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(Revision of IEEE 675-1979)

IEEE Standard Multiple Controlers in a CAMAC¹ Crate

Sponsor

**Instrumentation and Detectors Committee
of the
IEEE Nuclear and Plasma Sciences Society**

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¹Computer Automated Measurement and Control

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Foreword

(This Foreword is not a part of ANSI/IEEE Std 675-1982, IEEE Standard, Multiple Controllers in a CAMAC Crate.)

This standard makes provision for the use of auxiliary controllers in a CAMAC crate to extend the capabilities and fields of application of the CAMAC modular instrumentation and interface system of ANSI/IEEE Std 583-1982, Modular Instrumentation and Digital Interface System (CAMAC). (Also Report EUR 4100e of the Commissions of the European Communities.) The report on which this document is based (Dept of Energy Report DOE/EV-007), was prepared by the NIM Committee of the United States Department of Energy* and the ESONE Committee of European Laboratories**. Corresponding documents are ESONE Report EUR 6500e and IEC Publication 729 of the International Electrotechnical Commission.

Auxiliary Controllers (ACs), located in several crates on a CAMAC Command Highway (Parallel Branch or Serial), can provide the user with an extremely effective distributed processing capability. This capability is useful in both data acquisition and automatic control systems where parallel processing is desirable. Auxiliary controllers can be of various degrees of sophistication, and some may include processor elements for increased autonomy from central computers.

A further extension of the AC-based CAMAC system may include a special communication channel direct from an AC to another element in the system. High-speed block transfer of data can be effected to and from the AC in such a case.

To permit use of the ACs in CAMAC crates, this report defines the hardware and protocol so as to:

- 1) Provide means for granting control of the Dataway to auxiliary controllers that request control and to provide a priority selection scheme to arbitrate in the case of simultaneous requests from multiple controllers.
- 2) Provide means for the auxiliary controller to address (a) the dedicated module address lines and (b) the dedicated interrupt request LAM (Look-at-Me) lines, all of which terminate only at the crate controller station and at the module stations to which they are dedicated.

This standard was reviewed and balloted by the Nuclear Instruments and Detectors Committee of the IEEE Nuclear and Plasma Sciences Society. Because of the broad applicability of the CAMAC system, this standard was submitted for review to liaison representatives of numerous societies and committees including the Communications Society, Computer Society, Industry Applications Society, Industrial Electronics and Control Instrumentation Group, Instrumentation and Measurement Group, and the Power Generation and Nuclear Power Engineering Committees of the Power Engineering Society.

The revision of this standard was in conjunction with the 1981 review (1982 issue) of the entire family of IEEE CAMAC standards undertaken to incorporate existing addenda and corrections into the standards.

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CAMAC and NIM Standards and Reports

Title	IEEE, ANSI Std No	IEC No	DOE No	EURATOM (EUR) or ESONE No
CAMAC Instrumentation and Interface Standards*	SH08482* (Library of Congress No 8185060)	—	—	—
Modular Instrumentation and Digital Interface System (CAMAC)	ANSI/IEEE Std 583-1982	516	TID-25875 [†] and TID-25877 [†]	EUR 4100e
Serial Highway Interface System (CAMAC)	ANSI/IEEE Std 595-1982	640	TID-26488 [†]	EUR 6100e
Parallel Highway Interface System (CAMAC)	ANSI/IEEE Std 596-1982	552	TID-25876 [†] and TID-25877 [†]	EUR 4600e
Multiple Controllers in a CAMAC Crate	ANSI/IEEE Std 675-1982	729	DOE/EV-0007	EUR 6500e
Block Transfers in CAMAC Systems	ANSI/IEEE Std 683-1976 (Reaff 1981)	677	TID-26616 [†]	EUR 4100 suppl
Amplitude Analog Signals within a 50 Ω System	—	—	TID-26614	EUR 5100e
The Definition of IML A Language for Use in CAMAC Systems	—	—	TID-26615	ESONE/IML/01
CAMAC Tutorial Articles	—	—	TID-26618	—
Real-Time BASIC for CAMAC	ANSI/IEEE Std 726-1982	‡	TID-26619 [†]	ESONE/RTB/03
Subroutines for CAMAC	ANSI/IEEE Std 758-1979 (Reaff 1981)	713	DOE/EV-0016 [†]	ESONE/SR/01
Recommendations for CAMAC Serial Highway Drivers and LAM Graders for the SCC-L2	—	—	DOE/EV-0006	ESONE/SD/02
Definitions of CAMAC Terms	Included in SH08482	678	DOE/ER-0104	ESONE/GEN/01
Standard Nuclear Instrument Modules NIM	—	547 [§]	TID-20893 (Rev 4)	—

*This is a hard cover book that contains ANSI/IEEE Std 583-1982, ANSI/IEEE Std 595-1982, ANSI/IEEE Std 596-1982, ANSI/IEEE Std 675-1982, ANSI/IEEE Std 683-1976 (Reaff 1981), ANSI/IEEE Std 726-1982 and IEEE Std 758-1979 (Reaff 1981), plus introductory material and a glossary of CAMAC terms.

[†]Superseded by corresponding IEEE Standard listed.

[‡]In preparation.

[§]Covers only mechanical features and connector pin assignments.

NOTE — Availability of Documents

ANSI	Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.
IEEE	IEEE Service Center, 445 Hoes Lane, Piscataway, New Jersey 08854, USA.
IEC	International Electrotechnical Commission, 1, rue de Varembé, CH-1211 Geneva 20, Switzerland.
DOE and TID Reports	National Bureau of Standards, Washington, D.C. 20234, USA, Attn: L. Costrell.
EURATOM	Office of Official Publications of the European Communities, P.O. Box 1003, Luxembourg.
ESONE	Commission of the European Communities, CGR-BCM, B-2440 GEEL, Belgium, Attn: ESONE Secretariat, H. Meyer.

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An American National Standard

IEEE Standard Multiple Controllers in a CAMAC Crate

1. Introduction

This standard defines a method for incorporating more than one source of control into a CAMAC crate. The standard fully conforms to the mechanical and signal standards of the CAMAC system as described in ANSI/IEEE Std 583-1982, Modular Instrumentation and Digital Interface System (CAMAC), or EUR 4100e.

In order to allow more than one Controller to access the Dataway of a CAMAC Crate, an Auxiliary Controller Bus (ACB) and priority arbitration protocol are fully defined. This permits the use of Auxiliary Controllers (ACs) in normal stations in the crate. The ACB carries encoded address information from an AC to the Crate Controller (CC) in the control station of a CAMAC crate, and carries Look-at-Me signals from the CC to the ACs. The ACB, connected between controllers, may also be used to establish priority for control of the CAMAC Dataway.

This standard is fully compatible with ANSI/IEEE Std 595-1982, Serial Highway Interface System (CAMAC), or EUR 6100e, and the ANSI/IEEE Std 596-1982, Parallel Highway Interface System (CAMAC) or EUR 4600e. It may also be used in autonomous systems (systems with no external highways) or in systems with Type U Crate Controllers (such as systems with a computer I/O bus as the highway).

Section A.1 of the Appendix to this standard defines a Parallel Highway Crate Controller, Type A-2. This controller is similar to Crate Controller Type A-1 (as defined in Section A1 of the Appendix to ANSI/IEEE Std 596-1982 or EUR 4600e), except for the ACB connector and the priority arbitration protocol. When these two features are not required, Crate Controllers Types A-1 and A-2 are totally interchangeable.

Abbreviations used in this document are as follows:

AC	Auxiliary Controller
ACB	Auxiliary Controller Bus
ACL	Auxiliary Controller Lockout
CC	Crate Controller
R/G	Request Grant

2. Interpretation

This standard is a reference text describing and specifying multisource control within a CAMAC crate. It should be read in conjunction with, and is supplementary to, ANSI/IEEE Std 583-1982, ANSI/IEEE Std 595-1982, and ANSI/IEEE Std 596-1982 or EUR 4100e, EUR 6100e, and EUR 46003, respectively.

No part of this standard is intended to supersede or modify the above-mentioned standards.

In this standard there are mandatory requirements, recommendations, and examples of permitted practice.

Mandatory clauses of the standard are enclosed in a box, as here, and usually include the word “must.”

Definitions of recommended practices (those to be followed unless there are sound reasons to the contrary) include the word “should.”

Examples of permitted practice generally include the word “may,” and leave freedom of choice to the designer or user.

In order to “conform” with the specifications of this standard, an equipment or system must satisfy all the mandatory requirements in this standard, excluding the Appendix. If constructed as a CAMAC plug-in unit, the equipment must also satisfy the mandatory requirements of ANSI/IEEE Std 583-1982 or EUR 4100e.

Section A.1 of this standard’s Appendix defines the Parallel Crate Controller Type A-2 in such a way that Type A-2 Controllers produced by different manufacturers will be operationally interchangeable. The main text to this standard contains a less restrictive definition of Controllers that are not necessarily interchangeable. See Section A.1 of the Appendix regarding conformity with the specification of the CAMAC Crate Controller Type A-2.

In order to be “compatible” with the ACB, equipment need not satisfy all the mandatory requirements, but must not interfere with the full operation of all the features of Controllers which “conform” to this standard.

No part of this standard is intended to exclude the use of equipment that is compatible in the preceding sense, even if it does not conform fully to this standard or is not constructed as CAMAC plug-in units.

No license or permission is needed in order to use this standard.

3. The Auxiliary Controller Bus and Associated Front Panel Signals

The standard CAMAC crate, described in ANSI/IEEE Std 583-1982 or EUR 4100e requires the presence of a Controller to control and coordinate the activities of the crate. During a Dataway addressed command operation, the Controller establishes the necessary signals on the *B*, *N*, *A*, *F*, *S1*, and *S2* lines to define the command operation to be performed and to define the timing of the operation. During addressed command operations involving data, the Controller transmits or receives data via the *W* or *R* lines, respectively. During unaddressed operations, the Controller establishes the necessary signals on the *B*, *S1*, *S2*, and *C* or *Z* lines. The Controller may establish the state of the *I* signal and may monitor the state of the *L*, *X*, and *Q* signals.

Each CAMAC crate has one control station, which is the only station providing access to the *N* and *L* lines. The control station and a normal station together provide access to all signal lines needed by a Controller to perform the operations described above. The Controller which occupies the control station is designated the CC of the crate. Examples of CCs are the Serial Highway Crate Controller Type L-2 (Section A1 of the Appendix of ANSI/IEEE Std 595-1982 or EUR 6100e) and the Parallel Highway Crate Controller Type A-2 (Section A.1 of the Appendix of this standard).

An additional source of control within a CAMAC crate can be provided by an AC, which occupies one or more normal stations. In order to accommodate ACs, two features are required: (1) access to the *N* and *L* lines at normal stations, and (2) priority arbitration for control of the Dataway. Access to the *N* lines is necessary to allow an AC to generate a complete addressed command operation. Access to the *L* lines is necessary if an AC is to respond to Look-at-Me signals from other modules or controllers, or both. Priority arbitration protocol ensures that at any time only one Controller is permitted to have control of the crate. It also provides the means for assigning control of the Dataway on the basis of a prearranged priority.