycle, with A(0), the LAM_0 register is read. The module generates $T=0$, and a sub-address increment is allowed. During the second cycle, with A(1) the LAM_i register in the first non-zero group is read. The module generates $T=1$ in this and subsequent operations on this group of registers to inhibit the sub-address increment. During the following operations, still with A(1), the contents of the non-zero registers in group i are read, and the corresponding bits of LAM_i are reset. When all the bits of LAM_i have been reset the T-signal becomes zero, and the sub-address is incremented. After that, the process is repeated with A(2) in order to read the demand status LAM_j of the next non-zero group, and the contents of the non-zero registers in the group.

2

A RARELY-USED APPLICATION OF THE X-LINE

by

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Received 16th January 1975

SUMMARY The attention of CAMAC interface module designers is drawn to a simple method of indicating that a peripheral is unpowered or disconnected, by using the Command Accepted (X) line.

Some designers of CAMAC modules use only the simple OR-ed NAF signals for generating the X signal, even if the module interfaces a peripheral to the Dataway (e.g. Ref. 1). This arrangement does not indicate if the peripheral is disconnected or unpowered. In most cases, it is easy to generate in the module, from one of the power supply voltages of the peripheral, a signal which is logic '1' when the peripheral is connected to the module and is powered. An AND connection of this signal with the overall X, or with that part of X signal generated from the NAF signals that handle the peripheral, is enough to produce an X=0 in the case of a disconnected or unpowered peripheral. This useful indication method is not given explicitly in EUR 4100e (1972). The cited literature[2,3] sets examples for the use of this possibility.

REFERENCES

1. Vanuxem, J.P., APD/R7912 Controller, Interface between Textronix Waveform Digitizers and CAMAC Dataway, Type 161. CERN CAMAC Note 51-00, Feb. 1974.
2. Instruction Manual for the Waveform Digitizer Interface Type DIF 1, for Biomation Type 8100. CCR Euratom, Ispra, Elettronica. To be published.
3. Nanni, F., Verweij, H., REM.CTR, Interface between Remote Controlled Units and CAMAC Dataway, Type 077. CERN CAMAC Note 54-00, Oct. 1974.

ESONE-NIM COMMITTEES

ACTIVITIES OF THE CAMAC WORKING GROUPS

The ESONE Committee in Europe and the U.S.AEC NIM Committee in America have both authorised different working groups to investigate specific aspects of CAMAC. The European and American working parties are performing their activities in close collaboration.

ESONE-CAMAC WORKING GROUPS

During a joint session of the Dataway and Software Working Groups, at the time of their last meeting (KFA Jülich, June 1–5, 1975), it was agreed to organize two new, systems oriented working parties. One group will be concerned with remote intelligence of systems for which modern concepts are initiated by the availability of new semiconductor devices like microprocessors and RAM's.

The other Group will consider the possibilities of common agreements for systems with serial drivers.

Dataway Working Group

It is expected that under favourable conditions a final chaft of the Serial Highway Specifications will be available at the time of the next Annual General Assembly of the ESONE Committee (November 5–7, 1975).

Software Working Group

A real-time extension of BASIC, RT BASIC FOR CAMAC, has been elaborated by members of the Group and was accepted by the Group. It is planned to present a description inclusive semantic and syntactic definitions together with an implementation for the PDP-11 at the CAMAC Symposium in Brussels, October 14–16, 1975.

Information Working Group

In addition to the current work of preparation of the contents for the next issue of the CAMAC Bulletin, the Working Group has considered, at its last meeting in April 1975, three main topics:

1. Topic-oriented issues of the Bulletin.
2. How to make available, in different languages, the more important contributed articles.
3. The various possible methods for continuing the work of the Bulletin should the Commission of the European Communities decrease its support of the present Bulletin beyond 1975.

NIM-CAMAC WORKING GROUPS

The U.S. NIM Committee Dataway and Software Working Groups met March 24–28 at Florida State University in Tallahassee to consider the text of a document describing recommended block-transfer modes. An acceptable presentation of this information is being developed. The NSWG discussed some proposed clarifications to the IML report, considered a proposed implementation of IML in BASIC, and discussed further the organization and content of the proposed CAMAC Software Handbook.

The next NIM Working Group meetings are scheduled to be held at the National Bureau of Standards in Boulder, Colorado the week of July 21, 1975.

ESONE ANNOUNCEMENTS

ESONE COMMITTEE ANNUAL GENERAL ASSEMBLY, 1975

The assembly will be held from November 5th to 7th, 1975 at Research Establishment Risö, Denmark.

The agenda will include:

— Future activities in agreement with the needs of the member laboratories;
— Activity reports from the working groups;
— ESONE organization;
— Further developments of CAMAC;
— Activities of member laboratories;
— Relations between ESONE and ECA, IEC, and Purdue Europe.

The organization of the assembly is being carried out by the Risö Establishment and the address for correspondence will be:

Research Establishment Risö
Electronics Dept.
DK-4000 Roskilde
Denmark
Telephone 03-355101, ext. 347
Telex 43116
Contact: P. Skaarup

ESONE-NIM COMMITTEES

HOW TO CONTACT CAMAC WORKING GROUPS

Everybody who is interested in further information on the activities of the CAMAC Working Groups or who would like to obtain advice for the application of CAMAC specifications is invited to contact the appropriate chairman or secretary of the existing working groups. The corresponding addresses are given below.

ESONE-CAMAC WORKING GROUPS

Dataway Working Group (EDWG)

Chairman: R. Patzelt, Technische Hochschule Wien, 1040 - Wien, Gusshausstr. 21, Austria.

Secretaries: R.C.M. Barnes and I.N. Hooton, both of Electronics and Applied Physics Div., Building 347.2, AERE Harwell, Didcot, Oxfordshire OX11ORA, England.

Software Working Group (ESWG)

Chairman: I.N. Hooton, see above.

Secretary: A. Lewis, Electronics and Applied Physics Div., AERE Harwell, Didcot, Oxfordshire OX11ORA England.

Analogue Signals Working Group (EAWG)

Chairman: Th. Friese, Hahn-Meitner-Institut für Kernforschung Berlin GmbH, 1 Berlin 39, Glienickerstr. 100, Germany.

Mechanics Working Group (EMWG)

Chairman: F.H. Hale, Electronics and Applied Physics Div., Building 347.2, AERE Harwell, Didcot, Oxfordshire OX11ORA, England.

Information Working Group (EIWG)

Chairman: H. Meyer, CBNM EURATOM, Steenweg naar Retie, 2440 Geel, Belgium.

NIM-CAMAC WORKING GROUPS

Dataway Working Group (NDWG)

Chairman: F.A. Kirsten, Lawrence Berkeley Laboratory, University of California, Berkeley, Cal. 94720, U.S.A.

Secretary: R.J. Martin, FNAL, P.O. Box 500, Batavia, Illinois 60510, U.S.A.

Serial Systems Sub-group

Chairman: D.R. Machen, Los Alamos Scientific Laboratory, University of California, LAMPF/MP-1, Los Alamos, New Mexico 87544, U.S.A.

Block Transfers Sub-group (joint with NSWG)

Chairman: E.J. Barsotti, FNAL, P.O. Box 500, Batavia, Illinois 60510, U.S.A.

Systems Compatibility Sub-group

Chairman: D. Horelick, Stanford Linear Accelerator Center, Stanford University, P.O. Box 4349, Stanford, California 94305, U.S.A.

Software Working Group (NSWG)

Chairman: R.F. Thomas, Jr., Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87544, U.S.A.

Secretary: W.K. Dawson, University of Alberta, Dept. of Physics, Edmonton, Alberta, Canada.

Mechanical and Power Supplies Working Group (NMWG)

Chairman: L.J. Wagner, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720, U.S.A.

Analogue Signals Working Group (NAWG)

Chairman: D.I. Porat, Stanford Linear Accelerator Center, Stanford University, P.O. Box 4349, Stanford, California 94305, U.S.A.

MEMBERSHIP OF THE ESONE COMMITTEE

This list shows the member organisations and their nominated representatives on the ESONE Committee. Members of the Executive Group are indicated thus*.

International	European Organization for Nuclear Research (CERN)	*F. Iselin**	Genève, Suisse
	Centro Comune di Ricerca (EURATOM)	*L. Stanchi*	Ispra, Italia
	Bureau Central de Mesures Nucléaires (EURATOM)	*H. Meyer**	Geel, Belgique
	Institut Max von Laue - Paul Langevin	*NN*	Grenoble, France
	Joint Institute for Nuclear Research	*B.V. Fefilov*	Dubna, USSR
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	Daresbury Nuclear Physics Laboratory	*A.C. Peatfield**	Warrington
	Rutherford High Energy Laboratory	*M.J. Cawthraw*	Chilton
	University of Oxford	*R. Hunt*	Oxford
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Finland	Institute of Radiation Physics	*B. Bjarland*	Helsinki
France	Centre d'Etudes Nucléaires de Saclay	*P. Gallice**	Gif-sur-Yvette
	Centre d'Edutes Nucléaires de Grenoble	*J. Lecomte*	Grenoble
	Laboratoire de l'Accélérateur Linéaire		Orsay
	Centre de Recherches Nucléaires	*G. Metzger*	Strasbourg
	Laboratoire d'Electronique et d'Instrumentation Nucléaire du Centre Universitaire du Haut Rhin	"	Mulhouse
	Laboratoire des Applications Electroniques de l'Ecole d'Ingénieurs Physiciens	"	Strasbourg
F.R. Germany	Deutsche Studiengruppe für Nukleare Elektronik c/o Physikalisches Institut der Universität	*B.A. Brandt*	Marburg
	Deutsches Elektronen-Synchrotron	*H.-J. Stuckenberg*	Hamburg
	Hahn-Meitner-Institut für Kernforschung	*K. Zander**	Berlin
	Kernforschungsanlage Jülich	*K.D. Müller*	Jülich
	Gesellschaft für Kernforschung	*J.G. Ottes*	Karlsruhe
	Institut für Kernphysik der Universität	*W. Kessel*	Frankfurt/Main
	Max-Planck-Institut für Plasmaphysik	*D. Zimmermann*	Garching
Greece	Demokritus' Nuclear Research Centre	*Ch. Mantakas*	Athens
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	Istituto di Fisica dell'Università	*G. Giannelli*	Bari
Netherlands	Reactor Centrum Nederland	*A.T. Overtoom*	Petten
	Instituut voor Kernphysisch Onderzoek	*E. Kwakkel*	Amsterdam
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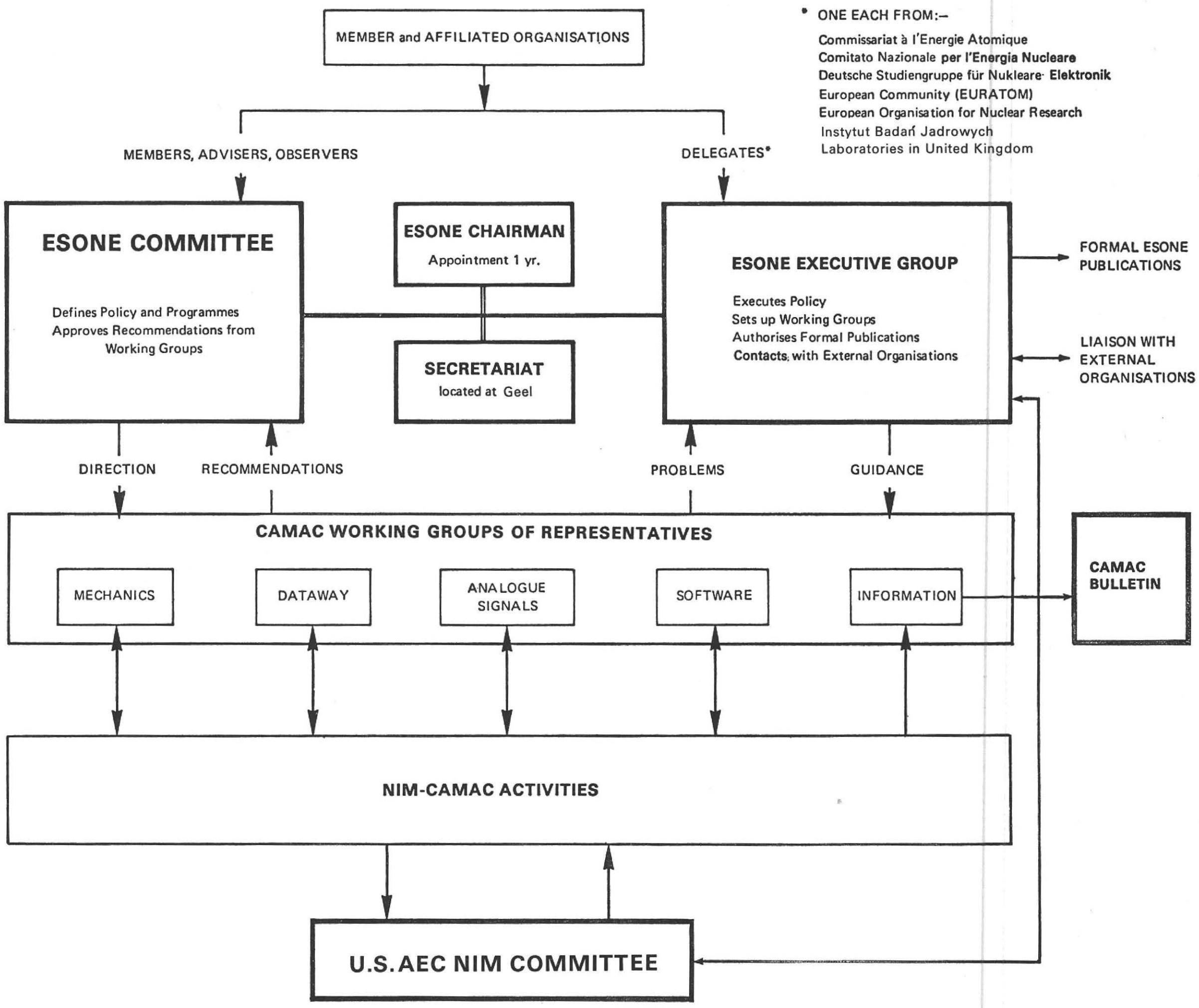
Romania	Institutul de Fizica Atomica	*M. Patrutescu*	Bucaresti
Sweden	Aktiebolaget Atomenergi Studsvik	*Per Gunnar Sjölin*	Nyköping
Switzerland	Schweizerische Koordinationstelle für die Zusammenarbeit auf dem Gebiet der Elektronik	*H.R. Hidber*	Basel
Yugoslavia	Boris Kidrič Institute of Nuclear Sciences	*M. Vojinovic*	Vinča Belgrade
Affiliated Laboratories			
Canada	TRIUMF Project, University of British Columbia Simon Fraser University, University of Victoria, University of Alberta	*W.K. Dawson*	Edmonton
German Dem. Rep.	Akademie der Wissenschaften	*J. Lingertat*	Berlin

LIAISON WITH THE U.S. AEC NIM COMMITTEE IS MAINTAINED THROUGH:

L. Costrell (Chairman) National Bureau of Standards – Washington, DC.

ESONE ORGANIZATION AND CAMAC ACTIVITIES

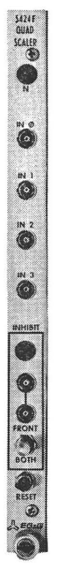


NEW PRODUCTS

DATA MODULES
(I/O Transfers and Processing)

Digital Serial Input Modules

Ref. No. 13.0101
200-MHz 24-Bit Quad Scaler



The Ortec S424F is a high-performance 24-bit quad scaler with a typical operating speed of 220 MHz and guaranteed continuous operation at 200 MHz. It is software-interchangeable with the Ortec S424B 150-MHz quad scaler and the Ortec S424S 50-MHz positive/negative input quad scaler. The S424F has a high-impedance bridging inhibit input circuit that will not increment the scaler. Its data inputs are protected against ± 50V fast transients ($\leqslant 1\,\mu$sec/sec). Many options for overflow detection are provided utilizing the module's fully CAMAC-compatible LAM structure.

Ref. Ortec Inc.

Digital Output Modules

Ref. No. 13.0102
Interval Timer/Watchdog

The functions of Interval Timer and System Watchdog are combined in this single-width module Type EC384, designed by the Daresbury Laboratory.

The Interval Timer may be used to produce a LAM after a preset period in the range 0.1 millisecond to 5 minutes, or for event timing or, with appropriate software, as a high-resolution "time of day" clock. A basic time unit of 100 microseconds is produced from a crystal clock and applied to an interval multiplier that may be programmed via the CAMAC dataway to vary the main count interval from 0.1 millisecond to 102.4 mS. The 16 bit main register, normally pre-loaded with a two s-complement number via the dataway, is counted up by one each time interval, and when its content changes from negative to positive, LAM is set. When its content changes from positive to negative, OVERFLOW is set. It may be written to or read from at any time.

The purpose of the Watchdog is to permit remote monitoring of the continuing operation of a CAMAC system; the output can drive a "system OK" LED indicator, or other equipment via twisted pair cable. When enabled, the Watchdog monitors the use of the Interval Timer. If no reference is made to the Timer or the Watchdog in the selected period, or if power to the crate fails, an alarm signal is generated and is available at the front panel. A switch in the module (accessible only when the side cover is removed) enables the period to be set to 1, 2, 5, 10, 20, 50 or 100 seconds. Timing of the period is restarted each time a valid command is received by the module.

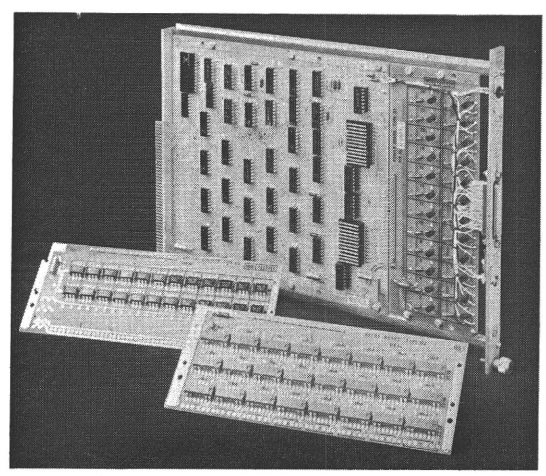
If a particular application does not require both facilities the Timer only or the Watchdog only may be used.

Ref. Sension Ltd.

Ref. No. 13.0103
Output Register/Driver Modules

This 9600 family of CAMAC Output Register/Driver modules is derived from the basic module 9600. The basic unit has a maximum capacity of 24 Bits which can be Loaded, Read or Incremented as one word or as three 8-bit bytes. Integrated circuit sockets are provided on the output lines so that any pin compatible device can be used as a buffer. Driver outputs to the front panel socket are by means of links or optional sub assembly printed circuit cards.

Certain versions of the add on printed circuit card are listed as standard but many other configurations are possible and can be supplied to order of fitted subsequently by the user. This concept permits a system designer to drive peripheral devices by a tailor made approach and the standard versions offer the module user a useful range of software compatible driver concepts.



The add on standard option cards are coded by the two least significant digits and a letter of the module type number as follows.

9600A	Output from totem pole 16 mA 5 V
9600B	Output from free collector 40 mA 30 V
9600C	Inverted output from free collector 40 mA 30 V
9601	Output from free collector 1 AMP 60 V
9602A	Relay contact closure multiplexer concept

9602B Relay contact closure free contact pairs
9603 Optical coupled outputs 7mA.

Applications

1. Peripheral Driver.
2. Temporary Storage Register.
3. Preset Counting Register 24 Bits 50MHZ.
4. Serial Parallel Converter.

Ref. Nuclear Enterprises Ltd.

Ref. No. 13.0104

Eight-Bit Latched Triac Output Register

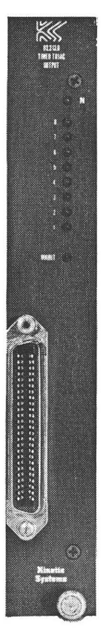
The model LT contains eight Triac switches in a single width CAMAC module. Each channel is identical and capable of switching inductive as well as resistive loads. The Triac switches can be opened or closed simultaneously or independently under program control. The outputs are triggered at zero voltage to minimize noise transients. To simplify wiring, each output has only two wires. Line voltage is sensed across the open triac to determine zero voltage. Each channel is floating and optically isolated. The outputs are normally opened but are available normally closed as an option. All outputs may be disabled from the Dataway. When logic power is first applied to the module, all the outputs are reset causing the output to open thus avoiding accidental trigger of any output devices attached.

Ref. Joerger Enterprises, Inc.

Ref. No. 13.0105

8 Channel, Timed Triac Output

Kinetic Systems' Model 3040 is a double width CAMAC module that provides eight individually isolated triac output circuits. The triacs are particularly suitable for driving motors, contactors, solenoids and other 120 VAC devices.



The triacs are energized for a programmable period. The eight timing registers have a maximum count of 4095. The module includes an internal clock with strap selectable frequencies of 60Hz, 10Hz and 1Hz. The shortest interval is one cycle of 60Hz and the longest is 4095 sec.

Each of the eight triac output circuits is a floating two-wire 'switch' which is connected to the AC source and load in the same manner as a relay contact. Each output can switch 120VAC to loads of 2A each (5A inrush) and is capable of withstanding 200V of common mode voltage. The output circuits are optically isolated from the control logic and feature zero crossing detectors to prevent turn-on except near zero voltage. This reduces RFI and minimizes crosstalk into logic circuits. The output circuits are individually fused and isolated from each other, increasing their versatility. The output circuits are of the 'Normally Open' type (i.e. open when there is a zero in the register). The output circuit includes transient and over voltage protection.

Ref. Kinetic Systems Corporation

Digital I/O, Peripheral and Instrumentation Interfacing Modules

Ref. No. 13.0106

CAMAC Disc System

The system, Type (9)370, consists of two units.

(1) A 7″ rack mounting chassis incorporating the CDS 110 Disc Drive and all the electronics for track and sector selection and serialisation from the parallel 8 Bit input, plus all the necessary power supplies.

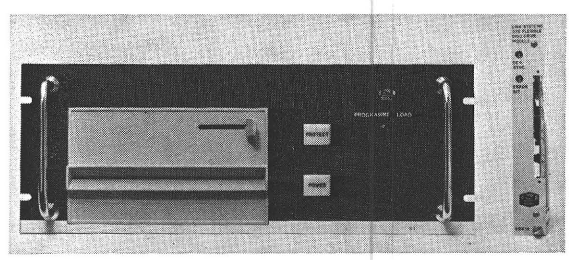
(2) A CAMAC module containing the Mode and Address register, Status register and connecting cable to the main unit.

The 'Floppy Disc' system provides a very rapid buffer storage for 1.4 million bits of information or program, and can provide a very attractive replacement for paper tape readers and punches, or even card systems where they are used for input/output to small computers with a CAMAC highway.

The system is designed to look like a paper tape punch and reader in that parallel 8 bit Words are the means of data transfer. These, of course, may be ASC11 or Binary data, and no great program changes are required to take advantage of the system.

Disc Cartridge

The recording medium is a flexible, mylar, 7.5 ins diameter, oxide coated disc which is jacketed in a 8.0 ins × 8.0 ins envelope. A 1,25 ins recording



band containing up to 64 tracks is located in the most stable area of the disc and is accessible through an aperture in the envelope. The index and eight sector holes located on the periphery of the mylar disc are photo-electrically detected through another aperture in the envelope. A third aperture in the envelope is used for write protection.

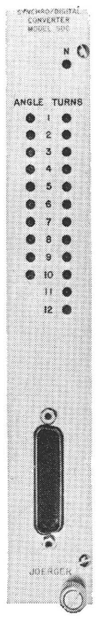
Data Transfer

The data is recorded on and read from one side of the disc serially at 33.8K bits per second via write data and read data lines interfaced to the CAMAC dataway.

Ref. Nuclear Enterprises Ltd.

Ref. No. 13.0107

Synchro-To-Digital Converter



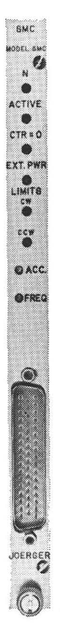
The model SDC conforms completely to EUR 4100e, 1972. It is packaged in a double width CAMAC module and it contains a 14 bit (10 bit optional) converter. In addition to this absolute single turn converter, it contains a 12 bit electronic turns counter. Position is read out visually on the front panel and remotely via the Dataway. All position data is synchronously loaded into registers for readout to insure error free readout because of the critical nature of the data. To satisfy initial turn-on conditions, the turns counter may be preset from the Dataway. The unit is available for either 60 Hz or 400 Hz synchro inputs. To identify the module to the system, an identity word is generated and contains the type of module and any significant options it may contain. This word can be read out on the Dataway.

Ref. Joerger Enterprises, Inc.

Ref. No. 13.0108

Stepping Motor Controller and Driver

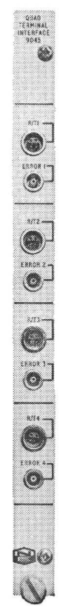
The model SMC is a self-contained stepping motor controller and driver all housed in a single width CAMAC module. It features an adjustable, linear acceleration and deceleration to provide an efficient method of driving high torque loads at their maximum speed. This maximum speed is adjustable from 50 pps to 2000 pps. The four drivers are capable of switching up to 2 A per phase at a maximum of 28 V. All components required to drive this load are internal with the exception of the current limiting resistors which are determined in each application by the motor voltage and current. Three external, high level logic inputs are used to test the status of the system, a clockwise limit, counter-clockwise limit and a signal that indicates power is being applied to the motor. Logic is provided that will inhibit the driver if a limit signal is received and the motor is requested to step in that direction. The number of steps is determined by a 16-bit command word that is in two's compliment. Bit 16 determines direction and the remaining 15 bits contain the number of steps to be performed.



Ref. Joerger Enterprises, Inc.

Ref. No. 13.0109

Quad Terminal Interface



This single width CAMAC module Type 9045 incorporates four asynchronous receiver/transmitters which are interfaced to the Dataway. The data is serially transmitted and received in full duplex on four multiple LEMO connectors normally using 20 mA current loop operation, alternatively on using the A and B versions data transmission conforms to the EIARS232C standard. Crystal controlled transmission rates may be selected from 110, 300, 600, 1,200, 2,400, 4,800, or 9,600 baud by means of a switch.

The number of bits, type of purity used, and number of stop bits may be selected by internal links. The standard module is provided with no links set, to give a mode op operation defined as no parity, 2 stop bits, 8 bits per character.

A comprehensive multiple LAM structure is incorporated and is designed to be compatible with other modules under development in this range.

The front panel is provided with four single pole LEMO sockets on which error signals are generated.

This module will find application in interfacing remote keyboard/display terminals to computer systems.

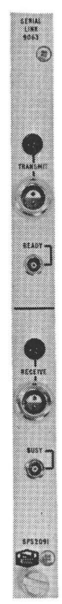
Power requirements +6, −6, +24, −24 volt.

Ref. Nuclear Enterprises Ltd.

Ref. No. 13.0110

Serial Input/Output register

This single width CAMAC module is capable of independent input and output 16 Bit serial transfers via front panel connectors. Data transmission including handshake is made on a single twisted pair cable with transformer isolation at each end. This type of transmission permits high common mode rejection of 80 dB plus.



After initialization by CAMAC command the output section of the module sets up a continuous handshake dialogue, each 20 μS, with the external equipment to ensure that it is ready to receive data. Data written by F(16) to the shift register is coded and clocked onto the output line at a 1 MHz rate. A device 'NOT READY' handshake is then sent every 20 μS until the device becomes ready again. This change of handshake state can be used to raise a LAM demand for new data. The external device could be another 9063 located in a remote crate, using this configuration data transmission of up to 17 K by 16 bit words per second over 300 metres distance on a single twisted pair cable can be achieved.

The input and output sections of the module may be operated independently of each other. Status registers are provided to monitor the exact status of the CAMAC module and remote device.

Front panel LED indicators flash each time a transfer occurs. The fault condition is available at a rear panel connector.

Power requirements, +6, −6V.

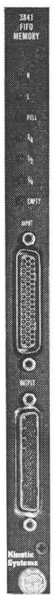
Ref. Nuclear Enterprises Ltd.

Digital Handling and Processing Modules

Ref. No. 13.0111

256-Word FIFO Buffer

Kinetic Systems' Model 3841 is a single-width module that contains a First-In First-Out memory stack organized as 256, 24-bit words. The memory has two parts for both input and output. It may be loaded and dumped from the Dataway or under control of external signals. External connections for loading and dumping data are made by way of two 31-way front-panel connectors. All external signals are single-ended TTL.



Reading and writing operations are independent. The module finds use in application where input or output data operations require a clock rate that is different from the data transfer rate in the CAMAC system. For example, to load the memory externally and read it from the Dataway or to load the memory from the Dataway and dump it externally. An input which sets a LAM source and a signal indicating the state of the LAM are provided on the external connectors to allow communication of 'ready' and 'done' status information.

Two 3841's may be interconnected to transfer data between two CAMAC systems. A control register is provided to establish direction of data flow in such applications.

'Memory-full' and 'Memory-empty' signals are provided externally and also function to set respective bits in the LAM register. A LAM source is also provided which indicates when the memory is three-quarters full. A 5-bit Status register provides information on the current stack size in the memory.

In addition to the 4-bit LAM source register a LAM mask register is provided which can be selectively set and selectively cleared as well as written and cleared. The LAM register can be cleared and selectively cleared, and bit 16 can be selectively set.

Ref. Kinetic Systems Corporation

Analogue Modules

Ref. No. 13. 0112

Digital Voltmeter

This double width CAMAC Type CS0080 module will perform as a full digital-voltmeter, combining the majority of the features associated with the more conventional rack mounted instruments.

Results of analogue to digital conversions are presented to the front panel as a $4\frac{1}{2}$ digit BCD number and this may be read out via the Dataway as a binary number or as a string of ASC11 characters with sign.

High common mode rejection is obtained using a differential amplifier with up to 2,000 Volt isolation. Series mode rejection is achieved using dual ramp techniques together with a phase locked loop synchronised to the mains frequency.

The user may select one of two ramp intervals; either 20ms for high resolution or 2ms for fast conversion with lower resolution. Five programmed ranges may be selected from ±19.999mV to ±1,999.9 volt full scale.

Zero and full scale calibration measurements may be controlled from the Dataway thus eliminating the need to wait until the warm up drift interval has finished and permits the user to compensate for temperature variations within the crate.

The DVM may be operated in two conversion modes; the first, free running, and the second conversion on command. In each case data will not be transferred into the read out buffer unless the 'LAM' flag has first been cleared. A LAM is generated when the conversion is complete. If the conversion overranges this may be checked using a test status command.

Power requirements 117v AC, ±24V, +6V.

Input connector 3 pole LEMO RAO303.

Ref. Nuclear Enterprises Ltd.

Ref. No. 13.0113

Fast-Conversion, Event-Buffered ADC

The LRS Model 2250 consists of 12 complete, 9-bit, analogue-to-digital converters in a single width CAMAC module. A common front panel gate signal defines the signal integration time and initiates a fast conversion requiring only 9 μsec. A 9-bit digital word from each of the 12-channels is transferred into a 32-event deep first-in-first-out (FIFO) memory which is especially useful at accelerators with many events per beam spill. The event rate capability is further enhanced by the ability to fast clear unwanted information in 1 μsec. For application requiring a faster conversion, the 2250 can be modified for use as an 8-bit unit with 3.2 μsec conversion time at the expense of reduced sensitivity (1 pC/count in linear mode, .25pC/count minimum in inverse quadratic mode).

To satisfy ever-increasing needs for a large dynamic range in calorimetry, lead glass shower counters, proportional or drift chamber application or similar total energy absorption counters, the model 2250 offers an inverse quadratic response, which gives a dynamic range of 10^4 with a sensitivity of .125pC per count for small signals and 1.75pC per count for full scale signals. A normal linear response (0.5pC/count) is also switch-selectably available. The inverse quadratic response gives a large dynamic range without the attendant large errors associated with logarithmic response at large pulse amplitudes.

CAMAC commands and responses: Z, C, I, Q, X, L.

CAMAC functions: F(0), F(2), F(9), F(25).

Available: May 1975.

Ref. LeCroy Research Systems Corp.

Ref. No. 13.0114

12-Channel Peak Sensing ADC

The Model 2259 is based largely on the design of the popular LRS Model 2249A Integrating ADC. It accepts 12 negative-going analogue inputs upon application of an externally-supplied gate signal and converts the highest voltage point in each pulse to a 10-bit digital number. Input full scale is set at -2V, giving a per count resolution of -2mV. The common gate signal must enclose the peak to be measured, and the analogue inputs themselves must be either DC or of a risetime >25nsec.

The 10-bit conversion time of the 2259 is 51.2μsec or, as a factory option, 12.8μsec for an 8-bit conversion. To eliminate the necessity of delaying the analogue inputs while waiting for a slow event trigger, conversion may be started within 1.5μsec by a front panel fast clear.

The Model 2259 is suitable for use with a variety of particle detectors in high energy physics research, including liquid Argon ionization chambers, NaI total absorption counters, and liquid or gas proportional chambers. DC voltage measurements for general system maintenance may also be appropriately entered into the system computer by use of the 2259. Such measurements include CAMAC or NIM supply voltages, magnet currents, temperatures, high voltage supplies and clearing field supplies.

Power consumption of the 2259 is low enough to permit the use of 23 modules in a single, 25-amp, CAMAC crate.

CAMAC Commands and Responses: Z, C, I, Q, X, L.

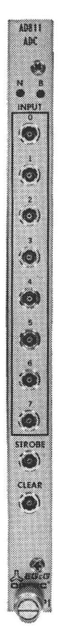
CAMAC Function Codes: F(0), F(2), F(8), F(9), F(10), F(24), F(25), F(26).

Available: May, 1975.

Ref. LeCroy Research Systems Corp.

Ref. No. 13. 0115

Octal ADC



The Ortec AD811 comprises eight peak-detecting amplitude-to-digital converters connected to a common strobe and packaged in a single-width CAMAC module. It measures positive unipolar or bipolar signals ranging from 0 to >2.0V with a resolution of 1.0mV and a full scale range of 2047 channels plus overflow. A unique front panel fast clear input can terminate the conversion of undesired events and reset the module within 1.0μsec; to ensure acceptance of the clear input, CAMAC logic requires it to occur within the same conversion cycle (80μsec after busy timer start). The AD811 has a fully CAMAC-compatible LAM structure. All eight channels may be tested by CAMAC command F25. The Ortec AD811 ADC and TD811 TDC use identical logic and are therefore software interchangeable.

Ref. Ortec Inc.

Ref. No. 13.0116

11-Bit Time Digitizer

The Ortec TD811 comprises 8 time to-digital converters coupled to a common start input and packaged in a single-width CAMAC module. Dynamic range is 0-200 nsec with 100 psec resolution; stability is $\pm 0.02\%/°C$; nonlinearity is less than $\pm 0.1\%$ integral and $\pm 2\%$ differential. To facilitate calculation of system deadtime, the TD811 has a fixed conversion time of 90 μsec independent of start/stop. While 10-bit read-out has been characteristic of time digitizers in the past, the Ortec TD811 has a 12-bit readout including 11 bits of data and 1 bit overflow status. A front-panel veto input responds to NIM fast logic and gates off the start input. A unique front-panel fast clear input can abort the conversion cycle within 70 μsec of a start pulse, totally resetting the unit within 1.0 μsec of the abort signal's leading edge, after which another start can be accepted. The TD811 has a fully CAMAC-compatible LAM structure. All 8 channels may be tested by the CAMAC F25 command or by external hardware. The Ortec AD811 analog signal digitizer uses the same logic as the TD811. Bot units are therefore software interchangeable.

Ref. Ortec Inc.

Ref. No. 13.0117

96-Channel Drift Chamber Digitizer

The LRS Model 2770 is a double width CAMAC module designed to process signals from 96 Drift Chamber wires. Line-driven, ECL-compatible wire pulses are received differentially by the 2770 via inexpensive, field-proven, 34-conductor flat ribbon cables. The time between each wire pulse and the common event-defining trigger (delayed stop) is digitized to 8-bits in each of the 96 channels, giving a time resolution of 4nsec in its 1 μsec full scale range and 2nsec in its optional 500nsec range.

For each channel (of the 96) that contains digitized time data, an address encoding is done. This resultant address is stored along with the time information in a 16-bit, 40 deep first-in-first-out (FIFO) memory. Subsequent events are separated by 8 flag words (event separators) that are read out along with the actual wire data. Standard CAMAC readout from the memory can proceed asynchronous to data accumulation into the memory, and direct memory access (DMA) transfers can be accomplished also.

A significant feature of the 2770 is its ability to update itself with negligible deadtime (<20 ns) each time a wire pulse is received. Time digitizing and encoding will only be performed on the last pulse on the wire to occur during the established full scale time interval. Double hits on a single wire can be monitored by dedicating two chambers to each plane, (which is typically done to remove left-right ambiguity), and provision is available via an accessory module for identifying and encoding multiplicities greater than 2.

CAMAC Commands and Responses: Z, C, Q, X, L.

CAMAC Functions: F(0), F(2), F(9).

Available: June, 1975.

Ref. LeCroy Research Systems Corp.

Ref. No. 13.0118

128-Channel Multiwire Proportional Chamber Encoder

The LRS Model 2720 is a double width CAMAC module designed to preprocess signals from 128 wires of a multiwire proportional chamber (MWPC).

The input to the Encoder module consists of eight 34-conductor flat ribbon cables connected to sockets on the printed circuit board. Each flat cable transmits 16 differential ECL levels to the 100 Ohm inputs.

Event selection is accomplished by strobing the pulses on the chamber wires with a fast (NIM level) coincidence gate signal. Wire 'hits' stored in primary registers are transferred to the secondary (or encoder) register in 100 nsec, permitting the acceptance of another event. 'Set' bits are then encoded as a series of 7-bit wire addresses which are stored in a 16-bit first-in-first-out (FIFO) memory capable of handling 80 8-bit half words. A special flag word signifies the end of each event.

The output memory may be read out asynchronous to the event rate as long as the FIFO memory is not full. Standard CAMAC commands including direct memory access (DMA) provisions may be used for readout.

The Model 2720 can be gated through CAMAC patch lines to inhibit the encoding and transfer after latching. In low rate situations, this procedure can eliminate the need for monostables or cable delays before latching. Alternately, the 2720 provides two optional front ends, one including a monostable delay where some lesser amount of deadtime can be tolerated, and one without any delay at a substantial cost savings, such that the user can provide cable delays for high rate situations.

Functions Used: F(0), F(2), F(9).

Commands and responses: Z, C, Q, X, L.

Available: June, 1975.

Ref. LeCroy Research Systems Corp.

Ref. No. 13.0119

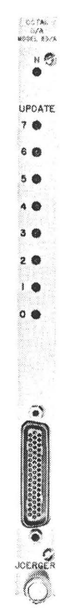
Dual, Digital-to-Analog Converter

This double-width CAMAC module conforms fully to the EUR4100e, 1972 specifications. It contains two digital-to-analogue converters available with either 10-or 12-bit, resolution. The channel's register is loaded from the dataway with information from the write lines. An 'update' output is generated for each channel to indicate when it's converter has been updated. A visual update indication is also provided. The output range is switch selected internally. To verify the state of the module, the registers may be read out on the Dataway. The output range and the resolution of the converters is also included in this data word to provide a complete description of the analogue output signal being generated by that channel.

Ref. Joerger Enterprises, Inc.

Ref. No. 13.0120

Octal 8-bit DAC



This single-width CAMAC module (8 D/A) provides eight digital to analogue converters, each with 8-bit resolution. The output is a current from 0 to 2 mA maximum. The maximum level is internally adjustable for each channel. Each channel contains an output buffer. The current output has been designed to be independent of line impedance. Each channel is loaded from the Dataway on command with data from the write lines. A lamp is provided for each channel to visually indicate when that channel is overwritten. An output signal is also provided for each channel when it has been overwritten. A test point is available to monitor each channel's output which is a voltage of 0 to +10 V. The module contains an identity word that may be read out to indicate the module's type.

Ref. Joerger Enterprises, Inc.

Ref. No. 13.0121

12-Input Multiplexer

This unit, Type MX 2070, is identical to the MX 2025 (see, CAMAC Bulletin No 6), except that the reed relay switches of the 2025 have been replaced by FET's.

CAMAC functions are the same as the MX 2025.

Specifications:

- FET unit switching.
- Typical insulation between wires: 80 dB with three wires switching
- Switching time: 200 ns.
- Signal range: ± 7V.
- Input overloaded protection: diodes on ± 7V.

12 channels with almost unlimited cascading possibilities.

Ref. SEN Electronique

Ref. No. 13.0122

Wide-Band Router WBR 2073

Using wide-band relays to handle switching functions, this WBR 2073 single-width module is designed for analogue signal multiplexing in output mode (1 input, 12 outputs) and multiple analogue signal switching in input mode (12 inputs, 1 output).

Channel selection can be obtained in two ways: a Write instruction from the dataway loads the 12-bit selection register and any combination of the 12 channels can be selected in this way. Alternatively an increment instruction will give a channel by channel scan, and can be programmed to recycle.

All connections are made on the front panel via Lemo sockets and channel selection is timed by an internal clock and displayed by the associated LEDs.

Power Requirements:

+6V	700 mA
+24V	80 mA

Ref. SEN Electronique

Ref. No. 13.0123

Programmable Precision Attenuator

This PPA 2071 is a 12-bit binary attenuator using an R/2R Ladder Network and reed relay switching. The attenuation value is selected by a dataway instruction which loads the 12-bit switch position register and the value is displayed by front panel LEDs. As the switching function is provided by reed relays an internal clock is used to define the positioning time.

The PPA 2071 is a single-width fully-shielded module with Lemo connectors on the front panel.

CMMR (2 wire system)	<95 dB.
Insulation:	± 300 V DC-AC 50 Hz
Max input signal amplitude:	20 V.

Power Requirements

+6V	700 mA
± 15V	50 mA (external power supply for common mode rejection).

Ref. SEN Electronique

Other Digital and/or Analogue Modules

Ref. No. 13.0124

CAMAC PROM Programmer

The Sension PROM programmer is a double-width CAMAC module used to program (i.e. write data into) programmable read-only memories. The initial version is designed for programming the Intel 1602A, 1702A, 4702A, and 8702A PROM chips and other pin-compatible and electrically compatible PROMs. Versions will be available for other types of PROM.

The PROM to be programmed is mounted in a socket on the front panel. The Programmer is driven via the dataway and works under the control of suitable software in the crate control processor. Software is available for the S-800 and S-804 programmable crate controllers and can be supplied for other processors if required.

The module can be used to write and/or check the contents of PROM chips using data supplied from another device e.g. tape reader or teletype. Alternatively data can be read from a ROM or PROM chips and then copied to other PROM chips.

Ref. Sension Ltd.

SYSTEM CONTROL

(Computer Couplers Controllers and Related Equipment)

Interfaces/Drivers and Controllers (Parallel Mode)

Ref. No. 13.0201

Crate System Controller for PDP-8/E

For many small CAMAC systems (one crate) to be operated by mini-computers the typical configuration with Crate Controller Type A-1 and System Controller is more complex and expensive than would be required. Therefore a CAMAC Single Crate Controller has been developed as a crate controller that directly interfaces the Dataway to the Omnibus of a PDP-8/E computer. The module provides single word programmed transfers and block transfers, one channel is provided for single-cycle direct memory access transfers with the sub-modes 'Data to/from memory', 'Add data to memory' and 'Add one to memory'. Interleaved programmed and DMA transfers are permitted. In programmed operations the Controller has a full 24-bit data transfer capability. The word length for autonomous transfers is 12-bit. The mode 'Add-one-to-memory' allows the accumulation of spectra of 2K channels with a capacity of 24-bit per channel.

24 signals are connected through an OR-gate to the Interrupt Request line. These comprise the 22 LAM signals from the modules of which anyone may also be used as trigger signal for an autonomous transfer, a signal indicating 'End of block' for block transfers, and the overflow of a word counter in the Controller during autonomous transfers of data. The demand handling subsystem has a built-in priority order and gives fast access to the appropriate interrupt servicing routine on application of one special command.

This Controller Type, LEM 52/32.1 is a triple-width CAMAC unit. It is designed to be operated in the right-hand stations of the crate. The connection to PDP8/E buslines must not exceed 2 meters.

Ref. Eisenmann

Ref. No. 13.0202

Crate System Controller for Microcomputer Micral

The JCMIC-10 Crate Controller, designed by CEN, Saclay, can be connected to each of the three MOCRAL versions, N, G or S. MICRAL is a 3U × 19″ microcomputer based on Intel microprocessors (8008 for the N and G versions, 8080 for the S version) associated with RAM and REPROM memory and peripherals (TTY, Punch tape, Reades, floppy disk, display, etc.). Available software includes REPROM monitor, local assembler, basic interpreter, floating point subroutines, etc.)

JCMIC-10 is a double width module connected via 2 câbles to two 32 logical Input X 32 logical Output MICRAL cards. All CAMAC functions are performed, and LAMS are transmitted on two interrupt levels. An hexadecimal selector on the front panel associated with a LAM pushbutton allows the choice of one of 16 user's programms. 24 bit Read or Write CAMAC operations are (performed in 500, 250 or 50 ms respectively with MICRAL N, G or S. Distance between a CAMAC crate and MICRAL should not exceed 25 m.

The CAMAC timing being a programmed one, the JCMIC-10 controller may be connected to every type of computer having logical stored output with TTL-40 mA capability and logical TTL input.

Ref. R2E

Ref. No. 13.0203

Programmable CAMAC Crate Controllers

The S-800 and S-804 CAMAC Crate Controllers provide a computing capability directly within a CAMAC crate. They act as fully autonomous programmed controllers, and, in many applications, can remove the need for an external computer. In other applications the controller can reduce the load on an external computer by carrying out data reduction and buffering. The basis of the controller is a complete micro-computer built around the Intel 8080 microprocessor chip.

With the S-800, communication with other processors and non-CAMAC devices is through normal CAMAC interface modules. The S-804 includes a universal asynchronous serial I/O port, by means of which it can communicate with a teletype, any other asynchronous terminal device, a conventional computer, or another S-804. An interesting possibility is to link a number of S-804s together through these ports, and have a serial highway system using the proposed CAMAC serial highway protocol but with normal asynchronous communication links.

The controller occupies the control station and one adjacent normal station, and is fully in accordance with EUR 4100e. The values sent to the N, A, F, W, Z, I and C lines are completely under program controls. The hardware latches the incoming values on the R, Q and X lines into registers at the appropriate time. The registers can be read as required by the processor. The L lines may be examined at any time by the processor. Also the presence of one or more L signals can optionally be allowed to cause an interrupt in the processor.

Ref. Sension Ltd.

Interfaces/Controllers/ Drivers for Serial Highway

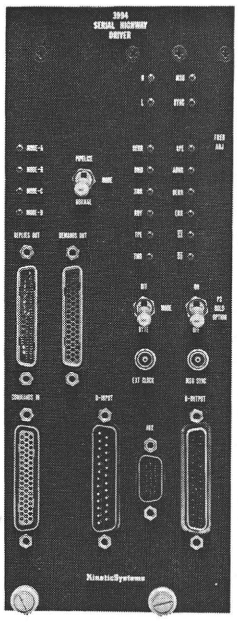
Ref. No. 13.0204

CAMAC Serial Highway Driver with Buffer Memory

Kinetic Systems' Model 3994 is a fivefold wide CAMAC module which transmits and receives messages on the CAMAC Serial Highway. The 3994 is designed for use with one or more FIFO buffer modules (Model 3841) to provide elastic buffering between the Dataway and the Serial Highway. Both bit-serial and byte-serial ports for serial messages are provided.

The 3994 can operate in programmed-transfer mode or in one of several block-transfer modes. Operation under programmed-transfer mode is identical to operation of Kinetic-Systems' Model 3992 Serial Driver module.

When operated in a block-transfer mode, serial messages (including data) or data are stacked in the FIFO from the Dataway, the serial messages are transmitted on the Serial Highway autonomously at a rate determined by the serial clock, and reply messages (including data) or data are stacked in the FIFO as serial messages are received. Reply messages and data stacked in the FIFO can be accessed by the Dataway for subsequent readout.



For all transfers, whether programmed or block, SC, SN, SA and SF are provided to the serial transmitter in a 24-bit word. Serial write data is provided in another 24-bit word. The serial message is formatted by the 3994. Formatting includes generating a parity bit for each byte in the serial message, generating a SUM-byte, generating the correct number of SPACE-bytes, and automatically inserting WAIT-bytes between messages. As reply messages are received, reply status information and data, if present, are stored in buffers for Dataway readout. A LAM-source indicates when a reply has been received.

The output clock can be controlled by crystal or by a variable frequency oscillator or from an external source. Means for selecting frequencies from 1 KHz to 5 MHz are provided for both the crystal-controlled and variable-frequency oscillators. The external source can range from arbitrarily slow to 5 MHz.

The 3994 has four modes of operation: MODE-A, MODE-B, MODE-C and MODE-D. Programmed transfers under direct control of the Dataway occur in MODE-A, and buffer registers provide communication between the Dataway and the Serial Highway. MODE-B, MODE-C and MODE-D are block-transfers modes, and the FIFO buffer is used to provide an elastic link between the Dataway and Serial Highway. In MODE-B, two parameter registers provide the serial command information (SC, SN, SA and SF). Write data is taken from the FIFO (previously loaded from the Dataway), and read data is stored in the FIFO. In MODE-C messages, including data, are stacked in the FIFO for transmission in a predefined order; reply messages, including data, are stacked in the FIFO as they are received. A delimiter word separates commands from replies in the FIFO and halts the block transfer when it reaches the bottom of the stack. Reply messages are then next in line in the FIFO for Dataway readout. MODE-D is similar to MODE-C except that only the data from reply messages is stacked in the FIFO.

Ref. Kinetic Systems Corporation

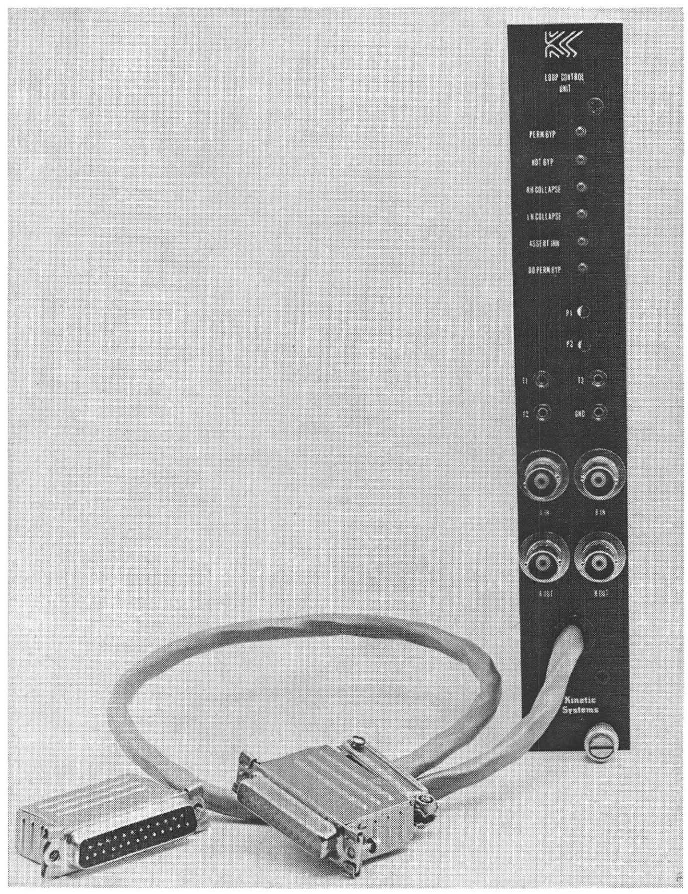
Ref. No. 13.0205

Serial Highway Loop Control Unit

Kinetic Systems' Model 3931 Loop Control Unit provides auxiliary loop control when used with a Type L-1 Serial Crate Controller such as the Model 3952 operated in bit serial mode. It fully complies with the specifications for U-port adapters in TID-26488. This module is a double-width unit.

The Model 3931 is intended to be used with coaxial cable such as RG-58U. A main highway (A loop) and a backup highway (B loop) are used. This provides redundancy in case the main highway is broken as well as allowing for special loop collapse features.

The serial highway input and output connections are isolated by transformers for high common mode rejection. This is necessary when the transient ground potential difference between adjacent crates on the serial highway exceeds approximately 10V or very high electrostatic or magnetic fields couple into the serial highway. D-port (defined port from L-1 SCC clock and data are multiplexed in the 3931 using biphase modulation; this signal is coupled by a pulse transformer to the U-port (undefined port



per TID-26488) output connector. Clock and data are transmitted over a single circuit. The multiplexed signal from the previous crate is received via the U-port input connector and demultiplexed to form a separate clock and data signal for the D-port receivers in the L-1 SCC. The biphase signal is without dc component and can readily be coupled through transformers.

Ref. Kinetic Systems Corporation

Ref. No. 13.0206

Type L-1 Serial Crate Controller

Kinetic Systems Model 3952 Type L-1 Serial Crate Controller meets or exceeds the requirements of *CAMAC Serial System Organization* (ESONE/SH/01-03, TID-26488) as amended. This controller is a double-width version of Kinetic Systems Model

3950. It is functionally equivalent to the 3950, that is currently in use at many facilities throughout the world. The 3952 uses the same proven printed circuit techniques used in all Kinetic Systems products. It is compatible with Kinetic Systems' full line of serial components, which includes serial system drivers, loop control units, LAM Graders, and autonomous controllers.

Ref. Kinetic Systems Corporation

Ref. No. 13.0207

Bit Serial Adapter

Kinetic Systems Model 3932 Bit Serial Adapter is used with an L-1 Serial Crate Controller to provide transformer isolation of the data paths and loop bypass and loop collapse. It is also used with a serial driver containing the standard D Ports. The Bit Serial Adapter combines the clock and data from the U Port of the L-1 Crate Controller using biphase modulation. This combined signal is then transformer coupled onto a single data path to the next element on the serial highway. One Bit Serial Adapter can be used with a cluster of L-1 Crate Controllers that are interconnected by standard D Port cables. The Bit Serial Adapter provides the relays for bypass and loop collapse. These relays are controlled by the L-1 Crate Controller. The U Port serial highway can be twisted pair or coaxial cable. Several highway connector options are available. The Bit Serial Adapter is packaged in a single width CAMAC module.

Ref. Kinetic Systems Corporation

Ref. No. 13.0208

Serial Crate Controller :

The Serial Crate Controller, L-1, Model CR.6001 is an interfacing module between the CAMAC dataway (based on EUR 4100e specifications) and the Serial Highway Description in accordance with the ESONE documents SH/01 and SH/03 and latest revised papers issued by CERN.

The Controller provides a user selectable bit serial or byte serial mode of operation at a clock frequency of maximum 5 MHz. The Controller is a double-width unit.

Switches and led's on the front panel display the actual address and status of the Serial Crate Controller.

Ref. Christian Rovsing A/S.

TEST EQUIPMENT

Dataway Related Testers and Displays

Ref. No. 13.0301

Dataway display

This single-width CAMAC module, Type 9554, permits the signal lines of the Dataway to be displayed and memorised. It has three modes of operation; Follow, ON LINE, and Trigger.

In the *Follow Mode* the state of the Dataway lines is monitored continuously. This mode can be used to diagnose basic Dataway faults, to incidate errors presented on the Dataway by faulty modules and to immediately display the state of the Dataway when a control program halts.

The *ON LINE MODE* permits the signal lines of the Dataway to be monitored at time S1.

Trigger Mode. This mode is an extension of the *ON LINE MODE.* Register update occurs only in accordance with an external trigger input. In this mode the state of the Dataway lines is tracked while an external trigger is active (low) and memorised on the low/high transition. Thus the state of all lines is memorised at the instant defined by the user, possibly by patching the module under investigation to this trigger input.

A front panel reset switch clears all the registers. Power Requirements, +6 V.

Ref. Nuclear Enterprises Ltd.

Index to Manufacturer's News and New Products

PAPER ABSTRACTS TRANSLATIONS

An optimized architecture for a multichannel pulse height analyser
R. M. Keyser and R. H. Baldry

Summary

The architecture of multichannel analysers (MCA) has progressed from hardwired analysers to computer-based analysers. An architecture for the next generation MCA is based on a computer with CAMAC and a high-level interactive language.

Zusammenfassung

Die Struktur von Multikanal-Analysatoren (MCA) wurde von festverdrahteten zu rechnergestützten Analysatoren weiterentwickelt. Eine Struktur für die nächste MCA-Generation basiert auf einem Rechner mit CAMAC und einer hochentwickelten interaktiven Sprache.

Résumé

L'architecture des analyseurs multicanaux a évolué, passant des analyseurs en logique câblée à des analyseurs réalisés à partir d'ordinateurs. Une des architectures prévues pour la prochaine génération est basée sur un ordinateur associé à CAMAC et à un langage conversationnel évolué.

Riassunto

La struttura degli analizzatori multicanali (MCA) è evoluta dagli analizzatori a connessioni fisse agli analizzatori abbinati a un calcolatore. L'architettura delle prossima generazione di analizzatori multicanali è basata su un calcolatore associato al CAMAC e su un linguaggio interattivo ad alto livello.

Samenvatting

Meerkanaalsanalysators (MCA) hebben zich in korte tijd ontwikkeld van volledig in hardware uitgevoerde analysators tot computer gestuurde analyse systemen. De volgende generatie maakt gebruik van een computer met CAMAC-modulen en een geavanceerd interactief programma.

Резюме

Архитектура многоканальных анализаторов развивалась от типов с жесткой программой до вычислительных анализаторов. Архитектура следующего поколения анализаторов базирует на ЭВМ вместе с CAMAC-ом и конверсационным языком высокого уровня.

Microcomputer controlled random data acquisition system
J. Lecoq, H. Tedjini, P. L.Wendel and G.Metzger

Summary

This CAMAC system for data acquisition and manipulation is controlled in an interactive way by an operator through a microcomputer. The system, built around an Intel 8008 chip, includes a magnetic tape unit, a CRT display, an XY recorder, a fast analogue-to-digital converter, and a CAMAC I/O register.

Zusammenfassung

Dieses CAMAC-System zur Datenerfassung und behandlung wird durch einen Operator über einen Mikrocomputer (interaktiv) gesteuert. Das als Peripherie mit einem Intel 8008 Chip zusammenarbeitende System umfaßt eine Magnetbandeinheit, ein Sichtanzeigegerät, einen XY-Schreiber, einen schnellen Analog-Digital-Konvertor und ein CAMAC I/O-Register.

Résumé

Ce système CAMAC destiné à la collecte et la manipulation des données est commandé en conversationnel par l'opérateur à l'aide d'un mini-ordinateur. Construit autour d'un circuit microprocesseur Intel 8008, le système comprend une unité de bandes magnétiques, une console de visualisation, un enregistreur XY, un convertisseur analogique/numérique rapide et un registre d'E/S CAMAC.

Riassunto

Questo sistema CAMAC per l'acquisizione e la manipolazione di dati è controllato in modo interattivo da un operatore mediante un microcalcolatore. Il sistema, costruito partendo da un «microprocessor» Intel 8008, comprende una unità a nastro magnetico, un visualizzatore oscillografico, un registratore XY, un convertitore analogico-digitale rapido ed un registro CAMAC di ingresso-uscita.

Samenvatting

Dit CAMAC-systeem dat voor de opname en verwerking van gegevens is bestemd, kan op interactieve wijze door een operator bestuurd worden. Het systeem, dat rond een Intel 8008 is opgebouwd, bestaat uit een magneetbandorgaan, een beeldbuis station, en XY-recorder, een snelle analoog-digitaalomzetter en een CAMAC I/O-register.

Резюме

Оператор управляет конверсационными способом систему CAMAC для приёма и манипулации при помощи микрокомпутера. Система построена на базе микросхемы Интель 8008 состоит из магнитофона, электроннолучевого дисплея, плоттера x-y, быстрого ЦАП-а и входно-выходного регистра CAMAC.

CAMAC equipment for monitoring a telecontrol system
H. Mayer

Summary

CAMAC equipment and a minicomputer are used to monitor a large telecontrol system for a group of hydro-electric stations. This monitoring equipment attempts to solve the problem of trouble-shooting sporadic faults in the telecontrol system.

Zusammenfassung

Ein CAMAC-Modul und ein Minicomputer sind in das Fernwirksystem zur Überwachung mehrerer Wasserkraftwerke eingebaut. Diese Anlage soll das Problem sporadisch auftretender Fehler im Fernwirksystem lösen.

Résumé

Un équipement CAMAC et un mini-ordinateur effectuent la surveillance d'un important système de télécommande, d'un groupe de stations hydro-électriques. Cet équipement de surveillance a pour but de résoudre le problème posé par les parasites entrainant des erreurs sporadiques du système de télécommande.

Riassunto

L'apparecchiatura CAMAC ed un minicalcolatore sono impiegati per il monitoraggio di un vasto sistema di telecomando per un gruppo di centrali idroelettriche. Tale apparecchiatura di monitoraggio serve a individuare sporadici guasti nel sistema di telecomando.

Samenvatting

Een installatie bestaande uit CAMAC-apparatuur en een minicomputer zorgt voor de besturing van een uitgebreid telebewakingssysteem bij een groep waterkrachtcentrales. Met deze installatie tracht men de moeilijkheden te voorkomen die gepaard gaan met het opsporen van sporadische gebreken in het telebewakingssysteem.

Резюме

Аппаратура CAMAC вместе с мини-ЭВМ применена для мониторования большой системы дистационного управления группы электрогидростанции. Надеются что эта установка решит проблему отброса случайных помех в системе телеуправления.

An interface between CAMAC and the digico Micro-16V computer
H. D. Blake and D. J. Folwell

Summary

A CAMAC interface unit has been developed to allow a Digico Micro-16V computer to be used with a GEC-Elliott Executive System.

Zusammenfassung

Um einen Digico-Micro-16 V-Rechner mit einem GEC-Elliott Executive System verwenden zu können, wurde eine CAMAC-Nahtstelleneinheit entwickelt.

Résumé

Une interface CAMAC a été mise au point en vue de permettre l'utilisation d'un ordinateur DIGICO Micro-16V avec un contrôleur de système GEC-Elliott.

Riassunto

E' stata preparata un'unità di interfaccia CAMAC per poter usare un calcolatore « Digico Micro-16V » con un sistema « GEC Elliott Executive ».

Samenvatting

Een CAMAC-interface werd ontwikkeld ten einde het gebruik van een GEC-Elliott Executive System bij een Digico Micro-16V computer mogelijk te maken.

Резюме

Разработан интерфейс CAMAC для ЭВМ Micяo-16 V фирмы Digico предназначен для работы в исполнительной системе фирмы GEC-Elliott.

An Alpha-Numeric and graphical display driver in CAMAC
N.V. Toy

Summary

This micro-programmed CAMAC module provides comprehensive facilities for displaying alphanumerics and graphics on an oscilloscope. The display can be refreshed from a local memory. Operational modes such as character size, generation of single vectors and sequences of vectors, and the choice of intensity, style of lines, and blink mode are selected by ASCII codes.

Zusammenfassung

Dieses mikroprogrammierte CAMAC-Modul bietet umfassende Möglichkeiten für die alphanumerische und graphische Bildschirmanzeige. Die Anzeige kann aus einem Lokalspeicher abgerufen werden. Betriebsvariable, wie die Zeichengröße, die Generierung einfacher Vektoren und Vektorensequenzen und die Wahl der Intensität des Zeilenstils und der Blinkart werden mit ASC II-Codes vorgewählt.

Résumé

Ce module CAMAC micro-programmé permet la visualisation directe d'informations alphanumériques et graphiques sur un oscilloscope.
Le rafraichissement de l'image peut être effectué à partir d'une mémoire locale. Des modes opératoires tels que définition des dimensions des caractères, génération d'un vecteur unique ou de séquences de vecteurs, choix de l'intensité, du type de lignes et du clignotement sont sélectionnés à l'aide de codes ASCII.

Riassunto

Questo modulo CAMAC microprogrammato offre vasta possibilità di visualizzazione di dati alfanumerici e grafici su un oscilloscopio. L'indicazione può venire aggiornata da una memoria locale. I modi operativi, quali la dimensione del carattere, la generazione di singoli vettori e di sequenze di vettori, la scelta del-l'intensità, il tipo di linee, nonché il lampeggiamento vengono selezionati mediante codici ASCII.

Samenvatting

Door toepassing van dit microprogrammeerbare CAMAC module, wordt het afbeelden van alfanumerieke en grafische tekens op een oscilloscoop aanzienlijk vereenvoudigd. Uit een extern geheugen kan een nieuw beeld worden ingevoerd. Met behulp van ASCII-codes worden de verschillende mogelijkheden ingesteld, zoals: de lettergrootte, het genereren van een enkele vector of van reeksen vectoren, de helderheid, het lijntype en "blink mode".

Резюме

Этот микропрограмированный блок CAMAC обеспечивает различные удобства при изображении альфанумерических и графических данных на оссциллоскопе. Изображение восстановливается из местной памяти. При помощи кодов ASCII определяется режимы работы, такие как: размер знаков, генерирование отдельных векторов или серии векторов, выборка яркости и стиля линии, пульсирование.

CAMAC interface module for the Biomation transient recorder Type 8100
I. Török

Summary

A single-width CAMAC module has been developed for control and readout of a single Biomation Type 8100 transient recorder. The module performs programmed data transfers.

Zusammenfassung

Für die Steuerung und zum Auslesen des Typs Biomation 8100 ist eine CAMAC Einheit, für Programm-gesteuerte Datenübertragungen entwickelt worden.

Résumé

Un module CAMAC 1/25e a été mis au point pour le contrôle et la lecture d'un seul enregistreur de transitoire Biomation de type 8100. Le module effectue des transferts de données programmés.

Riassunto

E' stato sviluppato un modulo CAMAC di largherra unitaria per il comando e la lettura di un singolo registratore di transitori Biomation Tipo 8100. Il modulo effettua trasferimenti di dati programmati.

Samenvatting

Beschreven wordt een enkelvoudig CAMAC module voor het besturen en uitlezen van een BIOMATION Type 8100 transient recorder.

Резюме

Разработан одномодульный блок для считывания и управления одным рекордерем переходных процессов Биоматон 8100. Блок выполняет програмный обмен данных.

CAMAC interface for a buffered card reader
K. van Dellen, F. Sporrel and L. M. Taff

Summary

This CAMAC module is an interface for a buffered card reader. Special hardware features include character decoding, packing characters into the computer's internal format, and detection of end-of-file cards.

Zusammenfassung

Bei diesem CAMAC-Modul handelt es sich um eine Interface für einen gepufferten Kartenleser. Zu den Hardware-Merkmalen gehören die Zeichendecodierung, die Packung von Zeichen auf das Eigenformat des Rechners und die Ermittlung der Datei-Endkarten.

Résumé

Ce tiroir CAMAC est une interface pour lecteur de cartes comprenant une mémoire. Des circuits spéciaux permettent le décodage des caractères, leur groupement au format interne du calculateur ainsi que la détection des cartes fin de fichier.

Riassunto

Questo modulo CAMAC è un'interfaccia per lettore di schede bufferizzato. Fra le Speciali caratteristiche di «hardware» comprendono la decodificazione dei caratteri, la compattazione dei caratteri nel formato interno del calcolatore e l'individuazione delle schede di fine «file».

Samenvatting

Dit CAMAC-module dient als interface voor een ponskaartlezer met buffergeheugen. Bijzondere mogelijkheden van de hardware zijn ondermeer: decoderen van de tekens, rangschikken van de tekens in een vorm die overeenkomt met het interne formaat van de computer en het herkennen van afsluitkaarten (EOF).

Резюме

Этот блок CAMAC является интерфейсом устройства считывания карт с буфером. Как особенные свойства блока включены: декодирования знаков, упаковка знаков согласно внутренным стандартом ЭВМ и нахождение карты конца файля.

Macro-IML implementations for the PDP-11 computer
M. Kubitz and R. Kind

Summary

IML has been implemented for the DEC PDP-11 computer with the DEC CA-11A CAMAC branch controller and the Borer 1533A single-crate controller, and with the DEC operating systems DOS, VO8/VO9 and RSX-11D (and in future with RSX-11M). The implementations follow the macro-syntax given as an appendix to the definition of IML.

Zusammenfassung

IML wurde für den DEC PDP-11-RECHNER mit dem DEC-CA-11A CAMAC vertikalen Datenweg und der Borer 1533A Einrahmensteuerung mit den DEC-Betriebssystemen DOS, VO8/VO9 und RSX-11D (und in Zukunft mit RSX 11M) eingesetzt. Die Anwendungen benützen die zur Definition der IML gehörenden Makro-Syntax.

Résumé

«IML» (Intermediate Language) a été mis au point sur ordinateur DEC PDP 11, équipé du contrôleur de branche CAMAC CA-11A et du contrôleur de châssis Borer 1533 A, sous contrôle des systèmes d'exploitation DOS, VO8/VO9 et RSX-11D (et dans l'avenir avec RSX-11M). Les instructions correspondent à la macro-syntaxe décrite dans l'annexe du document «Définition du IML».

Riassunto

L'IML è stato applicato al calcoatore DEC PDP-11, con l'elemento di controllo del ramo principale DEC CA-11A CAMAC e il modulo di controllo per singolo conteintore «Borer 1533A», e con i sistemi operativi DEC «DOS, VO8/VO9 e «RSX-11D» (nonchè, in futuro con l'«RSX-11M»). In tali la applicazioni si segue la macrosintassi indicata in appendice alla definizione dell'IML.

Samenvatting

In dit artikel wordt beschreven hoe IML kan worden gebruikt bij de DEC computer PDP-11 in combinatie met de CAMAC-branch driver DEC CA-11A, de Borer single-crate controller 1533A en bij de DEC besturingssystemen DOS, VO8/VO9 alsmede RSX-11D (en in de toekomst ook RSX-11M). Daarbij wordt de macro-syntaxis gevolgd die als bijlage in het document ESONE/IML/OI is opgenomen.

Резюме

Сделана имплементация языка IML для ЭВМ ПДП-11 работающего вместе с контроллером ветви CAMAC типа ДЕС CA-11A или однокрейтным контроллерем Borer 1533A при использовании оперативных систем ДЕС: ДОS, VO8/VO9, RSX-11Д (в будущем RSX-11M). Имплементация в согласии с макро-синтаксисом представленом в виде приложения к определению IML.

CAMAC with FORTRAN on a CDC 3100 An approach based on IML
W. Kneis and W. Karbstein

Summary

This paper describes a straightforward approach for using CAMAC with FORTRAN on a CDC 3100 computer. The solution is based on IML and consists of only four assembler subroutines and a LAM handler. It can be regarded as a high level expansion of an earlier implementation of IML in an assembler language environment.

Zusammenfassung

Dieser Beitrag beschreibt eine direkte Möglichkeit zur Verwendung des CAMAC-Systems mit einer Fortran-Sprache auf einem CDC 3100-Rechner. Die Lösung basiert auf der IML und besteht aus nur vier Assembler-Unterprogrammen und einem LAM-handler. Sie kann als eine Weiterentwicklung einer früheren IML-Ausführung in einer Assembler-Sprache angesehen werden.

Résumé

Cet article décrit une approche directe de l'utilisation du CAMAC à l'aide de FORTRAN, sur un ordinateur CDC 3100. Basée sur l'emploi de l'IML, la solution est uniquement constituée de quatre sous-programmes assembleur et d'un programme de traitement des LAM. Elle peut être considérée comme une version évoluée d'une précédente version d'IML écrite dans le cadre d'un langage assembleur.

Riassunto

Questo documento descrive un approccio diretto dell'uso del CAMAC con il FORTRAN su un calcolatore CDC 3100. La soluzione è basata sull'IML e consiste di solo quattro sottoprogrammi assembler e di un programma di trattamento dei LAM. Essa puo' essere considerata un perfezionamento ad alto livello di una precedente applicazione dell'IML in un sistema a linguaggio assembler.

Samenvatting

In dit artikel wordt beschreven hoe CAMAC in combinatie met FORTRAN op eenvoudige maar doeltreffende wijze kan worden gebruikt in een CDC 3100 computer. De voorgestelde methode is gebaseerd op het gebruik van IML en vereist slechts vier sub-programma's in assemblertaal en een programma voor het verwerken van de LAM's. Deze oplossing kan worden beschouwd als een verdere en meer geavanceerde ontwikkeling van een reeds bestaand systeem waarbij IML op assembler-niveau wordt toegepast.

Резюме

Вестати описан простой подход к использовании CAMAC-а вместе с Фортраном на ЭВМ СДС 3100. Он основан на ILM и пользуется только четыремья подпрограммами ассемблеря и программой манипуляции запросами LAM. Можно его рассмотривать как высокого уровня расширение первоначальной имплементации IML в окружении языка ассемблера.

A rarely-used application of the X-line
L. Stanchi and I. Török

Summary

The attention of CAMAC interface module designers is drawn to a simple method of indicating that a peripheral is inpowered or disconnected, by using the Command Accepted (X) line.

Zusammenfassung

Die Konstrukteure von CAMAC Interfacemoduln werden auf eine einfache Methode aufmerksam gemacht, um mit Hilfe der X-Leitung anzuzeigen, ob ein Peripheriegerät stromlos oder abgeschaltet ist.

Résumé

L'attention des concepteurs de tiroirs interface CAMAC est attirée sur une méthode simple utilisée pour indiquer qu'un périphérique n'est pas alimenté ou est déconnecté, cette méthode utilise la ligne «Commande acceptée» (X).

Riassunto

Si richiama l'attenzione dei projettisti di moduli interfaccia CAMAC su un metodo semplice per indicare che un'unità periferica non è alimentata da corrente o è disinserita usando la linea (X) di Comando Accettato).

Samenvatting

Ontwerpers van CAMAC interfacemodulen worden er attent op gemaakt dat er een heel eenvoudige methode bestaat om aan te duiden dat een randapparaat niet ingeschakeld of niet aangesloten is, namelijk door gebruik te maken van de Command Accepted (X) lijn.

Резюме

Обращается внимание разработчиков блоков — интерфейсов CAMAC на простой способ обнаружения что внешные устройство не получает питания или не включено, при помощи линии принятия комманды X.

Faster address-scan by reading only non-zero data

E. V. Chernykh, J. I. Chmielewski, V. A. Smirnov

Summary

A 'floating sub-address' technique is suggested. This speeds up the address scan mode by reading only the non-zero data registers in CAMAC modules. Implementations are described for modules with less than 16, and 16 or more, data registers.

Zusammenfassung

Vorgeschlagen wird eine „symbolische Unteradressentechnik", die das Adressenabtastverfahren dadurch beschleunigt, daß nur die Ungleich-Null-Datenregister in CAMAC-Moduln ausgelesen werden. Anwendungen für Moduln mit weniger als 16 und mit 16 oder mehr Datenregistern werden beschrieben.

Résumé

Une technique de «sous-adresse relative» accélère le mode de scrutation d'adresse en limitant la lecture à celle des registres «non vides» des tiroirs CAMAC, ou en décrit la réalisation pour des tiroirs contenant moins de 16, 16 ou plus de 16 registres de données.

Riassunto

Si propone una tecnica a sottoindirizzo mobile che consente di accelerare i trasferimenti di blochi di dati a scansione di indirizzi leggendo soltanto i registri con dati diversi da zero nei moduli CAMAC. Si descrwono le applicazioni per moduli con meno di 16 registri, e per moduli con 16 o più registri di dati.

Samenvatting

In dit artikel wordt een methode beschreven "vlottende sub-adressen", waarbij alleen de registers met gegevens die niet gelijk zijn aan nul worden gelezen. Hierdoor wordt de adresaftastsnelheid aanzienlijk verhoogd. Er volgt een beschrijving van toepassingsmogelijkheden voor modulen met minder dan 16 en met 16 of meer registers.

Резюме

Предложен метод плавающего адреса. Он ускоряет работу в режиме сканирования адресов так как считывается только ненулевые содержания регистров данных в блоках CAMAC. Описана имплементация для блоков с числом регистров меньше 16 или не меньше 16.

CAMAC PRODUCT GUIDE

CAMAC PRODUCT GUIDE

HARDWARE

This guide consists of a list of CAMAC equipment which is believed to be offered for sale by manufacturers in Europe and the USA. The information has been compiled by CERN–NP–Electronics and is mainly based on information communicated by manufacturers and available up to the 10th May 1975.

Every effort has been made to ensure the completeness and accuracy of the list, and it is hoped that most products and manufacturers have been included. Inclusion in this list does not necessarily indicate that products are fully compatible with the CAMAC specifications nor that they are recommended or approved by the ESONE Committee. Similarly, omission from this list does not indicate disapproval by the ESONE Committee.

Reader service

Readers are advised to use the Reader service enquiry card, inserted in this Bulletin, if you wish to obtain more information on CAMAC Products, and to be on the manufacturers mailing list.

Remarks on some columns in the Index of Products

Column

NC – N is new, C is corrected entry.

CODE – Classification code, a 2- or 3-digit decimal number (see below).

WIDTH – 1 to 25, indicates module width or—for crates—the number of stations available.
– 0 indicates unknown width or format.
– Blank, the width has no meaning.
– NA indicates other format, normally a 19 inch rack mounted chassis.

NPR – Number in brackets is issue number of the Bulletin in which the item was or is described in the New Products section.

DELIV – Date on which item became or will become available.

REF No – Reader service reference number.

CLASSIFICATION GROUPS

INDEX OF PRODUCTS

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
1	**DATA MODULES — I/O TRANSFERS AND PROCESSING**						
11	Digital Serial Input Modules — Scalers, Time Interval and Bi-directional Counters, Serial Coded etc.						
111	Simple Serial Binary Registers						
	1X24 BIT BINARY BLIND SCALER (20MHZ NIM OR 10MHZ TTL I/P,EXT INHIBIT IN,OVF O/P)	J EB 10	SCHLUMBERGER	1	/71		13,1001
	MINISCALER (2X16BIT,30MHZ,SEPARATE GATES AND EXTERNAL RESET,NIM LEVELS)	1002	BORER	1	/69		13,1002
	MINISCALER (2X16BIT,30MHZ,SEPARATE GATES AND EXTERNAL RESET,NIM LEVELS)	002	NUCL. ENTERPRISES	1			13,1003
	MINISCALER(2X16BIT,30MHZ,SEPARATE GATES AND EXT RESET,NIM LEVELS)	C 104	RDT	1	/71		13,1004
	DUAL SCALER (2X16BIT, 50MHZ)	DS 050	STND ENGINEERING	1	/73		13,1005
	DUAL 150 MHZ 16 BIT SCALER (ONE 50 OHMS, ONE UNTERMINATED NIM INPUT PER SCALER)	2S 2024/16	SEN	1	/70		13,1006
	DUAL SCALER (2X16BIT, 100MHZ)	DS 100	STND ENGINEERING	1	/73		13,1007
	DUAL SCALER (2X16BIT, 150MHZ)	DS 150	STND ENGINEERING	1	/74		13,1008
	DUAL SCALER (2X16BIT, 200MHZ)	DS 200	STND ENGINEERING	1	/74		13,1009
	DUAL 24 BIT BINARY SCALER (15MHZ, NIM OR TTL INPUTS)	FHC 1313	FRIESEKE	1	/72		13,1010
	DOUBLE SCALER (24/16BIT,50MHZ,2 I/P & 3 GATE MODES,INHIBIT, P1=OVERFLOW)	C-DS-24	WENZEL ELEKTRONIK	1	/72		13,1011
	DUAL 150 MHZ 24 BIT SCALER (ONE 50 OHMS, ONE UNTERMINATED NIM INPUT PER SCALER)	2S 2024/24	SEN	1	/70		13,1012
	QUAD CAMAC SCALER (4X16BIT OR 2X32BIT, 100MHZ)	1004A	BORER	1	01/75		13,1013
	TIME DIGITIZER (4X16BIT,50MHZ CLOCK,WITH CENTRE FINDER, USABLE WITH PRE-AMP 511)	1005	BORER	1	/72		13,1014
	SERIAL REGISTER (4X16BIT,2X32BIT SELECTABLE,25MHZ,COMMON GATE,NIM LEVELS)	SR 1605	GEC-ELLIOTT	1	/71		13,1015
	MICROSCALER (4X16 BIT,25MHZ,OPTIMIZED INPUT,3 NSEC,GIVES TYP 80MHZ COUNTING)	003-4	NUCL. ENTERPRISES	1	/71	(5)	13,1016
	MICROSCALER(4X16BIT,2X32BIT SELECTABLE, 25MHZ,COMMON GATE,NIM LEVELS)	C 102	RDT	1	/71		13,1017
	4X16 BIT BINARY BLIND SCALER (50 MHZ, 2X32BIT SELECTABLE,COMMON GATE,NIM/TTL)	J EB 20	SCHLUMBERGER	1	/71		13,1018
	FOUR-FOLD SCALER (4X16BIT,2X32BIT SELECTABLE,50MHZ,COMMON GATE,NIM LEVELS)	4 S 2003/50	SEN	1	/69		13,1019
	FOUR-FOLD CAMAC SCALER (4X16BIT,40MHZ, ONE 50 OHMS,ONE HI-Z NIM I/P PER SCALER)	4 S 2004	SEN	1	/70		13,1020
	TIME DIGITIZER(4X16BIT,CLOCK RATE 70/85MHZ, WITH CENTER FINDING LOGIC)	TD 2031	SEN	1	/72		13,1021
	TIME DIGITIZER (4X16BIT,CLOCK RATE 70/85MHZ,NIM LEVELS)	TD 2041	SEN	1	/72	(4)	13,1022
	QUAD SCALER (4X16BIT, 50MHZ)	QS 050	STND ENGINEERING	1	/73		13,1023
	SERIAL REGISTER (4X16BIT,2X32BIT SELECTABLE,100MHZ,COMMON GATE,NIM LEVELS)	SR 1608	GEC-ELLIOTT	1	/71		13,1024
	FOUR-FOLD SCALER(4X16BIT,2X32BIT SELECTABLE,100MHZ,COMMON GATE,NIM LEVELS)	4 S 2003/100	SEN	1	/70		13,1025
	QUAD SCALER (4X16BIT, 150MHZ)	QS 150	STND ENGINEERING	1	/74		13,1026
	QUAD SCALER (4X16BIT, 200MHZ)	QS 200	STND ENGINEERING	1	/74		13,1027
	QUAD SCALER (4X24BIT, 50MHZ, DATAWAY AND/OR EXT FAST INHIBIT, NIM LEVELS)	S424S	EG&G/ORTEC	1		(7)	13,1028
	QUAD COUNTING REGISTER(4X24BIT,NIM INP T TTL INHIBIT IN,TTL CARRY AND OVF OUT)	709-2	NUCL. ENTERPRISES	1	/71		13,1029
	SCALER (4X24BIT, 50MHZ)	9051	NUCL. ENTERPRISES	1	/73		13,1030
	QUAD SCALER (4X24BIT,150/125MHZ,DATAWAY AND/OR EXT FAST INHIBIT,NIM LEVELS)	S424B	EG&G/ORTEC	1	/71		13,1031

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	QUAD SCALER (4X24BIT, 200MHZ, DATAWAY AND/OR EXT FAST INHIBIT, NIM LEVELS)	S424F	EG&G/ORTEC	1		(13)	13,1032
	QUAD SCALER (4X24BIT, 125MHZ,INTERRUPT STRUCTURE, INDIVIDUAL INHIBIT INPUTS)	S1	JOERGER	1	/72	(5)	13,1033
	QUAD SCALER (4X24BIT, 200MHZ,INTERRUPT STRUCTURE, INDIVIDUAL INHIBIT INPUTS)	S1-1	JOERGER	1	/73		13,1034
	QUAD 100MHZ SCALER (4X24BIT,DISCR LEVEL -0,5V,TIME-INTERVAL APPL,NIM INHIB I/P)	85A	JORWAY	1	/71	(2)	13,1035
	QUAD 100 MHZ SCALER(4X16/24BIT,-0.5V I/P THRESHOLD,COMMON EXT FAST INHIBIT,NIM)	2550B	LRS-LECROY	1	/70		13,1036
	QUAD SCALER (4X24BIT, 300MHZ, 7-SEGMENT DISPLAY/SCALER, OVF GIVES LAM)		SCHLUMBERGER	3		(12)	13,1037
	QUAD SCALER (4X24BIT OR 2X48BIT,100MHZ, OVF GIVES LAM, COMMON INHIBIT GATE)	QS 100	STND ENGINEERING	1	/73	(12)	13,1038
	TIME DIGITIZER (6 CHANNELS,16 BITS, 100 MHZ CLOCK RATE)	TD	JOERGER	1	/74	(11)	13,1039
N	12-CHANNEL 100MHZ SCALER (16BIT,-0.5V I/P THR, FAST CLEAR, CASCADABLE, LAM)	2252	LRS-LECROY	1	05/75		13,1040
	12-CHANNEL 16 BIT SCALER (CERN SPS2135)	9054	NUCL. ENTERPRISES	1		(10)	13,1041
	HEX TTL/NIM 50 MHZ SCALER	3610	KINETIC SYSTEMS	1	/73		13,1042
	HEX COUNTING REGISTER (6X24BIT, 100MHZ NIM & TTL LEVELS, TTL CARRY OVF, BIN)	320	HYTEC	1	/74		13,1043
	HEX NIM 100 MHZ SCALER	3615	KINETIC SYSTEMS	1	/73	(8)	13,1044
	12-CHANNEL 100 MHZ SCALER(12X24BIT,-0.5V I/P THR, COMMON FAST CLEAR & INHIB, NIM)	2551	LRS-LECROY	1	/74	(12)	13,1045

112 Simple Serial Decade Registers

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	1X6 BCD DECADE SCALER (30 MHZ, BUILT-IN DISPLAY)	J EA 20	SCHLUMBERGER	1	/73		13,1046
	DUAL 24 BIT BCD SCALER (15MHZ, NIM OR TTL INPUTS)	FHC 1311	FRIESEKE	1	/72		13,1047
	2X6 BCD DECADE SCALER - 100 MHZ WITH REMOTE DISPLAY	J EA 10	SCHLUMBERGER	1	/71		13,1048
	QUAD BCD SCALER (4X6 DECADES,30MHZ)	9021	NUCL. ENTERPRISES	1	/71		13,1049
	HEX COUNTING REGISTER (6X24BIT, 100MHZ NIM & TTL LEVELS, TTL CARRY OVF, BCD)	321	HYTEC	1	/74		13,1050

113 Preset Serial Binary Registers

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PRESET COUNTING REGISTER (16BIT,10MHZ, NIM/TTL I/P,TTL INHIB + O/P,DATAWAY SET)	7039-1	NUCL. ENTERPRISES	1	/70		13,1051
	PRESET COUNTING REGISTER (24BIT,10MHZ, DATAWAY SET,NIM/TTL INPUT,TTL O/P+INHIB)	703-1	NUCL. ENTERPRISES	1	/71		13,1052
	SCALER 50 MHZ (12/16/18/24BIT,PRESET WITH OVF LINE,CONSTANT DEADTIME)	C 72451-A3-A1	SIEMENS	1	/72		13,1053
	PRESET SCALER(24/16BIT,50MHZ,DATAW. SET, BUFFER,2 I/P & 3 GATE MODES,INHIB,OVFLO)	C-PS-24	WENZEL ELEKTRONIK	1	/72		13,1054
	BIN,PRESET SCALER/BCD-DISPLAY(24BIT/6DEC 50MHZ,DATAWAY SET,2I/P&GATE MODES,INHIB)	C-SD-24	WENZEL ELEKTRONIK	1	/75		13,1055
	DUAL PRESET COUNTING REGISTER(16BIT BIN)	2204	BI RA SYSTEMS	1	/73		13,1056
	DUAL PRESET COUNTER/TIMER (2X16/24BIT, 40MHZ MIN, SELF RELOADABLE)	1006	BORER	1	/74		13,1057
	2X24 BIT PRESET SCALER (100MHZ COUNTING)	J EP 30	SCHLUMBERGER	1	/73		13,1058
	PRESET QUAD BINARY COUNTER (4X24BIT, 75 MHZ, NIM & TTL LEVELS, TTL CARRY OVF)	310	HYTEC	1	/73		13,1059
N	(SAME BUT 50 MHZ)	350		1	/74		

114 Preset Serial Decade Registers

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	REAL TIME CLOCK (3,8 USEC TO 18.2 HRS, PRESET-TIME AND PRESET-COUNT MODES)	RTC 2014	SEN	1	/71		13,1060
	24BIT BCD PRESET-SCALER (12MHZ, NIM OR TTL INPUTS,MANUAL OR DATAWAY PRESET)	FHC 1301	FRIESEKE	2	/71	(1)	13,1061
	24BIT BCD PRESET-SCALER (12MHZ, NIM OR TTL INPUTS,DATAWAY PRESET)	FHC 1302	FRIESEKE	1	/71		13,1062
	6 BCD DECADE SCALER (MANUAL AND DATAWAY PRESET,1 MHZ, START/STOP OUTPUT)	J EP 20	SCHLUMBERGER	2	/71		13,1063

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PRESET SCALER (20MHZ,8DECADE BCD,7 SEGM LED INDICATES CONTENTS AND PRESET NO)	PSR 0801	GEC-ELLIOTT	1	/72	(7)	13,1064
	PRESET SCALER(10MHZ,8 DECADE BCD,DISPLAY OF 2 SIGNIF NUMBERS+EXP,MAN PRESET,NIM)	C 103	RDT	3	/71		13,1065
	DUAL PRESET COUNTING REGISTER(4 DECADES)	2204	BI RA SYSTEMS	1	/73		13,1066
	PRESET QUAD DECADE COUNTER (4X6 DECADES, 75 MHZ, NIM & TTL LEVELS, TTL CARRY OVF)	311	HYTEC	1	/73		13,1067
N	(SAME BUT 50 MHZ)	351		1	/74		

117 Other Digital Serial Input Modules (Bi-Directional Sequential, Shift Types)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	UP/DOWN PRESETTABLE COUNTER(24BIT,10MHZ, GATE AND PULSE BURST OUTPUTS)	82	JOERGER	1	/72	(5)	13,1068
	UP/DOWN PRESETTABLE COUNTER(6 BCD DIGITS 10MHZ, MANUAL AND DATAWAY PRESET)	82-1	JOERGER	1	/73		13,1069
	QUAD PRESETTABLE UP-DOWN COUNTER	3640	KINETIC SYSTEMS	1	/73		13,1070
	DUAL INCREMENTAL POSITION ENCODER (2X20 BIT X-Y DIGITIZATION BY UP-DOWN COUNTER)	2IPE 2019	SEN	1	/71		13,1071

12 Digital Parallel Input Modules — Storing and Non-storing Registers, Coinc. Latch, Lam, Status etc.

121 Non-Storing Registers (Gates)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PARALLEL INPUT GATE (CERN SPS2133,16BIT)	9049A	NUCL. ENTERPRISES	1		(10)	13,1072
	ISOLATED INPUT GATE(16BIT,VERSION AG302D FOR 12,24 OR 48V, AG302A FOR 115VAC)	AG 302*	STND ENGINEERING	1	/74		13,1073
	INPUT GATE (16BIT, CONTACT CLOSURE)	AG 302C	STND ENGINEERING	1	/74		13,1074
	INPUT GATE (16BIT)	PG 301	STND ENGINEERING	1	/73		13,1075
	INPUT GATE (24BIT, SOURCE SELECTION BY 6BIT OUTPUT, DATAWAY GEN STROBE OUT)	J 007	JORWAY	1	/74	(8)	13,1076
	INPUT GATE 24-BIT	3420	KINETIC SYSTEMS	1	/71	(4)	13,1077
	PARALLEL INPUT GATE (24BIT STATIC DATA, INTEGRATED FOR 1 USEC,TTL LEVELS)	7059-1	NUCL. ENTERPRISES	1	/70		13,1078
	PARALLEL INPUT GATE (22BIT STATIC DATA, 500 NSEC INTEGRATION,STROBE SETS L,TTL)	7060-1	NUCL. ENTERPRISES	1	/70		13,1079
	PARALLEL INPUT GATE (24 BIT)	9049B	NUCL. ENTERPRISES	1		(10)	13,1080
	INPUT GATE (24BIT)	PG 304	STND ENGINEERING	1	/73		13,1081
	24-BIT ISOLATED INPUT GATE	3471	KINETIC SYSTEMS	1	/73		13,1082
	STATIC DIGITAL INPUT (2X16BIT, TTL)	C 76451-A8-A4	SIEMENS	1	/73	(6)	13,1083
	DUAL INPUT GATE (16BIT)	PG 601	STND ENGINEERING	1	/73		13,1084
	DUAL PARALLEL STROBED INPUT GATE(2X24BIT HANDSHAKE MODE TRANSFER TO DATAWAY,TTL)	61	JORWAY	1	/70		13,1085
	DUAL PARALLEL INPUT GATE (2X24BIT,NON-INTERLOCK CONTROL TRANSF TO DATAWAY,TTL)	61-1	JORWAY	1	/70		13,1086
	INPUT GATE DUAL 24 BIT	3472	KINETIC SYSTEMS	1			13,1087
	INPUT GATE (2X24BIT STATIC DATA,INTEGR FOR 1USEC,TTL LEVELS, 2X37-WAY I/P CONN)	321	POLON	1	/74		13,1088
	INPUT GATE (2X24BIT STATIC DATA,INTEGR FOR 10USEC,TTL LEVELS,2X37-WAY I/P CONN)	321A		1	/74		
	(SAME, INTEGRATION FOR 5MSEC)	321B		1	/74		
	DUAL 24 BIT PARALLEL INPUT GATE (WITH LED DISPLAY OPTION)	PG-604	STND ENGINEERING	1	/72	(6)	13,1089
	PARALLEL INPUT GATE (3X16BIT INPUT FROM ISOLATING CONTACTS)	1061	BORER	1	/72	(4)	13,1090
	3X16-BIT INPUT GATE (INPUTS ISOLATED BY OPTO-COUPLERS)	1063	BORER	1	/73	(8)	13,1091
	DIGITAL INPUT REGISTER WITH OPTO COUPLER (4X8BIT PARALLEL INPUT GATES,WITH L)	DO 200-2003	DORNIER	1	/72		13,1092
	(WITH FRONT PANEL CONNECTOR)	DO 200-2203		1	/72		
	DIGITAL INPUT REGISTER (5X8BIT PARALL INPUT GATES,5TH BYTE SETS L,TTL,1=H)	DO 200-2001	DORNIER	1	/71		13,1093
	(WITH FRONT PANEL CONNECTOR)	DO 200-2201		1	/72		
	(MODULE WITH ONLY LOGIC BOARD)	DO 200-2000		1	/73		
	DIGITAL INPUT REGISTER (5X8BIT PARALL INPUT GATES,5TH BYTE SETS L,HLL,1=H)	DO 200-2002	DORNIER	1	/72		13,1094
	(WITH FRONT PANEL CONNECTOR)	DO 200-2202		1	/72		

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PARALLEL INPUT GATE(16X16BIT,TTL, 1=LOW)	IG 25601	GEC-ELLIOTT	2	/72		13.1095
	128 BIT RECEIVER (ADDRESSABLE AS 8 16BIT WORDS OR 128 1-BIT WORDS)	C 341	INFORMATEK	1	/73		13.1096

122 Storing Registers

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	OPTICAL ISOLATED INPUT REGISTER	2601	BI RA SYSTEMS	1	/74		13.1097
	PARALLEL INPUT REGISTER (16BIT,CONTINUOUS OR STROBED MODES CONTROLLED BY REG)	7014-1	NUCL. ENTERPRISES	1	/70		13.1098
	DYN. DIG. INPUT (16BIT, TTL, LAM IF INPUT 0=1 OR 1=0 OR BOTH)	C 76451-A17-A4	SIEMENS	1	/73	(6)	13.1099
	INPUT REGISTER (16BIT)	PR 301	STND ENGINEERING	1	/73		13.1100
	DYNAMIC DIGITAL INPUT 16BIT FLOATING I/P	C 76451-A17-A3	SIEMENS	1	/73	(6)	13.1101
	ISOLATED INPUT REGISTER(16BIT,AR302D FOR 12,24 OR 48VDC, AR302A FOR 115VAC)	AR 302*	STND ENGINEERING	1	/74		13.1102
	INPUT REGISTER (16BIT,CONTACT CLOSURE)	AR 302C	STND ENGINEERING	1	/74		13.1103
	PARALLEL-INPUT-REGISTER (SINGLE 16/24BIT OPT,READY SIGNALS,I/O TTL,CONTROL BUS)	MS PI 2 1230/1	AEG-TELEFUNKEN	1	/70	(1)	13.1104
C	INPUT REGISTER (24BIT, SPEC CONN, 8 BIT ALSO VIA LEMO,LAM ON NON-ZERO OR STROBE)	FHC 1308	FRIESEKE	1	/71		13.1105
	INPUT REGISTER 24-BIT	3470	KINETIC SYSTEMS	1	/71	(4)	13.1106
	INPUT REGISTER (24BIT)	PR 304	STND ENGINEERING	1	/73		13.1107
	INPUT REGISTER (24 INPUTS, + STROBE, OPTICALLY ISOLATED)	IR-2	JOERGER	1	/74	(11)	13.1108
	BALANCED INPUT REGISTER WITH ADDRESSING	3430	KINETIC SYSTEMS	1	/72	(8)	13.1109
	PARALLEL INPUT REGISTER (2X16BIT, TTL)	2312	BI RA SYSTEMS	1	/73		13.1110
	DUAL INPUT REGISTER(2X16BIT,LAM & STROBE I/P & DATA-READ-STROBE O/P PER CHANNEL)	PR 1610 SERIES	GEC-ELLIOTT	1	/73		13.1111
	CAMAC UNTERM. I/P'S VIA SCHMITT TRIGGERS I/P FILTER RESPONSE 1USEC TO 10MS	PR 1611		1			
	DUAL 16 BIT INPUT REGISTER (TTL LEVELS, CERN SPECS 072)	2IR 2002	SEN	1	/72		13.1112
	DUAL 16 BIT INPUT REGISTER(EXT STROBE OR DATAWAY COMMAND STORES DATA,TTL LEVELS)	2IR 2010	SEN	1	/70		13.1113
	DUAL INPUT REGISTER (16BIT)	PR 601	STND ENGINEERING	1	/73		13.1114
	DIGITAL INPUT (2X16BIT FLOATING INPUT)	C 76451-A8-A3	SIEMENS	1	/73	(6)	13.1115
	DUAL 24 BIT PARALLEL INPUT REGISTER(TTL)	2322	BI RA SYSTEMS	1	/73		13.1116
	DUAL 24 BIT INPUT REGISTER (TTL, HANDSHAKE)	RI-224	EG&G/ORTEC	1	/72		13.1117
	DUAL INPUT REGISTER(2X24BIT,LAM & STROBE I/P & DATA-READ-STROBE O/P PER CHANNEL)	PR 2400 SERIES	GEC-ELLIOTT	1	/73		13.1118
	CAMAC UNTERM. I/P'S VIA SCHMITT TRIGGERS I/P FILTER RESPONSE 1USEC TO 10MS	PR 2401		1	/73		
	(SAME BUT WITH TWISTED PAIR INPUTS)	PR 2402		1	/73		
	(SAME BUT WITH OPTICAL ISOLATION INPUT, LOGIC 1 = 5V OR 12MA)	PR 2403		1	/73		
	DUAL INPUT REGISTER (2X24BIT,I/P INTEGR TTL, FULL LAM, OUTPUT STROBES)	220	HYTEC	1	/73		13.1119
	INPUT REGISTER (2X24BIT, 3 MODES OF DATA ENTRY, LED DISPLAY)	IR	JOERGER	1	/72	(7)	13.1120
	DUAL PARALLEL INPUT REGISTER(2X24BIT,EXT LOAD REQUEST,4 OPER MODES,TTL LEVELS)	60A	JORWAY	1	/70		13.1121
	24-BIT DUAL PARALLEL INPUT REGISTER (A HAS LO-Z, B HAS UNTERMINATED INPUT)	9041A/9041B	NUCL. ENTERPRISES	1	/72	(7)	13.1122
	PARALLEL INPUT REGISTER (2X24 BITS)	J RE 10	SCHLUMBERGER	1	/73	(7)	13.1123
	DUAL 24 BIT PARALLEL INPUT REGISTER (WITH LED DISPLAY OPTION)	PR-604	STND ENGINEERING	1	/72		13.1124
	DUAL INPUT REG.(2X24BIT,SEP.TIMING,LOGIC BITWISE POS/NEG,4TIMING& 3DATA IN MODES)	C-IC-48	WENZEL ELEKTRONIK	1	/75		13.1125
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13.1126
	DIGITAL INPUT REGISTER, EXTERNAL STROBE (4X8BIT INPUT LATCHES, 1X8BIT SET LAM)	DO 200-2004	DORNIER	1	/73		13.1127
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-2204		1	/73		

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.

123 Terminated Signal Input Registers (Coinc. Latch, Pattern etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	12 BIT PARALLEL INPUT REGISTER (NIM)	2351	BI RA SYSTEMS	1	/73		13,1128
	STROBED INPUT REGISTER (12BIT COINC AND LATCH,NIM LEVELS,PATTERN AND L-REQ APPL)	SIR 2026	SEN	1	/70		13,1129
	16BIT DISCRIMINATOR-COINCIDENCE REGISTER	2352	BI RA SYSTEMS	2	01/75		13,1130
	FAST COINCIDENCE LATCH(16BIT,DISCR I/P, MIN 2 NSEC STROBE-SIGNAL OVERLAP)	64	JORWAY	1	/71	(1)	13,1131
	16 FOLD DCR (16 DISCR, COMMON STROBE, -70MV THRESHOLD, FAST SUMMING OUTPUTS)	2340B	LRS-LECROY	2	/71	(6)	13,1132
	16-CH COINCIDENCE REGISTER (STROBE I/P, 2NS OVERLAP,FAST SUM O/P AND CLEAR,NIM)	2341S	LRS-LECROY	1	/71	(4)	13,1133
	PATTERN UNIT (16 INDIV NIM INPUTS,COMMON NIM GATE)	021	NUCL. ENTERPRISES	2	/71	(5)	13,1134
	FAST INPUT REGISTER (ASSEMBLES 16BIT WORDS FROM IL2 INPUTS)	9053	NUCL. ENTERPRISES	1	/74		13,1135
	PATTERN UNIT(16BIT,I/P STROBED WITH COMMON GATE,10 NSEC OVERLAP,NIM LEVELS)	C 101	RDT	2	/71		13,1136
	16 BIT PATTERN UNIT (NIM I/P AND GATE)	J PU 10	SCHLUMBERGER	1	/72		13,1137
	PATTERN UNIT 16 BIT (16 INDIVIDUAL NIM INPUTS,COMMON NIM GATE, CERN SPECS 021)	16P 2007	SEN	2	/70		13,1138
	16 BIT PATTERN UNIT (CERN 071, 16 INDIV NIM INPUTS,COMMON NIM GATE,LED DISPLAY)	16P 2047	SEN	1	/72	(11)	13,1139
	COINCIDENCE REGISTER/LATCH (16 CHANNEL)	CR 116	STND ENGINEERING	1	/74		13,1140
	COINCIDENCE REGISTER/LATCH (16 CHANNEL)	CR 216	STND ENGINEERING	1	/74		13,1141
	COINCIDENCE REGISTER (16 CH,COMMON GATE, MIN OVERLAP 2NS,DOUBLE PULSE RESOL 10NS)	CR-6001	STND ENGINEERING	1	/74	(12)	13,1142
	COINCIDENCE LATCH (24 NIM INPUTS WITH COMMON STROBE, EXT RESET, 2NSEC OVERLAP)	C124	EG&G/ORTEC	2			13,1143
	COINCIDENCE REGISTER/LATCH (24 CHANNEL)	CR 224	STND ENGINEERING	1	/74		13,1144
	COINCIDENCE BUFFER (2X12BIT,ONE STROBE PER 12BITS,MIN 2NS OVERLAP,NIM INPUTS)	C212	EG&G/ORTEC	2	/71		13,1145

124 Manual Input Modules (Word Generators, Parameter Units)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PARAMETER UNIT 12 BIT (PROVIDES 12 BIT COMMUNICATION,PUSH BUTTON L-REQUEST)	P 2005	SEN	1	/70		13,1146
	MANUAL INPUT REGISTER (INPUTS A HAND-SET 16-BIT WORD, MANUAL AND ELECTR LAM I/P)	1041	BORER	1	/73	(8)	13,1147
	24 BIT PARAMETER UNIT	2501	BI RA SYSTEMS	1	/73		13,1148
	WORD GENERATOR (24BIT WORD MANUALLY SET BY SWITCHES)	WG 2401	GEC-ELLIOTT	1	/71		13,1149
	DATA SWITCHES (16/24 BITS,READABLE + CONTENT ADDR)	C 322	INFORMATEK	1	/72		13,1150
	MANUAL INPUT/OUTPUT REGISTER (24 BITS, SWITCH I/P + LAM, 24 LED O/P REGISTER)	201	JORWAY	1	/74	(11)	13,1151
	24-BIT MANUAL INPUT	3460	KINETIC SYSTEMS	1	/73		13,1152
	WORD GENERATOR (24 BITS OF BINARY DATA, SWITCH SELECTED)	9020	NUCL. ENTERPRISES	1	/71	(2)	13,1153
	24 BIT WORD GENERATOR , WITH LAM	WGR-241	STND ENGINEERING	1	/73		13,1154
	MANUAL REGISTER (FOUR 16 BIT WORDS)	231	POLON	3	/74		13,1155
	PARAMETER UNIT (QUAD 4-DECADE BCD PARAMETERS MANUALLY SET)	022	NUCL. ENTERPRISES	4	/71	(2)	13,1156
	PARAMETER UNIT (QUAD 4 DECADE BCD PARAMETERS MANUALLY SET)	C 105	RDT	4	/71		13,1157

127 Other Parallel Input Modules (Incl. Lam and Status Registers, see 232 for Lam Grader)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	24-BIT INTERRUPT REGISTER (STATUS COMPARED,CHANGE GIVES LAM)	1051	BORER	1	/72	(3)	13,1158
	PRIORITY INPUT REGISTER(12BITS ORED TO LAM,FAST COINC LATCH APPL,MASK REGISTER)	63	JORWAY	2	/70		13,1159
	INPUT REGISTER (12 BIT, ORED TO LAM, COINCIDENCE LATCH APPL, NIM INPUTS)	65	JORWAY	1	/74		13,1160

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	INTERRUPT REQUEST REGISTER	EC 218	NUCL. ENTERPRISES	1			13.1161
	LAM REQUEST REGISTER (16 BIT)	300	POLON	1	/74		13.1162
	INTERRUPT ALARM REGISTER (16 BITS, INDIVIDUALLY MASKABLE)	J IR 10	SCHLUMBERGER	1	/74	(11)	13.1163
	64 LINE SURVEYOR (SINGLE OR CONTINUOUS SURVEY CYCLES, 3 SURVEY MODES)	64LS 2052	SEN	1		(9)	13.1164
	ISOLATED INTERRUPT GATE(16BIT,*=D FOR 12,24 OR 48V,*=A FOR 115VAC VERSION)	AIG 302*	STND ENGINEERING	1	/74		13.1165
	INTERRUPT GATE (16BIT,CONTACT CLOSURE)	AIG 302C	STND ENGINEERING	1	/74		13.1166
	ISOLATED INTERRUPT REGISTER(16BIT,*=D FOR 12,24 OR 48VDC,*=A FOR 115VAC)	AIR 302*	STND ENGINEERING	1	/74		13.1167
	INTERRUPT REGISTER(16BIT,COTACT CLOSURE)	AIR 302C	STND ENGINEERING	1	/74		13.1168
	INTERRUPT GATE (24BIT)	IG 304	STND ENGINEERING	1	/74		13.1169
	DUAL INTERRUPT GATE (24BIT)	IG 604	STND ENGINEERING	1	/74		13.1170
	INTERRUPT REGISTER (12BIT) INTERRUPT REGISTER (16BIT) INTERRUPT REGISTER (24BIT)	IR 012 IR 016 IR 024	STND ENGINEERING	1 1 1	/74 /74 /74		13.1171
	INTERRUPT REGISTER (24BIT)	IR 304	STND ENGINEERING	1	/74		13.1172
	STATUS INTERRUPT (24BIT,I/P&LATCH&LAM& MASK,GROUP&SEL=LAM=TEST,VAR.LOGIC&LEVEL)	C=SI=24	WENZEL ELEKTRONIK	1	/74	(12)	13.1173

13 Digital Output Modules — Serial: Clocks, Timers, Pulse Generators, Parallel: TTL Output, Drivers

131 Serial Output Modules (Clocks, Timers, Pulse GEN)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PRESET SCALER (LEVEL OR PULSE TRAIN O/P, DURATION SET BY COMMAND,SINGLE & REPEAT)	PSR 0801	GEC=ELLIOTT	1	/73		13.1174
	CRYSTAL CLOCK GENERATOR (7 TTL OUTPUTS FOR 1HZ TO 1MHZ FREQUENCY DECADES)	FHC 1303	FRIESEKE	1	/71	(1)	13.1175
	CRYSTAL CONTROLLED PULSE GENERATOR(7 DECADES=1HZ TO 1MHZ=500NS PULSES OUT,TTL)	PG 0001	GEC=ELLIOTT	1	/71		13.1176
	REAL TIME CLOCK (4SEC CLOCK/5MSEC STOP WATCH)	C 320	INFORMATEK	1	/72		13.1177
	CLOCK GENERATOR (INT 10MHZ, EXT 50MHZ, 8 DECADE STEPS,PLUS PROGRAMMABLE OUTPUT)	CG	JOERGER	1	/72	(7)	13.1178
	GATED CLOCK (10MHZ TO 1HZ, INT=EXT CLOCK, SYNCHRONOUS GATING)	217	JORWAY	1	/74	(11)	13.1179
	CLOCK PULSE GENERATOR (7 OUTPUTS=1HZ TO 1MHZ=IN DECADE STEPS,10MHZ EXT IN,TTL)	7019=1	NUCL. ENTERPRISES	1	/70		13.1180
	CLOCK GENERATOR(INTERN 1MHZ, EXT 10MHZ, 7 DECADES 1HZ=1MHZ TTL O/P,5USEC WIDTH)	730A	POLON	1	/74		13.1181
	CLOCK PULSE GENERATOR(7 DECADES=1HZ TO 1MHZ=500 NSEC PULSES OUT,TTL AND NIM)	C 109	RDT	1	/71		13.1182
	1 HZ = 1 MHZ QUARTZ CLOCK (7 O/P = 1HZ TO 1MHZ=200 TO 800 NSEC WIDTH,TTL LEVEL)	J HQ 10	SCHLUMBERGER	1	/71		13.1183
C	QUARZ=CLOCK WITH 2 TIMER FUNCTIONS	C 76451=A14=A2	SIEMENS	1	/72		13.1184
	CAMAC=CLOCK=GENERATOR(7 DECADES=10MHZ TO 1HZ,50/500 NSEC O/P PULSES,2,8V/50 OHMS)	C=CG=10	WENZEL ELEKTRONIK	1	/71		13.1185
	CLOCK/TIMER (0,001S TO 10 HRS TIME INTERVAL,TIME=OF=DAY OUTPUT)	1411	BORER	1	/72	(3)	13.1186
	REAL TIME CLOCK, LIVE TIME INTEGRATOR, PRESET TIMER	RC014	EG&G/ORTEC	1	/73		13.1187
	REAL TIME CLOCK (COUNTS .1 SEC TO 999 DAYS, DISPLAYS HRS/MIN/SEC, 50/60HZ GEN)	RTC	JOERGER	2	/73	(7)	13.1188
	REAL TIME CLOCK	9064	NUCL. ENTERPRISES	1		(10)	13.1189
	REAL TIME CLOCK (3,8 USEC TO 18,2 HRS, PRESET=TIME AND PRESET=COUNT MODES)	RTC 2014	SEN	1	/71		13.1190
	INTERVAL TIMER/WATCHDOG (100USEC=300SEC INTERVAL, 1 SEC==100 SEC TIMEOUT)	EC 384	SENSION	1	/74	(13)	13.1191
	REAL TIME CLOCK (PRESET COUNTER, PRESET TIMER 3,8USEC TO 18,2 HRS, ELAPSE TIME)	RTC 018	STND ENGINEERING	1	/74	(12)	13.1192
	DEAD TIME COUNTER	2203	BI RA SYSTEMS	1	/74		13.1193
	TIMER MODULE	3655	KINETIC SYSTEMS	1	/73		13.1194
	TIME BASE (10 TO 100MHZ IN INCREMENTS OF 10MHZ, USED WITH TD 2031/TD 2041)	TB 2032	SEN	1	/71		13.1195

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TIMER (MIN 1USEC,OVF FROM COUNTER-PP1)	C 76451-A12-A1	SIEMENS	2	/73	(6)	13,1196
	TEST PULSE GENERATOR (5 TO 50 NSEC NIM O/P PULSE DERIVED FROM S1,F(25) OR EXT)	TPG 0202	GEC-ELLIOTT	1	/71		13,1197
	TEST PULSE GENERATOR (NIM PULSE PAIR)	215	JORWAY	1	/75		13,1198
	8 CHANNEL DELAY GENERATOR (DELAY 0 TO 99 TIMES CLOCK, DELAYS CASCADABLE)	220	JORWAY	1	/74	(11)	13,1199
	DUAL PROGRAMMED PULSE GENERATOR(50HZ/ 2KHZ/5MHZ PULSE TRAIN,LENGTH BY COMMAND)	2PPG 2016	SEN	1	/71		13,1200

132 Parallel Output Registers (TTL, HTL, NIM etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	OPTICAL ISOLATED OUTPUT REGISTER	3601	BI RA SYSTEMS	1	/74		13,1201
	12 BIT PARALLEL OUTPUT REGISTER (NIM)	3251	BI RA SYSTEMS	1	/73		13,1202
	16 BIT PARALLEL OUTPUT REGISTER (BIT ADDRESSABLE, NIM LEVELS OR PULSES)	C 343	INFORMATEK	1	/73		13,1203
	12 BIT OUTPUT REGISTER(DC OR PULSE O/P, UPDATING STROBE OUTPUT,NIM LEVELS)	41	JORWAY	1	/71	(2)	13,1204
	OUTPUT REGISTER (12BIT, NIM PULSES OR LEVELS OUT)	OR 2027	SEN	1	/70		13,1205
	OUTPUT REGISTER (12BIT)	PR 312	STND ENGINEERING	1	/73		13,1206
	DIFFERENTIAL OUTPUT REGISTER	3030	KINETIC SYSTEMS	1	/72	(8)	13,1207
	OUTPUT REGISTER (12 CHANNEL)	OR 612	STND ENGINEERING	1	/73		13,1208
C	OUTPUT REGISTER (24BIT TTL VIA SPEC CONN 8BIT ALSO VIA FRONT PANEL LEMO)	FHC 1309	FRIESEKE	1	/72		13,1209
N	OUTPUT REGISTER (24 BIT, 16 MA 5V OUT)	9600A	NUCL. ENTERPRISES	0		(13)	13,1210
N	OUTPUT REGISTER (24BIT,OPTO-COUPLER,7MA)	9603	NUCL. ENTERPRISES	0		(13)	13,1211
	OUTPUT REGISTER (24BIT WORD, TTL O/P VIA 37-WAY CONN)	351	POLON	1	/73		13,1212
	OUTPUT REGISTER (24BIT)	PR 314	STND ENGINEERING	1	/73		13,1213
	PARALLEL OUTPUT REG. (24BIT,NEG/OPT POS TTL,ADJ, DURATION&LEVEL,4 TIMING MODES)	C-OC-24	WENZEL ELEKTRONIK	1	/73	(10)	13,1214
	DUAL 16BIT PARALLEL OUTPUT REGISTER(TTL)	3212	BI RA SYSTEMS	1	/73		13,1215
	DUAL 16 BIT OUTPUT REGISTER (SELECTABLE O/P STAGES ON PLUGABLE PC, FP CONNECTOR)	2OR 2051	SEN	1		(9)	13,1216
	DUAL 24 BIT PARALLEL OUTPUT REGISTER	3222	BI RA SYSTEMS	1	/73		13,1217
	OUTPUT REGISTER (2X24BIT DATA OUT,DATA-READY + BUSY FORM HANDSHAKE, TTL)	RO-224	EG&G/ORTEC	1	/72		13,1218
	OUTPUT REGISTER (2X24BIT OR 6X8BIT, LED DISPLAY)	OR	JOERGER	1	/72	(7)	13,1219
	24-BIT DUAL OUTPUT REGISTER	9042	NUCL. ENTERPRISES	1	/72	(7)	13,1220
	DUAL OUTPUT REGISTER (2X24BIT, DATAWAY READ AND WRITE, HANDSHAKE CONTROL, LO-Z)	9043A	NUCL. ENTERPRISES	1		(7)	13,1221
	(SAME BUT HI-Z)	9043B		1		(7)	
	PARALLEL OUTPUT REGISTER (2X24 BITS)	J RS 10	SCHLUMBERGER	1	/73	(7)	13,1222
	DUAL 24 BIT PARALLEL OUTPUT REGISTER (WITH LED DISPLAY OPTION)	PR-612	STND ENGINEERING	1	/71	(6)	13,1223
	DIGITAL OUTPUT REGISTER (4X8BIT PARALL OUTPUT REGISTER,NO L,TTL,1mH)	DO 200-2501	DORNIER	1	/71		13,1224
	(WITH FRONT PANEL CONNECTOR)	DO 200-2701		1	/72		
	(MODULE WITH ONLY LOGIC BOARD)	DO 200-2500		1	/73		
	DIGITAL OUTPUT REGISTER (4X8BIT PARALLEL OUPTPUT REGISTER, HLL 12V)	DO 200-2505	DORNIER	1	/73		13,1225
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-2705		1	/73		
	(SAME, NO F.P. CONNECTOR, INVERTING)	DO 200-2506		1	/73		
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-2706		1	/73		
	DIGITAL OUTPUT REGISTER (4X8BIT PARALLEL OUPTPUT REGISTER, HLL 24V)	DO 200-2507	DORNIER	1	/73		13,1226
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-2707		1	/73		
	(SAME, NO F.P. CONNECTOR, INVERTING)	DO 200-2508		1	/73		
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-2708		1	/73		
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13,1227
	128 BIT OUTPUT REGISTER (ADDRESSABLE AS 8 16BIT OR 128 1-BIT WORDS)	C 342	INFORMATEK	1	/73		13,1228

133 Parallel Output Drivers (Open Coll., Relay, etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TRIAC OUTPUT REGISTER (8 BITS, 2 AMPS, ZERO VOLTAGE SWITCHING)	LT	JOERGER	1	/74	(13)	13,1229
	8 CHANNEL TIMED TRIAC OUTPUT	3040	KINETIC SYSTEMS	2	/74	(13)	13,1230
	8 BIT TRIAC OUTPUT REGISTER	3080	KINETIC SYSTEMS	1	/73		13,1231
	12-BIT OUTPUT REGISTER (WITH OPTICAL ISOLATION,OPEN COLL O/P, MAX 30V/100MA)	3082	KINETIC SYSTEMS	1			13,1232
	12-BIT OUTPUT REGISTER WITH ISOLATED RELAY	3087	KINETIC SYSTEMS	1	/71	(4)	13,1233
	SWITCH (12BIT DATAWAY CONTROLLED RELAY REGISTER FOR SWITCHING AND MULTIPLEXING)	7066-1	NUCL. ENTERPRISES	1	/71		13,1234
	DRIVER (16BIT,OPEN COLLECTOR OUTPUT VIA MULTIWAY CONNECTOR,MAX 150MA/LINE)	9002	NUCL. ENTERPRISES	1	/71		13,1235
	OUTPUT REGISTER (16BIT, 48V/.05A MAX, 2X37-WAY O/P CONN)	360	POLON	1	/73		13,1236
	OUTPUT REGISTER (16BIT,250V/.1A MAX, 2X37-WAY O/P CONN)	360A		1	/73		
	(SAME, 25V/1A MAX)	360B		1	/73		
	RELAY DRIVER (16 WAY RELAY OUTPUT)	J RD 10	SCHLUMBERGER	1	/73	(8)	13,1237
	PARALLEL OUTPUT REGISTER (16BIT REED RELAY,MAX SWITCHED PWR 10W,4 TIMING MODES)	C-OR-16	WENZEL ELEKTRONIK	1	/72	(10)	13,1238
	DRIVER (24BIT OUTPUT REGISTER,SET AND READ BY COMMAND,24BIT I/P DATA ACCEPTED)	9017	NUCL. ENTERPRISES	1	/71	(1)	13,1239
N	OUTPUT REGISTER (24 BIT, 40 MA 30V OUT)	9600B	NUCL. ENTERPRISES	0		(13)	13,1240
N	(SAME INVERTED OUTPUTS)	9600C		0		(13)	
N	OUTPUT REGISTER (24 BIT, 1 AMP 60V OUT)	9601	NUCL. ENTERPRISES	0		(13)	13,1241
N	(SAME WITH RELAY CONTACTS, MUX CONCEPT)	9602A		0		(13)	
N	(SAME WITH RELAY CONTACTS,FREE CONTACTS)	9602B		0		(13)	
	OUTPUT REGISTER (2X16BIT,OPEN COLLECTOR)	1084	BORER	1	/74		13,1242
	OUTPUT DRIVER(2X16BIT,40MA SINKING,1=LO, DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 1613	GEC-ELLIOTT	1	/72		13,1243
	(SAME, 1=HI)	OD 1614		1	/72		
	OUTPUT DRIVER(2X16BIT,125MA SINKING,1=LO DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 1617	GEC-ELLIOTT	1	/72		13,1244
	(SAME, 1=HI)	OD 1618		1	/72		
	OUTPUT DRIVER(2X16BIT,TOTEMPOLE,30 LOADS DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 1620	GEC-ELLIOTT	1	/72		13,1245
	2X16 OR 4X8 BIT OUTPUT REGISTER	J RS 30	SCHLUMBERGER	1	/74	(11)	13,1246
	DUAL 16 BIT OUTPUT REGISTER (TTL LEVELS, OPEN COLL OUTPUTS VIA CABLE)	20R 2008	SEN	1	/70		13,1247
	DUAL OUTPUT DRIVER (200MA SINKING,24V)	20R 2051HC	SEN	1		(9)	13,1248
	DUAL OUTPUT DRIVER (HI VOLTAGE DRIVER)	20R 2051HV	SEN	1		(9)	13,1249
	DIGITAL OUTPUT (2X16BIT, MAX 30V)	C 76451-A9-A4	SIEMENS	1	/73	(6)	13,1250
	OUTPUT REGISTER (2X16BIT VIA ISOLATING CONTACTS)	1082	BORER	1	/72	(4)	13,1251
	DIGITAL OUTPUT (2X16BIT RELAYS)	C 76451-A9-A3	SIEMENS	1	/73	(6)	13,1252
	PARALLEL-OUTPUT-REGISTER (DUAL 24BIT, OR QUAD 12BIT,OPEN COLLECTOR OUTPUT)	MS PO 1 1230/1	AEG-TELEFUNKEN	1	/70	(1)	13,1253
	PARALLEL-OUTPUT REGISTER (24BIT, OPEN COLLECTOR OUTPUT, HANDSHAKE FACILITY)	MS PO 2 1230/1	AEG-TELEFUNKEN	1	/72	(4)	13,1254
	OUTPUT DRIVER(2X24BIT,40MA SINKING,1=LO, DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 2403	GEC-ELLIOTT	1	/72		13,1255
	(SAME, 1=HI)	OD 2404		1	/72		
	OUTPUT DRIVER(2X24BIT,125MA SINKING,1=LO DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 2407	GEC-ELLIOTT	1	/72		13,1256
	(SAME, 1=HI)	OD 2408		1	/72		
	OUTPUT DRIVER(2X24BIT,TOTEMPOLE,30 LOADS DATAWAY READ & WRITE,LAM I/P,STROBE O/P)	OD 2410	GEC-ELLIOTT	1	/72		13,1257
	DUAL OUTPUT REGISTER (2X24BIT, OPEN COLL O/P, FULL LAM, OUTPUT STROBES)	200-2	HYTEC	1	/73		13,1258
	OUTPUT REGISTER (2X24BIT OR 6X8BIT, 250MA SINKING, DIODE CLAMPED)	OR-1	JOERGER	1	/73		13,1259
	DUAL 24 BIT OUTPUT REGISTER(DC OR PULSE O/P,UPDATING O/P STROBE,TTL OPEN COLL)	40	JORWAY	1	/71	(2)	13,1260
	DUAL 24 BIT OUTPUT REGISTER (DC OR PULSE O/P UPDATING, 300MA SINK, DIODE CLAMPED)	40-2	JORWAY	1	/74		13,1261

X

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DUAL 24-BIT OUTPUT REGISTER (OPEN COLL DRIVERS, MAX 24V OR 250MA, REAR OUTPUTS)	3072	KINETIC SYSTEMS	1			13,1262
	DIGITAL OUTPUT REGISTER (4X8BIT PARALLEL OUTPUT REGISTER,NO L,OPEN COLL O/P,1=HI)	DO 200-2502	DORNIER	1	/72		13,1263
	(SAME WITH FRONT PANEL CONNECTOR, 1=HI)	DO 200-2702		1	/72		
	(SAME, NO F.P. CONNECTOR, 1=LO)	DO 200-2503		1	/72		
	(SAME WITH F.P. CONNECTOR, 1=LO)	DO 200-2703		1	/72		
	DIGITAL OUTPUT REGISTER WITH REED RELAYS (4X8BIT OUTPUT REG,OPEN CONTACT=0)	DO 200-2504	DORNIER	1	/71		13,1264
	(WITH FRONT PANEL CONNECTOR)	DO 200-2704		1	/71		
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13,1265

14 Digital I/O, Peripheral and Instrumentation Interfacing modules — Serial and Parallel I/O Regs, Printer-, Tape-, DVM-, Plotter- and Analyser Interfaces, Step-Motor Drivers, Supply CTR, Displays

141 Serial Input/Output Modules (General Purpose)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	SERIAL INPUT/OUTPUT REGISTER 16BIT CODED	9063	NUCL. ENTERPRISES	1	/74	(13)	13,1266

142 Parallel I/O Registers (General Purpose)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	UNIVERSAL INPUT/OUTPUT REGISTER (36BIT DATA+RANGE IN,12BIT REG O/P FOR CONTROL)	1031	BORER	1	/72	(3)	13,1267
	UNIVERSAL INPUT/OUTPUT REGISTER	SPS 2090	NUCL. ENTERPRISES	1	01/75	(12)	13,1268
	16 BIT INPUT/OUTPUT REGISTER (O/P STAGES ON PLUGABLE PC, FP CONNECTOR)	IOR 2053	SEN	1	/74	(11)	13,1269
	INPUT/OUTPUT REGISTER (24 BITS IN, 12 BITS OUT, OPTICALLY COUPLED)	IOR-1	JOERGER	1	/74	(11)	13,1270
	INPUT/OUTPUT REGISTER (24BIT)	IO 302	STND ENGINEERING	1	02/75		13,1271
N	INPUT/OUTPUT REGISTER (24BIT, INTEGRATED INPUT, OUTPUT STROBES, FULL LAM)	210	HYTEC	1	07/75		13,1272
N	INPUT/OUTPUT REGISTER (24 BIT, POS & NEG LOGIC O/P SINKING 450 MA)	9048	NUCL. ENTERPRISES	1			13,1273
	DUAL INPUT DUAL OUTPUT REGISTER (16BIT, TTL IN, OPEN COLL TTL OUT, MAX 40MA,30V)	C110	RDT	1	/72		13,1274
	INPUT/OUTPUT REGISTER(2X24BIT IN,2X12BIT OUT, 3 ENTRY MODES, LED DISPLAY)	IR-1	JOERGER	1	/72	(7)	13,1275
	BUFFER STORE/REGISTER (32X24BIT,WITH EXTERNAL ADDRESSING FACILITY)	104	HYTEC	1			13,1276
	(SAME, 32X24BIT, WITHOUT EXT ADDR)	100		1			
	(SAME, 32X16BIT, WITHOUT EXT ADDR)	101		1	/72		
	BUFFER STORE/REGISTER (32X16BIT, WITH EXTERNAL ADDRESSING FACILITY)	105	HYTEC	1			13,1277
	(SAME, 16X24BIT, WITHOUT EXT ADDR)	102		1	/72		
	(SAME, 16X16BIT, WITHOUT EXT ADDR)	103		1	/73		

143 Peripheral Interfacing Modules (For TTY, Tape etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DESK CALCULATOR CTRL (DIEHL INTERFACE TO FHC 1301/02/11 AND FHC 1309)	FHC 1312	FRIESEKE	1	/72		13,1278
	INTERFACE FOR ASR33 TTY,SERIAL DATA LINK	6711	BI RA SYSTEMS	1	/74		13,1279
	TELETYPE O/P CTRL (IO FHC 1301/02/11 AND FHC 1309 VIA SPEC CONN,TTY MOTOR ON/OFF)	FHC 1307	FRIESEKE	1	/71		13,1280
	TELETYPE INTERFACE	90	JORWAY	2	/71		13,1281
	TELETYPEWRITER INTERFACE(I/O DATA TRANSF AND CONTROL,LAM USED AS TWO-WAY FLAG)	7061-1	NUCL. ENTERPRISES	1	/70	(1)	13,1282
	TELETYPE INTERFACE (FOR ASR 33, SER I/O)	500	POLON	1	/74		13,1283
	TERMINAL DRIVER	J TY 20	SCHLUMBERGER	1	/73	(11)	13,1284
	TELETYPE OR CRT INTERFACE	TCO 100	STND ENGINEERING	1	/74		13,1285
	VERSATEC LINE PRINTER INTERFACE	3320	KINETIC SYSTEMS	1	/72		13,1286
	INTERFACING OUTPUT UNIT(8BIT DATA, CONTR & STATUS REGS, FOR FACIT SP1 INTERFACE)	SP1/ACCEPTOR	ARSYCOM	1	/74	(12)	13,1287
C	PAPER TAPE PUNCH INTERFACE, COUPLES TO FACIT 4070,DATA DYNAMICS,RACAL DIGISTORE	TP 0801	GEC-ELLIOTT	1	01/75	(1)	13,1288
	INTERFACING INPUT UNIT (8BIT DATA/STATUS & CONTR REGS, FOR FACIT SP1 INTERFACE)	SP1/SOURCE	ARSYCOM	1	/74	(12)	13,1289
C	PAPER TAPE READER INTERFACE (COUPLES TO LINWOOD, TREND, & RACAL DIGISTORE)	TR 0801	GEC-ELLIOTT	1	01/75	(1)	13,1290

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	MAGNETIC TAPE INTERFACE (TAPE DECKS OR CASSETTES)	CS 0042	NUCL. ENTERPRISES	1	/73	(8)	13,1291
	CASSETTE INTERFACE (READS & WRITES BY 8 OR 16BIT WORDS, 8BIT LAM REG) CONTROLS--	J CK 10	SCHLUMBERGER	1	/75	(12)	13,1292
	CASSETTE DRIVER FOR 1 CASSETTE	C CK 10			/75	(12)	
	CASSETTE DRIVER FOR 2 CASSETTES	C CK 11			/75	(12)	
	PORTABLE CASSETTE DRIVER(FOR 1 CASSETTE)	P CK 10	SCHLUMBERGER		/75		13,1293
N	DISK DRIVE FOR CDS-110	9370	NUCL. ENTERPRISES	NA		(13)	13,1294
N	INTERFACE FOR DISK DRIVE	9370		0		(13)	
	UNIVERSAL ASYNCHRONOUS TRANSMITTER/RECEIVER (129 CHAR,BUFFER)	C 317	INFORMATEK	1	/73		13,1295
	PERIPHERAL READER(8BIT PARALLEL DATA IN, NEG OR POS TTL,HANDSHAKE CONTROLS)	7064-1	NUCL. ENTERPRISES	1	/71	(1)	13,1296
	PERIPHERAL DRIVER (8BIT DATA OUT,NEG OR POS TTL,HANDSHAKE CONTROLS)	7065-1	NUCL. ENTERPRISES	1	/71	(1)	13,1297

144 Display Modules, Display and Plotter Interfacing

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	24 BIT LED BCD DISPLAY (ONE FHC 1301/02/11 VIA SPEC CONNECTOR)	FHC 1305	FRIESEKE	1	/71	(1)	13,1298
	24 BIT NIXIE BCD DISPLAY (SELECTS ONE OF 10 FHC 1301/02/11 VIA SPEC CONNECTION)	FHC 1306	FRIESEKE	2	/71	(1)	13,1299
	24 BIT LED BINARY DISPLAY (ONE FHC 1313 OR FHC 1309 VIA SPECIAL CONNECTION)	FHC 1315	FRIESEKE	1	/72		13,1300
	DECIMAL DISPLAY UNIT (ADDRESS AND 5 DATA DECADES + MULTIPLIER DISPLAYED)	9007	NUCL. ENTERPRISES	NA	/71		13,1301
	DISPLAY CONTROLLER (FOR 9007,INCLUDES BIN TO DECIMAL CONVERTER)	9006		2	/71		
	COLOUR DISPLAY INTERFACE	9062	NUCL. ENTERPRISES	NA	04/75	(12)	13,1302
	EXTERNAL DISPLAY FOR J EA 10 SCALER	C AE 10	SCHLUMBERGER	NA	/73		13,1303
	SCALER DISPLAY THROUGH,COMPUTER (DISPLAY OF 24BIT WORD, 30MHZ)	J AF 15	SCHLUMBERGER	2	/71		13,1304
	MANUAL BINARY DISPLAY (CONTENT OF A REGISTER DISPLAYED,EXT MULTIWAY CONN)	J AF 20	SCHLUMBERGER	1	/71		13,1305
	GRAPHIC DISPLAY DRIVER FOR HP1311/TEK604	4301	BI RA SYSTEMS	1	/74		13,1306
	GRAPHIC DISPLAY DRIVER FOR STORAGE DISPLAY TEK 602	4301A	BI RA SYSTEMS	2	/74		13,1307
N	INTERACTIVE GRAPHICS DISPLAY PROCESSOR	DP 1603	GEC-ELLIOTT	4	09/75		13,1308
N	128 CHARACTERS, 9X7 DOT MATRIX, 4 SIZES, VECTORS,ARCS,CIRCLES IN THREE LINE TYPES	DP 1603A		2			
N	LIGHT PEN & TRACKER BALL INPUTS. 32 CONTROL INSTRUCTIONS. BUILT IN 4K STORE.	DP 1603B		2			
	CRT DECIMAL DISPLAY SYSTEM (INCLUDING)	72A	JORWAY	NA	/71	(2)	13,1309
	DISPLAY DRIVER	72A		5			
	DISPLAY SYSTEM COMPRISING		KINETIC SYSTEMS		/71	(4)	13,1310
	DISPLAY SYNCHRONIZING (COMPATIBLE WITH 60HZ 525 LINE MONITORS)	3200		1	/71		
	DISPLAY SYNCHRONIZING (COMPATIBLE WITH 50HZ 625 LINE MONITORS)	3200E		1	/74	(12)	
	DISPLAY TIMING	3205		1	/71		
	DISPLAY CONTROL	3210		1	/71		
	DISPLAY REFRESH (ALPHANUMERIC + GRAPHS)	3212		1	/71		
	DUAL LIGHT PEN INTERFACE	3225		1	/72		
	COLOR MONITOR	RGB 5200 M			/71		
	STORAGE DISPLAY DRIVER	3260		1	/72		
	DISPLAY DRIVER (TWO 10BIT DAC,OUTPUT RANGE +5V TO -5V,TWO OPERATION MODES)	7011-2	NUCL. ENTERPRISES	2	/70	(1)	13,1311
	STORAGE OSCILLOSCOPE (DRIVER FOR TEKTRONIX 611 OR 601,USED WITH 7011)	9028	NUCL. ENTERPRISES	1	/71	(2)	13,1312
	SCOPE DISPLAY DRIVER	J DD 10	SCHLUMBERGER	2	/73	(7)	13,1313
	MANUAL CONTROL OF J DD 10	MC 10		NA			
	SCOPE DISPLAY DRIVER X-Y-Z (SYSTEM)	FDD 2012	SEN	1	/71	(1)	13,1314
	STORAGE DISPLAY DRIVER FOR TEKTRONIX 611 OR 601	SDD 2015		1	/71	(1)	
	CHARACTER GENERATOR	CG 2018		1	/71	(1)	
	VECTOR GENERATOR	VG 2028		1	/71	(1)	
	LIGHT PEN FOR FDD 2012 OR CG 2018	LP 2035			/71		
	PLOTTER DRIVER	J XY 10	SCHLUMBERGER	1	/73	(8)	13,1315

145 Instrumentation Interfacing Modules (DVM, Supply CTR, Stepping Motor Drivers, Pulse Analyser CTR)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DUAL 15 CHANNEL SERIAL OUTPUT MODULE (STEPPER MOTOR CONTROLLER, TTL)	3101	BI RA SYSTEMS	2	/73		13,1316

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	STEP MOTOR DRIVER (MAX 32768 STEPS,RATE, ROTATION AND START/STOP FULLY COMMANDED)	1161	BORER	1	/72	(3)	13.1317
	STEPPING MOTOR CONTROLLER & DRIVER (ADJUSTABLE ACCEL/DECEL,TIME & MAX FREQ)	SMC	JOERGER	1	/74	(13)	13.1318
	STEPPING MOTOR CONTROLLER, DUAL	3360	KINETIC SYSTEMS	1	/72	(4)	13.1319
	STEPPING MOTOR CONTROLLER, ACCELERATING	3361	KINETIC SYSTEMS	1	/73		13.1320
	STEPPING MOTOR DRIVER (USED WITH 7045)	0709	NUCL. ENTERPRISES	1	/71		13.1321
	DELAYED PULSE GENERATOR (4 TTL O/P,0.042 HZ-40KHZ RATE,LEVEL AND DIRECTION CONTR)	7045-1	NUCL. ENTERPRISES	1	/70		13.1322
	STEPPING MOTOR DRIVER SUPPLY FOR J CP 20	J CP 20 C APP 10	SCHLUMBERGER	1	/74 /74	(9)	13.1323
	CONTINUOUS STEPPER CONTROL (65536 STEPS, POSITION/DIRECT./SPEED/ACCELER. CONTROL)	C-ST-4	WENZEL ELEKTRONIK	2	/72		13.1324
	INCREMENTAL STEPPER CONTROL(65536 STEPS, POSITION/DIRECT./SPEED/ACCELER. CONTROL)	C-ST-4-I	WENZEL ELEKTRONIK	2	/72		13.1325
	VARIABLE PULSE DURATION TRIAC OUTPUT MODULE	3701	BI RA SYSTEMS	2	/74		13.1326
	TRIAC OUTPUT REGISTER (8 BITS, 2 AMPS, ZERO VOLTAGE SWITCHING)	LT	JOERGER	1	/74	(13)	13.1327
	POWER SUPPLY CONTROLLER 12-BIT	3158	KINETIC SYSTEMS	1	/73		13.1328
	CAMAC-TO-SCIPP PHA INTERFACE	2323	BI RA SYSTEMS	2	/73		13.1329
	INTERFACE CAMAC-TO-LABEN 8000SERIES MULTICHANNEL ANALYZERS	5380	LABEN	3		(12)	13.1330
	ADC-CAMAC INTERFACE (FOR PULSE ADC 8215, 8210,8211,8212,8112 & T-O-F CONV 8270)	5910	LABEN	1		(12)	13.1331
	MULTICHANNEL ANALYZER - CAMAC INTERFACE (FOR PACKARD 9000 AND 900 SERIES MCA)	9701	PACKARD	3		(4)	13.1332
	SYNCHRO TO DIGITAL CONVERTER (SINGLE AND MULTI-TURN CAPABILITIES)	SDC	JOERGER	2	/73	(13)	13.1333
	DUAL SYNCHRO-DIGITAL CONVERTER (14BIT)	CS 0047	NUCL. ENTERPRISES	2	/73		13.1334
	DUAL INCREMENTAL POSITION ENCODER (2X20 BIT X-Y DIGITIZATION BY UP-DOWN COUNTER)	2IPE 2019	SEN	1	/71		13.1335
	INTERFACE FOR MEASURING DEVICES (DUAL INPUT FOR 2 INSTRUMENTS)	DO 200-1412	DORNIER	1	/74	(10)	13.1336
	OUTPUT REGISTER (16 OR 24 BIT TTL DRIVER FOR FAST-ROUTING MULTIPLEXER SYSTEM)	CM 665	J AND P	1	/71		13.1337
	PULSE DURATION DEMODULATOR	3720	KINETIC SYSTEMS	1	/73		13.1338
	PLUMBICON READ OUT TERMINAL	J PG 10/PUDDING	SCHLUMBERGER	1	/71	(6)	13.1339
	PLUMBICON READ OUT (5 SCALERS RECORD DIGITIZED OUTPUTS FROM PLUMBICON CAMERA) SPARK CHAMBER READ OUT	J PM 10/PLUM J SC 10	SCHLUMBERGER	1 2	/71 /72	(6)	13.1340
	ADC/CAMAC INTERFACE (FOR ANY ADC,2X16BIT O/P BUFFER,STATUS,LAM HANDL,CLOCK TIME)	C-AI-2	WENZEL ELEKTRONIK	1	/73	(10)	13.1341
147	**Other Digital I/O Modules (Incl. Data Links)**						
	CAMAC DATA LINK MODULE (16 BIT PARALLEL,ASYNCHRONOUS DATA LINK)	6701	BI RA SYSTEMS	2	/73		13.1342
	BIT-SYNCHRONIZER - HARDWARE PROGRAMABLE 0 TO 10V INPUT, PCM-SIGNAL IN SERIES	DO 200-2251	DORNIER	3	/73		13.1343
	FORMAT-SYNCHRONIZER (IDENT & S/P OF DATA WORDS, SOFT- & HARDWARE PROGRAMMABLE)	DO 200-2260	DORNIER	4	/73		13.1344
	COMMUNICATION INTERFACE (V24/V23/V21 MODEM INTERFACE WITH AUTO-DIAL OPTION)	DO 200-2911	DORNIER	1	/73	(10)	13.1345
	START-STOP CONTROLLER(START,STOP,RESET, MANUAL OR DATAWAY CONTROL, 100HZ CLOCK)	FHC 1304	FRIESEKE	1	/71	(1)	13.1346
	SERIAL INTERFACE (V24 SPEC, QUAD VERSION VARIABLE TRANSMISSION RATES)	9045	NUCL. ENTERPRISES	1	/73	(13)	13.1347
	START-STOP UNIT (START, STOP CLOCK AND GATE OUTPUTS)	J AM 10	SCHLUMBERGER	1	/71		13.1348
	FOUR FOLD BUSY DONE (START SIGNAL INITIATED BY COMMAND,DEVICE RETURNS LAM)	4BD 2021	SEN	1	/71		13.1349

15 Digital Handling and Processing Modules — and/or/nor Gates, Fan-Outs, Digital Level and Code Converters, Buffers, Delays, Arithm. Processors etc.

151 Fan-Outs, and/or/not-Gates

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	FAN-OUT UNIT (2 ORED INPUTS PROVIDE 8 TRUE,2 COMPLEM OUTPUTS,NIM SIGNALS)	FO 0801	GEC-ELLIOTT	1	/71		13.1350
	NIM FANOUT (DUAL FOUR FOLD & COMPLEMENT, NIM DRIVER, -14MA INTO 50OHMS)	FON	JOERGER	1	/73		13.1351
	TTL FANOUT (DUAL FOUR FOLD & COMPLEMENT, TTL DRIVER, 50MA CURRENT SINK)	FOT	JOERGER	1	/73		13.1352
	NIM FANOUT (7-ORED INPUTS, 8 O/P+2 COMPL O/P GATED FROM DATAWAY)	216	JORWAY	1	/75		13.1353
	FAN OUT MODULE (IL2 I/P, 16 IL2 O/P)	9050	NUCL. ENTERPRISES	1	/73		13.1354
	SIX-FOLD CONTROLLED GATE (INDIV GATING, FAN-IN AND FAN-OUT CONTROLLED BY 3 REGS)	6CG 2017	SEN	1	/71	(4)	13.1355
C	FAST LOGIC UNIT (4X4 NIM INPUTS)	FLU 2062	SEN	1		(12)	13.1356

152 Digital Level Converters

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	6 CHANNEL TTL/NIM CONVERTER	5601	BI RA SYSTEMS	1	/73		13.1357
	6 CHANNEL NIM/TTL CONVERTER	5602	BI RA SYSTEMS	1	/73		13.1358
	HEX CONVERTER (NIM TO TTL LEVELS PLUS TWO COMPLEMENT OUTPUTS)	CNT	JOERGER	1	/73		13.1359
	HEX CONVERTER (TTL TO NIM LEVELS PLUS TWO COMPLEMENT OUTPUTS)	CTN	JOERGER	1	/73		13.1360
	HEX IL1 TO IL2 CONVERTER (6 TTL SIGNALS IN,6 NIM SIGNALS OUT)	7052-1	NUCL. ENTERPRISES	1	/70		13.1361

153 Code Converters

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DECIMAL INPUT 6 NUMBERS 3 DIGITS CODE CONVERTER	DO 200-2005	DORNIER	2	/74		13.1362
	(SAME BUT 3 NUMBERS)	DO 200-2006		2	/74		
	CAMAC BCD-TO-BINARY CONVERTER	LEM-52/5.7	EISENMANN	1			13.1363
	CAMAC BINARY-TO-BCD CONVERTER WITH DECIMAL DISPLAY	LEM-52/5.8	EISENMANN	1			13.1364
	GRAY CODE TO BCD CONVERTER (DUAL CHANNEL INPUT WITH MEMORY)	EIR	JOERGER	1	/74		13.1365
	BINARY CODE CONVERTER(BIN-BCD OR BCD-BIN CONVERSION, DATA FROM DATAWAY OR FRONT)	9044	NUCL. ENTERPRISES	1		(7)	13.1366
	BINARY TO DECIMAL CODE CONVERTER (24 BIT BINARY TO 8 DECADE)	610	POLON	1	/74		13.1367
	BCD TO BINARY CONVERTER (29BIT BCD TO 24BIT BINARY, CONV TIME 325 NSEC)	CD 001	STND ENGINEERING	1	/73	(12)	13.1368
	BINARY TO BCD CONVERTER (CONV TIME 325 NSEC,24BITS TO MAX 16777216-1 BCD CODED)	CD 002	STND ENGINEERING	1	/73	(12)	13.1369
	BINARY TO BCD-CONVERTER(24BIT TO 8 DECA-DE,DISPLAY,CONV 4USEC,TTL LEVEL OUT,1=H)	C-BBC-24	WENZEL ELEKTRONIK	2	/71		13.1370

154 Buffer Memories, Storage Units

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PROGRAM STORE/REGISTER (256X24BIT RAM + 64X24BIT ROM, EXT ADDR, USE WITH 7025-2)	110A	HYTEC	1			13.1371
	(SAME BUT WITHOUT EDIT ROM)	110		1			
	(SAME BUT NO BUFFER AND NO EXT ADDR)	112		1	/73		
N	1024 WORD 24 BIT STATIC STORE (NORMAL & BYTE MODES, CLEAR, INCR, DECR, READ, & OVERWRITE ON ADDRESS REG ARE PERFORMED)	130	HYTEC	1	07/75		13.1372
N	(SAME WITH MEMORY ACCESS ALSO FROM FRONT PANEL, MASTER/SLAVE OPERATION)	131		2	08/75		
	3-DECADE ADC & 16-WAY MUX (PRESET X1-X10 AMPL, 16X24 STORE, 100USEC/CH UPDATE)	500-1	HYTEC	1	/73		13.1373
N	(SAME AS 500-1 BUT WITH 8-WAY MUX)	502		1	/74		
	(SAME BUT BINARY ADC)	501		1	/74		
N	(SAME AS 501 BUT WITH 8-WAY MUX)	503		1	/74		
	(SAME, BUT AMPL GAIN CAN BE SET AND STORED INDIVIDUALLY/CHANNEL, BCD/BIN)	510		2	/74		
N	256 WORD FIFO BUFFER (24 BITS PER WORD)	3841	KINETIC SYSTEMS	1	05/75	(13)	13.1374
	2048-WORD 16 BIT STORE	9061	NUCL. ENTERPRISES	2		(10)	13.1375
	16 WORD STORE	CS 0003	NUCL. ENTERPRISES	1		(4)	13.1376

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	256 WORDS OF 24 BIT STORE MODULE	CS 0015	NUCL. ENTERPRISES	1	/72	(7)	13.1377
	PROGRAMMABLE READ ONLY MEMORY (32 WORDS, 18 BITS, LOADED BY SOLDER CONNECTIONS)	221	POLON	1	03/75		13.1378
	BUFFER MEMORY (256 16BIT WORDS, USE WITH J CAN 21/C/H)	J MT 20	SCHLUMBERGER	1	/72		13.1379
	CAMAC CORE MEMORY MODULE (2K X 16 BIT)	MM 216C	STND ENGINEERING	3	/74	(12)	13.1380
	(4K X 16 BIT)	MM 416C		3	/74	(12)	
	(8K X 16 BIT)	MM 816C		3	/74	(12)	
	(2K X 24 BIT)	MM 224C		3	/74	(12)	
	(4K X 24 BIT)	MM 424C		3	/74	(12)	

155 Logic and Arithmetic Processing Modules

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	FLOATING POINT ARITHMETIC INTERFACE (FOR USE WITH M. 128 HARD. FLOAT. POINT)	C 327	INFORMATEK	1	/73		13.1381
N	96 CHAN. DRIFT CHAMBER TDC (.5US/1US F.S., 8 BIT, 32 DEEP BUFFER, DIFF I/P)	2770	LRS=LECROY	2	05/75	(13)	13.1382
N	128 CHAN. MWPC ENCODER (RECEIVER, DELAY, LATCH, ENCODER, 80 HIT BUFFER, DIFF I/P)	2720		2	05/75	(13)	

16 Analogue Modules — ADC, DAC, Multiplexers, Amplifiers, Linear Gates, Discriminators etc.

161 Analogue Input Modules (DC and Pulse ADC, TDC)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	32 CHANNEL ANALOG DATA SYSTEM (EXPANDABLE WITH ADDITIONAL MUX MODULES)	5301	BI RA SYSTEMS	2	/74		13.1383
	ANALOG INPUT (DUAL SLOPE ADC, +/=16V RANGE,14BITS/16V+SIGN,0.2SEC CONVERSION)	DO 200=1021	DORNIER	1	/72		13.1384
	ANALOGUE TO DIGITAL INTEFACE (WITH PLUG= IN CONVERTER CARDS ADC/8Q, ADC/10Q AND ADC/12Q FOR 8, 10 AND 12 BIT CONVERSION)	ADC 1201	GEC=ELLIOTT	1	/71	(1)	13.1385
N	16 CHANNEL, SCANNING A/D CONVERTER	3510	KINETIC SYSTEMS	1	/74		13.1386
	INTEGRATING ADC (12BIT, RANGES 0 TO +5V, 0 TO =5V, 40MSEC CONVERSION TIME)	700	POLON	1	/73		13.1387
	VOLTAGE = FREQUENCY CONVERTER (USED WITH MULTIPLEXERS J MX 10/20)	J CTF 10	SCHLUMBERGER	2	/73		13.1388
	UP=DOWN SCALER/FREQUENCY METER	J EF 10		1	/73		
	DUAL DIGITAL VOLTMETER (+AND= 0.1V, 10 BIT, DIFFERENTIAL INPUT)	2DVM 2013	SEN	1	/71		13.1389
	DIG. VOLTMETER (12BIT + SIGN, POT=FREE RANGES==AC/DC .02V = 20V,DC 5=100MA)	C 76451=A13=A1	SIEMENS	2	/73		13.1390
	DIGITAL VOLTMETER (SAME AS TYPE C 76451=A13=A1 WITH DISPLAY)	C 76451=A13=A2	SIEMENS	2	/73		13.1391
	ANALOG INPUTS (MULTIPLEXER=ADC, 8 DIFF I/P,+/=10V RANGE,7BITS/10V+SIGN)	DO 200=1013	DORNIER	2	/72		13.1392
	(SAME FOR +/=5V RANGE, 7BITS/5V+SIGN)	DO 200=1016		2	/72		
	(SAME FOR +10V RANGE, 8BITS/10V)	DO 200=1019		2	/72		
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13.1393
	ANALOG INPUT (ADC, +/=10V RANGE, 7BITS/10V+SIGN)	DO 200=1027	DORNIER	2	/72		13.1394
	(SAME FOR +/=5V RANGE, 7BITS/5V +SIGN)	DO 200=1028		2	/72		
	(SAME FOR +10V RANGE, 8BITS/10V)	DO 200=1029		2	/72		
	ANALOGUE TO DIGITAL CONVERTER(8BIT, I/P RANGE 0 TO +5V OR 0 TO =5V,25 USEC CONV)	7028=1	NUCL. ENTERPRISES	1	/70		13.1395
	HIGH SPEED DIGITIZER (6BIT, 100NSEC, RESOLUTION, WITH 256 WORD BUFFER)	SA/D 01	STND ENGINEERING	1	/74	(12)	13.1396
	DUAL 10 BIT ANALOG TO DIGITAL CONVERTER	3515	KINETIC SYSTEMS	1	/73		13.1397
	SINGLE 10BIT ANALOG TO DIGITAL CONVERTER	3515S	KINETIC SYSTEMS	1	/74		13.1398
	DUAL ADC (10BIT, 10USEC CONV TIME)	A/D 210	STND ENGINEERING	2	03/75		13.1399
	DUAL SLOPE ADC (+AND= 0.01/1/10V RANGES, 11BIT RESOLUTION,20MS CONV TIME)	1241	BORER	2	/72	(3)	13.1400
	SUCCESS. APPROX. ADC (WITH S+H, +/=5V OR 0 TO +/=10V, 10=BIT,20/11 USEC ACCESS)	1243/1243A	BORER	2	/72	(9)	13.1401
	SUCCESS. APPROX. ADC (WITH S+H, +/=5V OR 0 TO +/=10V, 12=BIT,23/13 USEC ACCESS)	1244/1244A	BORER	2	/73	(9)	13.1402
	ANALOG INPUTS (MULTIPLEXER=ADC, 8 DIFF I/P,+/=10V RANGE,11BITS/10V+SIGN)	DO 200=1003	DORNIER	2	/72		13.1403
	(SAME FOR +/=5V RANGE, 11BITS/5V+SIGN)	DO 200=1006		2	/72		
	(SAME FOR +10V RANGE, 12BITS/10V)	DO 200=1009		2	/72		

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	ANALOG INPUT (ADC, +/-10V RANGE, 11BITS/10V+SIGN)	DO 200-1024	DORNIER	2	/72		13,1404
	(SAME FOR +/-5V RANGE,11BITS/ 5V+SIGN)	DO 200-1025		2	/72		
	(SAME FOR +10V RANGE,12BITS/10V)	DO 200-1026		2	/72		
	OCTAL ADC (8X11BIT + OVF, POS INPUT, 1 MV RESOL, COMMON STROBE, FAST CLEAR)	AD811	EG&G/ORTEC	1	03/75	(13)	13,1405
	3-DECADE ADC & 16-WAY MUX (PRESET X1-X10 AMPL, 16X24 STORE, 100USEC/CH UPDATE)	500-1	HYTEC	1	/73		13,1406
N	(SAME AS 500-1 BUT WITH 8-WAY MUX)	502		1	/74		
	(SAME BUT BINARY ADC)	501		1	/74		
N	(SAME AS 501 BUT WITH 8-WAY MUX)	503		1	/74		
	(SAME, BUT AMPL GAIN CAN BE SET AND STORED INDIVIDUALLY/CHANNEL, BCD/BIN)	510		2	/74		
	16-CHANNEL A/D CONVERTER (DIFFERENTIAL INPUTS, 11 BITS + SIGN)	AM-1	JOERGER	2	/74	(11)	13,1407
	A/D CONVERTER (12BIT,MAX 20 USEC CONVERSION, +AND-5V, +AND-10V, +10V RANGES)	30	JORWAY	2	/71	(2)	13,1408
	16 CHANNEL A/D CONVERTER (FET MUX DIFF INPUTS, 12BIT AUTO CYCLING, DUAL SLOPE)	34	JORWAY	2	/74		13,1409
	DUAL 12 BIT ANALOG TO DIGITAL CONVERTER	3520	KINETIC SYSTEMS	1	/73		13,1410
	SINGLE 12BIT ANALOG TO DIGITAL CONVERTER	3520S	KINETIC SYSTEMS	1	/74		13,1411
N	INSULATED ADC (12BITS, 100 USEC, 10MV, FULL SCALE, 300V COMMON MODE)	IADC 2069	SEN	2			13,1412
	DUAL ADC (12BIT, 25USEC CONV TIME)	A/D 212	STND ENGINEERING	2	03/75		13,1413
N	DIGITAL VOLTMETER (19.999MV TO 1999.9V)	CS 0080	NUCL. ENTERPRISES	2		(13)	13,1414
	DUAL ADC (14BIT, 50USEC CONV TIME)	A/D 114	STND ENGINEERING	1	03/75		13,1415
	OCTAL CHARGE DIGITIZER (8X8BIT CHARGE SENSITIVE ADC, READOUT IN 4X16BIT WORDS)	QD808	EG&G/ORTEC	1		(7)	13,1416
	QUAD FAST GATED INTEGRATOR (CHARGE DIGITIZER, 4X10 BIT)	QD410	EG&G/ORTEC	1	/74	(10)	13,1417
	OCTAL ADC (8 FAST I/P,8BIT/CH, COMMON GATE, NIM LEVELS, BILINEAR MODE)	2248	LRS-LECROY	1	/71		13,1418
	12-CHANNEL ADC (12 FAST I/P, 10BIT/CH, .25PC SENSITIVITY, FAST CLEAR)	2249A	LRS-LECROY	1	/74	(9)	13,1419
N	12-CHAN. FAST CONV. ADC (3US/8BIT, 9US/9 BIT, 12 EVENTS x 32 DEEP BUFFER,0-256PC)	2250	LRS-LECROY	1	04/75	(13)	13,1420
C	12-CHANNEL PEAK ADC (10BIT/CH, -2V FULL SCALE, FAST CLEAR, COMMON GATE)	2259	LRS-LECROY	1	02/75	(13)	13,1421
	OCTAL ADC (MIN 5 NSEC PULSES, POS OR NEG 8BIT/100 PC RESOLUTION, 250 USEC CONV)	9040	NUCL. ENTERPRISES	1	/72	(4)	13,1422
	ANALOGUE TO DIGITAL CONVERTER (80MHZ, 12 BITS)	9060	NUCL. ENTERPRISES	1	/74	(10)	13,1423
	16,000 CHANNEL PULSE ADC (200MHZ CLOCK)	J CAN 21 C/H	SCHLUMBERGER	6	/72	(6)	13,1424
	1024 CHANNEL PULSE ADC (100MHZ CLOCK)	J CAN 40	SCHLUMBERGER	2	/72	(6)	13,1425
	FAST ADC(10 & 12BIT VERSIONS,WITH SAMPLE AND HOLD, CONV TIME 2USEC/4.5USEC)	FADC 2067	SEN	2		(12)	13,1426
	FAST DUAL ADC (DATA AS FOR 2067)	2 FADC 2068		2		(12)	
	EVENT TIMER(4-CHANNEL TIME DIGITIZER, 8B 100MHZ INT. CLOCK, LAM WHEN DONE)	2205	BI RA SYSTEMS	1	/74		13,1427
	QUAD CAMAC SCALER (4X16BIT OR 2X32BIT, 100MHZ)	1004A	BORER	1	01/75		13,1428
	TIME DIGITIZER (4X16BIT,50MHZ CLOCK,WITH CENTRE FINDER. USABLE WITH PRE-AMP 511)	1005	BORER	1	/72		13,1429
	TIME DIGITIZER (4 NIM STOP CHANNELS, COMMON START, 200 PSECS RESOLUTION)	TD104	EG&G/ORTEC	1		(7)	13,1430
	OCTAL TDC (8X11BIT+OVF, COMMON START, 100PSEC RESOLUTION, FAST CLEAR)	TD811	EG&G/ORTEC	1	03/75	(13)	13,1431
	TIME DIGITIZER (6 CHANNELS,16 BITS, 100 MHZ CLOCK RATE)	TD	JOERGER	1	/74	(11)	13,1432
	QUAD TIME-TO-DIGITAL CONVERTER(9BIT/CH, 102/510NSEC RANGES,13USEC CONVERS,NIM)	2226A	LRS-LECROY	1	/70	(2)	13,1433
C	OCTAL TIME-TO-DIGITAL CONVERTER(10BIT/CH 102/204/510 NSEC RANGES, FAST CLEAR)	2228	LRS-LECROY	1	/74	(9)	13,1434
N	96 CHAN. DRIFT CHAMBER TDC (.5US/1US F.S., 8 BIT, 32 DEEP BUFFER, DIFF I/P)	2770	LRS-LECROY	2	05/75	(13)	13,1435
N	128 CHAN. MWPC ENCODER (RECEIVER, DELAY, LATCH, ENCODER, 80 HIT BUFFER, DIFF I/P)	2720		2	05/75	(13)	
	SIXTEEN FOLD TIME-TO-DIGITAL-CONVERTER (100MHZ EXT CLOCK, 4BIT SCALERS USED)	TDC-16	NUCLETRON	1	/74		13,1436

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TIME DIGITIZER(4X16BIT,CLOCK RATE 70/85MHZ, WITH CENTER FINDING LOGIC)	TD 2031	SEN	1	/72		13.1437
	TIME DIGITIZER (4X16BIT,CLOCK RATE 70/85MHZ,NIM LEVELS)	TD 2041	SEN	1	/72	(4)	13.1438
	SERIAL TIME DIGITIZER (8X8BIT 100MHZ, SER + SEQUENT COUNT MODE,SHIFT-REG GATE)	STD 2050	SEN	1	/72		13.1439
	OCTAL TIME TO DIGITAL CONVERTER	TD 008	STND ENGINEERING	1	04/75		13.1440

162 Analogue Output Modules (DAC)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	8 CHANNEL 8 BIT D/A CONVERTER (CURRENT OR VOLTAGE O/P,SLOW ANALOG METER DRIVER)	5405	BI RA SYSTEMS	1	/73		13.1441
	ANALOG OUTPUT (DAC, +10V O/P RANGE, 5MA, 8BIT RESOLUTION, SINGLE O/P)	DO 200-1511	DORNIER	1	/73		13.1442
	(SAME WITH 12BIT RESOLUTION, SINGLE O/P)	DO 200-1521		1	/73		
	(SAME WITH 8BIT RESOLUTION, DUAL O/P)	DO 200-1512		1	/73		
	(SAME WITH 12BIT RESOLUTION, DUAL O/P)	DO 200-1522		1	/73		
	(SAME WITH 8BIT RESOLUTION, QUAD O/P)	DO 200-1517		1	/73		
	(SAME WITH 12BIT RESOLUTION, QUAD O/P)	DO 200-1527		1	/73		
	ANALOG OUTPUT (DAC,+&-10V O/P RANGE,5MA, 8BIT RESOLUTION, SINGLE O/P)	DO 200-1513	DORNIER	1	/73		13.1443
	(SAME WITH 12BIT RESOLUTION, SINGLE O/P)	DO 200-1523		1	/73		
	(SAME WITH 8BIT RESOLUTION, DUAL O/P)	DO 200-1514		1	/73		
	(SAME WITH 12BIT RESOLUTION, DUAL O/P)	DO 200-1524		1	/73		
	(SAME WITH 8BIT RESOLUTION, QUAD O/P)	DO 200-1518		1	/73		
	(SAME WITH 12BIT RESOLUTION, QUAD O/P)	DO 200-1528		1	/73		
	ANALOG OUTPUT (DAC, +&-5V O/P RANGE,5MA, 8BIT RESOLUTION, SINGLE O/P)	DO 200-1515	DORNIER	1	/73		13.1444
	(SAME WITH 12BIT RESOLUTION, SINGLE O/P)	DO 200-1525		1	/73		
	(SAME WITH 8BIT RESOLUTION, DUAL O/P)	DO 200-1516		1	/73		
	(SAME WITH 12BIT RESOLUTION, DUAL O/P)	DO 200-1526		1	/73		
	(SAME WITH 8BIT RESOLUTION, QUAD O/P)	DO 200-1519		1	/73		
	(SAME WITH 12BIT RESOLUTION, QUAD O/P)	DO 200-1529		1	/73		
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13.1445
	OCTAL DAC (10BIT,0-5V,50OHMS,10USECS)	DAC 1082	GEC-ELLIOTT	1	/73		13.1446
	(SAME BUT WITH 2'S COMPLEMENT 9BIT+SIGN, +AND- 5V, 50OHMS)	DAC 1082(B)		1	/73		
	QUAD DAC (4 CHANNEL VERSION OF DAC 1082)	DAC 1042	GEC-ELLIOTT	1	/74		13.1447
	(SAME, 4 CHANNEL VERSION OF DAC 1082(B))	DAC 1042(B)		1	/74		
N	DUAL 12 BIT DAC (+/- 10V OR +/- 5V O/P, FOR X-Y DISPLAY DRIVE)	550	HYTEC	1	10/75		13.1448
	DUAL D/A CONVERTER (10 BIT, 10USEC CONV TIME, +10V, +AND-10V, +AND-5V RANGES)	D/A-10	JOERGER	1	/73	(13)	13.1449
	DUAL D/A CONVERTER (12 BIT, 30USEC CONV TIME, +10V, +AND-10V, +AND-5V RANGES)	D/A-12	JOERGER	1	/73	(13)	13.1450
	OCTAL D/A CONVERTER (8BIT RESOLUTION, 0 TO 2MA OR 0 TO +10V OUT)	8 D/A	JOERGER	1	/73	(13)	13.1451
	D/A CONVERTER (12BIT,5 USEC CONVERSION, O/P RANGES +AND-2.5V/5V/10V AND +5V/10V)	31	JORWAY	1	/71	(2)	13.1452
	8 CHANNEL 10 BIT D-A CONVERTER	3110	KINETIC SYSTEMS	1	/72		13.1453
	DUAL DIGITAL-TO-ANALOG CONVERTER (10BIT, OUTPUT 0 TO +10V OR -5 TO +5V)	2DAC 2011	SEN	1	/71		13.1454
	DUAL DAC (12BIT, +AND-10V OR +AND-20MA)	C 76451-A15-A4	SIEMENS	1	/73		13.1455
	ISOLATED DUAL DAC (10BIT,30USEC,10V/5MA, OPTOCOUPLER,4 TIMING MODES,RANGE-MODIF)	C-DA-210	WENZEL ELEKTRONIK	1	/74		13.1456
	QUAD DAC (8BIT,10USEC,5V/50MA,4TIMING-M, +,- &RANGE MODIF,OPT,GROUND-REJ&,5USEC)	C-DA-408	WENZEL ELEKTRONIK	1	/74	(11)	13.1457
	QUAD DAC(10BIT,10USEC,5V/50MA,4TIMING-M, +,- &RANGE MODIF,OPT,GROUND-REJ&,5USEC)	C-DA-410	WENZEL ELEKTRONIK	1	/74	(11)	13.1458

164 Analogue Handling and Processing Modules I (MX)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	SEE ALSO DORNIER ADC TYPES		DORNIER				13.1459
	12 INPUT ANALOGUE MULTIPLEXER (RANDOM OR SCAN ACCESS CONTROLLED BY SKIP REGISTER)	MX 2025	SEN	1	/72	(6)	13.1460
N	12-CHANNEL ANALOGUE MULTIPLEXER (FET, 5 USEC SWITCHING TIME, +/-10V)	MX 2070	SEN	1		(13)	13.1461
N	WIDE-BAND ROUTER (12-CHANNEL 50 OHMS ANALOGUE MULTIPLEXER)	WBR 2073	SEN	1		(13)	13.1462
	15 CHANNEL MULTIPLEXER (ANALOGUE SIGNALS ROUTED TO ADC/DVM,DIRECT + SCAN MODES)	1701	BORER	1	/72	(3)	13.1463
	DORNIER MODULES ALSO MARKETED BY SIEMENS		SIEMENS				13.1464

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	RELAY MULTIPLEXER(16 CHANNELS, MAX 200V/ 500MA OR 10VA, DATAWAY SET+INCR ADDRESS)	DO 200-1036	DORNIER	1	/72		13,1465
	(WITH FRONT PANEL CONNECTOR)	DO 200-1236		1	/72		
	(SAME WITH LOW THERMO VOLTAGE CONTACTS)	DO 200-1035		2	/71		
	(WITH FRONT PANEL CONNECTOR)	DO 200-1235		2	/71		
	ANALOG MULTIPLEXER (15 CHANNELS,REED RELAYS,MAN AND DATAWAY SEL, EXPANDABLE)	AM	JOERGER	2	/72	(6)	13,1466
	16-CHANNEL A/D CONVERTER (DIFFERENTIAL INPUTS, 11 BITS + SIGN)	AM-1	JOERGER	2	/74	(11)	13,1467
	15 CHANNEL RELAY MULTIPLEX	3530	KINETIC SYSTEMS	2	/73		13,1468
	MASTER MULTIPLEXER (16 CH, 4 POLE REED)	601	NUCL. ENTERPRISES		/70		13,1469
	SLAVE MULTIPLEXER (16 CH, 4 POLE REED)	600			/70		
	16 CHANNEL RELAY MULTIPLEXER STANDARD LEVEL)	J MX 10	SCHLUMBERGER	1	/73		13,1470
	(SAME FOR LOW LEVEL)	J MX 20		1	/73		
	MULTIPLEXER MANUAL CONTROL	J AX 10		1	/73		
	MULTIPLEXER 16X4 CONTACTS		SIEMENS	1	/74		13,1471
	16-CHANNEL FAST MULTIPLEXER (FET SWITCHES FOR ADC 1243 AND 1244)	1704	BORER	1	/72	(4)	13,1472
	FET MULTIPLEXER (16 CHANNELS, MAX +OR-10V, DATAWAY SET + INCR ADDRESS)	DO 200-1031	DORNIER	1	/72		13,1473
	(SAME WITH FRONT PANEL CONNECTOR)	DO 200-1231		1	/72		
	FET MULTIPLEXER (16 DIFF I/P, MAX +OR-10V, DATAWAY SET+INCR ADDRESS)	DO 200-1034	DORNIER	1	/72		13,1474
	(WITH FRONT PANEL CONNECTOR)	DO 200-1234		1	/72		
	16 CHANNEL A/D CONVERTER (FET MUX DIFF INPUTS, 12BIT AUTO CYCLING, DUAL SLOPE)	34	JORWAY	2	/74		13,1475
	MULTIPLEXER-SOLID STATE (16 SINGLE-ENDED OR 8 DIFF CHAN,RANDOM OR SEQUENT ACCESS)	9026	NUCL. ENTERPRISES	1	/71		13,1476
	SOLID STATE MULTIPLEXER (16 CH, RANDOM, & SEQUENT ACCESS, MULTI-MUX SCAN MODE)	MX 016	STND ENGINEERING	1	/74	(12)	13,1477
	32 CHANNEL ANALOG MULTIPLEXER (SERVE AS CHANNEL EXPANDER FOR 5301 DATA SYSTEM)	5101	BI RA SYSTEMS	1	/74		13,1478
	RELAY MULTIPLEXER (32 CHANNELS)	750	POLON	2	03/75		13,1479
	MULTIPLEXER (32 CHANNEL, 2 CONTACTS)	C 76451-A4-A1	SIEMENS	2	/73		13,1480
	MULTIPLEXER (32 CHANNEL, 4 CONTACTS)	C 76451-A4-A2	SIEMENS	2	/73		13,1481
	MULTIPLEXER 32X2 CONTACTS	C 72468-A0628-A001	SIEMENS	1	/74		13,1482
	FET MULTIPLEXER (32 CHANNELS, MAX +OR-10V, DATAWAY SET+INCR ADDRESS)	DO 200-1032	DORNIER	1	/72		13,1483
	(WITH FRONT PANEL CONNECTOR)	DO 200-1232		1	/72		
	FET MULTIPLEXER (32 DIFF I/P, MAX +OR-10V, DATAWAY SET+INCR ADDRESS)	DO 200-1037	DORNIER	2	/72		13,1484
	(SAME WITH FRONT PANEL CONNECTORS)	DO 200-1237		2	/72		
	FET MULTIPLEXER (64 CHANNELS MAX +OR-10V, DATAWAY SET+INCR ADDRESS)	DO 200-1061	DORNIER	2	/73		13,1485
	(WITH FRONT PANEL CONNECTOR)	DO 200-1261		2	/73		

165 Analogue Handling and Processing Modules II (LIN. Gates, Ampl., Discriminators etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	ACTIVE FILTER AMPLIFIER(10 - 1000 GAIN, .25-4USEC GAUSS. PULSE SHAPING,0-10V OUT	1101	POLON	3	/74		13,1486
	BASELINE RESTORER(.1% COUNT RATE STABIL UP TO 50KHZ,0-10 I/O SIGNALS,1V/V GAIN)	1102	POLON	2	/74		13,1487
	DELAY AMPLIFIER(.25 - 4.75USEC DELAY, 0 TO 10V IN/OUT SIGNALS, 1V/V GAIN)	1103	POLON	2	03/75		13,1488
	SUM-INVERT AMPLIFIER(.2% NON-LINEARITY, 1V/V GAIN, 0 TO 10V IN/OUT SIGNALS)	1104	POLON	1	/74		13,1489
	LINEAR GATE (.2% NON-LINEARITY, +/- 1V/V GAIN, 0 TO 10V IN/OUT SIGNALS)	1105	POLON	1	/73		13,1490
	PULSE STRETCHER(.05-.9USEC I/P WIDTH, 1USEC O/P WIDTH OF PULSES, .9 V/V GAIN)	1106	POLON	1	/74		13,1491
	SINGLE CHANNEL ANALYSER (.2-10V LO/HI LEVEL, .2-2V WINDOW, .5-2.5USEC DELAY)	1201	POLON	3	/74		13,1492
	LINEAR RATEMETER (10 TO 100K CPS RANGE, 1S TO 30S TIME CONSTANTS)	1301	POLON	3	/74		13,1493
	LOGIC SHAPER AND DELAY (.2 TO 110USEC DELAY, .2 TO 110USEC O/P PULSE WIDTH)	1401	POLON	2	/74		13,1494
	UNIVERSAL COINCIDENCE (.1 TO 2USEC RESOLVING TIME)	1402	POLON	2	/74		13,1495

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	FAN OUT (1 NIM IN, 2 NIM & 1 COMPL TTL OUT)	1504	POLON	1	/73		13.1496
	CAMAC CONTROLLED PULSE SHAPER (4 PM I/P, 4 NIM I/P & 6 NIM O/P)	CPS 2065	SEN	1		(12)	13.1497
	DUAL PULSE DELAY UNIT	PD 002	STND ENGINEERING	5	/73		13.1498
	SAMPLE-AND-HOLD AMPLIFIER (DUAL DIFF AMPL,+/-10V RANGE,20MA OUT,5USEC SETTL)	DO 200-1040	DORNIER	2	/72		13.1499
	(SINGLE AMPL VERSION, BOTH TYPES HAVE HOLD AND TRACK MODES)	DO 200-1041		2	/72		
	PROGRAMABLE AMPLIFIER/ATTENUATOR (GAIN 0DB TO 60DB IN 10 STEPS, ATTENUATION .5)	DO 200-1052	DORNIER	2	/73		13.1500
	(SAME BUT DUAL CHANNEL VERSION)	DO 200-1053		1	/73		
	PROGRAMMABLE AMPLIFIER (GAIN 1, 10, 100, 1000)	DO 200-1054	DORNIER	1	05/75		13.1501
	(SAME BUT DUAL CHANNEL VERSION)	DO 200-1055		1	05/75		
	DIFFERENTIAL AMPLIFIER (GAIN CONTROLLED FROM DATAWAY)	CS 0014	NUCL. ENTERPRISES	2	/72		13.1502
N	PROGRAMMABLE PRESISION ATTENUATOR (1/1 TO 1/2048, 20V MAX I/P RANGE)	PPA 2071	SEN	1		(13)	13.1503
	DIGITAL WINDOW DISCRIMINATOR (WITH 128X16BIT BUFFER, PARALLEL + SERIAL I/P)	DWD 2046	SEN	1	/72	(8)	13.1504

17 Other Digital and/or Analogue Modules — Mixed Analogue and Digital, Not Dataway Connected etc.

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DETECTOR BIAS SUPPLY (0 TO +/-2000V, 1MOHM AND 10MOHM OUTPUT RESISTANCE)	1901	POLON	4	/74		13.1505
C	NUMERICAL CONTROL SYSTEM, COMPRISING --	C 500	RDT				13.1506
C	DATA WRITER AND DISPLAY	C 504		NA			
	SERIAL CONTROLLER	C 502		0			
	DATA RECEIVER FOR MECHANICAL OPERATIONS (5 DECADE DATA,3 DECADE INSTRUCTION REG)	C 501		0		(7)	
N	CAMAC PROM PROGRAMMER		SENSION	2		(13)	13.1507
	CURRENT SOURCE (1MA TO 10MA AND FOR PT 100 ADAPTOR)	C 76451-A5-A1	SIEMENS	2	/73		13.1508

2 SYSTEM CONTROL EQUIPMENT — COMPUTER COUPLERS, CONTROLLERS AND RELATED EQUIPMENT

21 Interfaces/Drivers and Controllers — Parallel Mode for 4600 Branch and Other Multi-Crate Bus, Single-Crate Systems, Autonomous Systems

211 Interfaces/Drivers for Multicrate Systems I (4600 Branch Compatible)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	EXECUTIVE SUITE ASSEMBLY OF MODULAR CONTROLLERS IN CAMAC CRATE, COVERS SYSTEM COMPLEXITY FROM SINGLE SOURCE-SINGLE CRATE TO MULTI SOURCE-MULTI CRATE SYSTEMS,COMPRISING		GEC-ELLIOTT				13.2001
	EXECUTIVE CONTROLLER (TRANSFORMS STANDARD CRATE INTO SYSTEM CRATE)	MX-CTR-2		2	/72		
	BRANCH COUPLER (ONE PER BRANCH, MAX 7)	BR-CPR-2		2	/72		
	AND SYSTEM INTERFACE SOURCE UNITS, ALSO OPTIONALLY AUTONOMOUS CONTROLLER SOURCE UNITS (ALL INSERTED INTO SYSTEM CRATE)		GEC-ELLIOTT				13.2002
	PDP-11 SYSTEM INTERFACE, COMPRISING		GEC-ELLIOTT				13.2003
	PROGRAM TRANSFER INTERFACE	PTI-11 C/D		3	/72		
C	UNIBUS TERMINATION UNIT	TRM-11-1		1	/74		
C	INTER UNIT BUS (LINKS UNIBUS TO ALL SI SOURCE UNITS FORMING INTERFACE)	IUB-X		1	/74		
	INTERRUPT VECTOR GENERATOR (ADDS AUTONOMOUS ENTRY OF GL-DERIVED INTERRUPTS)	IVG-11		1	/72		
N	AUTONOMOUS MEMORY ACCESS CONTROLLER (2 USEC/WORD TRANSFER TO PDP-11 STORE)	AMC-11		2	08/75		
	NOVA/SUPERNOVA SYSTEM INTERFACE, COMPR		GEC-ELLIOTT				13.2004
	PROGRAM TRANSFER INTERFACE	PTI-N C/D		3	/72		
	I/O BUS TERMINATION UNIT	TRM-N		1	/72		
C	INTER UNIT BUS	IUB-X			/74		
N	INTERRUPT VECTOR GENERATOR (256 BIT TRAP STORE, BRANCH OR GL PRIORITY MODES)	IVG-2402		1	/74		
	INTERDATA 70-SERIES SYSTEM INTERFACE COMPRISING		GEC-ELLIOTT				13.2005
	PROGRAM TRANSFER INTERFACE	PTI-70 C/D		3	/73		
	I/O BUS TERMINATION UNIT	TRM-70		1			
C	INTER UNIT BUS	IUB-X			/74		
N	INTERRUPT VECTOR GENERATOR (256 BIT TRAP STORE, BRANCH OR GL PRIORITY MODES)	IVG-2402		1	/74		

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	HONEYWELL 316/516 SYSTEM INTERFACE,COMPR		GEC-ELLIOTT				13.2006
	PROGRAM TRANSFER INTERFACE	PTI-H16 C/D		3	/73		
	I/O BUS TERMINATION UNIT	TRM-H16		1			
	SYSTEM INTERFACE BUS	SI-BUS-XH16			/73		
C	GEC 4080 SYSTEM INTERFACE, COMPRISING		GEC-ELLIOTT				13.2007
	DIRECT TRANSFERS INTERFACE	PTI-2050 C/D		3	/73		
N	INTERRUPT VECTOR GENERATOR	IVG-2402		1	/74		
C	BLOCK TRANSFER CHANNEL CONTROLLER	PTI-2050 D		3	/73		
C	INTER UNIT BUS	IUB-X			/74		
N	AUTONOMOUS MEMORY ACCESS CONTROLLER (2,5 US/WORD TRANSFER TO GEC-4080 STORE)	AMC-4080		2	08/75		
C	GEC 2050 SYSTEM INTERFACE (SAME ITEMS AS FOR GEC 4080 INTERFACE)		GEC-ELLIOTT		/74		13.2008
	SYSTEM CRATE TEST UNIT (TWO-COMMAND TEST UNIT FOR CHECKING SYSTEM CRATE SYSTEMS)	SC-TST-1	GEC-ELLIOTT	3	/72		13.2009
	BRANCH HIGHWAY DRIVER	3991	KINETIC SYSTEMS	2	/75		13.2010
C	MICROPROGRAMMED BRANCH DRIVER FOR PDP-11 (FROM 256 UP TU 4K WORDS MEMORY)	1201	BI RA SYSTEMS	NA	/72	(5)	13.2011
	UNIBUS CABLE ASSEMBLY	8101			/72		
	PDP-11 CAMAC CONTROLLER(SEQUENTIAL READ/ WRITE,24 GRADED-L INTERRUPT DIRECTLY)	CA 11-A	D E C	NA	/71	(2)	13.2012
	PDP-15 CAMAC INTERFACE(18/24BIT,PROGR, SEQUENT ADDR AND BLOCK TRANSFER MODES)	CA 15 A	D E C	NA	/71	(1)	13.2013
	PDP-11 INTERFACE/BRANCH DRIVER (24 VECTOR ADDRESSES, PROGRAMMED AND MULTIPLE DMA-TRANSFER, ADDRESS SCAN AND -LIST MODE, REPEAT-, LAM- AND STOP MODE)	CA 11-C	D E C	NA	/72	(4)	13.2014
	PDP-11 BRANCH DRIVER (EUR 4600 COMPATI-BLE,PROGRAMMED AND SEQUENT ADDR MODES)	BD-011	EG&G/ORTEC	NA	/71		13.2015
	PDP-11 BRANCH DRIVER	KS 0011	KINETIC SYSTEMS	NA	/71	(4)	13.2016
	INTERFACE AND DRIVER FOR PDP 11 OR PDP 8 MULTI-CRATE SYSTEM, COMPRISING		NUCL. ENTERPRISES				13.2017
	BRANCH INTERFACE	9031		2	/72	(7)	
	16-BIT CONTROLLER (WITH EITHER OF THE FOLLOWING INTERFACE CARDS)	9030		3	/72	(7)	
	PDP 11 INTERFACE CARD	9032			/72		
	INTERFACE CARD FOR DEC PDP 8 SERIES	9034			/73	(7)	
	INTERFACE CAMAC-PDP 11 (PROGRAMMED,BLOCK TRANSFER AND SEQUENTIAL ADDR MODES)	ICP 11/ICP 11 A	SCHLUMBERGER	NA	/71	(4)	13.2018
	NOVA BRANCH DRIVER	1251-1	BI RA SYSTEMS	NA	/73	(5)	13.2019
	NOVA BRANCH DRIVER WITH DATA CHANNEL	1251-2	BI RA SYSTEMS	NA	/74	(5)	13.2020
	NOVA BRANCH DRIVER	NBD 100	STND ENGINEERING	2	/74		13.2021
	INTERFACE/SYSTEM CONTROLLER TO HP2100, 2114, 2115, 2116	2201	BORER	NA	/71	(4)	13.2022
C	PRIME COMPUTER BRANCH DRIVER (WITH DTM, PRIME COMPUTER BRANCH CABLE TYPE 8103)	1260	BI RA SYSTEMS	NA	/74		13.2023
	INTERFACE FOR VARIAN 620I/L/F COMPUTER (PROGR,SEQUENT AND BLOCK TRANSFERS)	2204	BORER	NA	/72		13.2024
	SYSTEM CONTROLLER FOR SIEMENS 404/3 (TRANSFER OF 16 OR 24 BIT DATAWORDS PARALLEL BRANCH COMMAND CHAINING)	DO 200-2921	DORNIER	6	/73		13.2025
	(SAME BUT WITHOUT COMMAND CHAINING)	DO 200-2922		6	/73		
	SYSTEM CONTROLLER FOR SIEMENS 404/3 (TRANSFER OF 16 OR 24 BIT DATAWORDS PARALLEL BRANCH BUT NO COMMAND CHAINING)	DO 200-2923	DORNIER	6	/73		13.2026
	MICRODATA 800/CIP 2000 BRANCH DRIVER	91	JORWAY	NA	/73	(7)	13.2027
	BRANCH DRIVER (24BIT, PROGR, SEQUENT AND BLOCK TRANSFER MODES, MAX 7 CRATES)	5400	LABEN	4		(8)	13.2028
	INTERFACE-DRIVER FOR VARIAN 73/620I/620L MULTI-CRATE SYSTEM, COMPRISING		NUCL. ENTERPRISES			(8)	13.2029
	BRANCH INTERFACE	9031		2	/72	(7)	
	16-BIT CONTROLLER .	9030		3	/72	(7)	
	AND						
	INTERFACE CARD FOR VARIAN 73/620I/620L SERIES COMPUTERS	CS 0044				(8)	
	SYSTEM CONTROLLER FOR SIEMENS 320/330 (AUTO-GL, 24 VECTOR ADDR, PROGRAMMED & DMA TRANSF, ADDR-SCAN,INCREM,RANDOM LIST REPEAT,LAM & STOP MODES)	C 72451 A1602	SIEMENS	8	/74		13.2030

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
212	**Interfaces/Drivers for Multicrate Systems II (for other Parallel Mode Control/Data Highway)**						
	DEDICATED CRATE CONTROLLER FOR NOVA	NC023	FG&G/ORTEC	2	/73		13,2031
	TERMINATOR FOR NOVA I/O BUS	NT022		1	/73		
	BIDIRECTIONAL DATA BREAK MODULE FOR PDP8 COMPUTERS (FOR USE WITH 7048-2)	1000	HYTEC	2	/74		13,2032
	PROGRAMMED DATAWAY CONTROLLER (PART OF 7000-SER SYSTEM WITH EXT CONTR HIGHWAY)	7025-2	NUCL. ENTERPRISES	2	/70		13,2033
	COMMAND GENERATOR	7062-1		2	/71		
	TRANSFER REGISTER	7063-1		1	/70		
	PROGRAM CONTROL UNIT	0362-2		NA	/70		
	WIRED STORE	7044-1		1	/70		
	PLUGBOARD STORE	7077-1		3	/71		
	CONTROLLER/INTERFACE FOR T1600 COMPUTER (MAX 8 CRATES, PROG/ADDR.SCAN/STOP MODE)	JCT 16-10	NUMELEC	2			13,2034
	DMA MODULE	JDM 16.10		2			
	CRATE CONTROLLER FOR NOVA COMPUTER	CC 2023A/B	SEN	2	/70		13,2035
	CRATE CONTROLLER BUS TERMINATOR FOR CC 2023A/B (ONE PER SYSTEM)	BT 2022		1	/71		
213	**Interfaces/Drivers for Single-Crate Systems (4100 Dataway Compatible)**						
	SINGLE CRATE SYSTEM CONTROLLERS(SEE EXECUTIVE SUITE, CLASS .211)		GEC-ELLIOTT				13,2036
	PDP-11-SERIES CRATE CONTROLLER	1304	BI RA SYSTEMS	2	/73		13,2037
	CRATE CONTROLLER/PDP11 UNIBUS INTERFACE	1533A	BORER	2	/72	(4)	13,2038
	NPR CONTROLLER FOR DMA TO PDP11 E.G. VIA 1533A CRATE CONTROLLER/INTERFACE	1542	BORER	NA	/73	(8)	13,2039
	SINGLE CRATE CONTROLLER/PDP-11 INTERFACE. (MULTIPLE BUS ADDRESS VERSION)	CA-11-E	D E C	2	/74	(9)	13,2040
	SINGLE CRATE CONTROLLER/PDP-11 INTERFACE (PROGRAMMED TRANSFERS, WITH NAF REG & CONNECTOR TO DMA OPTION CA-11-FN)	CA-11-FP	D E C	2	06/75		13,2041
	PDP-11 DMA INTERFACE FOR CA-11-FP (8 DMA CHANNELS, MI OR LIST MODE, 16BIT WC, CA, OFFSET FOR EACH CHANNEL, LIMIT REGISTER)	CA-11-FN		2	06/75		
	DEDICATED CRATE CONTROLLER FOR PDP-11 (MULTIPLE TRANSFER OR AUTO ADDRESS SCAN)	DC011	FG&G/ORTEC	2		(7)	13,2042
	SINGLE CRATE CONTROLLER FOR PDP-8/E ADDR.-SCAN MODE, DMA I/O, MAX 22 LAMS)	LEM-52/32.1	EISENMANN	3		(13)	13,2043
	UNIBUS CRATE CONTROLLER PDP-11	3911	KINETIC SYSTEMS	2	/72		13,2044
	INTERFACE AND DRIVER FOR PDP 11 OR PDP 8 SINGLE CRATE SYSTEM, COMPRISING		NUCL. ENTERPRISES				13,2045
	16-BIT CONTROLLER (WITH EITHER OF THE FOLLOWING INTERFACE CARDS)	9030		3	/72	(7)	
	PDP 11 INTERFACE CARD	9032			/72		
	INTERFACE CARD FOR DEC PDP 8 SERIES	9034			/73	(7)	
	AUTONOMOUS CONTROLLER FOR PDP 11	9033	NUCL. ENTERPRISES	2	/73	(8)	13,2046
	CAMAC CRATE-PDP 11 INTERFACE	J CC 11	SCHLUMBERGER	2		(7)	13,2047
	UNIBUS TERMINATOR	J UT 11		1	/74		
	UNIBUS EXTENDER	C BEX 11			/74		
	CRATE-SYSTEM CONTROLLER FOR PDP-11 (24 BIT READ & WRITE CAPABILITIES)	C-CSC-11	WENZEL ELEKTRONIK	2	/72		13,2048
	NOVA-SERIES CRATE CONTROLLER	1303	BI RA SYSTEMS	2	/73		13,2049
	SINGLE CRATE CONTROLLER TO HP COMPUTERS WITH EXT SYNCHRONISATION FACILITIES	1531A	BORER	2	02/75		13,2050
	INTERFACE FOR HP 2114-2115 COMPUTERS, COMPRISING--		NUCL. ENTERPRISES				13,2051
	16-BIT CONTROLLER	9030		3	/72	(7)	
	AND						
	INTERFACE CARD FOR HP 2114-2115	CS 0058			/74		
	VARIAN-CAMAC INTERFACE CRATE CONTROLLER (16BIT SEQUENT+BLOCK TRANSF, 1 CC/CRATE)	C 300	INFORMATEK	2	/72		13,2052
	INTERFACE-DRIVER FOR VARIAN 73/620I/620L SINGLE CRATE SYSTEM,COMPRISING		NUCL. ENTERPRISES			(8)	13,2053
	16-BIT CONTROLLER	9030		3	/72	(7)	
	AND						
	INTERFACE CARD FOR VARIAN 73/620I/620L SERIES COMPUTERS	CS 0044				(8)	
	INTERFACE FOR HONEYWELL 316-516 COMPUTERS, COMPRISING--		NUCL. ENTERPRISES				13,2054
	16-BIT CONTROLLER	9030		3	/72	(7)	
	AND						
	INTERFACE CARD FOR HONEYWELL 316-516	CS 0057			/74		

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	INTERFACE FOR K202 COMPUTER (24BIT,AUTONOMOUS BLOCK TRANSFERS TO/FROM MEMORY, L=NUMBER INTERRUPT ENCODER)	100	POLON	3	/73		13,2055
N	SINGLE CRATE CONTROLLER FOR MICRAL N/G/S	JC MIC 10	R 2 E	2	02/75	(13)	13,2056
	CRATE INTERFACE FOR MULTI 20 OR MULTI 8	J CM 8/20	SCHLUMBERGER	3	/74		13,2057
	CRATE CONTROLLER 320	C 72451=A1446=A6	SIEMENS	3	/72		13,2058
	CRATE CONTROLLER 404	C 76451=A1446=A7	SIEMENS	2	/73		13,2059

214 Controllers for Autonomously Operated Systems (and Related Units)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DATA PROCESSOR (AUTONOMOUS PROGRAMABLE SINGLE DATAWAY CONTROLLER 16 REGISTERS	DO 200=2951	DORNIER	3	/73		13,2060
	DATA PROCESSOR (AUTONOMOUS PROGRAMABLE SINGLE DATAWAY CONTROLLER 16 REGISTERS, REGISTERS AND MEMORY EXPANDABLE)	DO 200=2951		3	/73		
	CADET (SINGEL=CRATE CONTROLLER FOR READ=ONLY SYSTEM, INCL MODULE TEST & DISPLAY)	CT 2058	SEN	4		(12)	13,2061
	PRINT BUFFER (ALLOWS A PARALLEL PRINTER TO BE USED WITH THE CT 2058)	PB 2059		0		(12)	
N	PROGRAMMABLE CRATE CONTROLLER	S 800	SENSION	22		(13)	13,2062
N	PROGRAMMABLE CRATE CONTROLLER	S 804	SENSION	22		(13)	13,2063
	CAMAC MICROPROCESSOR CRATE CONTROLLER	MIK XA	STND ENGINEERING	0	/74		13,2064

217 Other Parallel Mode Interfaces/Drivers/Controllers

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	SYSTEM CRATE CONTROLLER	3960	KINETIC SYSTEMS	2	/73		13,2065
	MODCOMP I,MODCOMP II & MODCOMP III SYSTEM DRIVER(USE WITH 3960)	3970		2	/73		
	PDP=11 SYSTEM DRIVER (USE WITH 3960)	3971		2	/74		
	CONTROL DATA 6000 SERIES SYSTEM DRIVER (USE WITH 3960)	3973		3	/75		
	MANUAL SYSTEM DRIVER(USE WITH 3960)	3980	KINETIC SYSTEMS	2	/73		13,2066

22 Interfaces/Controllers/Drivers for Serial Highway

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
N	SERIAL CRATE CONTROLLER TYPE L=1 (CONFORMING TO ESONE/SH/01 AND ERRATA)	SCC 2401	GEC=ELLIOTT	2	06/75		13,2067
	SERIAL EXTENSION UNIT, 8 BIT BYTE SERIAL LINK, BRANCH COMPATIBLE, CONSISTING OF		JOERGER		/73	(8)	13,2068
	SERIAL CRATE CONTROLLER *L=1* (CONFORMS TO ESONE/SH/01 & TID=26488 + ERRATA)	74		2	/74	(11)	
	MANUAL SERIAL DRIVER (BIT/BYTE MODE, MULTIPLE MESSAGES, ERROR GENERATION)	78	JORWAY	4	/74		13,2069
N	SERIAL HIGHWAY LOOP CONTROL CIRCUIT	3931	KINETIC SYSTEMS	2		(13)	13,2070
	TRANSF. ISOLATED SERIAL D=PORT ADAPTER	3932	KINETIC SYSTEMS	1	/75	(13)	13,2071
C	TYPE L=1 CRATE CONTROLLER FOR THE "STANDARD" SERIAL HIGHWAY	3952	KINETIC SYSTEMS	2	/74	(13)	13,2072
	DRIVER FOR SERIAL HIGHWAY	3992	KINETIC SYSTEMS	3	/74	(11)	13,2073
	DRIVER FOR SERIAL HIGHWAY (WITH 256 WORD FIFO BUFFER)	3994	KINETIC SYSTEMS	4	/75	(13)	13,2074
N	SERIAL CRATE CONTROLLER SPECIFICATION L1	CR 6001	ROVSING	2	11/75	(13)	13,2075

23 Units Related to 4600 Branch or Other Parallel Mode Control/Data Highway — Crate Controllers, Terminations, Lam Graders, Branch/Bus Extenders

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DISPLAY DRIVER(CONTROLS 72A DISPLAY, ALSO CRATE CTR AND BRANCH DRIVER)	72A	JORWAY	5	/71		13,2076

231 Crate Controllers (Type A-1, Other CC Types)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TYPE A=1 CRATE CONTROLLER	1301	BI RA SYSTEMS	2	/73		13,2077
	CRATE CONTROLLER /ESONE TYPE A1/ (CONFORMS TO EUR4600 SPECS)	1502	BORER	2	/72		13,2078
	CRATE CONTROLLER TYPE CCA=1 ACCORDING TO EUR4600 SPECS WITH CERN OPTIONS	DO 200=2905	DORNIER	2	/74		13,2079
	CAMAC CRATE CONTROLLER TYPE A=1 (CONFORMS TO EUR4600 SPECIFICATIONS)	CC101	EG&G/ORTEC	2	/72		13,2080
	ESONE TYPE A.1 CRATE CONTROLLER(CONFORMS TO EUR4600 SPECS, INCL CERN HOLD OPTION)	CC 2405	GEC=ELLIOTT	2	/73		13,2081

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CRATE CONTROLLER TYPE A-1 (CONFORMS TO EUR4600 SPECS)	CCA-1	JOERGER	2	/72	(5)	13,2082
	BRANCH CRATE CONTROLLER/TYPE A-1 (CONFORMS TO EUR 4600 SPECS, 1972)	70A	JORWAY	2	/73	(7)	13,2083
	TYPE A-1 CRATE CONTROLLER	3900	KINETIC SYSTEMS	2	/73		13,2084
	CRATE A-1 CONTROLLER (CONFORMS TO EUR 4600 SPECS)	9016	NUCL. ENTERPRISES	2		(4)	13,2085
	CRATE CONTROLLER TYPE A (CONFORMS TO EUR4600 SPECS)	C 106	RDT	2	/71		13,2086
	CRATE CONTROLLER TYPE A-1 (CONFORMS TO EUR4600 SPECS)	J CRC 51	SCHLUMBERGER	2	/72	(1)	13,2087
	A-1 CRATE CONTROLLER (CONFORMS TO EUR4600 SPECS, INCL CERN SPEC HOLD LINE)	ACC 2034	SEN	2	/72		13,2088
	CRATE CONTROLLER A1 (EUR 4600 SPECS AND CERN NOTE 38-00)	C 72451-A1446-A2	SIEMENS	2	/70	(1)	13,2089
	TYPE A-1 (ESONE) CRATE CONTROLLER	CC-A1	STND ENGINEERING	2	/72	(6)	13,2090
	TYPE A1 CONTROLLER WITH TERMINATOR (MEETS 4600 SPECS OF JAN 1972)	CCT-A1	STND ENGINEERING	2	/73		13,2091

232 Lam Graders

	LAM GRADER (24 BIT MASK REGISTER, PLUG-IN PATCH BOARD, CERN 064)	LG 2401	GEC-ELLIOTT	1	/72		13,2092
	LAM GRADER (INTERNALLY PATCHABLE, SWITCH SELECTABLE MULTI-CRATE BG-RESPONSE)	LG	JOERGER	1	/73	(8)	13,2093
	LAM GRADER-SORTER	75	JORWAY	2	/73	(7)	13,2094
	LAM GRADER (DESIGNED TO EUR 4600 SPECS)	064	NUCL. ENTERPRISES	1	/72	(4)	13,2095
	PRIORITY GRADER	9037	NUCL. ENTERPRISES	1		(10)	13,2096
	LAM GRADER (CERN SPECS 064)	C 107	RDT	1	/71		13,2097
	LAM GRADER (CERN SPECS 064)	LG 2001	SEN	1	/72	(6)	13,2098
	LAM GRADER (24BIT MASK REG, WITH CABLE, PATCHABLE C-ADDR-REG FOR MULTI-CRATE BG)	C 76451-A18-A1	SIEMENS	0	/74		13,2099

233 Terminations (Simple, with Indicators)

	BRANCH HIGHWAY TERMINATOR	6601	BI RA SYSTEMS	1	/73		13,2100
	BRANCH TERMINATION UNIT (WITH BUILT-IN CABLE)	1592	BORER	1	/73		13,2101
	BRANCH TERMINATION UNIT (NON INDICATING)	BT 6503	GEC-ELLIOTT	2	/72		13,2102
	BRANCH TERMINATION UNIT	BT 6601	GEC-ELLIOTT	2	/71		13,2103
	BRANCH TERMINATOR	BT	JOERGER	2	/72		13,2104
	BRANCH TERMINATION WITH INTEGRAL CABLE	50C	JORWAY	2	/72		13,2105
	BRANCH TERMINATOR IN A CONNECTOR	BT-01	KINETIC SYSTEMS	NA	/73		13,2106
	BRANCH TERMINATOR	J BT 20	SCHLUMBERGER	2	/71		13,2107
	BRANCH TERMINATOR (NON-INDICATING, 40 CM FLYING CABLE WITH BRANCH CONNECTOR)	BT 231	SEMRA-BENNEY	1	/74		13,2108
	(DITTO, XXX= CABLE LENGTH IN CM)	BT 231XXX		1	/74		
	CRATE CONTROLLER BUS TERMINATOR FOR A-1 CRATE CONTROLLER	BT 2042	SEN	1	/72		13,2109
	BRANCH HIGHWAY TERMINATOR	BHT 2055	SEN	1	/74	(11)	13,2110
	BRANCH HIGHWAY TERMINATOR	BHT-001	STND ENGINEERING	1	/73		13,2111
	BRANCH HIGHWAY TERMINATOR, WITH DISPLAY	BHT-002/D	STND ENGINEERING	2	/73		13,2112
	BRANCH TERMINATOR (FULL BRANCH MONITOR WITH INTERNAL STORAGE AND LED DISPLAY)	BT 6502	GEC-ELLIOTT	2	/72		13,2113
	VISUAL BRANCH TERMINATOR (STORES AND DISPLAYS ON LEDS BRANCH SIGNALS)	VBT	JOERGER	2	/72	(6)	13,2114
	BRANCH TERMINATION WITH BRANCH DISPLAY	51	JORWAY	2	/72		13,2115
	BRANCH TERMINATION UNIT (WITH INDICATOR AND POWER SUPPLY)	C 72451-A10-A1	SIEMENS	NA	/73	(3)	13,2116

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.

234 Branch Extenders, Bus Extenders

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	EXTENDED BRANCH SERIAL DRIVER	3990	KINETIC SYSTEMS	5	/74		13,2117
	DIFFERENTIAL BRANCH EXTENDER (FOR EXTENDING BRANCHES UP TO 3 KM)	DBE 6501	GEC-ELLIOTT	2	/71		13,2118
	DIFFERENTIAL MODE BRANCH HIGHWAY EXTENDER (BI-DIRECTIONAL)	55	JORWAY	NA	/73	(7)	13,2119
	BRANCH HIGHWAY TRANSCEIVER FOR LONG DISTANCE TRANSMISSION	J BHT 10	SCHLUMBERGER	2		(4)	13,2120
	SERIAL DRIVER (TERMINATES BRANCH HIGHWAY AND RETRANSMITS COMMAND SERIALLY) SERIAL RECEIVER (RECEIVES SERIAL DATA, DRIVES TYPE A-1 SYSTEM, OPTICAL ISOL)	SD SR	JOERGER	2 2			13,2121
	UNIBUS EXTENDER, TRANSMITTER RECEIVER (FOR DISTANCES UP TO 200 METRE OR MORE)	1594 1595	BORER	2 2	/72 /72		13,2122

3 TEST EQUIPMENT

31 System Related test Gear

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
N	SYSTEM CHECK OUT UNIT. STORES DATA & COMMAND IN READABLE REGS, PROGRAMMABLE L	DTM 4	GEC-ELLIOTT	1	/74		13,3001
	SYSTEM TEST UNIT (FOR EXECUTIVE SUIT SYSTEM CONFIGURATION, SEE MX-CTR-2)	SC-TST-1	GEC-ELLIOTT	3	/72		13,3002

311 Computer Simulators

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	PDP-11 SIMULATOR	6101	BI RA SYSTEMS	NA	/72	(5)	13,3003
	TEST MODULE (USED IN SYSTEM TEST OF READ/WRITE CAPABILITY)	TM024	EG&G/ORTEC	2	/71		13,3004
	TEST CONTROLLER WITH PROGRAM PLUGBOARD	SPS 2048	NUCL. ENTERPRISES	2	01/75	(12)	13,3005
	CAMAC SYSTEM SIMULATOR/TESTER	CSS/T	STND ENGINEERING	6	/73		13,3006

32 Branch Related Testers/Controllers and Displays

321 Branch Testers/Controllers (Manual, Programmed)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	MANUAL BRANCH TESTER (TYPE A SYSTEM TEST SET WITH MX-CTR-2 & BR-CPR-2)	SC-TST-1	GEC-ELLIOTT	7			13,3007
	BRANCH HIGHWAY TEST POINT MODULE(24 DIRECT,22 INDIRECT ACCESS POINTS FOR TEST)	CD 18104	EMIHUS	NA	/71	(3)	13,3008
	BRANCH HIGHWAY REMOVE INHIBIT MODULE (REMOVES INHIBIT FROM BCR/BA/BF/BN/BTA)	CD 18105	EMIHUS	NA	/71	(3)	13,3009
	MANUAL BRANCH DRIVER (FOR TESTING TYPE A SYSTEMS)	MBD	JOERGER	5	/72	(6)	13,3010
	MANUAL BRANCH CONTROL SET (COMPRISING TYPES C COB 10 AND T CMB 10)	C CMB 10	SCHLUMBERGER	NA	/71	(1)	13,3011

33 Dataway Related Testers and Displays

331 Dataway Controllers/Testers (Manual, Programmed)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	MANUAL CRATE CONTROLLER	GFK-LEM	EISENMANN	8	/71		13,3012
	MANUAL CRATE CONTROLLER	MCC	JOERGER	5	/72		13,3013
	MANUAL DATAWAY CONTROLLER	7024-1	NUCL. ENTERPRISES	8	/70		13,3014
	MANUAL DATAWAY CONTROLLER/DISPLAY SYSTEM INTERFACE TO DATAWAY CONTROL AND DISPLAY CRATE	D AI 10 J DA 10 C AI 10	SCHLUMBERGER	 1 NA	/71		13,3015
	MANUAL CRATE CONTROLLER	J CMC 10	SCHLUMBERGER	8	/71	(1)	13,3016
	TEST MODULE FOR CRATE CONTROLLER AND DATAWAY	DTM 2040	SEN	1	/72		13,3017
	MANUAL 24 BIT CRATE CONTROLLER	MCC-240	STND ENGINEERING	2	/72	(5)	13,3018
	DYNAMIC TEST CONTROLLER (GENERATES ALL POSSIBLE CAMAC COMMANDS IN SINGLE CRATE)	TC 2403	GEC-ELLIOTT	3	/71		13,3019
	DYNAMIC TEST CONTROLLER (2 SIMULT TRANSF SINGLE,STEP-BY-STEP AND CONTINUOUS MODE)	C 108	RDT	8	/71	(4)	13,3020
	DATAWAY SERVICE MODULE	J DS 10	SCHLUMBERGER	1	/74	(12)	13,3021
	CONTROLEUR SORTIE DATAWAY (DATAWAY TEST MODULE)	41403	TRANSRACK	1	/70		13,3022

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.

332 Dataway Displays

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CAMAC TEST MODULE/DATAWAY DISPLAY	6102	BI RA SYSTEMS	2	/73		13,3023
	CAMAC DATAWAY DISPLAY (DATAWAY SIGNAL PATTERN STORED/DISPLAYED,2 TEST MODES)	1801	BORER	1	/71	(1)	13,3024
	CAMAC DATAWAY TEST AND DISPLAY MODULE	LEM=52/16,2	EISENMANN	1			13,3025
	DATAWAY MEMORY (DISPLAY + READABLE REGISTER)	C 340	INFORMATEK	1	/72		13,3026
	DATAWAY DISPLAY (STORES AND DISPLAYS DATAWAY SIGNALS, FARWQXCIZS1S2BP1P2)	DD	JOERGER	1	/72	(6)	13,3027
	DATAWAY DISPLAY (SEPARATE R & W DISPLAY, TRACKS OR STORES, MANUAL CLEAR)	202	JORWAY	1	/74	(11)	13,3028
	DATAWAY DISPLAY	3290	KINETIC SYSTEMS	1	/72		13,3029
N	DATAWAY DISPLAY (WITH MEMORY, FOLLOW, ON-LINE & TRIGGER MODES)	9554	NUCL. ENTERPRISES	1		(13)	13,3030
	DATAWAY DISPLAY	C 76451-A16-A1	SIEMENS	1	/73	(6)	13,3031
	DATAWAY DISPLAY MODULE	DD-002	STND ENGINEERING	1	/72	(5)	13,3032
	DATAWAY DISPLAY (DISPLAYS AND STORES DATAWAY SIGNAL PATTERN)	C-D1-24	WENZEL ELEKTRONIK	1	/72		13,3033

34 Module Related Test Gear (Module Extenders)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CAMAC MANUAL MODULE TESTER	6103	BI RA SYSTEMS	NA	/74		13,3034

341 Module Extenders

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CAMAC EXTENDER MODULE	8201	BI RA SYSTEMS	1	/73		13,3035
	EXTENSION FRAME (MODULE EXTENDER)	EF 1-1	GEC-ELLIOTT	1	/71		13,3036
	MODULE EXTENDER (+AND-6V,+AND-24V FUSED, RETRACTABLE LOCKING DEVICE)	ME	JOERGER	1	/72		13,3037
	EXTENDER MODULE	11	JORWAY	1	/71		13,3038
	EXTENDER MODULE (FUSED +&-6V AND +&-24V, SUPPORT ARM)	11A	JORWAY	1	/74		13,3039
	EXTENDER CARD	1100	KINETIC SYSTEMS	1	/71	(4)	13,3040
	EXTENSION UNIT	7007-1	NUCL. ENTERPRISES	1	/70		13,3041
	BUFFERED EXTENDER (25NSEC PROPAGATION DELAY, 60 CM FLEXIBLE CABLE)	060	POLON	1	03/75		13,3042
	EXTENDER MODULE	061	POLON	1	/73		13,3043
	EXTENDER	CEX	RDT	1	/72		13,3044
	MODULE EXTENDER	ME 2030	SEN	1	/70		13,3045
	DATAWAY EXTENDER MODULE	EB 01	STND ENGINEERING	1	/72		13,3046
	EXTENDER (XXX=LENGTH OF CABLE IN MM BEYOND RACK, SINGLE WIDTH)	577/XXX	TEKDATA	1	/72	(5)	13,3047
C	(DITO, DOUBLE WIDTH, FIXED SIDES)	5813/XXX		2	/73		
N	(DITO, DOUBLE WIDTH, HINGED SIDES)	5824/XXX		2	/75		
	PROLONGATEUR POUR TIROIRS CAMAC CABLE (WIRED EXTENDER)	41401	TRANSRACK	1	/70		13,3048
	PROLONGATEUR POUR TIROIRS CAMAC NON CABLE (UNWIRED EXTENDER)	41402	TRANSRACK	1	/70		13,3049

37 Other Test Gear for CAMAC Equipment

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TRANSIENT GENERATOR(MODULE NOISE SUSCEPT IBILITY TESTED BY TRANSIENTS ON DC LINES	TG	JOERGER	1	/73		13,3050

4 CRATES, SUPPLIES, COMPONENTS, ACCESSORIES

41 Crates and Related Components/Accessories — Crates with/without Dataway and Supply, Blank Crates, Crate Ventilation Gear

411 Crates with Dataway and Supply

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF, No.
	CRATE (270VA,COOLED,MODULAR POWERED BY MAX 8X1922 OR 1X1923/1925 + MAX 4X1922)	1902A	BORER	25	/69		13,4001
	VOLTAGE REGULATOR (FOR +OR-24V/6A, +/-12V/7A,+/-6V/8A/16A/24A)	1922			/69		
	VOLTAGE REGULATOR (+&-6V 25A MAX, OR 40A MAX WITH EXTERNAL +6V SUPPLY)	1923			/74		
	VOLTAGE REGULATOR (+AND-6V, 25A MAX, 270W RATING, USABLE WITH 4X1922)	1925			/73		
	CAMAC MINICRATE (19 INCH RACK MOUNTING) (+6V/15A,-6V/5A, +24V/2A,-24V/2A,200W)	307.100CC	EDS SYSTEMTECHNIK	17	/73	(10)	13,4002
	POWERED CRATE	MC200	EG&G/ORTEC	25	/74		13,4003
N	POWERED CRATE (INCL. CRATE AND POWER SUPPLY COOLING TO SUPPL CP 1 SPEC)	PS 004/PA1/VC 0040	GEC-ELLIOTT	25	05/75		13,4004
C	POWERED CRATE (+&-6V/40A, +&-24V/8A, 200V/.1A, 117V AC, MAX 300W)	CPC/14	GRENSON		/73		13,4005
	POWERED CRATE	1500		NA	/73		
	POWER CRATE (9070 CRATE WITH 9022 POWER SUPPLY)	9071	NUCL. ENTERPRISES	24	/74	(12)	13,4006
	POWERED CRATE (+AND-6V/25A, +AND-24V/6A, (INCL POWER DESIGN TYPE AEC432 SUPPLY)	NSI-875CC100AEC432	NUCL. SPECIALTIES	25	/72		13,4007
	POWERED CRATE (6U,VENTILATED,NO FAN,130W +6V/15A,-6V/4A,+AND-24V/2A,+200V/50MA)	015	POLON	25	/71		13,4008
	POWERED CRATE	CCHN-CSAN	RDT	25	/71		13,4009
	POWERED CRATE(SEE P7 ALJ 13)	C7 ALJ 13 DW	SAPHYMO-STEL	25		(1)	13,4010
	POWER SUPPLY (CAMAC CRATE)	CM5125/53/DW/BLOCS	SAPHYMO-STEL	25	/72		13,4011
	POWERED VENTILATED CRATE (+6V/24A, -6V/16A, +AND-24V/3A, MAX 400W)	C JAL-41	SCHLUMBERGER	25	/73	(8)	13,4012
	POWER CRATE (200W MAX,+6V/25A,-6V/10A, +AND-12V/3A,+AND-24V/3A,200V/0.05A)	PC 2006/B	SEN	25	/70		13,4013
	POWER CRATE (200W MAX,+6V/25A,-6V/10A, +AND-24V/3A,200V/0.05A)	PC 2006/C		25	/71		
	COMPLETE POWER CRATE	CPC 2057	SEN	25	/74	(11)	13,4014
	POWERED CRATE (7U,VENT,+AND-6V/26A,+AND-12V/6.5A,+AND-24V/6.5A,200V/0.1A,200W)	C 76455-A2	SIEMENS	25	/71	(3)	13,4015
	POWERED CRATE (SAME BUT WITH 117V AC)	C 76455-A1		25	/71		
	POWERED CAMAC CRATE	PCS/12	STND ENGINEERING	25	/72		13,4016
	POWERED CAMAC CRATE	PCS/42	STND ENGINEERING	25	/72		13,4017
N	POWERED CRATE (SEE CRATE C-CF AND SUPPLY P-156 FOR RATINGS)	C-CF + P-156	WENZEL ELEKTRONIK	25	05/75		13,4018
N	POWERED CRATE (SEE C-CF & SUPPLY P-264)	C-CF + P-264		25	03/75		
N	POWERED CRATE (SEE C-CF & SUPPLY P-300F)	C-CF + P-300F		25	04/75		

412 Crates with Dataway, without Supply

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF, No.
C	VENTILATED CRATE (HEAVY DUTY 25 STATION FASTON CONNECTORS, 6U HIGH)	VC 0022	GEC-ELLIOTT	25	/74		13,4019
N	(SAME BUT WITH ALL PATCH LINES BUSSED AS PER COGELAB REQUIREMENTS)	VC 0030		25	/74		
N	5U CRATE 25 STATION HEAVY DUTY, FITS TO PS 0004 USING ADAPTOR PA 1.	VC 0040	GEC-ELLIOTT	25	05/75		13,4020
	CONVERTS FASTON CONNECTORS TO RECOMMENDED FIXED POWER CONNECTOR ON CHOSEN CRATE	/AMP	GEC-ELLIOTT		/73		13,4021
	CAMAC CRATE VERDRAHTET (EMPTY CRATE WITH WIRED DATAWAY)	2,084,000.6	KNUERR	25	/73	(2)	13,4022
	CRATE	9070	NUCL. ENTERPRISES	24	/74		13,4023
	CAMAC COMPATIBLE CRATE (WIRED)	NSI-875 DB-WV	NUCL. SPECIALTIES	25	/71		13,4024
	CAMAC CRATE (WIRED)	NSI-875 CC 100	NUCL. SPECIALTIES	25	/72		13,4025
	UNPOWERED CRATE WITH DATAWAY (6U, EMPTU, VENTILATED, NO FAN)	012	POLON	25	/71		13,4026
	UNPOWERED CRATE WITH DATAWAY (360 MM)	CM 5125/33/DW	SAPHYMO-STEL	25			13,4027
	(525 MM)	CM 5125/53/DW		25			
	UNPOWERED CRATE WITH DATAWAY AND CONNECTORS	UPC 2029	SEN	25	/70		13,4028

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CRATE (WIRED CRATE)	WCS	STND ENGINEERING	25	/72	(5)	13,4029
N	WIRED CRATE (HEAVY DUTY, 3 FAN & MONIT,	C=CF	WENZEL ELEKTRONIK	25	03/75		13,4030
	UNIT, 6U, USE WITH P=156, P=264, P=300F)						
	CRATE (WITH DATAWAY AND VENTILATION)	C 76455=A3	SIEMENS	25	/72		13,4031

413 Crates without Dataway, with Supply

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CAMAC CRATE	DO 200=3001	DORNIER	NA	/74		13,4032
	(+6V/25A,=6V/12.5A,+&=24V/6A,+&=12V/4A)						
	(SAME WITHOUT +&=12V SUPPLY)	DO 200=3002		NA	/74		

417 Blank Crates and Other Components and Accessories

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CRATE (5U,EMPTY, 25 STATIONS)	MCF/5CAM/S/25	IMHOF=BEDCO	25	/71		13,4033
	(SAME BUT WITH 24 STATIONS)	MCF/5CAM/S/24		24	/72		
	CRATE (6U,EMPTY,WITH VENTILATION BAFFLE,	MCF/6CAM/SV/25		25	/71		
	25 STATIONS, HARWELL TYPE 7000)						
	(SAME BUT WITH 24 STATIONS)	MCF/6CAM/SV/24		24	/72		
	CRATE (6U,EMPTY,WITH VENTILATION BAFFLE,	MCF/6CAM/SVR/25		25	/71		
	REMOVABLE PANEL, 25 STNS, HARWELL 7000)						
	(SAME BUT WITH 24 STATIONS)	MCF/6CAM/SVR/24		24	/72		
	CAMAC CRATE (EMPTY)	2,080,000,6	KNUERR	25	/70	(2)	13,4034
	CAMAC CRATE (EMPTY,INCL HARDWARE SUPPLY	2,086,000,6		25		(2)	
	CHASSIS AND VENTILATION PANEL)						
	CAMAC COMPATIBLE CRATE	NSI 875 DB/WV	NUCL. SPECIALTIES	25	/70		13,4035
	CAMAC CRATE (UNWIRED)	NSI 875 CC 100	NUCL. SPECIALTIES	25	/72	(5)	13,4036
	CHASSIS CAMAC (6 UNITES AVEC FENTE	9905=1=05	OSL	25	/71		13,4037
	DE VENTILATION, 525 MM PROFONDEUR)						
	(360 MM PROFONDEUR)	9905=2=05		25	/71		
	CAMAC CRATE WITH VENTILATION BAFFLE	9905HVD3/98/525	OSL	25			13,4038
	(6U, 525MM DEPTH)						
	(SAME BUT WITH 460MM DEPTH)	99055HV3AVD/98/460		25			
	(SAME BUT WITH 360MM DEPTH)	99055HV3AVD/98/360		25			
	CRATE (6U, EMPTY, VENTILATED, NO FAN)	010	POLON	25	/71		13,4039
	VENTILATED CRATE NO POWER NO DATAWAY	CCHN	RDT	25	/71		13,4040
	(TWO FANS)						
	(SAME WITH 3 FANS)	CCHNA		25	/72		
	UNPOWERED CRATE	UC 2057	SEN	25	/74	(11)	13,4041
	CAMAC CRATE (EMPTY CRATE)	C	STND ENGINEERING	25	/72		13,4042
	CHASSIS CAMAC NORMALISE 5U	40206	TRANSRACK	25	/74		13,4043
	(EMPTY CRATE,360 MM DEEP)						
	(*=7 FOR 460MM & *=8 FOR 525MM DEEP)	4020*		25			
	CHASSIS CAMAC 5U UTILES (EMPTY CRATE,6U	40203	TRANSRACK	25	/74		13,4044
	TOTAL,360MM DEEP,VENTILATION HARDWARE)						
	(*=4 FOR 460MM & *=5 FOR 525MM DEEP)	4020*		25			
	CHASSIS CAMAC 5U UTILES (EMPTY CRATE,6U	40200	TRANSRACK	25	/74		13,4045
	TOTAL,360MM DEEP,WITH TWO FANS)						
	(*=1 FOR 460MM & *=2 FOR 525MM DEEP)	4020*		25			
	CAMAC CRATE (EMPTY) HEAVY DUTY		OSL/WILLSHER&QUICK		/73		13,4046
	6U WITH VENTILATION BAFFLE	9905=5HV		25	/73		
	5U NON VENTILATED	9905=5H		25	/73		
	DEPTH OPTIONS 360MM, 460MM, 525MM						
	CAMAC CRATE WITH VENTILATION BAFFLE	99055HV3AVD/98/525	OSL/WILLSHER&QUICK	25	/73		13,4047
	(6U, 525MM DEPTH)						
	(SAME BUT WITH 460 MM DEPTH)	99055HV3AVD/98/460		25	/73		
	(SAME BUT WITH 360 MM DEPTH)	99055HV3AVD/98/360		25	/73		
	VENTILATION UNIT	CAM/FV	IMHOF=BEDCO		/73		13,4048
	LUFTEREINHEIT (VENTILATION UNIT,COMPLETE	2,081,000,6	KNUERR		/70		13,4049
	WITH 3 FANS AND FILTER)						
	(VENTILATION UNIT,NO FAN,NO FILTER)	2,085,000,6					
	AIR SCOOP (STOPS CHIMNEY EFFECT BETWEEN	NSI=12109=AS	NUCL. SPECIALTIES	NA	/71		13,4050
	UN=VENTILATED CRATES IN RACK, 1U HIGH)						
	VENTILATION MODULE	VM 2057	SEN		/74	(11)	13,4051
	1U VENTILATION GRILL	1 UG	OSL/WILLSHER&QUICK		/72		13,4052
	CARD EXTENDER (FOR SUPPLY OF 2057)	CE 2061	SEN				13,4053

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.

42 Supplies and Related Components/Accessories — Single- and Multi-Crate Supplies, Blank Supply Chassis, Control Panels, Supply Ventilation

421 Multi-Crate Supplies

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
C	POWER SUPPLY FLEXIBLE SYSTEM (TO SPECS CERN-ISR-CO/72-43), COMPRISING	CPU/10	GRENSON		/71		13.4054
	BASIC CRATE(FOR SUPPLY MODULES,INCLUDES REFERENCE,CONTROL AND 200V/0.1A)	CFC					
	SUPPLY MODULE(* IN TYPE = P FOR POS AND N FOR NEG OUTPUT VOLTAGE 6V/ 6A)	CF*/6					
	(12V/ 3A)	CF*/12					
	(24V/ 3A)	CF*/S4					
	POWER SUPPLY SYSTEM (CRATE) (MODULE OPTTONS AS FOLLOWS)	C4BMT204/C6BMT306	SAPHYMO-STEL		/72		13.4055
	POWER SUPPLY MODULE 6 V/10 A (6V/20A & 6V/40A OPTIONS ALSO AVAILABLE)	BP 75 6.10					
	12 V/ 2 A (ALSO 12V/4A, 7A, 15A & 25A OPTIONS)	BSN					
	24 V/ 1.2A (ALSO 24V/2.5A, 3.5A, 9A & 15A OPTIONS)	BSN					

422 Single-Crate Supplies

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
N	POWER SUPPLY AND COOLING UNIT (+6V/42A, -6V/25A,+&-24V/6A, 375W, 2U FAN UNIT)	PS 0004	GEC-ELLIOTT		05/75		13.4056
	CAMAC POWER UNIT (+6V/15A,-6V/3A,+24V/2A -24V/2A,200V/0.05A,117VAC)	CPU/4	GRENSON				13.4057
	CAMAC POWER SUPPLY - RACK MOUNTING (+6V/20A,-6V/5A,+AND-24V/5A,200V/0.05A)	CPU/2	GRENSON		/71		13.4058
	CAMAC POWER SUPPLY - RACK MOUNTING (+6V/20A,-6V/5A, +&-12V/2A, +&-24V/3A)	CPU/5	GRENSON		/71		13.4059
	POWER SUPPLY (RACK MOUNTING,+6V/25A, -6V/15A,+AND-24V/5A,200V/0.1A)	CPU/6	GRENSON		/71		13.4060
	POWER SUPPLY (RACK MOUNTING,+6V/25A, -6V/15A,+AND-24V/5A,+AND-12V)	CPU/7	GRENSON		/71		13.4061
	POWER SUPPLY (+6V/20A,-6V/5A, +AND-24V/5A,200V/0.05A)	9001	NUCL. ENTERPRISES		/71		13.4062
	POWER UNIT (+6V/15A,-6V/3A, +AND-24V/2A,200V/0.05A)	9022	NUCL. ENTERPRISES		/71	(2)	13.4063
	POWER SUPPLY (BACK MOUNTING,+6V/15A, -6V/4A,+AND-24V/2A,+200V/50MA,130W)	CZC-10	POLON		/73		13.4064
	POWER UNIT (+6V/20A, -6V/15A,+24V/2A, -24V/2A,200V/0.1A)	SP 426	POWER ELECTRONICS		/74		13.4065
N	POWER UNIT (+6V/25A, -6V/25A, +24V/5A, -24V/5A, 200V/100MA)	SP 558	POWER ELECTRONICS		/75		13.4066
	POWER SUPPLY (+6V/25A,-6V/5A, +AND-12V/2A,+AND-24V/3A,200V/0.1A)	C 303	RDT		/71		13.4067
	POWER SUPPLY UNIT -MAINTENANCE ONLY- (+6V/10A,-6V/2A,+AND-24V/1.5A)	P4 ALJ 13	SAPHYMO-STEL		/71		13.4068
	(+6V/5A,-6V/1.5A,+AND-12V/1.5A, +AND-24V/1.5A) -MAINTENANCE ONLY-	P6 ALJ 13					
	(+6V/25A,-6V/10A,+AND-12V/3A, +AND-24V/3A,+200V/0.1A,MAX 200W)	P7 ALJ 13	SAPHYMO-STEL				13.4069
	POWER SUPPLY (+6V/32A,-6V/32A,+24V/6A, -24V/6A,+200V/.1A,300W, POWER FAIL LAM)	PS 2057	SEN		/74	(11)	13.4070
	SUPPLY (+AND-6V/26A,+AND-12V/6.5A,+AND-24V/6.5A,200V/0.1A,117V AC, 200W MAX)	C 76455-A4	SIEMENS		/72		13.4071
	SUPPLY (SAME BUT WITHOUT 117V AC)	C 76455-A5			/72		
	POWER SUPPLY (+AND-6V/6A SHARED AND +AND-24V/2A SHARED, METERING OF V AND I)	825	STND ENGINEERING		/72		13.4072
	POWER SUPPLY AND BLOWER UNIT	1410	STND ENGINEERING		/72	(5)	13.4073
	CAMAC POWER SUPPLY	1510/12	STND ENGINEERING	NA	/72		13.4074
	CAMAC POWER SUPPLY	1510/42	STND ENGINEERING	NA	/72		13.4075
N	PLUG-IN POWER SUPPLY 156W (+-6V/5A, +-12V/5A,+-24V/1A,117VAC)	P-156	WENZEL ELEKTRONIK		05/75		13.4076
N	PLUG-IN POWER SUPPLY 264W (+-6V/10A, +-12V/2A,+-24V/2A,OPT.+200V/40MA,117VAC)	P-264			03/75		
N	PLUG-IN POWER SUPPLY 300W&FAN(+-6V/32A, +-12V/3A,+-24V/6A,+200V/100MA,117VAC)	P-300F			04/75		

427 Blank Supply Chassis, Other Components/Accessories

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	POWER SUPPLY CRATE (STANDARD)	MCF/4/PPC	IMHOF-BEDCO	NA	/71		13.4077
	POWER SUPPLY CRATE (WIRED)	MCF/PPC/WV		NA	/71		
	NETZTEILCHASSIS (EMPTY SUPPLY CHASSIS)	2.082.000.6	KNUERR		/70		13.4078
	POWER SUPPLY CRATE(FOR SEPARATE SUPPLY)	CSAN	RDT		/71		13.4079
	MAINS SWITCH ASSEMBLY	MS 3	GEC-ELLIOTT	NA	/71		13.4080
	POWER INDICATOR	0704	NUCL. ENTERPRISES	NA	/70		13.4081

43 Recommended or Standard Components/Accessories — Branch Cables, Connectors etc., Dataway Connectors, Boards etc., Blank Modules, Other Stnd Components

431 Branch Related (Cables, Connectors etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	BRANCH HIGHWAY CABLE	8102	BI RA SYSTEMS		/73		13.4082
	BRANCH HIGHWAY CABLE	BH001	EG&G/ORTEC		/71		13.4083
	BRANCH HIGHWAY CABLE ASSEMBLY (WITH CONNECTORS,27 CM LONG)	CC 66 POL PB-27	EMIHUS		/71		13.4084
	(XX CM LONG,PVC JACKET)	CC 66 POL PB-XX					
	BRANCH HIGHWAY CABLE (COMPLETE PTFE CABLE ASSEMBLY,27CM LONG)	CD 18067-27	EMIHUS		/70		13.4085
	(***= 107, 207 - OR CUSTOMER SPECIFIED - FOR CORRESPONDING LENGTH IN CM)	CD 18067/***			/71		
	BRANCH HIGHWAY CABLE (WITH CONNECTORS, 27 CM LONG)	BHC 027	GEC-ELLIOTT		/72		13.4086
	SAME,***=067,107 & 207 FOR CORRESP LENGTH IN CM,OTHER LENGHTS TO SPEC ORDER	BHC ***			/72		
	BRANCH HIGHWAY CABLE		JOERGER				13.4087
	BRANCH CABLE WITH CONNECTOR (1.5 FT TO 75 FT LONG)		JORWAY		/71		13.4088
	BRANCH HIGHWAY CABLE (66 TWISTED PAIRS)	CL 90	SCHLUMBERGER		/71		13.4089
	BRANCH HIGHWAY CABLE ASSEMBLY (COMPLETE WITH CONNECTORS, LENGTH 27 CM)	BHC 27	SEMRA-BENNEY		/72		13.4090
	(SAME, XXX=LENGTH IN CM, 040,100 ETC)	BHC XXX			/72		
C	BRANCH HIGHWAY CABLES(COMPLETE WITH CONNECTOR,XXX = LENGTH IN METERS)	2000/132/XXX	TEKDATA		/71	(4)	13.4091
	BRANCH HIGHWAY CONNECTOR (FREE MEMBER, PIN MOULDING WITH METAL PIN PROTECTOR)	WSS0132P08BN527-M	FMTHUS		/73		13.4092
	BRANCH HIGHWAY CONNECTOR (FIXED MEMBER,SOCKET MOULDING)	WSS0132S00BN000	FMIHUS		/70		13.4093
	(FREE MEMBER,PIN MOULDING, PXX YYY SELECTS JACKSCREW)	WSS0132PXXBNYYY					
	HOOD (FOR FREE MEMBER)	WAC 0132 H005					
	BRANCH HIGHWAY CABLE ONLY (PLAIN PVC JACKET)	66 POL PB	EMIHUS		/71		13.4094
	EXTENDED BRANCH CABLE (LOW COST TELE- PHONE CABLE FOR LONG BRANCH RUNS)	EBC XXXX	GEC-ELLIOTT		/72		13.4095
	BRANCH HIGHWAY CABLE (132-WAY)	LIY-Y72X2X0.088	LEONISCHE		/72		13.4096
	BRANCH HIGHWAY CABLE (TRUE 132-WAY WITH METALISED POLYESTER SCREEN, PVC JACKET)	LI2Y(ST)Y66X2X0.18	LEONISCHE				13.4097
	CABLE FOR BRANCH HIGHWAY (PVC JACKET)	132 PE 189	PRECICABLE BOUR		/71		13.4098
	(BRAIDED RILSAN JACKET)	132 PE 210					
	(MEPLAT 20MMX10.8MM,GAINE PVC NOIR)	132 PE 291			/72		
	CABLE EXTENSION MODULE (JOINS TWO BRANCH HIGHWAY CABLES)	CD 18106	FMIHUS		/72		13.4099
	BRANCH HIGHWAY TO PDP-11 (COMPLETE WITH CONNECTORS, XXX= LENGTH IN METERS)	5805/P/132/XXX	TEKDATA		/73	(8)	13.4100
N	BRANCH HIGHWAY JUNCTION BOX	5849	TEKDATA		/75		13.4101

432 Dataway Related (Connectors, Boards, Assemblies)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	ADDRESS & FUNCTION DECODING PC	AFD 2066	SEN				13.4102
	DATAWAY MOTHERBOARD (MULTILAYER PNB)	DM-1	STND ENGINEERING		/72		13.4103
	DATAWAY MOTHERBOARD (WITH CONNECTORS)	1186	WEHRMANN		/74	(10)	13.4104
	DATAWAY SOCKET (MOTHERBOARD COMPLETE WITH 25 CONNECTORS)	CIM	RDT		/70		13.4105
	DATAWAY MINT WRAPPING (MOTHERBOARD WITH 25 DATAWAY CONNECTORS)	J/DW	SAPHYMO-STEL		/71		13.4106

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	DATAWAY MOTHERBOARD ASSEMBLY	DM 2	STND ENGINEERING		/72		13,4107
	DATAWAY CONNECTOR, EDGE TYPE II	1-163633-0	AMP AG		/70		13,4108
	(WIRE WRAP)						
	(TERMI-POINT/WIRE WRAP)	1-163634-0			/70		
	(MOTHERBOARD SOLDER)	1-163635-0			/70		
	(WIRE SOLDER)	1-163636-0			/70		
	DATAWAY CONNECTOR WITH CARD GUIDES (HAND	PBC SERIES	BURNDY	NA	/74		13,4109
	SOLDER, DIP SOLDER & MINI-WRAP)						
	DATAWAY CONNECTOR (MINIWRAP)	EAA 043 D301	EMIHUS		/71	(2)	13,4110
	CONNECTEUR,FUTS DROITS	KF86 254 BED T	FRB CONNECTRON		/70		13,4111
	(DATAWAY CONNECTOR,STRAIGHT PINS)						
	FUTS WRAPPING (WIRE WRAP PINS)	KF86 254 BEY T					
	FUTS A SOUDER (SOLDER PINS)	KF86 254 BES T					
	CAMAC DATAWAY CONNECTOR (* INSERT A FOR	G03D 086P 28 * BL	ITT CANNON		/73	(6)	13,4112
	SOLDER TAG, B SOLDER PIN, C MINI WRAP)						
	CAMAC-LEISTE(DATAWAY CONNECTOR,WIREWRAP)	4,000,060,0	KNUERR		/70		13,4113
	DATAWAY FEMALE CONNECTOR, MINI-WRAP	2422 061 64334	PHILIPS		/71	(5)	13,4114
	*=1 FOR WIRE SOLDER, 5 FOR BOARD SOLDER	2422 061 643*4				(5)	
	DATAWAY MALE CONNECTOR (MATING THE CRATE	2422 060 14314	PHILIPS		/72	(5)	13,4115
	MOUNTED 86-WAY CONNECTOR SOCKET)						
C	CONNECTEUR 254 DOUBLE FACE	254 DF 43 BWV	SOCAPEX		/70		13,4116
	(DATAWAY CONNECTOR,WIRE WRAP)						
	(MOTHERBOARD SOLDER)	254 DF 43 AYV			/70		
	(WIRE SOLDER)	254 DF 43 AZV			/70		
	DATAWAY CONNECTOR (MINI-WRAP)	8606 86 21 15 000	SOURIAU		/71		13,4117
	(WIRE-SOLDER)	8606 86 21 10 000					
	(FLOW SOLDER)	8606 86 21 14 000					
	DATAWAY CONNECTOR (*=2 FLOW SOLDER,*=3	C 288* CSP 221	UECL		/71		13,4118
	SOLDER LUGS,*=4 MINIWRAP,AU PLATING)						
	(FLOW SOLDER,NI + AU PLATING)	C 2885 CSP 221					
	(13 MINIWRAP CONTACTS,OTHER ARE FLOW	C 2886 CSP 221					
	SOLDER,NI + AU PLATING)						
	(*=7 MINIWRAP,*=8 SOLDER LUGS,	C 288* CSP 221					
	NI + AU PLATING)						
	MOUNTING BRACKETS FOR ABOVE	C 8523					
N	DATAWAY CONNECTOR HOOD (43-WAY DOUBLE	S 4051	TEKDATA	1	/75		13,4119
	SIDED, 2,54 MM PITCH CONTACTS)						

433 Module Related (Blank Modules, Patchboars etc.)

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	CAMAC CARRYING CASE (TAKES 8 MODULES)	C/NCC8-4	HENESA		/73		13,4120
	CAMAC CARRYING CASE (TAKES 12 MODULES	C/NCC12-6	HENESA		/73		13,4121
C	BLANK MODULE KIT (SINGLE WIDTH)	BM 1	GEC-ELLIOTT	1	/73		13,4122
	(SAME,*=2,3 & 4 FOR CORRESP WIDTH)	BM *					
	SINGLE CARD MOUNTING KIT	CAM/M1/A	IMHOF-BEDCO	1	/72		13,4123
	(EMPTY MODULE,SHORT SCREEN PLATE)						
	(SAME,*=2,3 & 4 FOR CORRESP WIDTH)	CAM/M*/A			/73		
	SINGLE CARD MOUNTING KIT (EMPTY MODULE,	CAM/M1/B		1	/72		
	(EMPTY MODULE,LONGT SCREEN PLATE)						
	(SAME,*=2,3 & 4 FOR CORRESP WIDTH)	CAM/M*/B			/73		
	CAMAC HARDWARE	CH-001	KINETIC SYSTEMS	1	/71	(4)	13,4124
	CAMAC-KASSETTE (EMPTY MODULE,WIDTH 1/25)	2,090,001,8	KNUERR	1	/70	(2)	13,4125
	(*=2,3,4,5,6 FOR CORRESPONDING WIDTHS)	2,090,00*,8			/70		
	CAMAC COMPATIBLE MODULE (EMPTY, WIDTH=1,	NSI 875 DM	NUCL. SPECIALTIES	1	/70		13,4126
	ALSO IN 2 & 3 UNIT WIDTHS)						
	CAMAC MODULE (EMPTY MODULE HARDWARE)	NSI 875 CM-100-1	NUCL. SPECIALTIES	1	/72	(5)	13,4127
	(SAME, *= 2, 3, & 4 FOR CORRESP WIDTH)	NSI 875 CM-100-*			/72	(5)	
	CAMAC MODULE,SHIELDED (EMPTY, 1 WIDTH)	NSI-875-DM/SPH-1	NUCL. SPECIALTIES	1	/71		13,4128
	(SAME, *=2, 3, AND 4 FOR CORRESP WIDTH)	NSI-875-DM/SPH-*			/71		
	CAMAC MODULE (EMPTY,W=1/25)	021	POLON	1	/71		13,4129
	(*=2,3,4,6 & 8 FOR CORRESP WIDTH)	02*			/71		
	(*=0&2 FOR WIDTH 10 & 12 RESPECTIVELY)	03*			/71		
	EMPTY MODULE 1 UNIT	CCA 1	RDT	1	/70		13,4130
	(SAME,*=2,3 & 4 FOR CORRESP WIDTH)	CCA *					
	EMPTY MODULE SCREENED (1 WIDE, ADD TYPE	CM1	SEMRA-BENNEY	1	/73		13,4131
	SUFFIX A FOR SHORT, B FOR LONG SCREENS)						
	(DITO, *=2,3,4 OR 6 FOR CORRESP WIDTH)	CM*					
	MODULE HARDWARE (EMPTY MODULE, W=1/25,		STND ENGINEERING	1	/72		13,4132
	ALSO AVAILABLE W=2/25,3/25 & UP TO 8/25)						
	TIROIRE MODULAIRE POUR CARTE BASCULANTE	41405	TRANSRACK	2	/72		13,4133
	(EMTY MODULE FOR HINGED CARD)						
	TIROIRE MODULAIRE POUR 2 CARTES BASCUL.	41406		3	/72		
	(EMTY MODULE FOR 2 HINGED CARDS)						

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	TIROIR MODULAIRE (EMPTY MODULE,W=1/25) (*=2,3,4 & 5 FOR CORRESPONDING WIDTH)) (**=06,08,10 AND 12 FOR CORRESP WIDTH)	TM 50125 TM 50*25 TM 5**25	TRANSRACK	1	/70		13.4134
	CAMAC MODULE (EMPTY,1/25 CARD MODULE) (*=2,3 & 4 FOR CORRESPONDING WIDTH)	CAMCAS 1 CAMCAS *	WILLSHER & QUICK	1	/71	(2) (2)	13.4135
	CAMAC MODULE (EMPTY,1/25 CARD MODULE) (*=2,3 & 4 FOR CORRESPONDING WIDTH)	CAMCAS 1-G CAMCAS *-G	WILLSHER & QUICK	1	/72 /72		13.4136
	CAMAC MODULE(EMPTY,1/25 SCREENED MODULE) (*=2,3 & 4 FOR CORRESPONDING WIDTH)	CAMMOD 1-G CAMMOD *-G	WILLSHER & QUICK	1	/72 /72		13.4137
	CAMAC MODULE(EMPTY,2/25 SCREENED MODULE) (*=3 & 4 FOR CORRESPONDING WIDTH)	CAMMOD 2 CAMMOD *	WILLSHER & QUICK	2	/71	(2) (2)	13.4138
	EMTY MODULE WITH HINGED CARDS (2/25) (3/25)	9905-CR2 9905-CR3	OSL/WILLSHER&QUICK	2 3	/73 /73		13.4139
	EMPTY MODULE (1/25) (**= T2, T3, T4, T5, T6, T8, T10, AND T12 FOR CORRESPONDING WIDTH)	9905-5T1 9905-5**	OSL/WILLSHER&QUICK	1	/73 /73		13.4140
	TIROIR MODULAIRE POUR COMMANDE	9905-TC-1	OSL	1	/71		13.4141
	TIROIR MODULAIRE DE COMMANDE (SUPPLY CONTROL MODULE)	41703	TRANSRACK	1	/70		13.4142
	BLANK CAMAC MODULE PC BOARD (GOLD PLATED & ETCHED FINGERS BOTH SIDES)	NSI-04071-PC	NUCL. SPECIALTIES		/71		13.4143
	GENERAL-PURPOSE IC PATCH BOARD	18605	VERO ELECTRONICS		/74		13.4144
	MK-1 KLUGE MODULE (131 MIXED 14, 16, 24 PIN SOCKETS) MK-5 KLUGE MODULE (HAS 70 14 PIN, 13 AND 2 24 PIN WIRE WRAP SOCKETS) MK-6 KLUGE MODULE (HAS 34 14 PIN, 16 16 PIN & 3 24 PIN WIRE WRAP SOCKETS)	8301 8305 8306	BI RA SYSTEMS	2 2 1	/73 /73 /73		13.4145
	CAMAC-UNIVERSAL-BOARD(PRINTED CARD MODU- LE WITH 28 14-PIN + 28 16-PIN SOCKETS)	DO 200-2900	DORNIER	2	/71		13.4146
	CAMAC PROTOTYPE ASSEMBLY BOARDS (MX B1 HAS 68 SITES, MX B2 HAS 80 SITES) (MX B3 HAS 68 SITES,MX B4 HAS 80 SITES, MX B3/MX B4 INCLUDE 5V CIRCUIT)	MX B1/MX B2 MX B3/MX B4	GEC-ELLIOTT	NA NA	/71 /71		13.4147
	PRINTED CIRCUIT TEST BOARD	10	JORWAY	1	/71		13.4148
	KLUGE BOARD FOR WIRE WRAP	15	JORWAY	3	/74		13.4149
	KLUGE CARD (FOR CREATING YOUR OWN CAMAC MODULES) KLUGE CARD	2000-36 2000	KINETIC SYSTEMS	1 1	/71 /73	(4)	13.4150
	EXPERIMENTIERPLATTE (PRINTED CIRCUIT BOARD) EXPERIMENTIERPLATTE (P.C.B.)	4.000.087.0 4.000.088.0	KNUERR	NA NA	/70 /73		13.4151
	DECODED MATRIX BOARD (FOR PROTOTYPE WIRING OF 64 14-PIN SITES, A&F DECODED)	D 21 62	NUCL. ENTERPRISES	0	/74		13.4152
	MODULE PRINTED CIRCUIT BOARDS(TAKE 24,16 OR 14 PIN, ON THE WHOLE 1092 PINS) (SAME, WITH MINI-WRAP TO OV AND +6V)	CBP 1 CBP 2	RDT	NA NA	/72 /72		13.4153
	BLANK MODULE(COMPLETE WITH PRINTED BOARD FOR 69 INTEGRATED CIRCUITS,1 U WIDTH) (SAME,2U WIDTH)	BM 2020/1U BM 2020/2U	SEN	1 2	/70 /70		13.4154
	EXPERIMENT PLATE	C 72468-A453-A1	SIEMENS	1	/72		13.4155

437 Other Recommended or Standard Components/Access.

NC	DESIGNATION & SHORT DATA	TYPE	MANUFACTURER	WIDTH	DELIV.	NPR	REF. No.
	NIM/CAMAC ADAPTOR	NCA-1	GEC-ELLIOTT		/74		13.4156
	NIM ADAPTOR	9072	NUCL. ENTERPRISES		/74		13.4157
	NIM-CAMAC ADAPTOR	CAN	RDT	NA	/71		13.4158
	NIM/CAMAC ADAPTOR	ANC 10	SCHLUMBERGER		/72		13.4159
	CAMAC NIM ADAPTOR	CNA 2033	SEN	2	/71		13.4160
	LAM GRADER CABLE (20CM, WITH CONNECTORS) (40CM, WITH CONNECTORS)	LGC 20 LGC 40	GEC-ELLIOTT		/72 /72		13.4161
	LAM GRADER CABLE		JOERGER				13.4162
	52 WAY CANNON 2DB52S HARNESSES LAM GRADER CABLE, XXX= LENGTH IN METERS)	5809/S/52/XXX	TEKDATA		/73		13.4163
	LAM GRADER CONNECTOR (52-PIN FIXED MEMBER, TAKES PIN TYPE 031-9540-000)	2 DB 52 P	ITT CANNON		/70		13.4164
	COAXIAL CONNECTOR (PANEL MOUNTING, CABLE CONNECTOR HAS TYPE F 00.250 & FS 00.250) T- & L-ADAPTERS, FREE DOUBLE SOCKET, AND ARE ALSO AVAILABLE	RA 00.250	LEMO		/70	(4)	13.4165

INDEX OF MANUFACTURERS

AEG-Telefunken
Elisabethenstrasse 3, Postfach 830
D-7900 Ulm, Germany

AMP AG
Haldenstrasse 11
CH-6000 Luzern, Switzerland

Applied Computer Systems Ltd.
2 Charlton Street,
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(Sales of F & H Products in Germany)
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3520 D Pan American Freeway, N.E.
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146 Main Street, Maynard
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Postfach 648
D-799 Friedrichshafen, Germany

EDS Systemtechnik GmbH
Trierer Strasse 281
D-5100 Aachen, Germany

EG & G/ORTEC, Inc.
High Energy Physics Department
500 Midland Road, Oak Ridge,
Tennessee 37830, USA

J. Eisenmann, Elektronik für Prozessautomatisierung
Vogesenstrasse 6
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Emihus — See Hughes

FRB Connectron
3-5, Rue des Tilleuls,
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D-8520 Erlangen-Brück, Germany

Frieseke & Hoepfner
See also BF Vertrieb
(Sales of F & H Products in Germany)

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C Hughes Microcomponents Limited,
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IDAS (Informations-, Daten -und Automationssysteme) GmbH
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C Imhof-Bedco Standard Products Ltd
Colne Way Trading Estate, By-Pass,
Watford, Herts, England

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ITT Cannon — See Cannon

J and P Engineering (Reading) Ltd.
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32 New York Avenue
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Knuerr — See Hans Knuerr

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LRS-LeCroy — See LeCroy

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100, Midland Road, Oak Ridge,
Tennessee 37830, USA

ORTEC GmbH
Frankfurterring 81
D-8000 München 40, Germany

O.S.L.
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F-06340 La Trinité, France

OSL/Willsher and Quick — See OSL respectively Willsher and Quick

Packard Instrument Company, Inc.
Subsidiary of AMBAC Industries, Inc.
2200 Warrenville Rd.,
Downers Grove, Illinois 60515, USA

Philips N.V., Dep. Elcoma
Interconnection Group, Building BA
Eindhoven, Netherland

Polon
Nuclear Equipment Establishment
00-086 Warsaw, Bielanska 1, Poland

Polon — See also Zjednoczone

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Kingston Road Commerce Estate
Leatherhead, Surrey, England

Precicable Bour
151, Rue Michel-Carré
F-95101 Argenteuil, France

RDT, Ing. Rosselli Del Turco
Rossello S.R.L.
Via di Tor Cervara, 261
Casella postale 7207
Roma Nomentano
I-00155 Rome, Italy

N Réalisations Études Électroniques (R 2 E)
Zone d'Activités de Courtabœuf
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N Rovsing — See Christian Rovsing

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F-75013 Paris, France

Schlumberger Instruments & Systèmes
Dépt. Instrumentation Nucléaire
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Semra-Benney (Electronics) Limited
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Hampshire SO5 3DP, England

SEN Electronique
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CH-1211 Genève 13, Switzerland

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SOCAPEX (Thomson-CSF)
9, Rue Edouard Nieuport
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CAMAC SOFTWARE PRODUCTS GUIDE

INTRODUCTION

The Software Products Section of the CAMAC Products Guide lists a number of software packages, programs and routines which have been developed by software firms, manufacturers of CAMAC equipment, and at research laboratories.

Work is going on to implement IML — the intermediate level CAMAC language. One contribution to IML implementation is listed below, but at least five other laboratories are at present engaged in implementing IML on several computers.

The products listed below are either in current use or will be so in the nearest few months. Some of the software listed is commercially available, information about other is presumably available from respective authors. The correctness of each entry has been carefully checked against data provided.

Inclusion in the list does not necessarily indicate endorsement, recommendation or approval by the ESONE Committee, nor does omission indicate disapproval.

The classification used tentatively and reproduced below, is the same as was proposed in the March 1974 issue (No. 9) of this Bulletin.

SOFTWARE CLASSIFICATION GROUPS

.50 Fundamental Concepts, General Subjects

READER SERVICE RS.REF. 13. 5001
CLASS CODE - .50
TITLE- - - - IMPLEMENTING CAMAC BY COMPILERS
AUTHOR(S)- - W. KNEIS, GFK, ZYKLOTRON-LB., KARLSRUHE, GERMANY
PUBL. REF. - PROC CAMAC SYMPOS, LUXMBG, DEC 1973

DESCRIPTION- -
DEMANDS ON REAL-TIME SYSTEMS SUCH AS MINIMUM EXECUTION TIME MINIMUM CORE REQUIREMENTS, ETC., RECOMMEND THE USE OF COMPILERS IN PROGRAMMING, THE POSSIBILITY TO IMPLEMENT A CAMAC LANGUAGE BY A COMPILER IS FIRST OF ALL A FUNCTION OF THE LEVEL AND CONCEPT OF THE LANGUAGE, META-LANGUAGES, THE SYNTAX OF A PROGRAMMING LANGUAGE, ARE USED TO FORMULATE A COMPILER FOR A SPECIFIC LANGUAGE. THE METHOD DESCRIBED HAS BEEN USED TO WRITE A COMPILER FOR IML, THE INTERMEDIATE LEVEL CAMAC LANGUAGE, IMPLEMENTED IN AN ASSEMBLER ENVIRONMENT.

READER SERVICE RS.REF. 13. 5002
CLASS CODE - .50
TITLE- - - - PROCEDURE CALLS - A PRAGMATIC APPROACH
AUTHOR(S)- - J. MICHELSON, H. HALLING, KFA, JUELICH.
PUBL. REF. - PROC CAMAC SYMPOS, LUXMBG, DEC 1973
ESONE REGSTR DATE 31 MAY 1974

DESCRIPTION- -
DISCUSSION OF PROCEDURE CALLS AS THE BASIS FOR CAMAC SOFTWARE WITHIN HIGH-LEVEL LANGUAGES. COMPARISON WITH SYNTAX MODIFICATIONS TO LANGUAGES. DISCUSSION OF IMPLEMENTATION RESTRICTIONS DUE TO LANGUAGE REQUIREMENTS FOR EXISTING HIGH-LEVEL LANGUAGES, E.G. CLOSED SYSTEM-SUBROUTINES WHICH EXECUTE ONE DEFINED OPERATION (INVOLVING ONE OR MORE CAMAC CYCLES AS A GROUP). COMPARISON OF US-NIM CAMAC FORTRAN SUBROUTINES AND PROCEDURE-CALL SYNTAX OF ESONE SWG IML LANGUAGE. APPLICATION OF PROCEDURE-CALLS TO APPLICATION-ORIENTED SOFTWARE.

READER SERVICE RS.REF. 13. 5003
CLASS CODE - .501(PL-11)
TITLE- - - - CAMAC FACILITIES IN THE PROGRAMMING LANGUAGE OF PL-11
AUTHOR(S)- - ROBERT D RUSSELL, CERN, GENEVA
PUBL. REF. - PROC CAMAC SYMPOS, LUXMBG, DEC 1973
YELLOW REPORT, CERN 74-24, DEC 1974
NAME/ACRONYM - EXTENDED PL-11
OPERATIVE DATE- 1971/72
COMPUTER - PDP-11, WORD LENGTH 16 BITS
INTERFACE(S) - CA-11 (EG&G/ORTEC)
SOFTWARE TYPE - LANGUAGE, PL-11(EXTENDED)
INCORP TECHNIQUE IN-LINE CODING OF CAMAC STATEMENTS
FACILITIES - SYMBOLIC DEVICE NAME USED
DEMAND HANDLING IS INCLUDED

DESCRIPTION- -
PL-11 IS AN INTERMEDIATE-LEVEL, MACHINE-ORIENTED PROGRAMMING LANGUAGE EXTENDED TO INCLUDE CAMAC FEATURES. SYNTACTIC FORM OF CAMAC STATEMENTS ARE ANALOGOUS TO STANDARD PL-11 STATEMENTS. SYMBOLIC NAMES FOR VARIABLES AND FUNCTIONS ARE DECLARED AT ONCE, AND OPERATIONS ARE EXECUTED BY STATEMENTS REFERRING TO THESE NAMES. USE OF SYMBOLIC NAMES MAKES PROGRAMS READABLE, AND SIMPLIFIES MODIFICATIONS OF CAMAC CONFIGURATIONS.
EXAMPLE OF STANDARD STATEMENT--
WHILE PRINTSTATUS = BUSY DO
EXAMPLE OF CAMAC STATEMENT--
WHILE CRTSTATUS = BUSY DO

READER SERVICE RS.REF. 13. 5004
CLASS CODE - .501 (CATY)
AUTHOR(S)- - F R GOLDING, DARESBURY LABORATORIES
NAME/ACRONYM - CATY
COMPUTER - ANY
SOFTWARE TYPE - LANGUAGE (BASED ON BASIC)

DESCRIPTION- -
CATY IS A MACHINE INDEPENDENT HIGH-LEVEL LANGUAGE BASED UPON A SUBSET OF BASIC WITH EXTENSIONS FOR ADDRESSING CAMAC. PROGRAMS WRITTEN IN CATY ARE COMPILED AND NOT INTERPRETED. THUS, THE SPEED OF OPERATION WHEN CAMAC IS TESTED UNDER CATY IS COMPARABLE WITH THE SPEED OF OPERATION IN APPLICATIONS. CATY HAS BEEN IMPLEMENTED ON SEVERAL COMPUTERS (SEE .543).

NEW*************** NEW ENTRY
READER SERVICE RS.REF. 13. 5005
CLASS CODE - .501 (CATY)
TITLE- - - - SPECIFICATION OF THE LANGUAGE CATY C1030
AUTHOR(S)- - R F CRANFIELD, GEC ELLIOTT (SEE ALSO PREVIOUS ENTRY)
NAME/ACRONYM - CATY
OBTAINABLE FROM- GEC ELLIOTT (SEE LIST OF MANUFACTURERS)
AVAILABLE ON/AS- DESCRIPTION
SOFTWARE TYPE- LANGUAGE (BASED ON BASIC)

DESCRIPTION- -
THE MAIN SPECIFICATION DESCRIBES THE FACILITIES AVAILABLE IN THE MACHINE INDEPENDENT HIGH LEVEL LANGUAGE CATY. APPENDICE[illegible] TO THE SPECIFICATION DESCRIBE THE ADDITIONAL FEATURES ASSOCI[illegible] ATED WITH IMPLEMENTATIONS, ALL USING GEC ELLIOTT SYSTEM CRAT[illegible] INTERFACES ON THE PDP-11, NOVA, GEC-4080, AND GEC-2050 COMPUTERS.

READER SERVICE RS.REF. 13. 5006
CLASS CODE - .501 (IML)
TITLE- - - - THE DEFINITION OF IML A LANGUAGE FOR USE IN CAMAC SYSTEMS
PREPARED BY - ESONE COMMITTEE, SOFTWARE W.G. AND AEC NIM COMMITTEE, SOFTWARE W.G.
PUBL. REF. - REPORT ESONE/IML/01, OCT 1974, AND REPORT TID-26615, JAN 1975
NAME/ACRONYM - IML
MAINTENANCE BY- ESONE COMMITTEE IN COLLABORATION WITH NIM COMMITTEE
OBTAINABLE FROM ESONE SECRETARIAT AND U.S. GOVERNMENT PRINTING OFFICE RESPECTIVELY
ESONE REGSTR DATE AUG/SEPT 1974
COMPUTER - ANY
SOFTWARE TYPE - LANGUAGE

DESCRIPTION- -
IML IS A LANGUAGE USED TO EXPRESS THE OPERATIONS DESCRIBED IN THE CAMAC HARDWARE SPECIFICATIONS, AND THEIR INTERACTION WITH A COMPUTER SYSTEM. IML STATEMENTS LINK CAMAC STRUCTURES AND MODES OF OPERATION TO DATA STRUCTURES AND REAL-TIME FEATURES IN THE COMPUTER SYSTEM.
THIS DEFINITION IS A GUIDE FOR THOSE IMPLEMENTING LANGUAGES AND OPERATING SYSTEMS WHO WISH TO MAKE CAMAC INPUT/OUTPUT AVAILABLE TO USERS. FEATURES ARE INCLUDED WHICH SUPPORT THE CAMAC BRANCH HIGHWAY AND THE CAMAC SERIAL HIGHWAY.
THE LANGUAGE IS DEFINED SEMANTICALLY - THE SYNTAX USED TO EXPRESS IML DEPENDS ON THE ENVIRONMENT. THE MACRO SYNTAX IML-M1 IS DEFINED IN AN APPENDIX.

NEW*************** NEW ENTRY
READER SERVICE RS.REF. 13. 5007
CLASS CODE - .501 (CASIC)
TITLE- - - - A CAMAC EXTENDED BASIC LANGUAGE
AUTHOR(S)- - J M SERVENT (SCHLUMBERGER)
NAME/ACRONYM - CASIC
OBTAINABLE FROM- SCHLUMBERGER (SEE LIST OF MANUFACTURERS)
AVAILABLE ON/AS- DESCRIPTION
SOFTWARE TYPE- LANGUAGE (EXTENDED BASIC)

DESCRIPTION- -
CASIC IS BASED ON BASIC AND PROVIDES ALL STANDARD STATEMENTS OF BASIC PLUS A SET OF CAMAC RELATED STATEMENTS.
CASIC - LIKE BASIC - IS CONVERSATIONAL. THE MOST RECENT VERSION CONFORMS TO THE IML LANGUAGE (SEE .501(IML)) DEFINED BY THE ESONE COMMITTEE.
CASIC IS IMPLEMENTED ON PDP-11 (SEE .544).

.51 User-Oriented Programs I (full system support)

READER SERVICE RS.REF. 13. 5008
CLASS CODE = .51
TITLE= = = = CAMAC OPERATING SYSTEM OR CONTROL APPLICATIONS
AUTHOR(S)= = DR B. MERTENS, IKP, KFA, JUELICH
PUBL. REF. = CAMAC BULLETIN NO 9, MARCH 1974
NAME/ACRONYM = COS
AVAILABLE ON/AS PAPER TAPE, ASCII CODE
OPERATIVE DATE= 1972
COMPUTER = PDP=15, CORE REQUIREMENTS= 16K
INTERFACE(S) = TYPE 2200 (BORER)
SOFTWARE TYPE = SYSTEM PROGRAM
LANGUAGE = FORTRAN & MACRO=ASSEMBLER
CAMAC FACILITIES SYMBOLIC DEVICE NAMES USED, SINGLE & MULTIPLE ACTION PER INSTRUCTION, REAL/TIME DEMEND HANDLING INCORPORATED

DESCRIPTION= =
THE SYSTEM SOFTWARE PACKAGE PERMITS READ AND WRITE OF UP TO 100 MODULES. REAL=TIME TASKS MAY BE DEFINED ON=LINE. ABOUT 60 ELEMENTARY COMMANDS ARE PRE=DEFINED, SUCH AS==
=NAME MODULE/C=1, N=2, A=3/DEFINE SYMBOLIC NAME
=READ MODULE/F=0
=WRITE MODULE 321/F=16
=DISAB MODULE/F=24
=DEFINE TASK/OPEN A TASK=DEFINITION
=END/CLOSE TASK=FILE
=AFTER 15 SECS TASK/EXECUTE USER=DEFINED TASK
=15 SECS FROM NOW
=SOLL MODULE 3456/VALUE TO BE WRITTEN NEXT TO MODULE

READER SERVICE RS.REF. 13. 5009
CLASS CODE = .51
TITLE= = = = BACKGROUND=FOREGROUND SYSTEM FOR PULSE=HEIGHT ANALYSIS OF TWO=DIMENSIONAL MULTIWIRE PROPORTIONAL CHAMBER DATA
AUTHOR(S)= = DR A HEUSLER, IPK, KFA, JUELICH
NAME/ACRONYM = BFG
AVAILABLE ON/AS PAPER TAPE, ASCII CODE
OPERATIVE DATE= 1974?
COMPUTER = PDP=15, CORE REQUIREMENTS = 24K
INTERFACE(S) = TYPE 2200 (BORER)
MIN SYSTEM CONFIG MAGTAPE, DECTAPE, DISK, & MEMORY SCANNING DISPLAY (IN=HOUSE)
SOFTWARE TYPE = SYSTEM PROGRAM
LANGUAGE = FORTRAN & MACRO=ASSEMBLER

DESCRIPTION= =
THE SYSTEM SOFTWARE PERMITS START AND STOP OF BLOCK TRANSFER FROM THE A/D CONVERTERS TO THE PDP=15 MEMORY (LIST MODE OUTPUT ONTO MAGTAPE ON=LINE SORTING IF DESIRED).
THE BORER INTERFACE HAS BEEN MODIFIED TO ALLOW BLOCK LENGTHS UP TO 4K 18 BIT WORDS.

READER SERVICE RS.REF. 13. 5010
CLASS CODE = .51
TITLE= = = = TRIUMF CONTROL SYSTEM SO TWARE
AUTHOR(S)= = D. P. GURD, W. K. DAWSON, TRIUMF, UNIVERSITY OF ALBERTA, CANADA
PUBL. REF. = CAMAC BULLETIN NO 5, NOVEMBER 1972
OPERATIVE DATE= 1973
COMPUTER = 4 SUPERNOVAS
INTERFACE(S) = IN=HOUSE TYPE
SOFTWARE TYPE = FULL SYSTEM SUPPORT FOR CONTROL OF TRIUMF CYCLOTRON

DESCRIPTION= =
THE SYSTEM SOFTWARE PACKAGE MONITORS OVER 1000 ANALOGUE PARAMETERS AND 1000 DIGITAL STATUS POINTS, SEARCHES OUT=OF=LIMIT READINGS, DISPLAYS MEASUREMENTS ON REQUEST, SETS OVER 300 ANALOGUE POINTS FROM A CENTRAL CONSOLE AND PERFORMS A NUMBER OF OTHER ROUTINES.
A REAL=TIME EXECUTIVE PROGRAM = NATS (FOR NOVA ASYNCHRONOUS TASKING SUPERVISOR) = SCHEDULES AND SUPERVISES CAMAC TASKS, SUPPORTED BY A SUBPROGRAM LIBRARY, AS THEY ARE REQUESTED. JOBS TO BE PERFORMED ARE STRUCTURED INTO SEQUENCES OF CAMAC OPERATIONS SPECIFIC TO A PIECE OF HARDWARE (= CAMAC MODULE). THERE IS THUS A DIRECT MODULAR HARDWARE=SOFTWARE CORRESPONDENCE. CONTROL IS BASICALLY CLOCK=INITIATED SOFTWARE SCAN OF CYCLOTRON MONITORING, BUT INTERRUPTS ARE INCLUDED, MAINLY INITIATED BY CONSOLE.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5011
CLASS CODE = .51
TITLE= = = = B SIC SINGLE PARAMETER MCA SYSTEM (MISP)
NAME/ACRONYM = MISP
OBTAINABLE FROM= NUCLEAR ENTERPRISES (SEE INDEX OF MFRS)
SOFTWARE TYPE= SYSTEM SOFTWARE
COMPUTER = = PDP=11, 8K MEMORY & REAL TIME CLOCK
INTERFACE(S) = 9030 (NUCL. ENTERPR) (PROGRAMMED TRANSFERS & INTERRUPT ONLY)
HARDWARE CONFIG ADC (LABEN OR 9060),9021 LIVE TIME RTC, TTY/READER (7064),TEK603/604 OR LANSCOPE

DESCRIPTION= =
THE PROGRAM OCCUPIES 2K OF MEMORY AND USES A DATA AREA OF 4K FOR UP TO 4096 CHANNELS ACQUISITION.
THE PACKAGE CONSISTS OF A DISPLAY DRIVER, A USER ORIENTED TELETYPE HANDLER, ACQUISITION CONTROL, AND A DATA MANIPULATION ROUTINE.
THE DISPLAY DRIVER IS RUN AS A BACKGROUND TASK WHICH IS INTERRUPTED BY THE ADC, CLOCKS AND TELETYPE.
THIS PACKAGE CAN BE OBTAINED WITH MULTISCALER OPTION, THE HARDWARE IS EXTENDED WITH A 9003 OR 003 SCALER, DATA AREA IS DIVIDED INTO 4 AREAS, EACH ONE THOUSAND CHANNELS.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5012
CLASS CODE = .51
TITLE= = = = DUAL MCA SYSTEM (DAMCAS)
NAME/ACRONYM = DAMCAS
OBTAINABLE FROM= NUCLEAR ENTERPRISES (SEE INDEX OF MFRS)
SOFTWARE TYPE= SYSTEM SOFTWARE
COMPUTER = PDP=11, 16K MEMORY & REAL TIME CLOCK
INTERFACE(S) = 9030 & 9033 (NUCL ENTERPR) (PROGRAMMED & AUTONOMOUS TRANSFERS)
HARDWARE CONFIG ADC (LABEN OR 9060),9021 LIVE TIME RTC, TTY/READER (7064), PUNCH (7065), MAGTAPE (CS 0042),TEK603/604 OR LANSCOPE

DESCRIPTION= =
THE PROGRAM OCCUPIES 6K LEAVING 10K OF MEMORY FOR DATA ACQUISITION (4K OF 16 BITS & 4K OF 24 BITS).
THE SOFTWARE PACKAGE CONSISTS OF A DISPLAY DRIVER, A TELETYPE HANDLER FOR OPERATOR CONTROL OF DATA ACQUISITION, DATA MANIPULATION ROUTINE, AND A ROUTINE FOR AUTONOMOUS CONTROL OF DATA ACQUISITION AND MAG TAPE TRANSFERS.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5013
CLASS CODE = .51
TITLE= = = = MULTI PARAMETER DATA ACQUISITION SYSTEM
NAME/ACRONYM = MUDAS 1
OBTAINABLE FROM= NUCLEAR ENTERPRISES (SEE INDEX OF MFRS)
SOFTWARE TYPE= SYSTEM SOFTWARE
COMPUTER = PDP=11, 8K MEMORY & REAL TIME CLOCK
INTERFACE(S) = 9030 (NUCL. ENTERPR) (PROGRAMMED TRANSFERS & INTERRUPT ONLY)
HARDWARE CONFIG ADC'S (LABEN OR 9060) & COINC SELECTOR (CS 0049), 9021 LIVE TIMER RTC, TTY & MAG TAPE, TEK 603/604.

DESCRIPTION= =
THE SYSTEM IS CAPABLE OF ACCEPTING FIVE PARAMETER EVENTS AND STORING THEM ON MAG TAPE, SIMULTANEOUSLY PERFORMING MULTI=CHANNEL ANALYSIS ON ONE SELECTED PARAMETER.
WINDOWS MAY BE SET ON EACH PARAMETER FOR BOTH MODES, TOGETHER WITH A COUNT DIVISION FACTOR SET OVER THE REGION OF INTEREST.
DATA DUMPED IN LIST MODE MAY BE READ BACK FOR ANALYSIS.

READER SERVICE - RS.REF. 13. 5014
CLASS CODE = .51
AUTHOR(S)= = D GURD, TRIUMF,UNIV. ALBERTA,CANADA
NAME/ACRONYM = CAMAC
OPERATIVE DATE= 1973
SOFTWARE TYPE = SYSTEM SOFTWARE

DESCRIPTION= =
THE SYSTEM SOFTWARE= CAMAC = CONSISTS OF SEVERAL SUBROUTINE CALLS. THESE ARE= = PRIMITIVE SUBROUTINES PERFORMING THE ACTUAL I/O OPERATIONS, MODULE SUBROUTINES, THE MUX/ADC SUBROUTINES, CAMAC LAMS OR INTERRUPTS, SERIAL TASKS, AND AN INTERPRETER (FOR DATA).

.52 User-Oriented Programs II (specific run-time programs)

READER SERVICE - RS.REF. 13. 5015
CLASS CODE = .52
TITLE= = = = OPERATING SYSTEM SOFTWARE PACKAGES
NAME/ACRONYM = SEE DESCRIPTION
MAINTENANCE BY= DEC
OBTAINABLE FROM DEC (SEE INDEX OF MANUFACTURERS)
OPERATIVE DATE= 1975
COMPUTER = PDP=11
INTERFACE(S) = SEE DESCRIPTION
SOFTWARE TYPE = CAMAC SERVICE ROUTINES, USER=, INTERFACE= & DESCRIPTOR PROGRAMS

DESCRIPTION= =
THE SOFTWARE PACKAGES ARE COMPLETE OPERATING SYSTEMS, CONTROLLERS AND OPERATING SYSTEMS ARE RELATED AS FOLLOWS==
CA=11=C USES RSX=11=D OPERATING SYSTEM
CA=11=E USES RSX=11=M OR RT=11
CA=11=F USES RSX=11=M OR RT=11

NEW************** NEW ENTRY
READER SERVICE - RS.REF. 13. 5016
CLASS CODE = .52
TITLE= = = = CASPAC = A SOFTWARE PACKAGE FOR COMMUNI= CATION WITH CAMAC=PROCESS=PERIPHERALS
NAME/ACRONYM = CASPAC
OBTAINABLE FROM= IDAS (SEE INDEX OF MANUFACTURERS)
SOFTWARE TYPE= SYSTEM OF RE=ENTRANT ASSEMBLER ROUTINES
COMPUTER = = PDP=11 (DEC), MIN 740 WORDS OF MEMORY
INTERFACE(S) = I CP=11 (SCHLUMBERGER)

DESCRIPTION= =
THE SYSTEM OF ASSEMBLER ROUTINES ALLOW COMMUNICATION WITH CAMAC=PROCESS=PERIPHERALS USING SINGLE=WORD TRANSFER MODE AS WELL AS BLOCK TRANSFER MODE ON FORTRAN AND ASSEMBLER LEVEL. INTERRUPT ACTIONS CAN BE OBTAINED IN THE FORM OF AN ARBITRARY SEQUENCE OF CAMAC TRANSFERS ON FORTRAN LEVEL.
NO SOFTWARE OPERATING SYSTEM IS NEEDED, AND CASPAC CAN THEREFORE BE USED AUTONOMOUSLY AS WELL AS IN CONNECTION WITH A REAL TIME OR BATCH OPERATING SYSTEM.

.53 User-Oriented Programs III (subprograms, etc.)

READER SERVICE - RS.REF. 13. 5017
CLASS CODE = .53 (BASIC)
TITLE= = = = CAMAC AND INTERACTING PROGRAMMING
AUTHOR(S)= = DR E M RIMMER, CERN, GENEVA
PUBL. REF. = PROC CAMAC SYMPOS, LUXMBG, DEC 1973 & BASIC CALLABLE ROUTINES, NP GROUP NOTE, NP=DHG, CERN
NAME/ACRONYM = HPCMA, HPCMB, HPCMC
MAINTENANCE BY= DR E M RIMMER
OBTAINABLE FROM NP DIV, CERN, CH=1211 GENEVA
AVAILABLE ON/AS PAPER TAPE, ASCII CODE
OPERATIVE DATE= 1971/72
COMPUTER = H=P 2100=SERIES, 8K 16 BIT WORDS
INTERFACE(S) = 2201(BORER), 7218 & HPCC=066(CERN)
MIN SYSTEM CONFIG TTY OR TEK 4010 TERMINAL & CC=A1
SOFTWARE TYPE = SET OF SUBROUTINES
LANGUAGE = HP ASSEMBLY
HOST LANGUAGE = BASIC (NP EXTENSION OF)
CAMAC FACILITIES IN=LINE CODED CALLS IN BASIC, SUBROUTINES IN ASSEMBLY, ABS ADDR
FACILITIES = SINGLE & MULTIPLE ACTION PER INSTRUCTION, NO DEMAND HANDLING

DESCRIPTION= =
THESE BASIC=CALLABLE CAMAC SUBROUTINES IN THREE VERSIONS FOR THREE INTERFACES PROVIDE MOST COMMAND FACILITIES FOR CONTROL AND DATA TRANSFER. DATA WORDS MAY BE 16 OR 24 BITS LONG (ONLY 16 BITS FOR HPCC=066), BINARY, BCD OR LOGIC (0 OR 1). ROUTINES COVER BLOCK TRANSFERS, PROGRAMMED AND SEQUENTIAL ADDRESSING & UTILITY ROUTINES, IN TOTAL 18 & 3 OPTIONALLY.
GENERAL FORM OF CALL STATEMENT==
= = =CALL (SUBROUTINE NUMBER,C,N,A,F,D,Q)
= = =CALL (SUBROUTINE NUMBER,C,N,A,F,D(I),Q,W)
WHERE W IS WORD COUNT, D IS DATA, C,N,A,F, & Q HAVE USUAL MEANING
EX== CALL(10,1,2,0,16,D(I),Q,20)
TIME IS APPR 5 MSECS/STATEMENT, BLOCK TRANSFER CALL GENE= RATED DIRECTLY BY INTERFACE ARE MUCH FASTER.

READER SERVICE - RS.REF. 13. 5018
CLASS CODE = .53(FORTRAN)
TITLE= = = = SPECIFICATIONS FOR STANDARD CAMAC SUBROUTINES
AUTHOR(S)= = RICHARD F THOMAS JR.
PUBL. REF. = CAMAC BULLETIN NO 6, MARCH 1973
NAME/ACRONYM = SEE DESCRIPTION
OBTAINABLE FROM USAEC NIM COMMITTEE, CAMAC SWG
AVAILABLE ON/AS ALGORITHM
OPERATIVE DATE= 1973
COMPUTER = INDEPENDENT, MEMORY SIZE NOT SPEC.
INTERFACE(S) = ANY
SOFTWARE TYPE = SET OF SUBROUTINES
LANGUAGE = FORTRAN
CAMAC FACILITIES FUNDAMENTAL CAMAC OPERATIONS, STANDARD BLOCK TRANSFERS IN SINGLE & MULTIPLE ACTION STATEMENTS

DESCRIPTION= =
A SET OF 6 SUBROUTINES, OF WHICH ONE IS CALLED BY ALL THE OTHER PERMITS A GREAT VARIETY OF SINGLE AND MULTIPLE CAMAC OPERATIONS TO BE PERFORMED. DEMAND HANDLING, OTHER THAN BY TEST LAM, IS NOT COVERED.
THE SUBROUTINES EXECUTE CAMAC OPERATIONS AS FOLLOWS==
CMCBSC = SINGLE CAMAC FUNCTION AT SINGLE ADDRESS ONE OR MORE TIMES
CMCSEQ = SINGLE CAMAC FUNCTION AT SUCCESSION OF ADDRESSES
CMCASC = SPECIFIED CAMAC FUNCTION IN ADDRESS SCAN MODE
CMCRPT = SPECIFIED CAMAC FUNCTION IN REPEAT MODE
CMCSTP = SPECIFIED CAMAC FUNCTION IN STOP MODE
CMCLUP = SPECIFIED CAMAC FUNCTION AT A HIERARCHICAL SEQUENCE OF ADDRESSES WITH OPTIONAL SKIP OF SEQUENCE BASED ON Q.
GENERAL FORM OF STATEMENT==
CALL CMC... (PARAMETER LIST)
EXAMPLE== CALL CMCSTP (F,B,C,N,AD,LN,DATA,ERRORA,NEX)

READER SERVICE - RS.REF. 13. 5019
CLASS CODE = .53(FORTRAN)
TITLE= = = = FORTRAN SUBROUTINES
AUTHOR(S)= = H POHL
NAME/ACRONYM = FORTRAN CALLS
VERSION= = = V002
OBTAINABLE FROM H POHL, ZEL, KFA, JUELICH
AVAILABLE ON/AS DECTAPE
OPERATIVE DATE= MARCH 1972
COMPUTER = PDP=11, 16K 16 BIT WORDS MEMORY
INTERFACE(S) = TYPE 1533A (BORER)
SOFTWARE TYPE = PROCEDURE CALLS
LANGUAGE = FORTRAN ON PDP=11 (THREADED CODE)
INCORP TECHNIQUE IN=LINE SUBROUTINE CALLS
CAMAC FACILITIES SINGLE ACTION STATEMENTS

DESCRIPTION= =
FORTRAN SUBROUTINES FOR SINGLE ACTIONS. MUCH SIMPLER THAN THE NIM APPROACH (REF. R. F. THOMAS) FOR THE BORER 1533A CONTROLLER WRITTEN IN RE=ENTRANT CODE.

READER SERVICE RS.REF. 13. 5020
CLASS CODE - .53
TITLE- - - - CAMAC UNCTION FOR RT11
AUTHOR(S)- - L RYARS, R KEYSER
NAME/ACRONYM - CAMAC, CAMINT
VERSION- - - RT11
MAINTENANCE BY- ORTEC
OBTAINABLE FROM ORTEC (SEE INDEX OF MANUFACTURERS)
AVAILABLE ON/AS PAPER TAPE
OPERATIVE DATE- 1974
COMPUTER - PDP-11
INTERFACE(S) - DC011 (EG&G/ORTEC)
SOFTWARE TYPE - SUBROUTINES
LANGUAGE - PDP-11 ASSEMBLY
HOST LANGUAGE - RT11/FORTRAN
INCORP TECHNIQUE CALLS TO FORTRAN LIBRARY ROUTINES
CAMAC FACILITIES SINGLE OR MULTIPLE INSTRUCTIONS, DEMAND HANDLING

DESCRIPTION- -
THIS SOFTWARE PACKAGE CONSISTS OF A NUMBER OF SUBROUTINES FOR FORTRAN/RT11 CALLING CAMAC FUNCTIONS.
THE CAMAC CALL STATEMENT HAS THE FOLLOWING FORM--
CALL CAMAC (IF, IN, IA, IQ, IDATA)
THEY ARE USED TO TRANSFER DATA TO/FROM CAMAC AND FOR TEST PURPOSES.
IF, IN, IA ARE RESPECTIVELY FUNCTION, STATION ADDRESS AND SUBADDRESS, IQ IS BOTH QBIT AND XBIT.
CAMINT IS USED TO HANDLE INTERRUPTS FROM CAMAC CRATE, AND HAS THE GENERAL FORM--
CAMINT(IN,NAME1)
WHERE IN IS THE STATION NUMBER AND NAME1 IS THE NAME OF THE SUBROUTINE TO BE EXECUTED WHEN THE INTERRUPT OCCURS.

READER SERVICE RS.REF. 13. 5021
READER SERVICE REF 12.5015
CLASS CODE - .53(FORTRAN)
AUTHOR(S)- - J M STEPHENSON, L A KLAISNER
NAME/ACRONYM - KSCLIB
OBTAINABLE FROM KINETIC SYSTEMS (SEE INDEX OF MFRS)
OPERATIVE DATE- 1974
COMPUTER - PDP-11, 16K CORE MEMORY REQUIRED
INTERFACE(S) - TYPES 3911A, 3991 & 3992 (KINETIC)
LANGUAGE - FORTRAN
SOFTWARE TYPE - LIBRARY OF FORTRAN FUNCTIONS AND SUBROUTINES

DESCRIPTION- -
THIS SOFTWARE PACKAGE IMPLEMENTS THE CMCBSC SERIES OF STANDARD FORTRAN CALLS DESCRIBED IN CAMAC BULLETIN NO 6, 1973. IT ALSO INCLUDES THE BIT MANIPULATION FUNCTIONS EXCLUSIVE OR, INCLUSIVE OR, AND, NOT, & SHIFT. THE PACKAGE SUPPORTS UP TO 8 CRATES INTERFACED THROUGH MODEL 3911A UNIBUS *) CRATE CONTROLLERS, UP TO 7 CRATES PER 3991 BRANCH DRIVER AND UP TO 61 CRATES PER 3992 SERIAL BRANCH DRIVER. THE NUMBER OF PARALLEL AND SERIAL BRANCHES SHOULD BE LESS THAN 8.

*) UNIBUS IS A TRADE MARK OF DIGITAL EQUIPMENT CORP.

CORR************* CORRECTED, REVISION A
READER SERVICE RS.REF. 13. 5022
CLASS CODE - .53
TITLE- - - - I/O MACROS FOR CAMAC
AUTHOR(S)- - D STUCKENBROCK, G KLENERT, SIEMENS AG, KARLSRUHE
NAME/ACRONYM - MACAM
OBTAINABLE FROM SIEMENS (SEE INDEX OF MFRS)
AVAILABLE ON/AS PAPER TAPE, CARDS & SOURCE DECK
OPERATIVE DATE- NOVEMBER 1974
COMPUTER - PR 320/330
INTERFACE(S) - CC 320 & SC 330 (SIEMENS)
MIN MEMORY SPACE .5K - 1K OF 16 BITS (SUPERVISOR EXCL) DEPENDING ON HARDWARE
MIN SYSTEM CONFIG TTY AND SUPERVISOR PROGRAM
SOFTWARE TYPE - I/O ROUTINES, LAM HANDLING
ENVIRONMENT FOR - CAMAC SOFTWARE IS ASSEMBLER 300
LANGUAGE - MACROS - ASSEMBLER,CALLS - FORTRAN
FACILITIES - CONCURRENT MULTI-USER OPERATION, SYSTEM RUNS UNDER REAL-TIME SUPERVISOR

DESCRIPTION- -
A SET OF I/O MACRO SUBROUTINES CAN BE CALLED BY ANY USER PROGRAM CONCURRENTLY RUNNING ON THE COMPUTER, PROVIDED THEY OPERATE UNDER A REAL-TIME SUPERVISOR PROGRAM. THE ROUTINES COMPRISE THE FUNCTIONS READ, WRITE, AND EXECUTION OF CONTROL COMMANDS. BLOCK TRANSFERS ARE PERFORMED ON CONSTANT OR VARIABLE CAMAC ADDRESS, AND IN INCREMENT MODE OR RANDOM-LIST MODE. THE COORDINATION OF USER PROGRAMS AND CAMAC PROVIDED BY THE SUPERVISOR, FACILITATES GREATLY THE LAM HANDLING. THE SYSTEM ALLOWS UP TO 8 BRANCHES, EACH WITH 7 CRATES. SYSTEM SOFTWARE ENVIRONMENTS FACILITATE INCORPORATION OF THE SUBROUTINE CALLS AS STATEMENTS EMBEDDED IN FORTRAN PROGRAMS.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5023
CLASS CODE - .53 (BASIC)
TITLE- - - - BASIC - SUBROUTINES
AUTHOR(S)- - D STUCKENBROCK, SIEMENS AG, KARLSRUHE
NAME/ACRONYM - BASIC - CALLS
OBTAINABLE FROM- SIEMENS (SEE INDEX OF MANUFACTURERS)
AVAILABLE ON/AS- PAPER TAPE, CARDS
OPERATIVE DATE - 1973
COMPUTER - - PR 320
MIN MEMORY SPACE 1K OF 16 BITS (BASIC COMPILER EXCLUDED)
INTERFACE(S) - CC 320
SOFTWARE TYPE- SUBROUTINES
MIN SYSTEM CONFIG TTY AND BASIC COMPILER
INCORP TECHNIQUE EMBEDDED BASIC CALLS TO SUBROUTINES
CAMAC FACILITIES LAM HANDLING

DESCRIPTION- -
THE SUBROUTINES IN ASSEMBLER ARE HANDLED BY THE BASIC-ON-320 COMPILER (INTERPRETER?).
THE STATEMENT - -
CALL (CM, PARAMETER LIST)
CAUSES PROGRAM TO JUMP TO SUBROUTINE CALLED.
THE FOLLOWING CAMAC OPERATIONS CAN BE EXECUTED - -
- SINGLE OPERATION (READ, WRITE, CONTROL)
- INTERRUPT REGISTRATION AND JUMP TO LAM HANDLING ROUTINE
- WAITING FOR LAM
'PARAMETER LIST' IS A STRING OF CHARACTERS SPECIFYING THE OPERATION TO BE EXECUTED.
EXAMPLE - -
CALL(CM,NAF,11,0,0,X1)
- WHERE 11,0,0, = STATION,SUBADDRESS,FUNCTION, X1 = VARIABLE

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5024
CLASS CODE - .53
TITLE- - - - TWO-LEVEL CAMAC PERIPHERAL HANDLER
AUTHOR(S)- - L M TAFF, UNIV OF GRONINGEN, NETHERLANDS
PUBL. REF. - COMPUTER PHYSICS COMMUNICATIONS (TO BE PUBLISHED)
MAINTENANCE BY AUTHOR
OBTAINABLE FROM- AUTHOR
AVAILABLE ON/AS- DECTAPE (ASCII CODE)
OPERATIVE DATE - 1974
COMPUTER - - DEC PDP-11, MIN 8K OF MEMORY
INTERFACE(S) - CA-15 (DEC)
OPERATING SYSTEM (SOFTWARE) - DEC MONITOR SYSTEM (ADSS)
SOFTWARE TYPE- CAMAC DRIVER/LAM HANDLER SUBROUTINE, I/O DEVICE HANDLERS, CMCBSC SUBROUTINE
LANGUAGE - - ASSEMBLER
HOST LANGUAGE- ANY SUPPORTED BY SYSTEM
INCORP TECHNIQUE LINKED AT LOAD TIME
CAMAC FACILITIES SINGLE CAMAC OPERATIONS, DATA CHANNEL TRANSFERS, DEMAND HANDLING, RE-ENTRANT

DESCRIPTION- -
THE CAMAC DRIVER/LAM HANDLER IS A GLOBALLY LINKED SUBROUTINE FOR EXECUTING SINGLE CAMAC OPERATIONS, CONTROLLING ACCESS TO 2 HARDWARE DATA CHANNELS VIA QUEUES, AND GIVING CONTROL TO THE PROPER USER ROUTINE WHEN A LAM OCCURS. IT MAY BE CALLED BY ASSEMBLER CODED USER PROGRAMS, THOMAS' STANDARD SUBROUTINE CMCBSC (HENCE ALL OTHER OF HIS ROUTINES WHICH CALL CMCBSC) -SEE .53 ABOVE - AND I/O HANDLERS FOR CAMAC INTERFACED PERIPHERALS, EITHER FROM MAINSTREAM OR LAM HARDWARE PRIORITY. CAMAC INTERFACED DEVICES FOR WHICH HANDLERS CURRENTLY EXIST INCLUDE A LINE PRINTER, CARD READER, INCREMENTAL PLOTTER, AND A TEKTRONIX 4010 TERMINAL. FOR DEVICE HANDLERS, CAMAC IS TRANSPARENT.
IT IS RELATIVELY EASY TO ADAPT A HANDLER FOR AN I/O BUS DEVICE TO CAMAC SIMPLY BY SUBSTITUTING SUBROUTINE CALLS TO THE DRIVER FOR I/O OPERATIONS AND OBSERVING A FEW NON-RESTRICTIVE CONVENTIONS. THIS TWO-LEVEL APPROACH CAN ACCOMODATE CAMAC LANGUAGES IF ACTION STATEMENTS ARE COMPILED INTO SUBROUTINE CALLS.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5025
CLASS CODE - .53
TITLE- - - - CAMAC/FORTRAN V INTERFACE SOFTWARE
AUTHOR(S)- - A GSPONNER, SEN ELECTRONIQUE
MAINTENANCE BY SEN
AVAILABLE ON/AS- DISK (RDOS). FULL RDOS COMPATIBILITY
OPERATIVE DATE - MAY 1975
COMPUTER - - ANY NOVA (WITHWITHOUT FLOATING POINT)
INTERFACE(S) - CC 2023 (SEN)
SOFTWARE TYPE- POST PROCESSOR

DESCRIPTION- -

.54 Support Software I (translators)

READER SERVICE	RS.REF. 13. 5026
CLASS CODE =	.54
TITLE= = = =	S/UNIP AN UNIVERSAL MACRO PROCESSOR
AUTHOR(S)= =	SOFTWARE=PARTNERS
MAINTENANCE BY=	SOFTWARE=PARTNERS
OBTAINABLE FROM	SAME, (SEE INDEX OF MANUFACTURERS)
OPERATIVE DATE=	APRIL 1974
SOFTWARE TYPE =	MACRO PROCESSOR
LANGUAGE =	WRITTEN IN HIGH LEVEL LANGUAGE
COMPUTER =	CAN RUN ON IBM, UNIVAC, CDC,ICL, SIEMENS, ETC.
CAMAC FACILITIES	INCORPORATED IN=LINE FOR FULL=SET IML WITH MACRO PROCESSOR DIRECTIVES

DESCRIPTION= =
S/UNIP IS A LANGUAGE INDEPENDENT MACRO PROCESSOR AND THEREFORE A TOOL FOR MACRO EXPANSION OF EVERY EXISTING OR OR FUTURE PROGRAMMING LANGUAGE. THUS S/UNIP MAINTAINS AND PROCESSES MACROS IN HIGH LEVEL LANGUAGES (FORTRAN, BASIC, ALGOL, PEARL, ETC.) AS WELL AS ASSEMBLY LANGUAGES. S/UNIP OPERATES AS A PRE=PROCESSOR GENERATING SOURCE CODE STATEMENTS FOR SUBSEQUENT COMPILATION, POSSIBLY ON ANOTHER COMPUTER.

CORR*************	CORRECTED, REVISION A
READER SERVICE	RS.REF. 13. 5027
CLASS CODE =	.541
TITLE= = = =	A MACRO ASSEMBLER FOR TYPE MBD=11 MICROPROGRAMMED BRANCH DRIVER
COMPUTER =	PDP=11
OBTAINABLE FROM	BI RA SYSTEMS (SEE INDEX OF MFRS)
SOFTWARE TYPE =	MACRO ASSEMBLER (TRANSLATOR)
INTERFACE(S) =	MBD=11 (BI RA SYSTEMS)

DESCRIPTION= =
THE MACRO ASSEMBLER HAS BEEN DEVELOPED TO FACILITATE THE WRITING OF PROGRAMS FOR THE MBD=11 MICROPROCESSOR=INTERFACE. THE ASSEMBLER TRANSLATES PROGRAMS WRITTEN IN MACRO CODE INTO INSTRUCTIONS ACCEPTABLE BY THE MBD=11. UP TO 4K INSTRUCT=IONS CAN BE STORED IN THE MBD=11, A FUNCTION OF MEMORY SIZE WHICH GO FROM 256 TO 4K WORDS IN INCREMENTS OF 256 AND 1K. INSTRUCTIONS ARE MICRO=STRUCTURED FORMING A POWERFUL SET.

READER SERVICE	RS.REF. 13. 5028
CLASS CODE =	.541(MACRO11)
TITLE= = = =	MACROS FOR 1533A
AUTHOR(S)= =	MR. HEER
NAME/ACRONYM =	MACRO 1533A
MAINTENANCE BY=	MR. HEER
OBTAINABLE FROM	MR. HEER, ZEL, KFA, JUELICH
AVAILABLE ON/AS	DECTAPE
OPERATIVE DATE=	FEBRUARY 1973
COMPUTER =	PDP=11, MIN 8K 16 BIT WORDS
INTERFACE(S) =	TYPE 1533A (BORER)
MIN SYSTEM CONFIG	DOS V004, 008, 009
SOFTWARE TYPE =	MACRO=SET
LANGUAGE =	MACRO 11
CAMAC FEATURES=	ARE INCORPORATED IN=LINE
ENVIRONMENT FOR =	CAMAC SOFTWARE IS ASSEMBLER
CAMAC FACILITIES	SINGLE ACTION STATEMENTS, SYMBOLIC DEVICE NAMES

DESCRIPTION= =
THIS IS A SIMPLE MACRO SET (NO DECLARATIONS) FOR SINGLE ACTION STATEMENTS. EXECUTION SPEED IS HIGHER (APPROX 30 MICROSECS PER INSTRUCTION, DEPENDING ON TYPE OF INSTRUCTION ON TYPE OF PDP=11). NOT INTERRUPTABLE MACROS (PRIORITY=7)

CORR*************	CORRECTED, REVISION A
READER SERVICE	RS.REF. 13. 5..29
CLASS CODE =	.541(IML)
TITLE= = = =	MACRO=IML IMPLEMENTATIONS FOR DEC PDP=11 COMPUTERS
AUTHOR(S)= =	M KUBITZ, R KIND, HMI=BERLIN
PUBL. REF. =	CAMAC BULLETIN NO 12, APRIL 1975
OBTAINABLE FROM	M KUBITZ, BEREICH D/E, HMI=BERLIN GERMANY
AVAILABLE ON/AS	ALL MEDIA
OPERATIVE DATE=	1974
COMPUTER =	PDP=11, 16K, 24K, 44K, OR 52K
INTERFACE(S) =	CA=11A (DEC), 1533A (BORER)
MIN SYSTEM CONFIG	DOS V08/09, RSX=11D, RSX=11M
SOFTWARE TYPE =	MACRO SET OF IML (IMPLEMENTED)
LANGUAGE =	PDP=11 ASSEMBLY
CAMAC FEATURES=	INCORPORATED BY MACROS
CAMAC FACILITIES	FULL SET OF IML=MACROS INCLUDING DEMAND HANDLING

DESCRIPTION= =
IML IS IMPLEMENTED ON PDP=11 IN ACCORDANCE WITH THE MACRO SYNTAX AS DEFINED IN THE DOCUMENT ESONE/IML/01 (SEE CLASS .501 ABOVE). VERSIONS ARE AVAILABLE FOR INTERFACE= CONTROLLERS AND DEC OPERATING SYSTEMS AS MENTIONED IN THE LEFT COLUMN.
IMPLEMENTATION COVERS THE FULL SET OF IML MACROS AND DEMAND HANDLING EXCEPT BLOCK TRANSFER ON SPECIAL LAM, X=ERROR CONTROL STATEMENTS, AND SUBSCRIPT MODE. TRANSFER MODES NOT IMPLEMENTED BY HARDWARE ARE SIMULATED BY SOFTWARE.
I/O TRANSFER INSTRUCTIONS ARE EMBEDDED IN THE MACROS AND ARE PERFORMED DIRECTLY IN ACTION BY THE MACROS.
ADDRESS CALCULATION AT ASSEMBLY TIME GIVES OPTIMIZED ADDRESS CALCULATION AT ASSEMBLY TIME GIVES OPTIMUM RUN TIME CODE. HOST LANGUAGES CAN BE PDP=11 MACRO ASSEMBLER OR FORTRAN (VIA SUBROUTINE CALL).
MEMORY REQUIREMENTS VARY WITH OPERATING SYSTEM AND IF FULL SET IS NEEDED, OR A SUB=SET IS ACCEPTABLE. 16K IS REQUIRED FOR A SUB=SET WITH DOSV08/09 OR RSX=11M AND 52K FOR FULL SET AND RSX=11D.

CORR*************	CORRECTED, REVISION A
READER SERVICE	RS.REF. 13. 5030
CLASS CODE =	.543(CATY)
TITLE= = = =	A CAMAC TESTING AID FOR USE ON PDP=11
AUTHOR(S)= =	F R GOLDING, APPLIED COMPUTER SYST.
NAME/ACRONYM =	CAT11
OBTAINABLE FROM	APPLIED COMPUTER SYSTEMS LTD, WENZEL ELEKTRONIK, NUCL ENTERPRISES, (SEE INDEX OF MANUFACTURERS)
OPERATIVE DATE=	1973
COMPUTER =	PDP=11, 4K OR 8K MEMORY REQUIRED DEPENDING ON VERSION
INTERFACE(S) =	C=CSC=11 (WENZEL), 9030 (N.E.)
MIN SYSTEM CONFIG	CONTROL VISTA, READER, PUNCH
SOFTWARE TYPE =	SYSTEM (EXECUTIVE, COMPILER ETC)
LANGUAGE =	CATY (BASED ON BASIC)

DESCRIPTION= =
USERS TEST PROGRAMS ARE TYPED IN AND THEREAFTER COMPILED AND RUN. IT IS POSSIBLE TO EDIT THE PROGRAM AND RERUN IT WITH=OUT HAVING TO RETYPE THE ORIGINAL PROGRAM. CAMAC COMMANDS ARE EMBEDDED IN PROGRAM AS STATEMENT LINES.
CAT11 HAS INTERRUPT AS SYSTEM FEATURE, THE USER MAY TYPE HIS OWN INTERRUPT ROUTINE.
THE CAT11 EXECUTIVE PROGRAM CHANGES SLIGHTLY WITH INTERFACE USED, BUT ALL ROUTINES ARE IDENTICAL.
VERSIONS OF THIS SYSTEM IS ALSO AVAILABLE FROM GEC ELLIOTT (SEE FOLLOWING ENTRIES)

NEW**************	NEW ENTRY
READER SERVICE	RS.REF. 13. 5031
CLASS CODE =	.543(CATY)
TITLE= = = =	A CAMAC TESTING AID = CATY = FOR PDP=11
AUTHOR(S)= =	F R GOLDING, R F CRANFIELD
OBTAINABLE FROM=	GEC ELLIOTT (SEE INDEX OF MANUFACTURERS)
OPERATIVE DATE =	1974
COMPUTER = =	PDP=11, MIN 4K REQUIRED
MIN MEMORY SPACE	
INTERFACE(S) =	PTI=11C/D, IVG=11 (GEC ELLIOTT)
MIN SYSTEM CONFIG	CONTROL TTY OR VISTA, READER, PUNCH
LANGUAGE = =	CATY (BASED ON BASIC)

DESCRIPTION= =
SEE PRECEEDING ENTRY

NEW***************	NEW ENTRY
READER SERVICE	RS.REF. 13. 5032
CLASS CODE -	.543(CATY)
TITLE- - - -	A CAMAC TESTING AID - CATY - FOR NOVA
AUTHOR(S)- -	F R GOLDING, R F CRANFIELD
OBTAINABLE FROM-	GEC ELLIOTT
OPERATIVE DATE -	MARCH 1975
COMPUTER - -	NOVA SERIES (DATA GENERAL), MIN 4K
INTERFACE(S) -	NOVA EXECUTIVE SUITE (GEC ELLIOTT)
MIN SYSTEM CONFIG	CONTROL TTY OR VDU, READER, PUNCH
LANGUAGE - -	CATY (BASED ON BASIC)

DESCRIPTION- -
(SEE CLASS .501(CATY) AND PRECEEDING ENTRIES CLASS .543)

NEW***************	NEW ENTRY
READER SERVICE	RS.REF. 13. 5033
CLASS CODE -	.543(CATY)
TITLE- - - -	A CAMAC TESTING AID - CATY - FOR THE
OBTAINABLE FROM-	GEC ELLIOTT
COMPUTER - -	2050 AND 4080 (GEC)
INTERFACE(S) -	EXECUTIVE SUITE FOR 2050/4080 (GEC)
LANGUAGE - -	CATY (BASED ON BASIC)

DESCRIPTION- -
(SEE CLASS .501(CATY) AND PRECEEDING ENTRIES CLASS .543)

READER SERVICE	RS.REF. 13. 5034
CLASS CODE -	.543
TITLE- - - -	A BASIC MACRO-11 COMPILER
AUTHOR(S)- -	B BECKS
PUBL. REF. -	CAMAC BULLETIN NO 10, JULY 1974
NAME/ACRONYM -	MABA
MAINTENANCE BY-	B BECKS
OBTAINABLE FROM	B BECKS, ZEL, KFA, JUELICH
AVAILABLE ON/AS	DECTAPE
OPERATIVE DATE-	JANUARY 1974
COMPUTER -	PDP-11, 16K 16 BIT WORDS OF MEMORY
INTERFACE(S) -	TYPE 1533A (BORER)
MIN SYSTEM CONFIG	DOS V08 OR V09, 16K
SOFTWARE TYPE -	COMPILER
LANGUAGE -	BASIC
INCORP TECHNIQUE	IN-LINE
ENVIRONMENT FOR -	CAMAC SOFTWARE IS MACRO ASSEMBLER
CAMAC FACILITIES	SINGLE ACTION STATEMENTS

DESCRIPTION- -
THIS COMPILER TRANSLATES TESTED (INTERPRETIVE) BASIC PROGRAMS INTO MACRO-11 SOURCE CODE. RUN TIME IS IMPROVED BY A FACTOR OF 15 TO 20. EASILY ADAPTABLE TO OTHER CONTROLLERS (MACROS).
OUTPUT CODE LINKED WITH FLOATING POINT PACKAGE CAN RUN ON STAND-ALONE MINI-COMPUTERS.

READER SERVICE	RS.REF. 13. 5035
CLASS CODE -	.543
TITLE- - - -	PRECOMPILER FOR IML SUBSET
AUTHOR(S)- -	W. KNEIS
PUBL. REF. -	CAMAC BULLETIN NO 10, JUNE 1974, AND GFK REPORT KFK2121, GFK, 1975 (IN PRESS)
NAME/ACRONYM -	META-II/X
OBTAINABLE FROM	W. KNEIS, IAK II/CYCLOTRON,GFK, D 7500 KARLSRUHE, POSTFACH 3640
AVAILABLE ON/AS	TAPE, CARDS
OPERATIVE DATE-	JULY 1974
COMPUTERS-	IBM/370 (TRANSL.), CDC 3100 (EXECUTION)
INTERFACE(S) -	IN-HOUSE TYPE
MIN MEMORY SPACE	36K BYTES (MAX 86K BYTES)
SOFTWARE TYPE -	PRECOMPILER (METACOMPILER SYSTEM)
LANGUAGES-	IML (USER), FORTRAN IV (SYSTEM), META-II (FOR COMPILER/WRITING)
INCORP TECHNIQUE	IN-LINE
HOST LANGUAGE -	COMPASS ASSEMBLER (CDC 3100)
FACILITIES -	SINGLE ACTIONS, MULTIPLE ACTION(MA) BLOCKTRANSFER(UBL), AND LAM-, CRATE-, AND SYSTEM-STATEMENTS

DESCRIPTION- -
META-II/X IS A SYSTEM FOR WRITING COMPILERS. THE IMPLE-MENTED VERSION OF THE IML PRECOMPILER IS A CROSS-COMPILER VERSION, I.E. TRANSLATION IS DONE ON AN IBM/370, EXECUTION ON A CDC 3100 COMPUTER. THE OBJECT CODE FOR PRECOMPILING IS THE MNEMONIC COMPASS ASSEMBLER (CDC). THEREFORE AN ADDITIO-NAL ASSEMBLER STEP IS INVOLVED. WITH META-II/X A PRECOM-PILER CAN BE WRITTEN AND TESTED IN A FEW DAYS. THE IML SUB-SET CONTAINS THE DECLARATION- (LOCL, LOCD) AND ACTION-STATE-MENTS (SA, SJQ, SJNQ, MA, UBL, ALL LAM HANDLING-, SYSTEM- AND CRATE-CONTROLLRR- STATENENTS).
SET CONTAINS THE DECLARATION STATEMENTS LOCL AND LOCD. THE SUBSET ALSO CONTAIN ACTION STATEMENTS SUCH AS SA, SJQ, SJNQ, MA, UBL, ALL LAM-HANDLING STATEMENTS, SYSTEM STATEMENTS, AND CRATE CONTROLLER STATEMENTS.

READER SERVICE	RS.REF. 13. 5036
CLASS CODE -	.544(BASIC)
TITLE- - - -	A PDP-11 BASIC EXTENSION FOR CAMAC PROGRAMMING
AUTHOR(S)- -	T BALS, E DE AGOSTINO, CNEN, ROME
PUBL. REF. -	CAMAC BULLETIN NO 7, JULY 1973
OPERATIVE DATE-	1973
COMPUTER -	PDP-11
INTERFACE(S) -	EXECUTIVE SUITE (GEC ELLIOTT)
SOFTWARE TYPE -	INTERPRETER
INCORP TECHNIQUE	SUBROUTINES IN ASSEMBLY CODE
ENVIRONMENT FOR -	CAMAC SOFTWARE IS BASIC
LANGUAGE -	BASIC (EXTENDED)

DESCRIPTION- -
THE SUBROUTINES WHICH EXTEND THE BASIC INTERPRETER TO CAMAC ARE CALLED BY AN EXTERNAL FUNCTION STATEMENT, WHERE ADDRESS, FUNCTION, ETC, ARE TRANSMITTED AS ARGUMENTS. THE STATEMENT HAS THE FOLLOWING GENERAL FORM- -
LET U = EXF (A1,A2, ... ,A10)
THE FIRST ARGUMENT SELECTS THE APPROPRIATE SUBROUTINE. DATALESS, READ, AND WRITE OPERATIONS WITH DIRECT/INDIRECT ADDRESSING ARE POSSIBLE. ALSO SINGLE OR BLOCK TRANSFERS IN ADDRESS SCAN, REPEAT OR STOP MODES CAN BE PERFORMED.
THE EXTENSION FEATURES LAM HANDLING.

CORR**************	CORRECTED, REVISION B
READER SERVICE	RS.REF. 13. 5037
CLASS CODE -	.544(BASIC)
TITLE- - - -	A CAMAC EXTENDED BASIC LANGUAGE
AUTHOR(S)- -	J M SERVENT (SCHLUMBERGER)
PUBL. REF. -	PROC CAMAC SYMPOS, LUXMBG, DEC 1973
NAME/ACRONYM -	CASIC
OBTAINABLE FROM	SCHLUMBERGER (SEE INDEX OF MFRS)
OPERATIVE DATE-	1973
COMPUTER -	PDP-11, 16K WORDS MEMORY
INTERFACE(S) -	ICP11 OR JCC11 (SCHLUMBERGER)
MIN SYSTEM CONFIG	TTY
SOFTWARE TYPE -	INTERPRETIVE LANGUAGE, EXTENDED WITH MACRO-INSTRUCTION GENERATOR
LANGUAGE -	BASIC (EXTENDED)
INCORP TECHNIQUE	IN-LINE CAMAC STATEMENTS
CAMAC FACILITIES	SYMBOLIC DEVICE NAMES, INTERRUPT HANDLING, RE-ENTRANT.

DESCRIPTION- -
STANDARD BASIC IS EXTENDED WITH A SET OF CAMAC RELATED STATEMENTS. EXECUTION TIME FOR A 100 LINE PROGRAM IS ABOUT 10 SECONDS. DECLARATIVE STATEMENTS ALLOW SYMBOLIC REFERENCE OF A MODULE. ADDRESS PARAMETERS CAN BE CONSTANTS OR VARIABLES, EVEN EXPRESSIONS, THUS PROVIDING GREAT FLEXIBILITY. SEVERAL CONTROL FUNCTIONS ARE IN MACRO-STATE-MENT FORM, SUCH AS - TST LAM MODULE (SAME AS MODULE(8)). SOME SYNTAX CHANGES FACILITATES IMPLEMENTATION OF THE SEMAN-TICS OF IML (SEE .501(IML)). TYPICAL STATEMENTS ARE - -
ASSIGN ADDRESS - - STATION(MODULE) = (B,C,N,A)
EXECUTING STATEMENT - -
SINGLE TRANSFER - - SA(F,MODULE,A)
MULTIPLE TRANSFER - - MA(F,MODULE,A)
CONTROL FUNCTION - EXEC MODULE(F)
LAM REG OPERATION- CLR LAM MODULE (=MODULE(10))
LAM/INTERRUPT- - - ON LAM(MODULE) DO 100

READER SERVICE RS.REF. 13. 5038
CLASS CODE = .544(FOCAL)
TITLE= = = = FOCAL OVERLAY FOR CAMAC DATA AND COMMAND HANDLING
AUTHOR(S)= = F MAY, H HALLING, K PETRECZEK
PUBL. REF. = CAMAC BULLETIN NO 1, JUNE 1971
NAME/ACRONYM = FOCADAT
OPERATIVE DATE= 1970
COMPUTER = PDP=8, 4K OR 8K 12 BIT WORD MEMORY
INTERFACE(S) = IN=HOUSE CC & INTERFACE
SOFTWARE TYPE = INTERPRETER (EXTENDED)
INCORP TECHNIQUE CAMAC EXTENSION OF OVERLAY, IN=LINE CODING OF CAMAC COMMANDS
ENVIRONMENT FOR = CAMAC SOFTWARE IS FOCAL

DESCRIPTION= =
THE INTERPRETER IS PRIMARILY INTENDED FOR EASILY PROGRAMMED ON=LINE CAMAC SYSTEMS IN NON=TIME=CRITICAL CONTROL AND DATA HANDLING APPLICATIONS AND FOR TEST ROUTINES.
THERE ARE 9 CAMAC STATEMENT TYPES COVERING GENERAL CONTROLS (Z, C, I) AND CAMAC COMMANDS WITH/WITHOUT DATA TRANSFER.
THE GENERAL FORM OF A CAMAC STATEMENT IS ==
+A CF,C,N,A,F,FB,HW [,LW,Q]
WHERE SEVERAL PARAMETERS MAY BE OMITTED.

READER SERVICE RS.REF. 13. 5039
CLASS CODE = .544(BASIC)
TITLE= = = = 8=USER BASIC UNDER DOS WITH INTERPRETER EXTENDED FOR CAMAC
AUTHOR(S)= = PFEIFFER, SPICKMAN, CARLEBACH
VERSION= = = 001
MAINTENANCE BY= D P PFEIFFER
OBTAINABLE FROM D P PFEIFFER, ZAM, KFA, JUELICH
AVAILABLE ON/AS DECTAPE
OPERATIVE DATE= JANUARY 1974
COMPUTER = PDP=11, 16K OF 16 BIT WORD MEMORY
INTERFACE(S) = TYPE 1533A (BORER)
MIN SYSTEM CONFIG DOS V08 OR V09, 16K
SOFTWARE TYPE = DOS SYSTEM INTERFACE TO CAMAC
LANGUAGE = BASIC
INCORP TECHNIQUE EXTENSION OF INTERPRETER

DESCRIPTION= =
THE 8=USER BASIC CAN BE RUN UNDER DOS. A HELP FILE CONTAINS ALL MODIFICATIONS OF THE 1 TO 8 USER BASIC. NO INTERRUPT HANDLING. COMMUNICATION BETWEEN THE 8 USERS IS POSSIBLE BY ONE COMMUNICATION WORD PER USER. EXPANDED ERROR MESSAGE HANDLING. FILE HANDLING EXTENDED. TIME COMMAND ADDED.

READER SERVICE RS.REF. 13. 5040
CLASS CODE = .544
TITLE= = = = ORACL (TM), AN INTERPRETIVE REAL=TIME MONITOR WITH CAMAC SUPPORT
AUTHOR(S)= = L BYARS, R KEYSER (ORTEC INC)
NAME/ACRONYM = ORACL (TM)
MAINTENANCE BY= ORTEC
OBTAINABLE FROM ORTEC (SEE INDEX OF MANUFACTURERS)
AVAILABLE ON/AS PAPER TAPE AND DISK
OPERATIVE DATE= APRIL 1974
COMPUTER = PDP=11, MIN 8K 1L BIT MEMORY
INTERFACE(S) = TYPE DC011 (EG&G)
MIN SYSTEM CONFIG TTY & DC011
SOFTWARE TYPE = INTREPRETER, SYSTEM MONITOR
LANGUAGE = PDP=11 ASSEMBLER
INCORP TECHNIQUE EMBEDDED CAMAC FEATURES
CAMAC FACILITIES SINGLE OR MULTIPLE INSTRUCTIONS, DEMAND HANDLING IS INCLUDED.

DESCRIPTION= =
ORACL INTERPRETS ARITHMETIC STATEMENTS, PROGRAM CONTROL STATEMENTS, COMMENTS, I/O STATEMENTS, AND HARDWARE CONTROL STATEMENTS AND EXECUTES THE DESIRED FUNCTION.

ORACL (TM) IS A TRADE MARK REGISTERED BY ORTEC, INC.

NEW************** NEW ENTRY
READER SERVICE RS.REF. 13. 5041
CLASS CODE = .544
TITLE= = = = GENERAL PURPOSE I/O INTERFACE SOFTWARE
AUTHOR(S)= = F WORM, SEN ELECTRONIQUE
MAINTENANCE BY SEN
OBTAINABLE FROM= SEN (SEE INDEX OF MANUFACTURERS)
OPERATIVE DATE = MAY 1975
AVAILABLE ON/AS= DISK
COMPUTER = = NOVA SERIES (DATA GENERAL)
INTERFACE(S) = ANY (IRRESPECTIVE OF MAKE)
SOFTWARE TYPE= INTERPRETER
OTHER REMARKS FULLY RDOS/SOS COMPATIBLE

DESCRIPTION= =

.55 Support Software II

READER SERVICE RS.REF. 13. 5042
CLASS CODE = .553(FOCAL/PAL)
TITLE= = = = A FOCAL INTERRUPT HANDLE FOR CAMAC
AUTHOR(S)= = F MAY, W MARSCHIK, H HALLING
PUBL. REF. = CAMAC BULLETIN NO 6, MARCH 1973
NAME/ACRONYM = FOCALINT
OPERATIVE DATE= 1971
COMPUTER = PDP=8
SOFTWARE TYPE = INTERRUPT HANDLER (SYSTEM PROGRAM)

DESCRIPTION= =
FOCALINT IS A GENERAL PURPOSE SYSTEM PROGRAM, ADAPTABLE FOR SPECIAL USE. UP TO 3 CRATES WITH 24 INTERRUPTS EACH CAN BE SERVICED. ONE PROGRAM LINE IN FOCAL IS RESERVED FOR EACH INTERRUPT. SHORT ROUTINES CAN BE TYPED INTO THESE LINES SERVICING THE ASSOCIATED INTERRUPTS, ALTERNATIVELY A FOCAL SUBROUTINE CAN BE USED. CURRENT LINE IN THE BACKGROUND PROGRAM WILL BE FINISHED BEFORE JUMPING TO INTERRUPT ROUTINE AND RETURNS TO NEXT LINE IN THE BACKGROUND PROGRAM AFTER SERVICING.

.57 Test Routines

```
READER SERVICE      RS.REF. 13. 5043
CLASS CODE =        .57
TITLE= = = =        TEST PROGRAMS FOR SYSTEMS, BRANCH
                    DRIVER & MODULES
OBTAINABLE FROM     BI RA SYSTEMS (SEE INDEX OF MFRS)
OTHER REMARKS       FOR BRANCH DRIVER MBD=11, SYSTEM TEST
                    MODULE 6102, AND DATA MODULES
```

```
DESCRIPTION= =
A SET OF THREE DIAGNOSTIC PROGRAMS ARE SUPPLIED WITH THE
MBD=11 MICROPROGRAMMED BRANCH DRIVER.  TESTS OF MEMORY, FILE
REGISTERS, INSTRUCTION SET, DMA TRANSFERS, INTERRUPTS ETC.
A COMPLETF SYSTEM TEST IS SUPPLTED WITH 6102.
A CAMAC TEST ROUTINE IS SUPPLIED FOR CAMAC MODULE TESTING
FROM THE TELETYPE.  NO ASSEMBLY LANGUAGE KNOWLEDGE REQUIRED.
```

```
READER SERVICE      RS.REF. 13. 5044
CLASS CODE =        .573
TITLE= = = =        CAMAC TEST PROGRAM
AUTHOR(S)= =        DR. B MERTENS, IKP, KFA, JUELICH
AVAILABLE ON/AS     PAPER TAPE, ASCII CODE
OPERATIVE DATE=     1971
COMPUTER =          PDP=11, 16K OF 16 BIT WORDS MEMORY
INTERFACE(S) =      TYPE 2200 (BORER)
SOFTWARE TYPE =     TEST ROUTINES, STAND=ALONE PROGRAMS
```

```
DESCRIPTION= =
STAND ALONE PROGRAMS TEST SOME FUNCTIONS OF THE BORER TYPE
2200 INTERFACE, THE CRATE CONTROLLER AND TWO IN=HOUSE
MODULES (C01 & C02).
ERROR MESSAGES ARE OUTPUT IF THERE ARE HARDWARE FAILURES.
```

```
READER SERVICE      RS.REF. 13. 5045
CLASS CODE =        .573
TITLE= = = =        3911A TEST CAMAC
AUTHOR(S)= =        L A KLAISNER
OBTAINABLE FROM     KINETIC SYSTEMS (SEE INDEX OF MFRS)
OPERATIVE DATE=     1973
COMPUTER =          PDP=11, 4K OF CORE MEMORY REQUIRED
INTERFACE(S) =      TYPE 3911A (KINETIC)
SOFTWARE TYPE =     TEST ROUTINE
```

```
DESCRIPTION= =
A STAND ALONE PROGRAM FOR EXERCISING A CAMAC SYSTEM FROM A
TELETYPE.  IT SUPPORTS UP TO 8 CRATES WITH MODEL 3911A
UNIBUS *) CRATE CONTROLLERS.  A FUNCTION MAY BE EXECUTED
ONCE OR REPETITIVELY.

*) UNIBUS IS A TRADE MARK OF DIGITAL EQUIPMENT CORP.
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```
READER SERVICE      RS.REF. 13. 5046
CLASS CODE =        .573
TITLE= = = =        TEST CAMAC
OBTAINABLE FROM     KINETIC SYSTEMS (SEE INDEX OF MFRS)
OPERATIVE DATE=     1972
INTERFACE(S) =      TYPE KS0011 (KINETIC)
COMPUTER =          PDP=11, 4K OF CORE REQUIRED
SOFTWARE TYPE =     TEST ROUTINE
```

```
DESCRIPTION= =
A STAND ALONE PROGRAM FOR EXERCISING A CAMAC SYSTEM FROM A
TELETYPE.  IT SUPPORTS ONE BRANCH DRIVER WITH UP TO 7
CRATES.  A FUNCTION MAY BE FXECUTED ONCE OR REPETITIVELY.
```

```
READER SERVICE      RS.REF. 13. 5047
CLASS CODE =        .573
TITLE= = = =        PDP=11 INTERFACE TEST PROGRAM
OBTAINABLE FROM     GEC=ELLIOTT (SEE INDEX OF MFRS)
OPERATIVE DATE=     1974
COMPUTER =          PDP=11
INTERFACE(S) =      PDP=11 EXECUTIVE SUITE/GEC=ELLIOTT
SOFTWARE TYPE =     TEST ROUTINE
LANGUAGE =          PAL=11 ASSEMBLER
```

```
DESCRIPTION= =
THIS IS A STAND=ALONE PROGRAM USED IN CHECKING THE EXECUTIVE
SUITE, A MODULAR PDP=11 = CAMAC INTERFACE.  DIAGNOSTIC
MESSAGES ARE ISSUED.
```

```
NEW**************   NEW ENTRY
READER SERVICE      RS.REF. 13. 5048
CLASS CODE =        .573
TITLE= = = =        TEST PROGRAMS FOR BRANCH DRIVER AND
                    SYSTEM WITH MODULE 6102 AND TYPE A
OBTAINABLE FROM=    BI RA SYSTEMS (SEE INDEX OF MFRS)
COMPUTER = =        PRIME COMPUTER
INTERFACE(S) =      1260 (BI RA SYSTEMS)
SOFTWARE TYPE=      DIAGNOSTIC PROGRAMS
MIN SYSTEM CONFIG   BRANCH DRIVER 1260, 6102 CAMAC TEST
                    MODULE/DATAWAY DISPLAY
```

```
DESCRIPTION= =
A SET OF DIAGNOSTIC PROGRAMS ARE SUPPLIED WITH THE MODEL
1260 PRIME COMPUTER BRANCH DRIVER.
A COMPLETE SYSTEM TEST IS SUPPLIED, BUT REQUIRES MODEL 6102
TEST MODULE.
```

NEWS

ANNOUNCEMENTS BY CAMAC MANUFACTURERS

BORER ELECTRONICS AG is introducing an autonomous crate-controller fitted with a built-in microprocessor (Intel 8080), teletype port (V 24), real-time clock, automatic power fail restart, and RAM with the possibility of up to 64K bytes. Interfaces to various peripherals such as floppy disks, modems etc, are in preparation and provision is made for use of the controller in conjunction with the standard serial highway.

A large amount of software support will be immediately available thanks to collaboration with the KFA, Jülich, F.R. Germany. Amongst the many packages available are a cross-assembler and a simulator which can be run on a PDP-11.

Production is scheduled to start autumn 1975 and a live demonstration of a system will be given at the CAMAC Symposium in Brussels from October 14–16th, 1975.

Ref. No. 13.0002

CAMAC AT THE 1st CONFERENCE OF IRAQI ATOMIC ENERGY COMMISSION

The 1st Conference of Iraqi AEC took place in Baghdad on April 7–11, 1975. In addition to the general topics of the Conference (radioisotopes, radiology, food preservation, radiochemistry, biology, medicine, theoretical physics and energy from reactors) CAMAC was presented by the chairman of the ESONE Committee, F. Iselin, CERN, in a paper entitled, CAMAC Interfacing at CERN and future trends. At the moment CAMAC is used in Iraq at the Nuclear Research Institute near Baghdad which is working with a 2 MW research reactor. An exhibition took place at the time of the Symposium informing also about existing facilities in CAMAC.

READER SERVICE ENQUIRY CARD

In issue 12, a Reader Service Enquiry Card was introduced, and this is intended to be a standard feature of the CAMAC Bulletin. You will find that reference numbers are attached to the products mentioned in both the 'New Products' section, in the 'Product Guide' and for News of manufacturers. Six digits of which the first two are referring to the issue number are used in the reference number. This number reflects the techniques used in the editorial work.

The Reader Service Enquiry Cards are received by the ESONE Secretariat which passes them to the relevant manufacturers.

SECOND INTERNATIONAL SYMPOSIUM ON CAMAC IN COMPUTER APPLICATIONS

The second CAMAC symposium will take place in Brussels on October 14th to 16th, 1975. The symposium is jointly organized by the ESONE Committee and the European CAMAC Association, and sponsored by the Commission of the European Communities.

The main topics of the symposium will be the application of CAMAC in Industrial Process Control, Laboratory Automation, Medicine and Health Services, Data and Computer Communications, Public Utilities, and Environmental Control. There will be survey talks in plenary sessions, and users of CAMAC will give applications papers in parallel sessions. In all, 59 papers will be presented orally and 21 additional papers will be mentioned shortly.

An exhibition of CAMAC equipment, including complete systems, and related products from more than 30 companies and institutes is being arranged to take place simultaneously with the symposium.

An invitation for the symposium and a preliminary programme were distributed already in May, 1975.

The latest data of registration is September 1st, while organized hotel reservation must take place before August 15th.

Further information and copies of invitation and programme are available on request from the secretary of the symposium:

H. Meyer
Commission of the European Communities
CRC, CBNM
Steenweg naar Retie
B-2440 GEEL
Belgium.

CAMAC BIBLIOGRAPHY

Specifications and Supplementary Information*

CAMAC: A Modular Instrumentation System for Data Handling. Description and Specification. EUR 4100c, CEC, Luxembourg 1972, 64 p., and AEC Report TID-25875, U.S.AEC, Washington DC, U.S.A., supercedes EUR 4100e (1969).

CAMAC: Organisation of Multi-Crate Systems. Specification of the Branch Highway and CAMAC Crate Controller Type A. EUR 4600e, CEC, Luxembourg 1972, 46 p. and AEC Report TID-25876, U.S.AEC, Washington DC, U.S.A.

CAMAC: Specification of Amplitude Analogue Signals within a 50Ω System, EUR 5100e, CEC, Luxembourg 1974, 13 p.

CAMAC: Supplementary Information on CAMAC Instrumentation System. AEC Report TID-25877, U.S.AEC, Washington DC, U.S.A., and Supplement to *CAMAC Bulletin* No. 6, CEC, Luxembourg, March 1973, 16 p.

CAMAC: Serial System Organization, a Description. ESONE/SH/01, ESONE Secretariat and TID-26488, U.S.AEC, Washington DC, U.S.A., December 1973, 83 p.

Addenda and Errata to: CAMAC Serial System Organization, a Description (ESONE/SH/01 and TID-26488). ESONE/SH/03, ESONE Secretariat, Nov. 1974, 11 p.

CAMAC: Proposal for a CAMAC Language. ESONE Committee Software Working Group. Supplement to *CAMAC Bulletin* No. 5, CEC, Luxembourg, Nov. 1972, 42 p.

BARNES, R.C.M. A CAMAC Glossary. Supplement to *CAMAC Bulletin* No. 7, CEC, Luxembourg, July 1973, 18 p.

CAMAC, Bibliography. Supplement to *CAMAC Bulletin* No. 8, CEC, Luxembourg, Nov. 1973, 16 p.

CAMAC: The Definition of IML, a Language for Use in CAMAC Systems, ESONE/IML/01, ESONE Secretariat, Oct. 1974, 36 p.

Recommended Introductory Reading

Proceedings of the 1st International Symposium on CAMAC in Real-Time Computer Applications, Luxembourg, Dec. 1973. (*)

DECKER, W. Measuring and Control System CAMAC. Siemens A.G. Karlsruhe, R.R. Germany, *Steuerungstechnik*, 6 (2), 1973, pp. 25-27 (in German).

FRIEDLE, T., HEEP, W., STIEFEL, W. CAMAC Data Logging System. Kernforschungszentrum Karlsruhe, F.R. Germany, KFK-1813, June 1973, 22 p.

ATTWENGER, W. Modular Instrumentation in Nuclear Electronics: Introduction to CAMAC. Österreichische Studiengesellschaft für Atomenergie GmbH, Seibersdorf, May 1973, 29 p. (in German).

KIRSTEN, F.A. CAMAC Specifications, *IEEE Trans. Nucl. Sci.*, NS-20, No. 1, Feb. 1973, pp. 562-568.

COSTRELL, L. CAMAC: A Review and Status Report. *IEEE Trans. Nucl. Sci.*, NS-20, No. 1, Feb. 1973.

WAGNER, F. CAMAC System. Pomiary, *Autom. Kontr.*, 18, No. 11, Poland, Nov. 1972, pp. 508-510 (in Polish).

ZACHAROV, B. CAMAC Systems: A Pedestrian's Guide. DNPL-R-23, Daresbury Nuclear Physics Laboratory, U.K., 1972, 44 p.

GALLICE, P., ROBIN, G. Système CAMAC. Informations pratiques pour son utilisation avec un calculateur. CEA-N-1549. CEA-SES-SESG-R-3135, France, 1972, 20 p.

BARNES, R.C.M., WHITEMAN, A.R.C. CAMAC Bibliography, Harwell Report AERE-Bib 180, U.K., 1972.

DE AGOSTINO, E., RISPOLI, B. Il sistema CAMAC. *Notiziario CNEN*, (18) No. 2, Italy 1972, pp. 55-72.

VOJINOVIC, M. Sistem Nuklearnih Instrumenata za Rad sa Racunskim Masinama CAMAC. *Nuklearna Energija*, 6, No. 1, 1971, 19 p.

ISELIN, F. *et al.* Introduction to CAMAC. CERN, Report CERN-NP CAMAC Note 25-00, Switzerland, Jan. 1971, p. 51.

KINBARA, S. Introduction to the CAMAC System. *J. Atomic Energy Soc., Jap.*, **13**, 1971, p. 635 (in Japanese).

PATRUTESCU, M. Modular System CAMAC. Institutul de Fizica Atomica, Bucharest. IPA-ER-4-1973. 31 p. (in Rumanian).

COSTRELL, L. Highways for CAMAC Systems, a Brief Introduction, *IEEE Trans. Nucl. Sci.*, NS-21, No. 1, Feb. 1974.

COSTRELL, L. Standardized Instrumentation System for Computer Automated Measurement and Control, *IEEE-Industry Application Society 1974 Annual Meeting*, Pittsburgh, PA, Oct. 1974.

Other Recent References**

FOSTER, E., HALE, F.H. A CAMAC Digital Output System for the MS 5 Mass Spectrometer, AERE-R7914, AERE Harwell, Jan. 1975.

WALLACE-SIMS, G.R. A CAMAC Shaft Positioning System, AERE-R7299, AERE Harwell, Jan. 1975.

ISELIN, F., LOFSTEDT, B., PONTING, P. Localised Processing Power for CAMAC Systems, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 484.

HORELICK, D. The Confusing Digital Standards Picture — Are they Related? *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 488.

BRENNER, A.E., DROEGE, T.F., MARTIN, R.G. Bison-Net, A High Speed Block Multiplexer Channel for Interconnecting Computers Via CAMAC, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 494.

SCAIEF, C.C., TROYER, G.L. A CAMAC Serial Highway Utilizing a Laser Link, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 499.

BOBBITT, J. A CAMAC Crate Controller Using a Microprocessor, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 508.

BRENNER, A.E., MARTIN, R.G. CAMAC Extended Branch Serial Driver, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 511.

HORELICK, D. Simple, Versatile CAMAC Crate Controller and Interrupt Priority Encoding, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 517.

TRAINOR, J.H., EHRMANN, C.H., KAMINSKI, T.J. CAMAC and NIM Systems in the Space Program, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 521.

BARNES, R.C.M., CAMAC at AERE Harwell, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 526.

TENTEN, W., REINHART, P., MUELLER, K.D. Megachannel Pulse Height Analyzer Based on a Magnetic Drum with CAMAC Instrumentation, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 529.

RAMSTHALER, J.A., LAU, L.D., JUST, F.H. Data Acquisition and Process Control System for the Hot fuel Examination Facility, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 536.

LAU, L.D., RAMSTHALER, J.A., JUST, F.H. CAMAC Software for the Hot Fuel Examination Facility Real-Time Computer System, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 540.

BUCHANAN, J.A. CAMAC MWPC Readout System with Event Selection Logic, *IEEE Trans. Nucl. Sci.*, NS-22, No. 1, 543.

DE BRUIN, M., KORTHOVEN, P.J.M. CAMAC — Based Instrumentation for a Non-Destructive Neutron Activation Analysis System, *J. Radioanal. Chem.*, 22, 1974, 131.

MIKHAILOV, Y.V., SHUVALOV, R.S. Switching of a CAMAC System Between Two Computers, IHEP 74-26, Serpukhov 1974.

INYAKIN, A.V., JOHNSON, R.P., KRASNOKUTSKY, R.N., LEBEDEV, A.A., MIKHAILOV, Y.V., PROKOSHKIN, Y.D., SHUVALOV, R.S. Pulse Height Analysis of a Large Counter System, *Nucl. Instr. Meth.*, 120, 1974, 385.

DAVIS, M.P.H., HADDON, S., HAGAN, P.J., HUNT, R.A., MACEFIELD, B.E.F., WILKINSON, C.A. A CAMAC Data Collection Facility, *Nucl. Instr. Meth.*, 122, 1974, 451.

* Obtainable from: Office for Official Publications of the European Communities. Luxembourg, P.O. Box 1003.

** Publications in the previous CAMAC Bulletin issue are listed on the inside front cover of this issue.

WAS IST CAMAC?

CAMAC ist ein international verbreitetes Instrumentierungssystem zum Anschluss von Prozessperipheriegeräten an digitale Prozessoren und Rechner für automatische Mess- und Steuereinrichtungen.

Die System-Spezifikationen umfassen:

— ein digitales Interface, in dem Daten über einen standardisierten Datenweg übertragen werden;
— ein modulares Gerätekonzept zur Anpassung von Peripheriegeräten und Rechnern an den Datenweg.

Mit den modularen, in Überrahmen zusammengefassten Einheiten können viele Peripheriegeräte im Multiplexverfahren über den Datenweg betrieben werden. Weitere Spezifikationen bestehen für parallele und serielle Datenübertragungswege zur Realisierung grösserer Systeme mit mehreren Überrahmen.

CAMAC gewährleistet, dass Geräte verschiedener Hersteller austauschbar oder kompatibel sind und gemeinsam in unterschiedlichen Systemen verwendet werden können. So sind auch Änderungen der Systemkonfiguration aufgrund neuer Anforderungen leicht möglich. Für unterschiedliche Anwendungen stehen kompatible Geräte von Firmen aus vielen Ländern zur Verfügung.

CAMAC ist das Ergebnis einer multinationalen Zusammenarbeit von System-Ingenieuren, aus dem Gebiet der Prozessdatenverarbeitung und **ist ein firmenunabhängiger internationaler Standard, der von jedermann lizenzfrei benutzt werden kann.**

WHAT IS CAMAC?

CAMAC is an internationally used scheme for connecting digital processors and computers to on-line peripherals in systems for Computer Automated Measurement And Control.

There are rules for:

— a digital interface for transferring data on a common highway;
— a modular equipment format for adaptors to match peripherals and computers to the highway.

A compact assembly of these modular units can be used to multiplex many peripherals. Additional parallel and serial highways are defined for larger systems consisting of several of these assemblies.

CAMAC ensures that items of hardware from various suppliers are compatible and can be used together in any system, and also their subsequent reconfiguration to meet changing needs. Compatible products are available from firms in many countries and for uses in different application areas.

CAMAC is the result of multinational cooperation between data-processing system engineers. **It is a non-proprietary international standard that can be freely used by any organisation.**

QU'EST-CE QUE CAMAC?

CAMAC est un concept utilisé sur une base internationale pour relier des processeurs digitaux et des ordinateurs à des périphériques en ligne, dans des systèmes de « Contrôle – Commande Ainsi que Mesure Automatisés par Calculateur ».

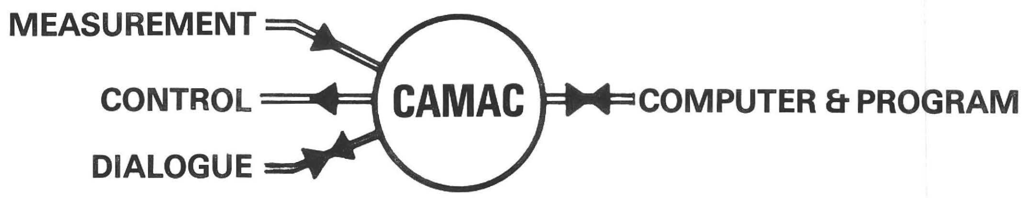
Des règles définissent :

— une interface numérique transférant des données sur une interconnexion générale;
— un format d'équipement modulaire pour l'adaptation des périphériques et des ordinateurs à cette interconnexion.

Un ensemble compact de ces unités modulaires peut être utilisé pour multiplexer de nombreux périphériques. Des interconnexions complémentaires, parallèle aussi bien que série, sont également définies pour des systèmes plus importants composés de plusieurs de ces ensembles.

CAMAC assure la compatibilité des éléments matériels fournis par différents producteurs ainsi que leur utilisation conjointe dans tout système; il facilite la constitution et la programmation des systèmes de même que leur reconfiguration consécutive à des changements d'utilisation. Dans de nombreux pays, différentes firmes proposent des produits CAMAC.

CAMAC résulte d'une coopération multinationale entre ingénieurs spécialistes des systèmes de traitement de données. **C'est une norme internationale non brevetée pouvant être utilisée librement par tout organisme.**



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