KERNFORSCHUNGSZENTRUM

KARLSRUHE

September 1971 KFK 1471

Labor für Elektronik und Meßtechnik

CAMAC-Bibliographie

I. Tradowsky-Thal

GESELLSCHAFT FÜR KERNFORSCHUNG M. B. H.

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Zusammenfassung

Dieser Bericht enthält die Titelangaben der bis August 1971 erschienenen Veröffentlichungen über das CAMAC-System einschließlich der Zusammenfassung in Englisch, soweit sie vom Autor angegeben wurde. Jedes der 114 Literaturzitate ist - in der Art von Karteikarten - auf einem Raum von DIN A 6-Format untergebracht, wobei der zugehörige Abstract auf der Rückseite steht.

Abstract

This report contains the bibliographical references and the abstract, if given by the author, of the publications on the CAMAC system up to August, 1971. Each of the 114 citations is placed on a 14.8 mm x 10.5 mm field with abstract on the back.

Manuskript eingegangen am 2. 9. 1971

Lewis, A.

A Small Computer Used as a Multi-Channel Analyzer

U.K.A.E.A. Research Group, Report AERE - 5844, Harwell 1968, 8 S.

Bisby, H.

An Advanced Modular System of Electronic Equipment for On-Line Computer Applications

U.K.A.E.A. Research Group, Report AERE - 5815, Harwell 1968, 24 S.

Hooton, I. N.; Barnes, R. C. M.

A Standardised Data Highway for On-Line Computer Applications

U.K.A.E.A. Research Group, Report AERE - 5866, Harwell 1968, 20 S.
S. auch: Fall Joint Computer Conf., San Francisco, December 1968. AFIPS Conf. Proc. vol. 33, part 2, S. 1077 - 1087

Becker W.

An Advanced Modular System of Nuclear Electronics for On-Line Computer Applications

Nucl. Instrum. Meth. 64 (1968) S. 197 - 200

European laboratories have collaborated under the auspices of the ESONE Committee to specify the essential features of a new international modular system of instrumentation. This system is primarily for on-line use with digital controllers or computers and incorporates a comprehensive data and control highway. The specification consists of mechanical and signal standards sufficient to ensure full interchangeability of units developed in different laboratories.
This paper gives an informal account of the system and then outlines its implementation at A.E.R.E. Harwell as a standard interface between digital computers and peripheral devices. The organisation of systems which provide interaction with commonly available computer facilities is described.

A prescribed method for associating transducers on-line with computers has been defined by collaboration between major nuclear laboratories in Europe, acting under the auspices of the ESONE Committee.

A 2,000 channel pulse height analyser with 18-bit count capacity per channel is described. The hardware comprises a PDP-8 computer (4K - 12-bit words) with DEC-tape, a control panel with switches and lamps to simulate a conventional analyser, and uses computer independent peripherals (Prototype IANUS modules). The system is intended to work with Harwell 2000 Series nuclear counting equipment.

Representatives from major nuclear laboratories in Europe have collaborated, under the title of the ESONE Committee, in defining a standard physical form and other basic features for a new modular unit System of electronic instrumentation. The design of this system anticipates the inevitable future prominence of integrated circuit components. It further takes into account the current trend, in scientific work, towards the 'real-time' association of transducers with computers or other data processors for the collection, display and analysis of measurement data and for the purpose of control.
This presentation sets out the design principles, which have evolved from the ESONE Committee and its two Working Groups, and gives interpretation of the role which equipments designed to the new standard could play. A description is also included but without the detail in appropriate definitive documents to which reference is essential.
The Harwell 7000 Series of equipment, also described in this report, conforms to this new System.

Bisby, H.

An Advanced Modular System of Nuclear Electronics for On-Line Computer Applications

In: Proc. Internat. Symposium on Nucl. Electronics, Paris, 10. - 13.9.1968. Bd. II, Vortrag 108, 27 S.

Lewis, A.

An Application of IANUS Modules to Multi-Channel Analysis in Association with a Computer

In: Proc. Internat. Symposium on Nucl. Electronics, Paris, 10. - 13.9.1968. Bd. II, Vortrag 138, 11 S.

Iselin, F. u. a.

CAMAC CERN-NP Options

CERN-NP CAMAC Note No. 1 - 00, Genève 1968, 16 S.

Iselin, F. u. a.

Crate CTR (Crate Controller) Type 011

CERN-NP CAMAC Note No. 2 - 00, Genève 1969, 12 S.

This note was written to introduce the subject and to give preliminary indications. Further notes will be more specific and shall more be limited to particular units or particular problems.

Representatives from major nuclear laboratories in Europe have collaborated, under the title of the ESONE Committee, in defining a standard physical form & other basic features for a new modular unit System of electronic instrumentation. The design of this system anticipates the inevitable future prominence of integrated circuit components. It further takes into account the current trend, in scientific work, towards the 'real-time' association of transducers with computers or other data processors for the collection, display and analysis of measurement data and for the purpose of control. - This presentation sets out the design principles, which have evolved from the ESONE Committee and its two Working Groups, and gives an interpretation of the role which equipments designed to the new standard could play. A description is also included but without the detail contained in appropriate definitive documents to which reference is essential.

A 2,000 channel pulse height analyser with 18-bit count capacity per channel is described. The hardware comprises a PDP-8 computer (4K - 12-bit words) with DEC-tape, a control panel with switches and lamps to simulate a conventional analyser, and uses computer independent peripherals (IANUS modules). The system is intended to work with Harwell 2000 Series nuclear counting equipment.

Iselin, F. u. a.

X - CTR (Executive Controller) Type 007

CERN-NP CAMAC Note No. 3 - 00, Genève 1969, 21 S.

Iselin, F. u. a.

Pattern A (Pattern Unit A) Type 021

CERN-NP CAMAC Note No. 8 - 00, Genève 1969, 6 S.

Iselin, F. u. a.

Parameter A (Parameter Unit A) Type 022

CERN-NP CAMAC Note No. 9 - 00, Genève 1969, 5 S.

Iselin, F. u. a.

Display CTR (Display Controller) Type 014

CERN-NP CAMAC Note No. 4 - 00, Genève 1969, 12 S.

Iselin, F. u. a.

Oct.-Dec. Display (Octal-Decimal Display) Type 012

CERN-NP CAMAC Note No. 5 - 00, Genève 1969, 11 S.

Iselin, F. u. a.

Print CTR (Print Controller) Type 010

CERN-NP CAMAC Note No. 6 - 00, Genève 1969, 11 S.

Iselin, F. u. a.

Miniscaler Type 002

CERN-NP CAMAC Note No. 11 - 00, Genève 1969, 7 S.

Senator, A.; Hooton, I. N.; Miller, G. L.; Lie, H. P.; Gere, E. A.

Modular Data Highway Systems

In: Proc. Skytop Conf. on Computer Syst. in Exper. Nucl. Phys., March 2-7, 1969. U. S. AEC Publ. CONF-690301, EANDC (U. S.) 121-U, New York 1969, S. 394 - 412

A survey has been made of the requirements involved in a broad range of on-line computer applications. An examination of a number of detailed cases has indicated that bus or highway oriented systems offer considerable advantages in terms of economics and operating flexibility. In such systems a common set of cables convey address, data, instructions and status signals between the computer, and the on-line equipment. Experience has shown that interconnections between external hardware and the highway can conveniently be made via functionally modular units. Numbers of such systems now exist and have demonstrated their usefulness in a wide range of applications. In experimental nuclear physics such systems offer advantages in data acquisition, display, and experiment control. Several examples are given including the newly standardized European CAMAC modules and the jointly developed Rutgers University-BTL data highway system.

Hooton, I. N.

Modular Instrumentation System for Computer Aided Measurement and Control

In: Proc. Skytop Conf. on Computer Syst. in Exper. Nucl. Phys., March 2-7, 1969. U. S. AEC Publ. CONF-690301, EANDC (U. S.) 121-U, New York 1969, S. 466 - 471

Egl, W.

Steuerlogik für computercompatibles System (CAMAC)

Frühjahrs-Tag. d. Dt. Phys. Ges., Fachausschuß "Elektronik im Physikalischen Experiment", Berlin, 24. - 28.3.1969
ZAED, Karlsruhe, AED-Conf. 1969-047-001, 12 S.

CAMAC - A Modular Instrumentation System for Data Handling - Description and Specification

Euratom-Bericht EUR 4100 e, Luxembourg 1969, 44 S.

CAMAC - Ein modulares Instrumentierungssystem in der Datenverarbeitung - Beschreibung und Spezifikation

Euratom-Bericht EUR 4100 d, Luxembourg 1969, 53 S.

European laboratories have collaborated under the auspices of the ESONE Committee to specify the essential features of a new modular system of instrumentation. This system is primarily for on-line use with digital controllers or computers and incorporates a comprehensive digital data and control highway. The specification consists of mechanical and signal standards sufficient to ensure compatibility between units developed in different laboratories.

Europäische Laboratorien haben unter der Führung des ESONE-Komitees zusammengearbeitet, um die wesentlichen Merkmale eines neuen modularen Instrumentierungssystems festzulegen. Dieses System ist in erster Linie für den on-line-Betrieb mit digitalen Steuereinheiten oder Rechnern gedacht und enthält einen umfassenden Digitaldaten- und Steuerweg. Die Spezifikation umfaßt Vereinbarungen über mechanische und elektrische Standardwerte, um die Kompatibilität von Einheiten, welche in verschiedenen Laboratorien entwickelt werden, sicherzustellen.

A system of modular instrumentation, recently adopted by European nuclear laboratories, is based on a standardized highway for data and control signals. The highway acts as a communication path between instrumentation modules, required by the experiment, and controllers which provide an interface to a specific computer. A number of instrumentation modules and controllers developed at A.E.R.E., Harwell, England are described. The use of the controllers with the program controlled and direct store access features of a small computer is discussed.

Iselin, F. u. a.

PRTML (Print Terminal) Type 016

CERN-NP CAMAC Note No. 7 - 00, Genève 1969, 7 S.

Iselin, F. u. a.

Review 1 (with ref. to Notes: 1 - 00, 2 - 00, 3 - 00, 4 - 00, 5 - 00, 6 - 00, 7 - 00, 8 - 00, 9 - 00, 11 - 00)

CERN-NP CAMAC Note No. 0 - 01, Genève 1969, 26 S.

CAMAC: A European Standard Specification for Modular Interface Units Between Nuclear Experiments and Data Processing Equipment

Nucl. Engng. Internat. 14 (1969) S. 345 - 347

Iselin, F. u. a.

B to D CVTR (Binary to Decimal Converter) Type 004

CERN-NP CAMAC Note No. 13 - 00, Genève 1969, 9 S.

Richards, J. M.

7000 Series CAMAC Controllers

U.K.A.E.A. Research Group, Report AERE - M 2145, Harwell 1969, 21 S.

Iselin, F. u. a.

Bin. Display (Binary Display) Type 023

CERN-NP CAMAC Note No. 12 - 00, Genève 1969, 5 S.

Iselin, F. u. a.

Digest of CERN-NP CAMAC External Control Logic (XCL) Type 029

CERN-NP CAMAC Note No. 14 - 00, Genève 1969, 15 S.

Iselin, F. u. a.

Preset Scaler Type 025

CERN-NP CAMAC Note No. 15 - 00, Genève 1969, 8 S.

CAMAC is a convenient system, for the design of digital instruments, which has been specified by the International ESONE Committee. The 7000 Series of plug-in units is being developed to the CAMAC Specification, by AERE and industry in collaboration. While the operation of the digital units in the 7000 Series has largely been settled by the CAMAC Specification, the method of control and read-out of these modules by computers or other digital hardware has not been closely specified. This report describes how the control of CAMAC - compatible modules is organised in the 7000 Series.

Best, G. C.; Hooton, I. N.

A CAMAC Multi-User System

In: Proc. Ispra Nucl. Electronics Symposium 6. - 9.5.1969 (Euratom-Bericht EUR 4289 e, Brussels 1969) S. 305 - 306
S. auch: U.K.A.E.A. Research Group, Report AERE - R 6082, Harwell 1969, 3 S.

Barnes, R. C. M.; Hooton, I. N.

The CAMAC System of Modular Instrumentation

In: Proc. Ispra Nucl. Electronics Symposium 6. - 9.5.1969 (Euratom-Bericht EUR 4289 e, Brussels 1969) S. 379 - 383
u. IEEE Trans. Nucl. Sci. 16 (1969) H. 5, S. 76 - 80
S. auch: U.K.A.E.A. Research Group, Report AERE - R 6081, Harwell 1969, 6 S.

Attwenger, W.; Egl, W.; May, F.; Patzelt, R.; Petreczek, K.; Schwarzer, J.

CAMAC Crate Control for a PDP 8 and a CAMAC 24 Bit Counter

In: Proc. Ispra Nucl. Electronics Symposium 6. - 9.5.1969 (Euratom-Bericht EUR 4289 e, Brussels 1969) S. 391 - 394

Richards, J. M.; Ward, L. D.

Programmed Control of Autonomous Transfers in a CAMAC System

In: Proc. Ispra Nucl. Electronics Symposium 6. - 9.5.1969 (Euratom-Bericht EUR 4289 e, Brussels 1969) S. 395 - 397
S. auch: U.K.A.E.A. Research Group, Report AERE - R 6085, Harwell 1969, 3 S.

A Camac crate control for a PDP8 or a semi-automatic control system and a 24 bit preset counter for the Camac-System is described. Details of the use of four device addresses of the PDP8 and timing requirements are described. For the preset counter two methods are compared.

The transfer of data under the control of a CAMAC installation is essential in many applications. The programmed control of these transfers can provide very desirable flexibility. This is illustrated by the Programmed Command Generator 7038 which is an autonomous transfer controller in the Harwell 7000 Series of CAMAC units.

A data collection system for multi-user access to a small computer is being implemented using CAMAC hardware. The system is described, and some of the general principles involved in the software for such systems are discussed.

A new standard for modular instrumentation has been developed by the ESONE (European Standard of Nuclear Electronics) Committee and adopted by many European nuclear laboratories. The outstanding characteristic of this standard is a highway for the transfer of digital data and control information. This and other main features of the CAMAC specification are introduced in this paper. The use of CAMAC is illustrated by outlining the organisation of a typical small system in which CAMAC units are associated with a PDP-8 computer to operate as a multi-channel analyser.

Bisby, H.; Becker, W.; Barnes, R. C. M. (Editors)

CAMAC and Modular Instrumentation - A Report on the Discussion

In: Proc. Ispra Nucl. Electronics Symposium 6. - 9.5.1969 (Euratom-Bericht EUR 4289 e, Brussels 1969) S. 399 - 401

Strukturanalyse von rechnergekoppelten Experimenten in der Niederenergiekern- und Strahlenphysik

Hahn-Meitner-Institut für Kernforschung Berlin, Zwischenbericht zu einem Förderungsvorhaben des BMwF, Berlin 1969, 21 S.

Lallemant, C.; Sarquiz, M.

Système "CAMAC"

Bull. Inform. Sci. Techn. H. 138 (1969), Suppl., S. 33 - 41 = Bull. Instrumentation Nucléaire H. 37

Bisby, H.

The CAMAC Scheme of Electronic Modules

Phys. Bull. 20 (1969) S. 366 - 369

Barnes, R. C. M.; Hooton, I. N.; Richards, J. M.

Data Transfers and Demand Handling in Multicrate CAMAC Systems

U.K.A.E.A. Research Group, Report AERE - R 6214, Harwell 1969, 6 S.
S. auch: Proc. 1969 Nucl. Sci. Symposium & Nucl. Power Syst. Engng. Symposium, San Francisco, 29. - 31.10.1969 (IEEE Trans. Nucl. Sci. 17 (1970) H. 1) S. 463 - 466

Iselin, F. u. a.

TR SLTR (Transfer Selector) Type 015

CERN-NP CAMAC Note No. 10 - 00, Genève 1969, 6 S.

Iselin, F. u. a.

Crate CTR (Crate Controller) Type 024

CERN-NP CAMAC Note No. 18 - 00, Genève 1970, 15 S.

Iselin, F. u. a.

System Controller I Type 038 (A Description of the Current System with Comments on Further Related Developments)

CERN-NP CAMAC Note No. 21 - 00, Genève 1970, 37 S.

The CERN-NP CAMAC Control System is designed to work autonomously (ex. Display, Print), ON-line with computer(s) or in any combination of both.

It consists mainly of Programming Units (PU's) - of which computer interface is one - interconnected via a Control Highway and driving the CAMAC system through a Branch Driver (or Executive Controller, X-CTR).

The system is described in general and also in view of possible further discussions about system philosophy and Control Highway.

The CAMAC modular instrumentation scheme provides a standardised means of data transfer between plug-in units within the same crate (data-bin). An extension of the scheme permits multicrate systems to make use of a standard interconnection which incorporates flexible demand handling and automatic adjustment of the transfer timing. With the exception of the computer interface all components of a system are then computer independent and interchangeable.

Iselin, F. u. a.

Microscaler Type 003

CERN-NP CAMAC Note No. 16 - 00, Genève 1970, 8 S.

Halling, H.; Egl, W.

Handeinstellbare Programmsteuerung für CAMAC System

Nucl. Instrum. Meth. 80 (1970) S. 122 - 124

Iselin, F. u. a.

TR SLTR (Transfer Selector) Type 044

CERN-NP CAMAC Note No. 22 - 00, Genève 1970, 7 S.

Ward, L. D.; Mitchell, G. S. L.; Richards, J. M.

A Programmed Controller in the CAMAC System

U.K.A.E.A. Research Group, Report AERE - R 6334, Harwell 1970, 9 S.

This instrument conforms to the CAMAC-System specified in the Publication "EUR 4100e". It is adapted to computers like PDP8L of DEC. The crates can be controlled directly by the PDP8L, without an additional logic interface (system controller).
For simple automatic programs, for adjusting and optimizing experiments without computer the Camac Manual Controller has been developed. The outputs of this adjustable hardware-programmer deliver the same electrical signals as the output of the PDP8L, thereby enabling the control of up to 7 crates. The purpose of the Manual Controller is to have the possibility to set a limited number of single instructions by pushbuttons as well as logical niveaus, e.g. inhibit, clear, Initialize, read, write, print etc. The unit also allows an automatic control of the Camac Devices by delivering a number of hardware instructions in automatic cycles. Data set by 6 decade switches are written into the addressed module register, the contents of the registers can be displayed or printed out by a teletype. An array of switches enables the preselection of the addresses of registers to be printed out.

Lewis, A.

Coupling CAMAC to Computers

U.K.A.E.A. Research Group, Report AERE - R 6407, Harwell 1970, 6 S.

Description et Organisation du Système CAMAC

Bull. Inform. Sci. Techn. H. 149 (1970), Suppl., S. 4 - 10 = Bull. Instrumentation Nucléaire H. 40

Mack, D. A.

CAMAC: A Standard for Digital Data Handling

CAP-APS-SMF Meet., University of Manitoba, Winipeg, June 22-24, 1970
S. auch: Lawrence Radiation Laboratory, University of California, Report UCRL-20034, Berkeley 1970, 13 S.

Ottes, J.; Tradowsky, K.

Spezifikation des CAMAC-25-MHz-Zähler-Moduls Typ LEM-52/1.1.

Kernforschungszentrum Karlsruhe, Bericht KFK 1184, Karlsruhe 1970, 15 S.

In the laboratory the interfacing of digital data sources to various data processors, computers, and recorders is a difficult and expensive problem. Frequent reconfiguration of data-gathering systems to meet new experimental requirements further complicates the situation. A great deal of study has gone into methods of effectively constructing as well as modifying these systems.
The CAMAC standard provides a means of interconnecting a number of data-handling devices via a common dataway. Specified by the European Standards Organization for Nuclear Energy (ESONE) and endorsed by the Nuclear Instrument Module (NIM) Committee, the CAMAC System is now available for laboratory application.

The interaction between CAMAC and a computer is through a hardware Coupler and an appropriate software Executive. This paper discusses some basic parameters and lays the groundwork for machine independent software.

In this report a 25-MHz counter module in CAMAC is specified. The CAMAC counter module may work computer-controlled or with a digital controller. The module has a timer gate and a second gate which is switched on and off manually. The module is one unit wide. It has a 24-bit counting register and one overflow bit which is stored by the digital controller or computer and by the timer for preset count.
From 1971 the CAMAC counter timer system with digital controller or computer will replace the old ESONE counter timer system in Karlsruhe Nuclear Research Center. The other parts of the system will be specified and described in further reports.

Tradowsky, K.

CAMAC - Ein System rechnergeführter Elektronik. Prinzip und Anwendungen.

Kernforschungszentrum Karlsruhe, Bericht KFK 1241, Karlsruhe 1970, 31 S.

Ottes, J. G.

CAMAC - Ein System rechnergeführter Elektronik (Beschreibung der gleichbleibenden Systemteile)

Elektronik 19 (1970) S. 335 - 338 u. 387 - 389; 20(1971) S. 53 - 56 u. 83 - 87
S. auch: Kernforschungszentrum Karlsruhe, Bericht KFK 1402, Karlsruhe 1971, 16 S.

Ottes, J.; Tradowsky, K.

Spezifikation des CAMAC-25-MHz-Zähler-Moduls Typ LEM-52/1.3.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/70-2, Karlsruhe 1970, 19 S.

Ottes, J.; Tradowsky, K.

Spezifikationen für den CAMAC-Timer-Modul Typ LEM-52/2.4. und den CAMAC-Inhibit-Overflow-Driver Typ LEM-52/3.2.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/70-3, Karlsruhe 1970, 30 S.

In this report a 25-MHz counter module in CAMAC is specified. The CAMAC counter module may work computer-controlled or with a digital controller. The module has a timer gate and a second gate which can be switched on and off. The module is one unit wide. It has a 24-bit counting register and one overflow bit which is stored by the digital controller or computer and by the timer for preset count.
From 1971 the CAMAC counter timer system with digital controller or computer will replace the old ESONE counter timer system in Karlsruhe Nuclear Research Center. The other parts of the system will be specified and described in further reports.

In this report a CAMAC timer module is specified which drives CAMAC 25-MHz scalers. The timer has a 1-µsec quartz controlled time base and a divider to get time intervals from 1-µsec to 1-ms. These time intervals are counted in 24-bit registers to get the measuring time and the interval time with the same accuracy. The first overflow from each of the scalers is counted in a register for the preset count mode. Preset count, preset time, and preset interval mode can be mixed.
To drive more than twenty scalers where scalers are in two or more crates, a special unit (inhibit overflow driver module) is necessary in each crate except the crate with the timer.

The CAMAC system creates a strong connection between a computer and measuring and control techniques. A specified 24-bit dataway with command and function codes ensures the development of compatible modules. So this modular system is very flexible and has a great reliability.
The CAMAC system is not restricted to the instrumentation of nuclear physics experiments and the like. It is also applicable to measurement and control systems and process control. A computer increases the features of the CAMAC system enormously but it may also be used with any digital controller.

The CAMAC system of computer-controlled electronics is described in summary. It is pointed out that CAMAC has correlations with the software. By means of some finished or projected equipment assemblies the state-of-art of the system is shown.

CAMAC is the name of a system of computer-guided electronics which has been developed by European nuclear research centers in the ESONE Committee. This is a universally applicable interfacing system between arbitrary processes and process computers of arbitrary design. The characteristics of a computer are taken into account in a special unit, and the demands placed by the processes themselves are considered in modules. The data flow in the system is standardized.

Heep, W.; Ottes, J.; Tradowsky, K.

Erzeugung und Auswertung der Q- und L-Signale im CAMAC-System in Verbindung mit einem Statusregister

Kernforschungszentrum Karlsruhe, Externer Bericht 22/70-4, Karlsruhe 1970, 8 S.

Birnbaum, J.

A Time-Shared System for Multiple Independent Laboratories

1970 Nucl. Sci. Symposium & Nucl. Power Syst. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 1, S. 287 - 291

Eichholz, J. J.; Lenkszus, F. R.; Strauss, M. G.

Versatile CAMAC Crate Controller for Computer-Based Data Acquisition Systems

1970 Nucl. Sci. Symposium & Nucl. Power Syst. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 1, S. 292 - 298

Klaisner, L. A.; Stephenson, Jr., J. M.

An Accelerator Instrumentation and Control System Using CAMAC

1970 Nucl. Sci. Symposium & Nucl. Power Syst. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 1, S. 299 - 301

A crate controller that provides an economical interface between the CAMAC dataway and the I/O bus of computers such as the Lockheed MAC-16 has been designed. One such controller is required for each crate. The controllers are capable of transferring commands from the computer to a single module or to several modules in one or more crates simultaneously. They can also perform 16 or 24-bit word data transfers between the computer and an addressed module. In addition, parallel logic is provided for determining the complete address of the highest priority interrupt source. This includes the station number (L) of the interrupting module and the Look-at-Me (LAM) source within this module. Each controller is built in a double-width CAMAC module and is implemented with 135 integrated circuit packages.

The 8 GeV Booster Synchrotron, presently under construction at the National Accelerator Laboratory, is controlled by a computer based system, which has been implemented using the CAMAC standard for data handling systems. The design philosophy and the hardware for the control system are described.

General rules are proposed for generating and handling Q and L signals. These rules meet the CAMAC specifications and are applicable to all modules. The endorsement of these rules would allow the same software to be applied with respect to these signals in all systems.

A new approach to computer-based data acquisition and control for multiple, diverse and remote laboratories is described. Modular techniques are used in the programming system, as well as in the input-output and instrument interfacing facilities. The system is designed to achieve some of the benefits of multiprocessing systems, but at lower cost and with higher system efficiency. Ease of use is stressed throughout, and language processors developed to help achieve that goal are described. An example of initial use is presented.

Costrell, L.

CAMAC Instrumentation System - Introduction and General Description

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 3 - 8

Kirsten, F. A.

Operational Characteristics for the CAMAC Dataway

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 9 - 18

Kirsten, F. A.

A Short Description of the CAMAC Branch Highway

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 19 - 25

Larsen, R. S.

CAMAC Dataway and Branch Highway Signal Standards

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 26 - 32

This paper presents a short summary and description of the CAMAC Branch Highway. The purpose of the Branch and some of its characteristics are explained. Certain operational sequences are described in detail.
The paper is designed to supplement the CAMAC Branch Highway Specification, and is one of a series of papers on CAMAC topics.

The CAMAC instrumentation system developed by the ESONE Committee of European laboratories has been endorsed by the U. S. AEC NIM Committee as a dataway system complementary to the NIM (Nuclear Instrument Module) system. CAMAC is described in a general way in this introductory paper which is followed by papers that discuss the system in greater detail and describe typical implementation.

The basic purpose of CAMAC is to provide a standardized method for transmitting data and control information between instrumentation modules and a digital controller. CAMAC encompasses both a hardware standard for housing the modular components of a system and an electrical and logical standard for the control "language" used in the transfer of digital information. The CAMAC specification contains the rules for both of these aspects of CAMAC. This paper describes the features and uses of the control language in a less formal way than must be used in the specification. Examples are given of the interplay of control and synchronization signals between the modules concerned.
Other papers in this series consider other aspects of CAMAC, including its place in the context of instrumentation systems, hardware aspects, signal standards, the Branch Highway, and coupling to computers and control systems. Here, the scope is limited to the process of information interchange within the CAMAC crate.
This paper is designed to supplement the CAMAC specification. The reader is advised to obtain a copy of that document, and to read it first. The reader's attention is also called to other references containing informal descriptions of the CAMAC system.

Dhawan, S.

CAMAC Crate Controller Type A

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 33 - 38

Kirsten, F. A.

Some Characteristics of Interfaces Between CAMAC and Small Computers

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 39 - 45

Strauss, M. G.; Lenkszus, F. R.; Brenner, R.; Eichholz, J. J.; Larsen, R. N.; Daly, R. T.

Computer Controlled CAMAC Systems at Argonne

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 46 - 52

Bertolucci, B.; Carman, R.; Faust, J.; Horelick, D. (Editor); Pellegrin, J.-L.

A Proportional Wire Chamber Electronics System Utilizing CAMAC

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 53 - 60

Several computer controlled CAMAC systems are presently being developed at Argonne for data acquisition in low-energy nuclear physics. This paper discusses four of these. The systems are designed around 8K, 16-bit, Lockheed MAC-16 computers. A typical system includes two CAMAC crates and a complement of 15 modules. The crate controller in each crate serves as interface between the computer I/O bus and the CAMAC dataway. Up to 14 individual crates can be addressed in addition to a Teletype and other peripheral devices. The CAMAC modules being developed include Crate Controller, Dual ADC Controller, ADC Coincidence Unit, Dual Stabilizer, Quad Pre-Scaler, Clock, Display Controller, Readout Selector, Magnetic Tape Controller and Disk Controller. Most units are built in double-width modules using computer controlled wire-wrap construction.

This report describes a system of electronics to be used with a proportional wire chamber hodoscope. The system, which uses CAMAC packaging and data handling philosophy, consists of octo (8 channel) wire signal amplifiers, octo 4-bit per wire latch modules, gate fanout modules, crate controllers, and two types of data processor-interface units to the SDS 9300 computer. System operation is explained, and each component is described.

The typical CAMAC system has a small computer attached to it. In the usual case, the computer acts as a repository for data generated by CAMAC, and also controls and directs the CAMAC operations. This paper discusses some of the aspects of the hardware interface, and also some of the interaction between the computer and the CAMAC system.

Klaisner, L. A.

NAL CAMAC Accelerator Control

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 61 - 62

Machen, D. R.; Biswell, L. R.

CAMAC Systems at LAMPF

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 63 - 64

Dhawan, S.

Yale - NAL CAMAC System

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 65 - 68

Mack, D. A.

Summary of CAMAC: Status and Outlook

IEEE Nucl. Sci. Symposium, New York, November 4-6, 1970
In: IEEE Trans. Nucl. Sci. 18 (1971) H. 2 (CAMAC Tutorial Issue), S. 69 - 70

A data acquisition system for high energy physics experiments is described here, which is in accordance with the specifications of EUR 4100e and EUR 4600e. This is a multi-crate system using branch highway and type A crate controllers. Most of the components are now commercially available.

Is everyone going to use CAMAC? Probably not. Does CAMAC represent the latest thinking in data handling? Again the answer is no. However one must remember that the time from conception to delivery of a computer makes it partially obsolete before it is ever used. This is the price of progress. A similar gestation time is inevitable for CAMAC. If we were to begin today, CAMAC would be different, but at this point in time we cannot start over. CAMAC is the only system with any chance of widespread acceptance in the near future. We intend to take advantage of its opportunities right away.

The control system for the National Accelerator Laboratory's Booster Synchrotron is compatible with the CAMAC standard which represents the first application of this standard to a large process control system, Parts of the system are presently installed and have operated successfully.

The use of CAMAC has been proposed in the experimental area of one of the nation's newest particle accelerators. This paper will describe briefly the computer-based data system to be implemented and how CAMAC might solve the interface problem.

Block, R. L.; Briandet, Ph.; Simon, A.

SCRO (Spark Chamber Read Out) Type 041

CERN-NP CAMAC Note No. 19 - 00, Genève 1970, 16 S.

Iselin, F. u. a.

CAMAC Products Reference

CERN-NP CAMAC Note No. 23 - 01, Genève 1970, 26 S.

Gagel, G.

Vorschlag zur Realisierung der autonomen Dateneingabe in Rechner bei Benutzung von CAMAC als Datentransportsystem

Kernforschungszentrum Karlsruhe, Bericht KFK 1329, Karlsruhe 1970, 9 S.

Tradowsky, K.

Zukunftssichere Rechnerführung durch CAMAC

Elektr. Ausrüst. 11 (1970) H. 6, S. 15 - 19

Two variable possibilities of autonomous data input into computers using a CAMAC-system of data transmission are described.
The first method allows the connection of up to 16 autonomous working modules and is sufficient for most experiments.
The second method does not limit the number of autonomous working modules. This allows free choice of module positions in the CAMAC-system, but the response of this concept is slower than that of the first one.

Das CAMAC-System, ein modulares Elektroniksystem für die Rechnerführung von industriellen und wissenschaftlichen Prozessen, entstand aus internationaler Gemeinschaftsarbeit von wissenschaftlichen Forschungsstätten mit der einschlägigen Industrie. Das Prinzip der Anlage wird dargestellt und ein Überblick über die bereits realisierten Anwendungen sowie über weitere, für die Zukunft der Automatisierung wichtige Anwendungsbereiche gegeben.

The CAMAC Products Reference provides condensed information for actual and potential users and producers. Information presented here is based on manufacturers' catalogues, advertisements or written communications.
Items listed are intended as users' guide, people interested should write to manufacturers for detailed information.
All information available at the time of running the job on the computer has been included. The line of modules advertised by Tennelec in Physics Today, Nov. issue was announced too late to be included.

Hooton, I. N.; Lewis, A.; Whitehead, N. P.

Implementing CAMAC-Computer Systems

U.K.A.E.A. Research Group, Report AERE - R 6664, Harwell 1970, 3 S.

Whitehead, N. P.

CAMAC Dataway Control for the PDP-8 Computer Family

U.K.A.E.A. Research Group, Report AERE - R 6673, Harwell 1970, 13 S.

Heep, W.; Ottes, J.; Tradowsky, K.

Erzeugung und Auswertung der Q- und L-Signale im CAMAC-System in Verbindung mit einem Statusregister. Erweiterte Fassung.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/70-5, Karlsruhe 1970, 9 S.

Požar, F.

Computer Controlled Multicounter Experiment

Nucl. Instrum. Meth. 91 (1971) S. 253 - 265

General rules are proposed for generating and handling Q and L signals. The rules meet the CAMAC specifications and are applicable to all modules. The endorsement of these rules would allow the same software to be applied with respect to these signals in all systems.
This paper is an addition and amendment to paper No. 22/70-4.

A project for a computer controlled multicounter experiment is described. The arrangement of the closed loops, data way, experimental electronics, the electronics, which analyses the parameters, and CAMAC Interface is discussed.

CAMAC hardware provides the interaction with the external world required for real-time computer systems. The concept of a 'coupler' (comprising device handler software and a hardware controller) is examined together with an instruction set which defines the performance of the coupler but is independent of the combination of hardware and software used in its implementation.

The design philosophy of a Dataway Control System which couples CAMAC to any of the PDP-8 family of computers is discussed. A 7000 series implementation is outlined and brief specifications of the component units are given.

Sarquiz, M.

Situation Générale du Système CAMAC

Bull. Inform. Sci. Techn. H. 155 (1971), Suppl., S. 6 - 9 = Bull. Instrumentation Nucléaire H. 42

Servent, M. J.-M.

Système "CAMAC", Développement Industriel

Bull. Inform. Sci. Techn. H. 155 (1971), Suppl., S. 10 - 19 = Bull. Instrumentation Nucléaire H. 42

Duclos, J.

Utilisation du Système "CAMAC" pour l'Acquisation de Données d'une Expérience de Diffusion Pion-Nucleon

Bull. Inform. Sci. Techn. H. 155 (1971), Suppl., S. 20 - 21 = Bull. Instrumentation Nucléaire H. 42

Iselin, F. u. a.

Introduction to CAMAC

CERN-NP CAMAC Note No. 25 - 00, Genève 1971, 52 S.

Euratom reports EUR 4100e and EUR 4600e are detailed technical descriptions of CAMAC mainly intended as the basic reference for designers and specialists. These documents have been produced by ESONE as the result of a collaboration of many European Laboratories including CERN.
The aim of this introduction is to present CAMAC in its various aspects to people interested from a general point of view and also as a good base for future designers and users.

Iselin, F. u. a.

LAM Grader ("Look-at-Me" Grader) Type 064

CERN-NP CAMAC Note No. 26 - 00, Genève 1971, 6 S.

Lewis, A.

A Basis for a Small Computer Modular Executive

U.K.A.E.A. Research Group, Report AERE - R 6600, Harwell 1971, 7 S.

Lewis, A.

Parallel Organisation of CAMAC Processes

U.K.A.E.A. Research Group, Report AERE - R 6601, Harwell 1971, 10 S.

Ward, L. D.

The Use of the 7025 Programmed Dataway Controller in CAMAC Systems

U.K.A.E.A. Research Group, Report AERE - R 6677, Harwell 1971, 13 S.

The use of computers in real-time applications requires interaction between the software and the environment. An executive structure is described which facilitates the optimisation of both software and input/output.

The 7025 Programmed Dataway Controller is a digital controller for use in computerless CAMAC systems. This report briefly describes the controller and its associated units in the Harwell 7000 Series range of CAMAC compatible equipment. Typical configurations of systems controlled by the 7025 Programmed Dataway Controller are outlined and compared.

Most operating systems require a resident executive to handle interrupts, scheduling etc. Around this an application program is developed comprising a user program and independently compiled sub-programs. The resident part of the present executive is solely an interface between a standard calling sequence and the corresponding sub-program format, with appropriate facilities to enable the usual executive functions to be written as sub-programs. By this means new executive functions are readily incorporated and in addition the link loader or link editor loads only those executive functions called for in the user program.

Bisby, H. (Editor)

The CAMAC Scheme - A Presentation at Harwell on 24th September, 1970

U.K.A.E.A. Research Group, Report AERE - R 6713, Harwell 1971, 40 S.

Sarquiz, M.

Système de Spectrométrie Nucléaire Connecté a un Calculateur (Standard CAMAC)

Bull. Inform. Sci. Techn. H. 157 (1971), Suppl., S. 34 - 36 = Bull. Instrumentation Nucléaire H. 43

L'Archeveque, R.; Yan, G.

A Review of the CAMAC Concept

Atomic Energy of Canada Limited, Report AECL-3806, Chalk River 1971, 40 S.

Iselin, F. u. a.

D to A CVTR (Digital to Analogue Converter) Type 030

CERN-NP CAMAC Note No. 28 - 00, Genève 1971, 7 S.

CAMAC, which is a modular instrumentation system developed under the auspices of the ESONE Committee, is reviewed from the viewpoint of general electronic packaging concepts and described in a format that is readily available to AECL personnel. Its envisaged advantages are evaluated within the framework of present and projected electronic technology for instrument and system applications. The computer independence of CAMAC at the crate level has far reaching implications and is discussed in detail. The viability of the CAMAC Branch as a generalized system approach is also considered.

This report contains the edited notes of three lectures presented to an audience of representatives of the Automation Liaison and Industrial Liaison Committees of the (then) Ministry of Technology. The lectures outline the main features of CAMAC, give typical CAMAC-compatible modules and controllers, and indicate the advantages and disadvantages of CAMAC as a standardised multiplexing interface for on-line real-time computer applications. An additional part deals with the implications for a CAMAC programming language.

The unit has been designed for the Tektronix "611 Storage Display Unit" but can also drive the "Tektronix 564" or similar storage or non-storage oscilloscopes.

Iselin, F. u. a.

D to A CVTR (Digital to Analogue Converter with Histogram Generator) Type 052

CERN-NP CAMAC Note No. 29 - 00, Genève 1971, 9 S.

Iselin, F. u. a.

CERN-NP Type 057 CAMAC Interfaces and their Use

CERN-NP CAMAC Note No. 31 - 00, Genève 1971, 29 S.

Heep, W.; Stiefel, W.

CAMAC-Modul zur Steuerung von Drehverstellungen, insbesondere mittels Motoren und Schrittmotoren, Typ LEM-52/17.1.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/71-2, Karlsruhe 1971, 32 S.

Bisby, H.

Development of Modular Systems for Nuclear Instrumentation and Data Handling

Nucl. Engng. Internat. 16 (1971) S. 321 - 324
S. auch: Atom H. 175 (1971) S. 123 - 129

The described CAMAC module has been especially designed for driving mechanical and electro-mechanical apparatus.
The module gets a number of steps to be performed by a stepping motor or the number of revolutions of dc- or ac-motors and controls the execution.
In current applications the module is frequently used in controlling stepping motors driving potentiometers and in positioning rotating mechanical systems with ac- or dc-motors.

The unit has been designed for the Tektronix "611 Storage Display Unit" but can also drive the "Tektronix 564" or similar storage or non-storage oscilloscopes. It is identical to the D to A converter type 030, but has an additional logic circuitry card to permit the drawing of horizontal or vertical lines.

Of all the various fields of instrumentation, that associated with the nuclear sciences has been quick to apply technological developments and is now in the forefront of the changing operational practices created by the data processing revolution. This progressive situation has been helped considerably by the introduction of modularity at a very early stage (and may lead to widespread rationalisation in the application of small computers in real-time, on-line situations).

Richards, J. M.

Harwell 7000 Series CAMAC Controllers

U.K.A.E.A. Research Group, Report AERE - R 6723, Harwell 1971, 48 S.

Bouharrour, S.; Gruber, P.; Lenhardt, H.; Ottes, J.

Ein Vielzähler-Experiment aus der Hochenergiephysik im CAMAC-System mit einem Telefunken-Rechner TR 86 A

Kernforschungszentrum Karlsruhe, Bericht KFK 1191, Karlsruhe 1971, 54 S.

Heep, W.; Stiefel, W.

CAMAC-Hochspannungsmodul Typ LEM-52/15.1.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/71-3, Karlsruhe 1971, 32 S.

Tradowsky, K.

Analoge Signale im CAMAC-System

Kernforschungszentrum Karlsruhe, Externer Bericht 22/71-4, Karlsruhe 1971, 22 S.

A computer controlled high voltage power supply in the CAMAC system is described. The output voltages can be varied in steps of 0.5 V from 0 to 1000 V by means of stepping motors driving potentiometers with ten turns.
The stepping motor control accepts the number of steps to be performed via the dataway and controls the execution.
The control unit of the module contains two CAMAC units No 52/17.1. described in Externer Bericht 22/71-2. However, only those parts of the module have been duplicated which are necessary to allow the simultaneous operation of two drive units.
A prototype of this module has been working since a few months.

The Euratom Report EUR 4100 published in 1969 describes and specifies the CAMAC system of computer-controlled electronics but does not yet define analogue signal standards. Specification of amplitude analogue signals, however, is necessary for the communication between CAMAC modules and should consider the fact, that within an equipment assembly a CAMAC module may be associated with a non CAMAC unit.
The presented paper interprets and discusses the enclosed preliminary issue of the Specification of Amplitude Analogue Signals prepared in the meantime by the Analogue Signal Working Group of the ESONE Committee. The considerations were given, which were the basis of the statements.
The proposed analogue signal standard is + 5 V. The output must have 50 Ω impedance and must be able to provide > 5 mA. It should be able to provide 50 mA. The input is expected to have either 50 Ω impedance or high impedance.

The CAMAC specification described in EUR 4100e defines the essential features of data handling modules for use in the CAMAC system, but it leaves great freedom in the design of units to control such modules. This report describes a modular system of control units which has been developed at A.E.R.E. Harwell. It is a revised and enlarged version of an earlier report on the same subject.

The rather high data rate at the experiment "Neutral Resonances" at CERN in Geneva demands for on-line data acquisition by a process computer. The CAMAC system offers a flexible and efficient method for interfacing experiment electronics to a computer. Different types of modules from various groups of physicists - e.g. from the University of Pisa - could be easily plugged into the system on the grounds of the compatibility of CAMAC equipment (EUR 4100 e, d, f, i).
The most frequently used module - a four fold 16-bit scaler - was already available off the shelf. Other units like a system controller, two crate controllers, dynamic parallel output and punch control for emergency case have been especially designed. Details of the electronic system and the basic software structure are given.
During the total running time of 14 months for the experiment the hardware did not fail.

Bisby, H.

Applications of CAMAC

U.K.A.E.A. Research Group, Report AERE - R 6794, Harwell 1971, 30 S.

Deimling, B.; Heep, W.; Klein, D.; Stiefel, W.

Integrierendes Digitalvoltmeter und Meßstellenmultiplexer im CAMAC-System Typ LEM-52/9.1.

Kernforschungszentrum Karlsruhe, Externer Bericht 22/71-5, Karlsruhe 1971, 37 S.

Simmen, A.

Automatic Analysis of Sleep Encephalograms

CAMAC Bull.* H. 1 (1971) S. 5 - 6

Ward, L. D.

A Meteorological Data Logging System in the CAMAC Standard

CAMAC Bull.* H. 1 (1971) S. 7 - 11

* Hrsg. von ESONE Committee. Bruxelles: Commission des Communautés Européennes.

Modern medicine is interested in studying the various stages of sleep. Sleep-Encephalograms recorded over the period of one night on magnetic tapes can be analysed by an electronic system in about half an hour.
Standard CAMAC-Modules from SEN, together with some special analog modules, are used in this system which has been developed by SEN Electronique in collaboration with the Psychiatric Clinic of Bel-Air/Geneva.

The article describes a data logging system designed in the CAMAC standard to monitor meteorological parameters. The system is controlled by a computerless controller, the 7025 Programmed Dataway Controller, working to a program of instructions held in a plug-board. Various digital and analogue channels are scanned at 10 minute intervals with the output being punched on paper-tape for subsequent computer analysis.

The CAMAC Scheme is described as an architecture for a multiplexing highway whereby input/output channels of information share a common data processor.
Many facilities are described to indicate the potential applicability of CAMAC-compatible equipment and programming to real-time situations. Some of these are illustrated by typical real-time systems, both with and without an on-line computer(s), which have been or are about to be realised.

An analog multiplexer in connection with a unit to control an integrating digital voltmeter has been developed. The control unit fits into the rules proposed for a general CAMAC analog to digital converter system.
The features of the module and the reasons for using the flying capacitor measuring method are described. Finally the accuracy of measurement and the methods to avoid errors are discussed.

Duclos, J.; Sarquiz, M.

Experiment on Pion-Proton Elastic Scattering Under 100 MeV

CAMAC Bull.* H. 1 (1971) S. 12 - 14

May, F.; Halling, H.; Petreczek, K.

FOCAL Overlay for CAMAC Data and Command Handling

CAMAC Bull.* H. 1 (1971) S. 18 - 19

Whitehead, N. P.

A Parallel Processing Coupler for CAMAC-Computer Systems

U.K.A.E.A. Research Group, Report AERE - R 6817, Harwell 1971, 8 S.

Ottes, J. G.

CAMAC System Controller für CALAS-Endstelle

Kernforschungszentrum Karlsruhe, Bericht KFK 1412, Karlsruhe 1971, 67 S.

The concept of a CAMAC 'coupler' (comprising of device handler software and hardware controller) is reviewed together with parallel processing of CAMAC I/O Program Segments and an I/O processor designed as the hardware analogue of the device handler software is described.

A CAMAC System Controller capable of driving a full CAMAC Branch in conjunction with a CALAS Terminal is presented. Single operations, block transfers, module-to-module transfers and autonomous transfers in both directions on a cycle-stealing basis can be handled by the Controller. The device can be adapted to other computers by changing some parts of its computer peripheral electronics.

An overlay for FOCAL DEC-08-AJAE-LA has been developed to allow data and command handling with CAMAC systems. Data can be stored and handled like normal variables. The overlay is especially useful for the execution of test routines and for rather slow control systems with data handling. To complete the system it is intended to develop a CAMAC interrupt handler, which allows interrupt programming in FOCAL. A disk-tape monitor system will be developed later.

Zwoll, K.; Schmidt, H. H.; Müller, K. D.

A Computer Controlled Triple Axis Neutron Spectrometer With CAMAC Instrumentation

Kernforschungsanlage Jülich, Bericht Jül - 774 - ZE - FF, Jülich 1971, 59 S.

Iselin, F. u. a.

Pattern B (Pattern Unit B) Type 071

CERN-NP CAMAC Note No. 32 - 00, Genève 1971, 14 S.

Iselin, F. u. a.

2 IN REG (Dual Input Register) Type 072

CERN-NP CAMAC Note No. 33 - 00, Genève 1971, 18 S.

Heep, W.; Ottes, J.; Tradowsky, K.

Konzept für Entwurf und Spezifizierung von CAMAC-Modulen

Kernforschungszentrum Karlsruhe, Externer Bericht 22/71-6, Karlsruhe 1971, 15 S.

This note describes a versatile and inexpensive dual 16-bit parallel register in single width CAMAC package. It features sampled or continuous data storage, inverted TTL-level inputs and outputs, and external data transfer control lines.

General rules for designing CAMAC modules have been proposed. All modules have a status register and a control register. Alarm generation and handling are standardized. On all commands the module is able to execute the Q signal is generated.
These rules meeting the CAMAC specifications support the designing engineer and would help to generate modules with a certain amount of common features valuable in the software field.

This report describes in detail the electric and electronic components of the Triple Axis Neutron Spectrometer operated by a PDP 8/I - computer at the DIDO - Reactor of the KFA Jülich. The communication between computer and experimental process is carried out via CAMAC - instrumentation. Its flexibility and expandability particularly in a laboratory environment is demonstrated.

This note describes an inexpensive single-width CAMAC module with fast NIM data inputs and common gate to a 16-bit register. The command structure is adapted to its operation with the Bit-to-Address Coder which permits saving in computer memory and time.

Iselin, F. u. a.

Branch Test Box Type 048

CERN-NP CAMAC Note No. 34 - 00, Genève 1971, 5 S.

Iselin, F. u. a.

Branch Selector Type 079

CERN-NP CAMAC Note No. 35 - 00, Genève 1971, 5 S.

Friedle, T.; Heep, W.

Prüfgerät für CAMAC-Crates

Kernforschungszentrum Karlsruhe, Bericht KFK 1446, Karlsruhe 1971, 14 S.

CAMAC - Organisation of Multi-Crate Systems - Specification of the Branch Highway and CAMAC Crate Controller Type A

Euratom-Bericht EUR 4600 e (im Druck)
[Preliminary Issue, November, 1970. ESONE Committee.]

An equipment for testing CAMAC crates is described. The lines of the Dataway can be tested automatically and by hand. It is possible to find out short circuits and breaks within the Dataway.

The CAMAC Specification (EUR 4100e), drawn up by European laboratories under the auspices of the ESONE Committee, defined the means of communication, within a CAMAC crate, between modules and a crate controller. This extension to the specification defines a CAMAC Branch Highway for communication between the crate controllers in seven crates and a system controller or computer. The connections from units to the Highway are specified in sufficient detail to ensure compatibility between units from different sources of design and production. A standard CAMAC Crate Controller Type A is specified, and there are general recommendations for all crate controllers used with the Branch Highway.

CAMAC - A Modular Instrumentation System for Data Handling - Specification of Amplitude Analogue Signals

Euratom-Bericht EUR 5100 e (im Druck)
[Preliminary Issue, February, 1971. ESONE Committee.]

The EURATOM Report EUR 4100e defines the essential features of the CAMAC system of instrumentation.
This system is primarily for on-line use with digital controllers or computers.
This document specifies amplitude analogue signals which are recommended for use by CAMAC compatible units.

Patzelt, R.; Attwenger, W.

Camac - ein rechengesteuertes Gerätesystem

Isotope in Ind. u. Landwirtsch. 7 (1970) H. 2/3, S. 14 - 18

Nachtrag