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NSRDS NEWS

This column regularly reports significant developments in the program of the National Standard Reference Data System. The NSRDS was established in 1963 by the President's Office of Science and Technology to make critically evaluated data in the physical sciences available to science and technology on a national basis. The System is administered and coordinated by the National Bureau of Standards through the NBS Office of Standard Reference Data, located in the Administration Building at the NBS Gaithersburg Laboratories.

The Document Image Code System

Part of the program of the NBS Office of Standard Reference Data is the development of a General Purpose Scientific Document Image Code (GPSDIC) system. The purpose of a GPSDIC system is to relieve the scientist of the chore of changing his notations to meet arbitrary restraints imposed by machine processing. Such a system has been designed and is currently under development at the Bureau. The design and development of this system is being carried out by Blanton C. Duncan and David Garvin of the Bureau's Physical Chemistry Division in conjunction with the Chemical Thermodynamic Data Group and the Chemical Kinetics Information Center, both of which are at NBS. As designed, the system permits a scientific typescript, with all its complex symbolism and highly structured page format, to be transferred to digital machine form with virtually no limitations on the notations employed.

The system was designed to assure broad applicability by emphasizing: (a) exchange of information via telecommunications devices compatible with the USA Standard Code for Information Interchange (USASCII), (b) design of hardware to permit the use of the proven skills of ordinary scientific typists in the record capture process, (c) exploitation of the capabilities of commercially available extended character high-speed line printers for direct computer output, and (d) publication using this type of machine record as the "typescript" input to computerized typesetting programs.

A significant portion of the system is in daily use utilizing computer programs for the input, editing, and retrieval of records. Such use indicated a need for certain design adjustments, and these have been made. The current effort is directed toward producing the basic detailed descriptive documentation required as part of the specifications in hardware and software procurement.

Because of space limitations, and the fact that parts of the system have been described earlier, a detailed explanation of this system cannot be given here. However, an overall view of the kinds of notational complexity the system is able to handle should be of interest.

The six accompanying design drawings are being used to specify typefaces for a computer printer to be installed shortly at the Bureau. These drawings involve more than the particular specification of a computer printer. They relate to the specification of a class of devices collectively described as General Purpose Scientific Document Writers (GPSDW).

A GPSDW is any output device capable of producing documents at the level of symbolic complexity found in typescripts produced by scientific typists who may overstrike, space by half lines, and use auxiliary typefaces. Besides a typewriter, it may be a line printer, an x-y plotter, a cathode ray display, or any other suitable equipment. An upper boundary of necessary capability lies somewhere between the ability to produce diagrams such as structural formulas from organic chemistry and the ability to produce smooth curves representing mathematical functions. A pragmatic test is whether or not a competent scientific typist could produce the same result.

A typescript page can be viewed as a rectangular array of points. These points are half-spaced vertically (the y-coordinate) and single-spaced horizontally (the x-coordinate). The illustrations that follow show how the concept is applied in detail. Figures 1 and 2 show simple symbols, which are the result of striking a single typeface at an x-y coordinate. A composite symbol is the result of striking two typefaces at the same x-y coordinate. Figure 3 shows part of the set of composite symbols already defined in

continued

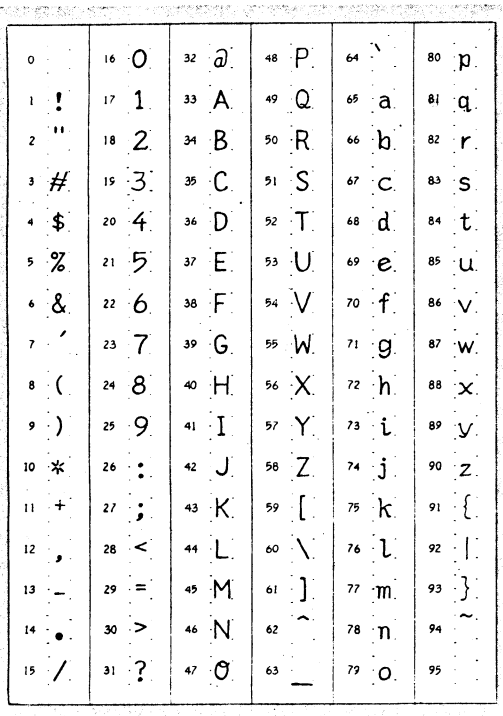

Figure 1. Simple GPSDIC symbols corresponding to the standard (shift in) USASCII set.

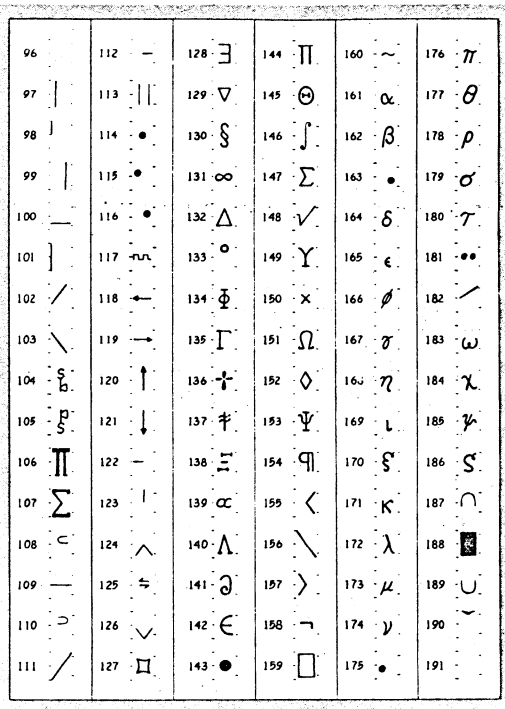

Figure 2. Simple GPSDIC symbols adopted for use as a secondary (shift out) USASCII set.

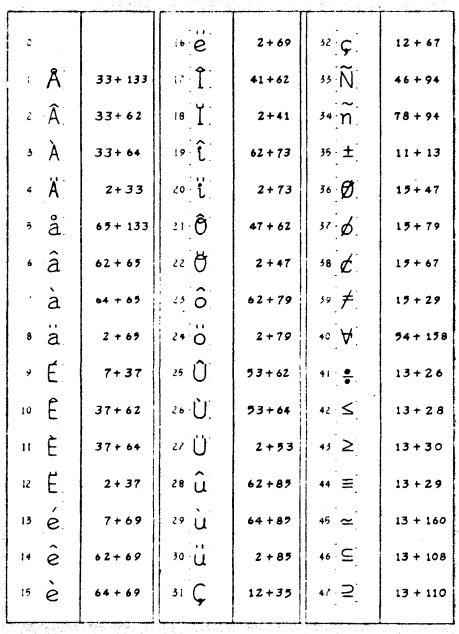

Figure 3. Composite symbols. The numbers to the right of each symbol correspond to the two simple symbols used to make the composite.

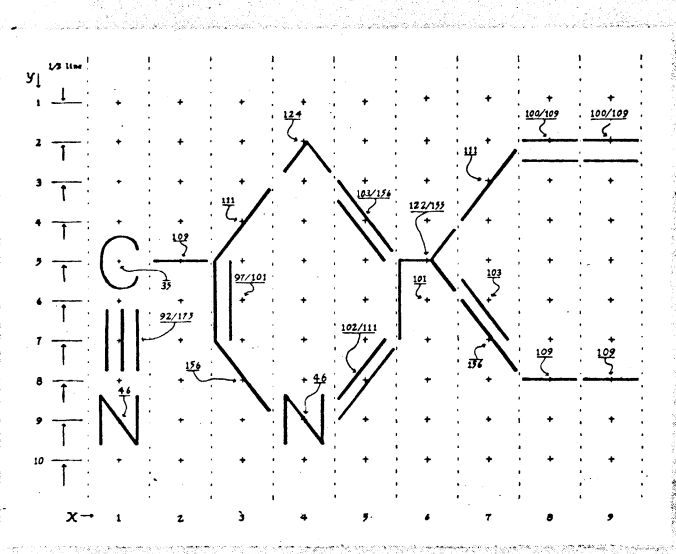

Figure 4. Detailed illustration of the use of rule segments.

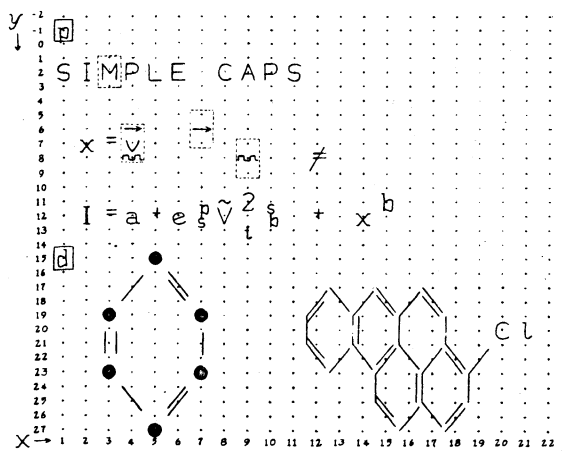

Figure 5. Model typescript page at expanded scale.

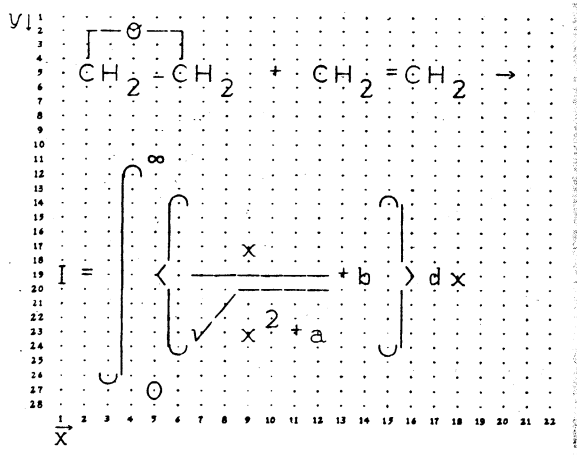

Figure 6. Two illustrative display formulas.

GPSDIC. The binary code employed in GPSDIC permits assignments of up to two, but no more than two, simple symbols to a particular x-y coordinate. Figures 4, 5, and 6 are large-scale illustrations of some of the complex notations that can be handled routinely by this system.

With GPSDIC, 244 simple symbols may be specified; however, a restriction to 188 has been established to retain adequate compatibility with USASCII. The 94 symbols in Figure 1 are the defined USASCII symbols. USASCII also defines the format effecting control code *shift out* (SO) and *shift in* (SI). These codes are provided for the purpose of causing the interchange between the defined set of symbols and a secondary set of 94. USASCII leaves the specification of such secondary sets to mutual agreement among users who wish to implement the shift-out provision. The set specified for GPSDIC is given in Figure 2.

Updating Photonuclear Data Index

Supplement No. 1 to NBS Miscellaneous Publication 277, *Photonuclear Data Index,* was published October 1, 1967. This Supplement primarily covers data published in the period from January 1965 through April 1967. In addition, it also corrects and gives the complete index entry for a number of reactions for which only partial entries were available at the time of publication of the original *Photonuclear Data Index.*

Taken together, Miscellaneous Publication 277 [1] (April 1966, 55 cents) and its Supplement [1] (October 1967, 45 cents) form a complete annotated bibliography and index to experimental data published in the field of photonuclear reactions in the period from January 1955 through April 1967. Organized by element and isotope, each entry in the index supplies quantitative information for a specific reaction on the ranges of excitation energy, source energy, detected particle energy, and emission angles for products in each reference. Information is also given on the type of measurement and detector used.

It is planned to issue supplements to the *Photonuclear Data Index* at about 20-month intervals. Future issues will contain cumulative entries. This will continue until a given supplement covers the data published over a five- or ten-year period. At that time a new cumulative supplement will be started. It is hoped that this will prevent the Index and its supplements from becoming unwieldly.

Selected Values of Chemical Thermodynamic Properties

Selected Values of Chemical Thermodynamic Properties, Tables for the First Thirty-Four Elements in the Standard Order of Arrangement, Technical Note 270–3 [1] ($1.25), contains material prepared as a revision of the tables of Series I of NBS Circular 500, *Selected Values of Chemical Thermodynamic Properties.* This Technical Note supersedes Technical Notes 270–1 and 270–2, containing all their tables, including corrections, as well as extending the number of compounds covered. Compounds of the following elements are covered: oxygen, hydrogen, helium, neon, argon, krypton, xenon, radon, fluorine, chlorine, bromine, iodine, astatine, sulfur, selenium, tellurium, polonium, nitrogen, phosphorus, arsenic, antimony, bismuth, carbon, silicon, germanium, tin, lead, boron, aluminum, gallium, indium, thallium, zinc, and cadmium. The tables contain values of the enthalpy and Gibbs energy of formation; enthalpy, entropy, and heat capacity at 298.15 K (25 °C); and the enthalpy of formation at 0 K, for all inorganic substances and organic molecules having not more than two carbon atoms.

As additional revised tables are completed, they will be published in the Technical Note 270 Series because of the urgent need for the data. After all the tables have been revised, they will be combined with a description of the evaluation process and a listing of the sources of the data into a single publication which will be part of the NSRDS Series of critically evaluated compilations.

The authors of Technical Note 270–3 are D. D. Wagman, W. H. Evans, V. B. Parker, I. Halow, S. M. Bailey, and R. H. Schumm.

International Cooperation in Standard Reference Data Projects

Individual standard reference data activities are leading to an increasing number of international projects. Several projects begun unilaterally have become recognized as bases for international cooperation. An example is the excellent reception which the recent Madrid Conference on Molecular Spectroscopy gave to the recommendations presented by Norman Jones and Richard Lord on applications of computers to digitization, storage, and retrieval of spectral data. The presentation was derived from conclusions reached previously at the *ad hoc* Conference on Computer Utilization in Spectroscopy, organized for the Office of Standard Reference Data by the National Academy of Sciences-National Research Council. These recommendations provided the basis for a voluntary set of contributions and eventual exchange of high-quality infrared spectra. The criteria for the evaluation of infrared spectra developed by the Board of Managers of the Coblentz Society for the Office of Standard Reference Data provide a tentative definition of quality standards to be observed. A second international project arises out of the *Tables of Bimolecular Gas Phase Kinetic Data* which Aubrey F. Trotman-Dickenson has prepared under an NBS contract. Professor Trotman-Dickenson's future updatings of this work will be sponsored by the British Office of Scientific and Technical Information.

[1] Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for the price indicated.