IFAC INFORMATION BULLETIN

No. 81 January 3, 1974

International Federation of Automatic Control

Published by the IFAC Secretariat
D 4 Düsseldorf 1 - P.O.B. 1139

Automatic Control Terminology – 1972/73 Survey of U.S. Standards Activities

Compiled by *Dr. H.L. Mason*, past chairman and member of the IFAC Committee on Terminology and Standards, this survey covers documents published and work in progress over the past 18 months. It includes control systems and their major elements used in power, transportation, manufacturing, and processing. It is concerned with organizations in North and South America and with documents of the ISO and IEC. It updates the 1971 survey which appeared in IFAC Information Bulletin No. 74 of October 2, 1972.

IFAC is indebted to the magazine "Control Engineering" for the permission to reproduce this survey which originally appeared in the September 1973 issue of "Control Engineering", vol. 20, No. 9, pages 71 through 74.

AEC U.S. Atomic Energy Commission Washington, D.C. 20545

The NIM bin specified in U.S. AEC Report TID 20893 is a sensing instrument module with a common power supply, used widely in the nuclear field throughout the world. In applications where it is necessary to transmit large amounts of digital data between instruments and between instruments and computers and computers and computer peripherals, a data highway system with compatible signals, which retain the mechanical and electrical compatibility of NIM, becomes appropriate. Such a dataway system known as CAMAC was developed by the ESONE Committee of European Laboratories in collaboration with the U.S. NIM Committee. Its current specifications, dated 1972, are AEC Reports TID 25875 (reprint from EUR 4100e) and TID 25876 (reprint from EUR 4600e). Recommendations on the implementation and interpretation of CAMAC specifications, and descriptions of preferred practices and current applications will appear in TID 25877 and the CAMAC Bulletin of Euratom.

Tutorial papers on CAMAC may be found in the IEEE Transactions on Nuclear Science. One of the big payoffs in CAMAC will be in software, and significant results are expected in 1973. Already CAMAC instruments are used in or produced by about 20 West European countries, as well as CERN, Poland, and U.S.S.R. Major process-control applications are to be found in particle accelerators—the proton synchrotrons at NAL and CERN; the cyclotrons at TRIUMF, at Eindhoven, at Julich, and at the University of Indiana; the beam lines at LAMPF. Observatories are using CAMAC for telescope control, and there is great interest in the system for application at Alcoa and at medical facilities in U.S., U.K., Canada, and Germany.

ANSI American National Standards Institute, Inc. 1430 Broadway, New York, N.Y. 10018

The recently formed Measurement and Automatic Control Technical Advisory Board (MACTAB) has the following scope: Recommended practices and standards for measurement, control and safeguarding of industrial processes and laboratory operations, including programming languages, computer-controlled systems, metrication, automatic control terminology, process measurement and control, analytical instrumentation and fluid power control, but excluding standards of measurement and control which are assigned to other technical advisory boards.

The authorized areas of Standards activity include Measurement Practice, Terminology, Analytical Instrumentation, Digital Techniques, and Industrial Process Measurement and Control. The ANSI Committee MCL on Programmable Measurements is being organized within the Digital Techniques Area by IEEE, to relate to IEC TC66 WG3. The U.S. Advisory Group for ISO TC30, Fluid Flow Measurement in Closed Conduits, and ANSI C-96 on Thermo-

couples are both relocated within the Measurement Practice area. ANSI C-85 on Automatic Control Terminology is transferred to the Terminology area. Industrial Process Measurement and Control takes full responsibility for both national and international standards work. Among the other matters under consideration by the Board are the standardization of programming languages and digital communication in process control. W.E. Vannah of Foxboro is the chairman of the Advisory Board.

Two new measurement standards recently issued by ANSI are S1.20, Calibration of Underwater Electroacoustic Transducers, and S1.21, Sound Power Levels of Small Sources in Reverberation Rooms. ANSI C-85 is revising its 1963, 1966, and 1972 issuances, and will probably incorporate a revision of PMC 20-2-1970 developed by SAMA.

AIIE

American Institute of Industrial Engineers
25 Technology Park/Atlanta,
Norcross, GA 30071

After 20 years of research by ASME and AIIE, 12 volumes of Industrial Engineering were published in 1972, together with an overall index. Their titles are:

Z94.1 Biomechanics
Z94.2 Cost Engineering
Z94.3 Data Processing and Systems Design
A94.4 Distribution and Marketing
Z94.5 Engineering Economy
Z94.6 Facility Planning
Z94.7 Materials Processing
Z94.8 Applied Mathematics
Z94.9 Organization and Planning
Z94.10 Production Planning and Control
Z94.11 Applied Psychology
Z94.12 Work Measurement, Methods

ASEE

American Society for Engineering Education
One Dupont Circle,
Washington, D.C. 20036

The International Symposium on System Engineering and Analysis, held at Purdue in October 1972, was a cross-disciplinary effort with NSF to integrate economic theory, quantitative economics, sociological principles, the use of computer simulation, and sophisticated methods of analysis into a comprehensive process for design and evaluation. At the annual conference of June 1973, hosted by Iowa State, were papers on process control in materials processing, closed-loop servohydraulic testing systems, and manufacturing systems integrated by computerized numerical control.

ASSE

American Society of Safety Engineers
850 Busse Highway,
Park Ridge, Ill. 60068

The recently published Dictionary of Terms Used in the Safety Profession offers definitions supplemented with illustrations, formulas, and mathematical relationships.

EIA

Electronic Industries Association
20001 Eye Street,
Washington, D.C. 20006

Work by TR-31 under R.V. Miskell of Oak Ridge has produced a new RS408 standard on the BTR interface between numerical control equipment and data terminal equipment. It employs parallel binary data interchange, and a revision of Bulletin 3B, the Glossary of Terms for Numerically Controlled Machines. N. Prochaska of Ford heads a group which considers problems associated with high—speed nc data transmission between computers and dnc equipment in the shop. This will lead to the revision of Bulletin 4, on Perforated Tape Format, and of RS358, a subset of ASCII for numerical control. K. Merner, of Kearny and Trecker, is coordinating an effort with NMTBA to standardize a modular interface between a hardwired or cnc system and the machine tool. This is important because of the effort of European standards on U.S.A. licensees. A new proposal 1147 on interchangeable perforated tape variable block format for positioning and contouring was developed by a group under F. Hesford of Cincinnati Milacron. It is now under industry review.

IAP

Instituto Argentino del Petroleo
Maipu 645,
Buenos Aires

The Automatic Control Committee published in 1973 a second, enlarged edition of Automatic Control Terminology in Spanish, with an English-Spanish technical glossary. The committee is working on norms for primary instruments (including thermocouples and industrial thermometers), system identification, circuit and functional diagrams, and symbols for control valves and motors.

IRIG

Inter-Range Instrumentation Group
White Sands Missile Range,
N.M. 88002

In April 1972 the Transducer Committee hosted a successful workshop. 120 persons attended, including representative manufacturers. Another is planned for 1974 in Washington, D.C. The Committee is presently at work on a request from the Telemetering Group for a standard on end-to-end telemetry system calibration, and hopes to revive the NBS-Interagency transducer project.

IEC

International Electrotechnical Commission
1, rue de Varembe
Geneva, Switzerland

Document IEC 25 (Central Office) 52 was issued in February 1973 for approval under the Six Month's Rule. Titled Letter Symbols for Automatic Control Science and Technology, it supplies symbols for 14 quantities or signals used in vocabularies IEV 50-37 and the IFAC Multilingual Dictionary, and shows their use in functional block diagrams. Document 1 (IEV 351) (Cen. Ofc.) 1037, Automatic Control and Regulation, was issued October 1972 for National Members' approval. Its subsections are headed General Terms, Variables, Block Diagrams, Performance, Functioning, System Elements, and Final Control Elements.

A.R. Parsons of Honeywell, Chairman of U.S.A. Technical Advisory Group for IEC TC65, Industrial Process Measure-

ment and Control, met with technical organization representatives and working group members in March to plan for the IEC sessions in Munich. At the June Plenary Sessions, the U.S.A. was represented by W.E. Vannah, A.R. Parsons, H.H. Koppel, and J.E. French; in Subcommittee 65A by H.H. Koppel, A.R. Parsons, J.V. Werme, and W.E. Vannah; in Subcommittee 65B by W.E. Vannah, E.D. Zysk, and G.R. Leavitt.

SC 65A, System Considerations, was organized to prepare international recommendations relating to the operation of systems considered as a whole and for the compatibility of the main elements of the system.

Its Secretary is W.M. Houston of U.K. At Munich its WG3, Assured Operation recommended the distribution of Report 65A (Secretariat) 31 for comment by National Members. Its WG4, Interface Characteristics, adopted a supplement to IEC Pub. 381 (the 4-20 mA standard) calling for supply voltage limits of 22 and 33 volts, a transmitting voltage range of 1-5 volts, and a maximum load impedance of 250 ohms. Its WG2 has been transferred to the new TC 75, Classification of Environmental and Service Conditions for Electrical Equipment. SC65A also authorized a new WG to develop evaluations for system performance. Belgium has accepted the Secretariat. The question of standardization of voltage levels for coded signals, to agree with IEC Pub. 323 of the Nuclear Instrument Committee, was also discussed in SC 65A, but the use of TTL logic for this purpose was viewed as archaic by the delegates from the U.S.A.

SC 65B, Elements of Systems, adopted the scope: to prepare international recommendations and reports relating to dimensions, performance, and evaluation procedures, for primary measuring elements through final control elements as used in industrial process measurement and control.

The Secretariat was assigned to J.E. French of SAMA, and Otto Winkler of Chemische Werke Hüls was elected Chairman. Its WG5, Temperature Sensors, has reached agreement on a temperature table based on a large number of sample resistance elements, a reference resistance value for Pt-based thermometers (under discussion with OIML), and a draft recommendation providing emf's corrected for IPTS-68 (to be circulated soon.) Its WG6, Methods of Evaluating Performance, adopted a draft for measurement of offset, proportional action factor, integral action time, and derivative action time; it also recommended standards for evaluating static and dynamic behavior, pressure and leak testing, and protection from electrical shock, for transmitters with either pneumatic or electrical output signals. Its WG8, Dimensions of Panel and Rack Mounted Instruments, whose Secretary is R.D. Thompson of Taylor-Sybron, has agreed on a dimensional module of 12.5 mm, applicable to indicating controllers with scales 100-130 mm long, and to recorders and associated instruments. Its WG9, Final Control Elements, has reconfirmed the definition of an industrial process control valve, and completed a recommendation (to be circulated soon) on nominal sizes, ratings, and face-to-face dimensions for flanged two-way globe-style valves. SC 65B also discussed the possibility of standardizing some hardware and software aspects of industrial process control computers.

Other recent IEC Documents of interest are:
1 (Cen. Ofc.) 1028, Procedures for the work on IEV;
1 (Cen. Ofc.) 1029, Directives for preparing the IEV;
45 (Secretariat) 161, Dimensions for Modules for Nuclear Electronic Instruments (in three incompatible systems—NIM, CAMAC, 20 mm);
66 (Cen. Ofc.) 4, Digital Voltmeters and electronic A/D dc convertors;
16 (Secretariat) 236, Colors of Indicator Lamps and Push-Buttons;
TC 48 revision of Pub. 297, Dimensions of Panels and Racks;
79-3 Electrical Apparatus for Explosive Atmospheres, part 3, Spark Test Apparatus for Intrinsically Safe Circuits;
79-10 Electrical Apparatus for Explosive Atmospheres, part 10, Classification of Hazardous Areas;
117-15 Recommended Graphical Symbols, part 15, Binary Logic Elements;
231B Second supplement to General Principles for Nuclear Instrumentation, IEC 231 (1967).

IEEE

Institute of Electrical and Electronic Engineers
345 East 47th Street,
New York 10017

The Gyro and Accelerometer Panel of the IEEE Aerospace Electronic Systems Society, chaired by A.T. Campbell of JPL, published in 1972 IEEE Std 337, Specification Format Guide and Test Procedure for Linear, Single-Axis, Pendulous, Analog Torque Balance Accelerometer. Work is under way on a standard gyro terminology and a digital accelerometer specification and test procedure. Earlier publications were IEEE 292 and 293, covering Specification Format and Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros.

ISO

International Organization for Standardization
1, rue de Varembe,
Geneva, Switzerland

USNC for ISO has approved the transformation into International Standards the following Recommendations prepared by TC 37, Terminology Principles and Coordination:
ISO/R 639, Symbols for Languages, Countries and Authorities;
ISO/R 704, Naming Principles;
ISO/R 919, Guide for the Preparation of Classified Vocabularies;
ISO/R 1149, Layout of Multilingual Classified Vocabularies.
Similar transformation has been proposed for ISO/R 860, International Unification of Concepts and Terms, and ISO/R 1087, Vocabulary of Terminology. Also proposed is a new task on Signs and Symbols (other than mathematical and graphical) as used in DIN 2338. For consideration as additional languages for coding, those in the list used by the U.S. Civil Service Commission have been submitted to TC 37 by ANSI Z39, chaired by Jerrold Orne.

Other recent Standards and Recommendations of interest include:
921 (E/F/R) Nuclear Energy Glossary;
1538 Programming Language ALGOL;
1539 Programming Language FORTRAN;
1745 Basic Mode Control Procedures for DATA Communication Systems;
1858 Hubs and Reels for Magnetic Tape Used in Interchange Communication;
1859 Unrecorded Magnetic Tapes for Interchange Instrumentation;
1860 Precision Reels for Interchange Instrumentation Applications;
2195 Data Interchange on Rolled-up Punched Paper Tape;
1861 7-Track RPI Magnetic Tape for Information Interchange;
1862 9-Track 200RPI Magnetic Tape for Information Interchange;
2593 Pin Allocations for High-Speed Data Terminal Equipment;
2629 Basic Mode Control Procedures Conversational Messages;
2690 Unrecorded Magnetic Tape for Instrumentation Applications—Physical Properties and Test Methods;
2711 Information Processing Interchange Ordinal Dates; and
2972 Graphic Symbols for Numerical Control of Machines.

ISA Instrument Society of America
400 Stanwix Street,
Pittsburgh, Pa. 15222

Since 1963 various Divisions have been studying the needs of the industrial computer applications field in terms of recommended practices and operating procedures for the sensor-based tasks of plant data collections, process monitoring, and automatic control. Currently there are two Industrial Computer Workshops, as described by A.C. Lumb of Proctor and Gamble and T.J. Williams of Purdue University. The first deals with hardware and has four subject committees: Man-Machine Interface, chaired by R.S. Crowder of Dupont; Functional Requirements for Plant Backup, Safety and Maintenance, W.B. Field of Union Carbide; Guidelines for System Reliability Analysis, J.K. Bannon of Leeds and Northrup; and Guidelines for Interface and Data Transmission, R.L. Curtis of Alcoa.

These groups are actively studying the completely compatible set of interface equipment known as CAMAC, developed by a EURATOM committee on European Standards of Nuclear Electronics and a U.S. AEC committee on Nuclear Instrument Modules. Another device believed to merit attention is the non-crt operator's console specified by the Japan Electronics Industry Development Assn. The ISA Computer Workshop, along with the Language Standardization Workshop described below, enjoys designation as WG 5.4 of TC-5 in IFIP, the world coordinating body for digital computer technology. With a wide representation of vendors and users from various industries, it seems hopeful that compatible data transmission facilities, code and signal standards, and interconnection compatibility can be specified without stifling the vigorously developing industry.

The second Workshop looks toward standardization of programming languages for industrial computers. Three proposed ISA standards in FORTRAN have been developed to meet the functional requirements developed by a committee under R.L. Curtis of Alcoa. These standards, which supply the missing function necessary for process control use by means of a set of CALL statements, will shortly be available as S61.1, Procedures for Executive Functions and Process Input-Output; S61.2, Procedures for Handling Random Unformatted Files, Bit Manipulation, and Data and Time Information; S61.3, Procedures for Task Management. Source cards in Hollerith code may be purchased from T.J. Williams as Tests of Standard FORTRAN. These have been used on more than a dozen different process computer systems around the world to debug and evaluate FORTRAN compilers. A language known as PL/1 is in process of standardization by ANSI committee X3J1.4, and a subset of this language will be tested by the Long Term Procedural Language Committee chaired by R.C. Dennis of Ford.

A Problem-Oriented Language Committee under N.P. Wilburn of WADCO aims to develop a set of macro-compiler routines which will allow the user to establish his own special language while still preserving transportability. This would be accomplished by translator languages such as TILT or STAGE-2 which could convert into one or the other of the standardized procedural languages before compilation. In order that all committees should have a common usage of the special terms of computer programming, a Glossary Committee under P.C. Hill of Union Carbide has compiled a Dictionary of Industrial Digital Computer Terminology, 1972.

In addition to ISA and IFIP sponsorship, the Purdue Workshop on Standardization of Industrial Computer Languages is likely to be similarly recognized by IFAC. Delegates have come from Japan and seven European countries in addition to Canada and the U.S.A. The nearly total attention directed toward the use of higher level languages means that the vendor must be responsible for producing a combination of computer hardware and of operating system programs which will accept the user's programs written in the higher level languages in the most efficient manner. However, the present effort is largely based on the needs of the continuous-process industries.

In 1972 Edition 4 of Electrical Safety Abstracts was published, and in 1973 Edition 2 of the Handbook of Control Valves. A Control Valve Compendium listing product data for over 200 model series is expected shortly. RP 31.1 has been expanded to cover volumetric turbine transducers for measuring either flow rate or quantity (except for cryogenic fluids); these devices can be either self-generating or modulating. Standard S39.1 provides control valve sizing equations based on the Bernoulli relation for Newtonian incompressible fluids, applicable to pressure or flow control of process liquids. A test procedure S39.2 determines valve size coefficient, liquid pressure recovery factor, piping geometry factor, Reynolds number factor, and liquid critical pressure ratio factor. In S61.1 are given external-procedure references for industrial computer control systems; these conform to ANSI X3.9 FORTRAN and permit interface with executive programs, process I/O functions, and manipulation of bit strings.

Standards committees newly authorized are SP 65, Installation of Weather Instruments; SP 66, Bridge Excitation Supplies and Signal Conditioners; SP67, Power Plant Standards; and SP68, Environmental Measurements Terminology.

NBS National Bureau of Standards
Washington, D.C. 20234

U.S.A. standards for the basic SI units for physical quantities—meter, kilogram, second, Kelvin, ampere, candela, and mol are coordinated with the International Committee on Weights and Measures (CIPM) by Ernest Ambler, Deputy Director of NBS, through a measurement assurance program. Other standards for weights and measures are coordinated with ANSI and the International Organization for Legal Metrology (OIML) by W.E. Andurs, Program Manager for Engineering and Information Processing Standards. A supplement was recently issued to the keyword-in-context index to the voluntary engineering standards developed by some 300 U.S. professional groups and trade associations. Federal Information Processing Standards Pub. 12-1 lists the task groups, Federal agency contacts, and ANSI X3 committees concerned with this activity.

SAE Society of Automotive Engineers
2 Pennsylvania Plaza,
New York, N.Y. 10001

Committee A-6 has finalized a draft of AS 1290, Graphic Symbols for aircraft Hydraulic and Pneumatic Systems, which attempts to suit industry-wide and international usage. Basic documents were ANSI Y32.10-1967 and ISO/TC10 R1219-1970. □

ACKNOWLEDGEMENT

The author acknowledges with thanks the background material supplied by W.E. Andrus, J.A. Berger, E.A. Bianchi, L. Costrell, J.E. French, F.T. Gutmann, K.L. Lamm, P.S. Lederer, J.A.E. Lavenás, R.V. Miskell, C.H. Page, W.A. Samsonoff, W.A. Slattery, M.L. Stoner, G.E. Sweetman, W.E. Vannah, W.K. Waymeyer, T.J. Williams, and J.F. Wolbrink.