NASA CR-62031

IMPROVING ANNOUNCEMENT MEDIA FOR TECHNICAL REPORTS

By Douglas S. Price

May 1966

Prepared under Contract No. NASw-1315 by
DOCUMENTATION INCORPORATED
College Park, Md.

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

For sale by the Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151 – Price $2.00

IMPROVING ANNOUNCEMENT MEDIA

FOR TECHNICAL REPORTS

ABSTRACT

30254

Experiments and techniques utilized in the NASA Scientific and Technical Information Facility to solve problems associated with producing camera-ready copy of abstract journals and their indexes are described. The journal principally discussed is Scientific and Technical Aerospace Reports (STAR). Since the entries in the abstract section of the journals are published only once and are not subsequently manipulated, a photocomposition system was selected to produce this section to the highest graphic standards. Index requirements involving multiple entries and cumulations initially dictated computer printout for the production of the index section.

The production of indexes evolved from the original upper case chain, through a 120-character, upper-and-lower case chain, to the present system of preparing indexes on the 300-character-per-second GRACE (GRaphic Arts Composing Equipment) photocomposition device at the National Library of Medicine. The productivity of the Facility's original photocomposition equipment used for preparing the abstract portion of STAR was improved by the addition of a paper-tape reader and multiple off-line keyboards. The recent installation of a Photon 713 offers 3 to 5 times faster composition speeds and the capability of operating either from paper tape or magnetic tape prepared by the computer. This new capacity opens up many possibilities for improving efficiency and adding new services.

CONTENTS

	Page
ABSTRACT	i
INTRODUCTION	1
COMPUTER PRINTING	7
Design	7
Printing Quality	8
Boldface	9
Operation	9
Upper And Lower Case	10
PHOTON 200	12
Equipment Description	12
Modifications	13
Tape Operation	15
PHOTOCOMPOSED INDEXES	21
PHOTON 713	23
Equipment Description	23
Implementation	23

ILLUSTRATIONS

Figure 1.	Catalog Page Produced From Existing Catalog Cards	2
2.	Catalog Page Produced From Shingled Cards	3
3.	Portion of STAR Announcement Page	5
4.	Portion of STAR Index Page (Standard Chain)	6
5.	Portion of STAR Index Page (120 Character Chain)	11
6.	Keyboard Modified LCC-Justowriter	18
7.	Special Character Reference Chart-LCC Justowriter	19
8.	Portion of STAR Index Page	22

INTRODUCTION

At the First International Conference on Scientific Information, a considerable amount of time was spent on two separate but closely related debates. The first of these was the acceptability or non-acceptability of printing of less than letterpress quality. The second was the relative merits of the card catalog and the book catalog.

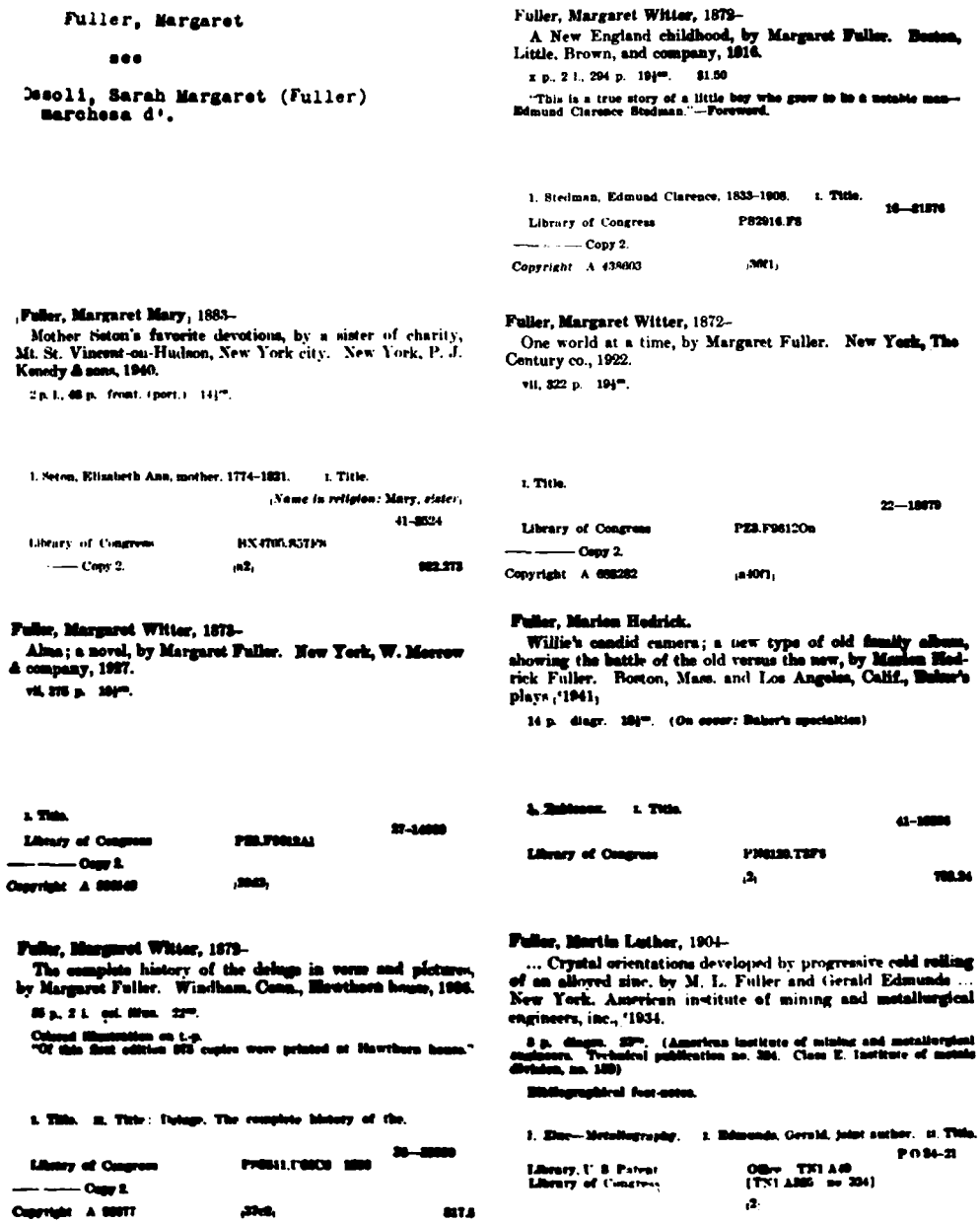
The first debate resulted from the outbreak of new methods of printing, during and after World War II, which had undoubtedly contributed to the quantity of the "information explosion," but too often at the expense of quality. To traditionalists accustomed to the harmonies of the proportional spacing and justified margins of letterpress, the typewritten or computer-generated offset master and its adherents were regarded as aberrations. There was strong sentiment—even at that time—in support of the position that anything not produced in letterpress would not be considered published.

The second debate found proponents of (serial record, reproducible, portable) book catalogs at odds with proponents of (unit record, continuously-updated) card catalogs. Strangely, no one seemed to realize that by this time the either/or nature of the debate was strictly academic, since techniques of converting catalog cards to book catalogs already existed and were in current use.

Fully six years earlier, the Edwards Brothers had begun production of a 167-volume "Catalog of Library of Congress Printed Cards" by butting existing catalog cards and preparing lithographic plates. The final product (Figure 1) left something to be desired. The required reduction and the distribution of white and black space on the catalog cards resulted in a page which was neither very legible nor aesthetically pleasing. Nonetheless, a card catalog had been converted to a book catalog without resetting.

However, this was only the first step. Very quickly the Library of Congress took advantage of the fact that its cards were produced on letterpress. By the simple expedient of removing the leading from between the lines of type, a compacted entry could be printed on cards, which, when shingled rather than butted, could be used to produce book pages which compared favorably with fully typeset copy (Figure 2). This technique gained widespread acceptance and is still in use today. Nevertheless, even though this approach simplified make-up and produced better copy, a laborious amount of make-ready work was still required. Cumulations and cross-references had to be interfiled by hand, and if multiple indexes were required, expensive duplicate sets of cards had to be maintained or the shingled pages had to be torn down and the cards re-sorted—an even more expensive procedure.

Mounting catalog cards by hand was also a laborious task, and a search began for a means of mechanizing the photographic operation. This led to the development of automatic line-photographing equipment typified by the Listomatic, the Foto List, and the Compos-O-Line. These devices automatically photograph previously prepared cards (one to three lines per card) in sequence with varying reductions from original size, advancing the film synchronously so as to produce a single negative for a complete column or page. If the cards are originally prepared with a proportional spacing device, such as a Varityper, a high quality final product can be obtained. Further, if the cards used are punch card size, they can be punched with the appropriate codes to permit



Fuller, Margaret

see

Ossoli, Sarah Margaret (Fuller) Marchesa d'.

Fuller, Margaret Witter, 1879–

A New England childhood, by Margaret Fuller. Boston, Little, Brown, and company, 1916.

x p., 2 l., 294 p. 19½cm. $1.50

"This is a true story of a little boy who grew to be a notable man—Edmund Clarence Stedman."—Foreword.

1. Stedman, Edmund Clarence, 1833–1908. I. Title.

Library of Congress PS2916.F8 16—21576

—— Copy 2.

Copyright A 439603 (3001)

Fuller, Margaret Mary, 1883–

Mother Seton's favorite devotions, by a sister of charity, Mt. St. Vincent-on-Hudson, New York city. New York, P. J. Kenedy & sons, 1940.

2 p. l., 68 p. front. (port.) 14½cm.

1. Seton, Elizabeth Ann, mother, 1774–1821. I. Title.

(Name in religion: Mary, sister)

41-8524

Library of Congress BX4705.S37F8

—— Copy 2. (a2) 922.273

Fuller, Margaret Witter, 1872–

One world at a time, by Margaret Fuller. New York, The Century co., 1922.

vii, 322 p. 19½cm.

I. Title.

22—13079

Library of Congress PZ3.F9612On

—— Copy 2.

Copyright A 668282 (a40f)

Fuller, Margaret Witter, 1872–

Alma; a novel, by Margaret Fuller. New York, W. Morrow & company, 1927.

vii, 275 p. 19½cm.

I. Title.

27-14699

Library of Congress PZ3.F9612Al

—— Copy 2.

Copyright A 998149 (3843)

Fuller, Marion Hedrick.

Willie's candid camera; a new type of old family album, showing the battle of the old versus the new, by Marion Hedrick Fuller. Boston, Mass. and Los Angeles, Calif., Baker's plays (1941)

14 p. diagr. 19½cm. (On cover: Baker's specialties)

[illegible] I. Title.

41-16286

Library of Congress PN6120.T3F8

(2) 792.24

Fuller, Margaret Witter, 1879–

The complete history of the deluge in verse and pictures, by Margaret Fuller. Windham, Conn., Hawthorn house, 1926.

35 p. 2 l. col. illus. 22cm.

Colored illustration on t.-p.

"Of this first edition 975 copies were printed at Hawthorn house."

I. Title. II. Title: Deluge. The complete history of the.

30—22020

Library of Congress PS3511.U68C3 1926

—— Copy 2.

Copyright A 28977 (32d) 817.5

Fuller, Martin Luther, 1904–

... Crystal orientations developed by progressive cold rolling of an alloyed zinc, by M. L. Fuller and Gerald Edmunds ... New York, American institute of mining and metallurgical engineers, inc., 1934.

8 p. diagr. 23cm. (American institute of mining and metallurgical engineers. Technical publication no. 594. Class E. Institute of metals division, no. 189)

Bibliographical foot-notes.

1. Zinc—Metallography. I. Edmunds, Gerald, joint author. II. Title.

P C 94-21

Library, U. S. Patent Office TN1 A49

Library of Congress [TN1 A385 no 594]

(2)

Cards were laid up in page format, 18 at a time and photographed at approximately 50% reduction. Note irregular gaps, uneven density, poor legibility and generally poor appearance. (Catalog of Library of Congress Printed Cards, Edwards Bros., 1942-47)

Figure 1. Catalog Page Produced From Existing Catalog Cards

Vātsyāyana, *called* **Mallanāga.**
The Kama sutra; love precepts of the Brahmins. A complete and unexpurgated ed. of this celebrated Hindu treatise on love. [Delhi, Rajkamal Publications, 1948]
258 p. 19 cm.
1. Love. I. Title.
HQ470.S3V3 1948 392 56-31189

Vātsyāyana, *called* **Mallanāga.**
The Kama sutra; love precepts of the Brahmans. With a pref. and introd. A complete and unexpurgated ed. of this celebrated Hindu treatise on love. Paris, Éditions de la Fontaine d'or [1952]
224 p. 28 cm.
1. Love. I. Title.
HQ470.S3V3 1952 392 56-31190

Vatta, Rinaldo.
Aspri sentieri: Grande Atlante, Isole Lofoten, Etiopia, Lapponia, Durmitor [e] Anatolia [di] Rinaldo Vatta [e] Mauro Bottari. Udine, Del Bianco [1956]
191 p. illus. 23 cm.
1. Mountaineering. I. Bottari, Mauro, joint author. II. Title.
G610.V3 57-17511 ‡
MH

Vattasso, Marco, 1869–1925.
Le due Bibbie di Bovino, ora Codici vaticani latini 10510–10511, e le loro note storiche. Roma, Tip. vaticana, 1900.
44 p. 25 cm. (Studi e testi, 2)
1. Bible. Manuscripts, Latin. 2. Manuscripts, Italy—Bovino. I. Title. (Series: Vatican. Biblioteca vaticana. Studi e testi, 2)
BS69.V3 53-56153

Vattel, Emmerich de, 1714–1767.
El derecho de gentes; ó, Principios de la ley natural, aplicados a la conducta, y a los negocios de las naciones y de los soberanos; escrita en francés por Mr. Vattel; traducida al español, corregida y aumentada en esta impresion con una noticia de la vida del autor por Manuel Maria Pascual Hernandez. Madrid, Impr. de D. L. Amarita, 1834.
2 v. 19 cm.
1. International law. 2. War. I. Title.
JX9414.S5 1834 53-53967

Vattel, Emmerich de, 1714–1767.
Il diritto delle genti; ovvero, Principii della legge naturale, applicati alla condotta e agli affari delle nazioni e de' sovrani. Opera scritta nell'idioma francese dal sig: Di Vattel, e recata nell'italiano da Lodovico Antonio Loschi. Lione, 1781–83.
3 v. 28 cm.
1. International law. 2. War (International law)
JX9414.I 5 1781 54-49508 ‡

Vatter, Albert Ernst, 1921–
The structure of the maize chloroplasts. Ann Arbor, University Microfilms [1956]
([University Microfilms, Ann Arbor, Mich.,] Publication no. 15,283)
Microfilm copy of typescript. Positive.
Collation of the original: iv, 124 l. illus.
Thesis—University of Illinois.
Abstracted in Dissertation abstracts, v. 16 (1956) no. 5, p. 851–852.
Vita.
Bibliography: leaves 121–123.
1. Chromatophores. 2. Maize.
Microfilm AC-1 no. 15,283 Mic 56-1383
Illinois. Univ. Library

Vatter, Arnold, *joint author*
see **Rettenmaier, Adolf. Warenkunde, mit Einschluss der Technologie. 5. Aufl. Stuttgart, C. E. Poeschel, 1952.** A 53-750

Vatykan
see
Vatican.

Ватикан і Україна. Париж, 1950.
47 p. 16 cm.
"З вступної статті 'Україна в Римі Святого, 1950 року,' видрукуваної у 'Віснику' Українського Греко-католицького церкви у Західній Європі, Париж, ч. 2(61), москвень, 1950."
1. Catholic Church. Byzantine rite (Ukrainian) 2. Ukraine—Church history. *Title translliterated:* Vatykan i Ukraina.
BX1520.U4V3 55-19496 ‡

Vauban, Sébastien Le Prestre de, 1633–1707.
De l'importance dont Paris est à la France et le soin que l'on doit prendre de sa conservation. Mémoire inédit du maréchal de Vauban, faisant partie d'un ouvrage manuscrit de cet homme célèbre, intitulé: Oisivetés; précédé de l'éloge du maréchal de Vauban par M. de Fontenelle. Paris, Treuttel et Würtz, 1821.
56 p. 2 plates, port. 22 cm.
Bound with Petrasc, N. C. F. de. Correspondance inédite ... avec Jérôme Alexandre, etc. Paris, 1819.
1. Paris.
DC36.98.P3A4 Rosenwald Coll. 54-107

Vaubel, Hildegard.
Der Lebensablauf des Menschen im Rahmen einer Wellenlehre; eine Deutung des Leib–Seele–Problems unter Einbeziehung der Grenzgebiete im Naturgeschehen. Darmstadt [J. von Liebig Verlag, 1956.
95 p. 19 cm.
Bibliography, p. 94–95.
1. Philosophy, 1901–
NN MH

Vaubel, Ludwig.
Unternehmer gehen zur Schule; ein Erfahrungsbericht aus USA. Düsseldorf, Droste [1952]
127 p. 20 cm.
1. Industrial management—Study and teaching. 2. Harvard University. Graduate School of Business Administration. I. Title.
A 53-726
New York Univ. Wash. Sq. Library HD30.V3

Vaubel, Siegfried.
Die rechtlichen Grundsätze der Bestimmung der Volksgruppenzugehörigkeit; dargestellt nach der geschichtlichen Entwicklung und dem geltenden Minderheitenrecht unter besonderer Berücksichtigung des Systems der Nationalkataster. Würzburg-Aumühle, K. Triltsch, 1940.
198 p. 20 cm.
Thesis—Breslau.
1. Minorities. 2. Minorities—Europe. I. Title.
JX4231.M5V3 53-47768 ‡

Vaubel, Wilhelm.
Arsen und Thallium, die ungeahnte und bisher unbekannte Grösse ihrer Wirkung auf das ganze Naturgeschehen, auf Leben und Sterben. Darmstadt, J. von Liebig-Verlag [Vorwort 1951]
48 p. illus. 21 cm.
1. Arsenic. 2. Thallium.
RA1231.A7V3 57-19418 ‡

Vaucaire, Maurice, 1863?–1918.
Valet de cœur, comédie en trois actes, en prose. Représentée pour la première fois au Théâtre-Libre, le 27 avril 1893. Paris, G. Charpentier et E. Fasquelle, 1893.
94 p. 19 cm.
I. Title.
PQ2459.V7V3 1893 55-53080 ‡

After printing conventional cards, leading was removed from between the type slugs and additional cards were printed with the compacted entry at the top. These were laid up in page format in the manner of shingles, with only the type exposed. Note the clarity, even density, and generally improved appearance. (The National Union Catalog, Rowman and Littlefield, 1948 to present)

Figure 2. Catalog Page Produced From Shingled Cards

mechanical compilation of copy. The same cards can be used repetitively for additional listings in various orders, thereby eliminating the necessity of making multiple copies or retyping These devices offered a considerable improvement over the shingling technique, and they are still widely used. However, the simplification of compilation and photography solved only part of the problem. It was still necessary to maintain the card decks, and multiple-entry indexes required the preparation of duplicate cards.

It should be noted here that although machines were being used for compilation, the printing was generated from other sources. Although devices such as Photon, Intertype, and Linofilm had made possible more direct offset printing which was fully comparable to letterpress, computer printing was still generally unacceptable.

This was the situation in 1961 when NASA and the National Library of Medicine issued nearly simultaneous Requests for Proposals (RFP's) for the development of information systems. While these RFP's were very similar in that they both required machine-oriented journal publication, bibliography production, and reference services, there were major differences which significantly affected the approaches taken.

The most important of these differences was schedule. The National Library of Medicine RFP allowed two full years for systems design and startup. NASA required publication of the first biweekly journal in 90 days and full operation within six months.

The second difference was format. The Index Medicus follows the format of the Cumulative Book Index (H. W. Wilson Company). That is, each entry is a descriptive citation which is repeated in full under each index heading. This gave impetus to the development of GRACE*. NASA on the other hand required that the descriptive citation be accompanied by a 150- to 200-word abstract. Since this precluded repetition of the entire entry under each heading, it followed that the journal must be in two parts: an announcement section with the descriptive citation and abstract, arranged by broad subject category; and an index section which listed under each heading a reference which would lead a searcher to the complete entry in the announcement section. With a two-part journal, a compromise was possible.

The nature of the compromise was dictated by the schedule and by the character of the two sections. Since the entries in the announcement section would be printed only once and would not be further manipulated after publication, it was decided to produce this section to the highest graphic arts standards (Figure 3). For this purpose, a high-quality, versatile phototypesetter, the Photon 200, was selected. In the index section, however, each entry would appear three to five times under various subject headings, one or more times under source headings, and several under personal author headings. This multiple entry requirement, plus the requirement for cumulations, dictated computer printout for the production of camera-ready copy (Figure 4).

The following describes the experiments and techniques employed by Documentation Incorporated to improve the quality and efficiency of both methods of production for the abstract journals prepared by the NASA Scientific and Technical Information Facility.

---

*GRaphic Arts Composing Equipment. See Photocomposed Indexes, section for description.

N66-12873*# Tennessee Univ., Knoxville. Dept. of Chemical and Metallurgical Engineering.
THE APPLICATION OF DIFFUSE X-RAY-SCATTERING TO THE STUDY OF THE STRUCTURE OF BINARY ALLOYS Semiannual Progress Report, 1 Mar.–31 Aug. 1965
J. E. Spruiell [1965] 9 p refs
(Grant NGR-43-001-018)
(NASA-CR-68233) CFSTI: HC $1.00/MF $0.50 CSCL 20B

Research is reported in an experimental and theoretical investigation of the relationship between the local atomic arrangements in metallic solid solutions, and the physical and mechanical properties of the solid solutions. Emphasis was placed on the growth of satisfactory alloy single crystal specimens for X-ray diffuse scattering experiments, and the development of an experimental apparatus for both X-ray and resistivity measurements. It is also reported that some measurements were performed on Ni-10 at. % W and Ni-20 at. % Mo alloys. C.T.C.

N66-12875*# Union Carbide Corp., Parma, Ohio. Carbon Products Div.
HIGH TEMPERATURE PROTECTIVE COATINGS FOR REFRACTORY METALS Progress Report No. 3, 1 May–31 Jul. 1965
J. M. Criscione, J. Rexer, and R. G. Fenish [1965] 22 p ref
(Contract NASw-1030)
(NASA-CR-68181) CFSTI: HC $1.00/MF $0.50 CSCL 11C

The rate of interdiffusion of iridium and tantalum was determined as a function of temperature in the range 1200° to 1600° C. An apparent activation energy of 53.5 kcal/mole was obtained for the overall diffusion process. Iridium-coated tantalum specimens were subjected to oxidation tests in slow moving air at 1850° C. Pressure bonded and electrodeposited coatings of iridium on tantalum were subjected to oxidation tests in slow moving air and in an oxygen-methane flame. A 5-mil iridium coat completely protected tantalum from oxidation for 51 hours at 1850° C in slow moving air. The recession rate of the coating was 0.02 mils/hr. No internal oxidation was observed. A 5-mil iridium coat on tantalum was also cycled four times without failure through various temperature spans in the range 25° to 1700° C in an oxygen-methane flame. Preliminary oxidation tests in slow moving air and in an oxygen-methane flame showed early failure for electrodeposited iridium coats on molybdenum, tantalum, and tungsten. Premature failure was due to poor adherence of the coating. Author

N66-12901# Los Alamos Scientific Lab., N. Mex.
HYDROGEN EMBRITTLEMENT TESTS OF CRYOGENIC METALS
R. L. Mills and F. J. Edeskuty 29 Nov. 1965 10 p refs
(Contract W-7405-ENG-36)
(LA-3404-MS) CFSTI: $1.00

Specimens of six aluminum alloys, 1100, 2024, 5052, 6061, 7039, 7079; Invar-36; titanium-6Al-4V; and mild carbon steel AISI-C1019 were exposed to cathodic hydrogen for 30 min at a current density of 1 amp/sq in. Immediately following exposure, the samples were bent through successive 180-deg bends until broken. Except for AISI-C1019, which was known to embrittle, none of the materials was measurably affected by the exposure. Other specimens of Invar-36 which were exposed to gaseous hydrogen at 1700 lb/sq in. and ambient temperature for 24 hr likewise showed no hydrogen embrittlement. Author

Paul S. Kingsley 15 Jul. 1965 11 p
(Contract AT(45-1)-1350)
(RL-SEP-508)

It has been demonstrated that a casting of stainless steel (ACI# CD_4M Cu) has adequate strength and corrosion resistance when properly heat treated to become a capable substitute for the stellite-faced 304-L male connector (nozzle) employed at Hanford for a number of years. Author

N66-12932# Battelle-Northwest, Richland, Wash.
CORROSION EVALUATION OF HIGH-SILICON ALUMINUM ALLOYS
H. C. Bowen Sep. 1965 23 p ref
(Contract AT(45-1)-1830)
(BNWL-125) CFSTI: $1.00

A battery of tests was performed on four high-silicon aluminum alloys containing nickel and/or magnesium. The tests included high and low flow isothermal and nonisothermal 140° C water tests, galvanic couples, stress corrosion cracking tests, and tests in 400° C steam and 360° C water. The HDA-1 and -4 alloys were decidedly superior to the other two alloys in the nonisothermal high flow, the 360° C water, and the 400° C steam tests which are considered the tests of most significance. The HDA-4 alloy had better resistance in high temperature water and is considered the most promising alloy. Author

N66-12934# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
SPARK PLANING DAMAGE IN COPPER
John J. Gniewek, Alan F. Clark, and John C. Moulder 6 Sep. 1965 10 p refs
(NBS-TN-321) GPO: $0.15

The damage to copper crystals, produced by spark planing operations, has been measured using a dislocation etch pit technique. The tabulated results show the depth of damage to vary from 0.7 to 1.1 mm on the coarsest planing range used, to 0.2 to 0.3 mm on the finest range. Two photomicrographs showing the etch pit density increase near the spark planed surface are included. Author

N66-12935# Battelle-Northwest, Richland, Wash.
METALLURGY RESEARCH OPERATION Quarterly Progress Report, Apr.–Jun. 1965
15 Jul. 1965 129 p refs
(Contract AT(45-1)-1830)
(BNWL-120) CFSTI: $4.00

Research progress is reported on the effects of impurities and neutron irradiation on properties and structure of molybdenum, nickel, and rhenium; properties of high purity unalloyed and alloyed plutonium; damage to mechanical properties of irradiated iron caused by interaction of moving dislocations with irradiation induced defects; swelling of irradiated fissionable materials; irradiation and environmental effects on nickel-base alloys; in-reactor creep and rupture properties of annealed 304 SS; irradiating, testing, and data processing for different structural materials; irradiation and reactor environment effects on stainless steels; effect of modified microstructures on irradiation stability of nickel-base alloys; fracture studies; corrosion and materials testing studies with Advanced Test Reactor loop; N-reactor corrosion and hydriding; gas loop development; Plutonium Recycle Test Reactor pressure

Copy is set at 12 points with bold character escapements and 13 point leading. Made-up pages are photographed at 30% reduction.

Figure 3. Portion of Star Announcement Page

AVIATION
SPEED AND SAFETY IN CIVIL AVIATION
WGL PAPER-7 N63-10006 01-04

AXIAL COMPRESSION
IMPELLER ADJUSTMENT IN AXIAL COMPRESSORS
WGL PAPER-62 N63-10057 01-03

AXIAL LOADS
ELASTIC STABILITY OF THIN-WALLED ORTHOTROPIC CONICAL SHELLS UNDER AXIAL LOAD AND INSIDE PRESSURE
WGL PAPER-34 N63-10030 01-34

AZIMUTH ANGLE
SATELLITE LOOK ANGLE CALCULATOR FOR SATELLITE TRACKING AND CONFIGURATIONS
RADC-TDR-62-391 N63-10464 01-08

B

BACKWARD SCATTER
A ROTATING AERIAL BACK-SCATTER SOUNDER - F-REGION
AFCRL-62-903 N63-10135 01-12

BALLISTIC MISSILES
SYMPOSIUM ON BALLISTIC MISSILES
AM-84 N63-10370 01-01

BALLISTIC MISSILE DECOY OPTIMIZATION THROUGH DYNAMIC PROGRAMMING N63-10379 01-30

BALLISTIC VEHICLE
EARTH TRAJECTORY MODEL FOR SUBSURFACE BALLISTIC AND THRUSTED VEHICLES
AFSWC-TDR-62-106 N63-10430 01-20

BALLISTICS
HYPERVELOCITY PARTICLE EFFECTS ON MATERIAL
TO-B-62-3 N63-10161 01-34

BALLOON FLIGHTS
THE STRATOSPHERIC SOLAR CORONA
N63-10196 01-05

SOLAR-CELL POWER SYSTEMS TESTING - BALLOON FLIGHTS
ARS PAPER-2504-62 N63-10255 01-06

BANG-BANG CONTROLS
UNIQUENESS OF TIME-OPTIMAL CONTROL FOR LINEAR PROCESSES N63-10413 01-20

BANKING
LATERAL RANGE CONTROL BY BANKING DURING INITIAL PHASES OF SUPERCIRCULAR REENTRIES
NASA-TN-D-1511 N63-10328 01-32

BARIUM
LIFE TESTS, EVAPORATION RATES, AND PULSED EMISSION MEASUREMENTS ON A TUNGSTEN-BARIUM ORTHOSILICATE DISPENSER CATHODE
AFCRL-62-110 N63-10437 01-09

BARRELS
MICROWAVE MEASUREMENT OF PROJECTILE KINEMATICS WITHIN LAUNCHER BARRELS
AEDC-TDR-62-213 N63-10131 01-15

BATTERIES
SOLAR POWER SYSTEM FOR THE ARIEL SATELLITE /UK-1/
ARS PAPER-2498-62 N63-10252 01-06

NICKEL-CADMIUM BATTERIES FOR THE ORBITING ASTRONOMICAL OBSERVATORY /OAO/
ARS PAPER-2508-62 N63-10257 01-06

BEAM CURRENTS
ELECTRON SPECTROMETER, INCREASED RESOLUTION AND BEAM CURRENT, ELECTRON IMPACT SPECTRA
AFCRL-62-1070 N63-10562 01-15

BEARINGS
BEARING MATERIALS FOR PROCESS FLUID LUBRICANTS - WATER, CORROSION, OXIDE FILMS
MTI-62TR20 N63-10096 01-17

PLAIN CYLINDRICAL JOURNAL BEARINGS IN A TURBULENT REGIME
MTI-62TR22 N63-10125 01-17

AIRFRAME BEARINGS FOR AEROSPACE VEHICLES
N63-10172 01-17

RESEARCH ON HIGH-TEMPERATURE BEARINGS
ASD-TR-61-705 N63-10194 01-17

BENDING MOMENTS
BUCKLING OF RING-STIFFENED CYLINDERS UNDER A PURE BENDING MOMENT AND A NONUNIFORM TEMPERATURE DISTRIBUTION
NASA-TN-D-1513 N63-10179 01-33

BERYLLIUM
BERYLLIUM RESEARCH - ELECTRON MICROSCOPY, POWDER, RECRYSTALLIZATION, AND IMPURITIES
NMI-9522 N63-10311 01-18

REACTOR FUELS - PLASTICS, X-RAYS, RADIOELEMENTS
MLM-1135 N63-10421 01-01

BERYLLIUM - TOXICOLOGY, LABOR HYGIENE, SAFETY
JPRS-16496 N63-10540 01-16

BERYLLIUM ALLOYS
LIQUID METAL EMBRITTLEMENT OF A COPPER 2 PERCENT BERYLLIUM ALLOY
R-1652 N63-10154 01-18

BIBLIOGRAPHY SEE ALSO ABSTRACTS
POLYMERS, PLASTICS, SYNTHETIC FIBERS LITERATURE REVIEW
CORL-SP-4-34 N63-10073 01-19

HEALTH HAZARDS AND TOXICITY OF PLASTICS - BIBLIOGRAPHY
PLASTEC-5 N63-10163 01-19

EFFECTS OF SPACE ENVIRONMENT ON PLASTICS - ANNOTATED BIBLIOGRAPHY
PLASTEC-12 N63-10170 01-19

BIBLIOGRAPHY ON THE HIGH TEMPERATURE CHEMISTRY AND PHYSICS OF GASES AND GAS-CONDENSED PHASE REACTIONS
N63-10195 01-07

LASERS - BIBLIOGRAPHY
UCRL-6769 N63-10461 01-23

REACTOR SAFETY - LITERATURE SEARCH
TID-3525 /REV. 4/ N63-10518 01-23

PROBABILITY INTEGRALS OF MULTIVARIATES, STATISTICS AND BIBLIOGRAPHY N63-10528 01-20

BILIRUBIN
DETERMINATION OF SERUM BILIRUBIN
LF-3 N63-10547 01-16

BILLET
CASTED HEAT RESISTANT BILLETS FOR COMBUSTION TURBINE BLADES

Page is photographed exactly as it comes from the computer at 40% reduction. Note offset and "bold-face" effect which makes heading clearly legible, even density and clarity of printing.

Figure 4. Portion of Star Index Page (Standard Chain)

COMPUTER PRINTING

Once the decision was made to produce camera-ready copy for the indexes from the computer, the system designers believed it essential to achieve the best possible quality, and immediately began an investigation into the problem of obtaining high-quality copy from existing equipment.

The objections to computer printing can be generally divided into three areas:

Type Face. Computer printouts in 1961 were confined to a limited number of characters, all upper case, and without either proportional spacing or justification. This contributed directly to the second problem.

Format. Computer printouts generally fall at two extremes. The lack of varying type faces to break up the page led some designers to spread the information with double and triple spacing to insure separation of the various elements. This resulted in excessive bulk, high cost, and poor handling qualities. On the other hand, if the material was compressed for economy, it became difficult to identify separate entries.

Character Legibility. On most material reproduced from computer printouts, the individual characters have a tendency to fill in and/or fade out, notwithstanding the fact that computers usually use a highly legible, Open Gothic typeface.

Although a computer print chain with upper and lower case characters had been ordered, delivery was many months away, and the problem became one of determining the optimum page format for all upper-case printing.

Design

The first order of business in determining the format was the definition of the entry. In lieu of the conventional descriptive citation, it was decided that the entry would consist of a Notation of Content, the prime report number, the accession number, the journal issue number, and the number of the subject category in which it was announced. Briefly, the Notation of Content is a short phrase or sentence containing the subject terms under which the entry is indexed, with additional language to provide connections and establish relationships. The Notation of Content was limited to a maximum of three 50-character lines. This was followed by an additional line with the report number, accession number, issue number, and category number, in that order. The accession, issue and category numbers provide the searcher with the information necessary to find the citation and abstract from either individual or cumulative indexes.

The 50-character line was determined in conjunction with the decision to produce a two-column page format. This combination was felt to be the optimum for legibility, economy, and aesthetic appeal. Separation of successive entries was achieved by supplying a line space after each entry.

Index headings were clearly identified by offsetting them three spaces to the left, and by providing a boldface effect (details on the boldface effect are discussed below under boldface). An index heading guide was printed at the top of each page, consisting of the first index heading over the lefthand column of a left-hand page, and the last index heading over the righthand column of a righthand page. The index identification (Subject, Corporate Source, or Personal Author) was printed over the inside column on each page, and the page number was centered at the bottom of each page. Provision was made for space at the top of the first page of each index for a masthead and introduction. Alphabetic separators were used in the body of the index to facilitate location of the desired section. When the first character of an index term was different from the first character of the previous term, extra spaces were left to permit manual insertion of an oversize alphabetic character.

Printing Quality

The problem of character legibility was traced to a number of causes. Probably the most important was the build-up of ink on the type. Conventional computer printer ribbons are woven nylon fabric impregnated with ink. When the type strikes the ribbon, leaving an impression on the paper, some of the ink adheres to the type. Over a period of time, this may build up to the point where the type face is distorted, producing either fill in or fade out. The obvious solution to this problem is to insure that the type is clean. IBM provides a standard program (RIPPLE PRINT) and a special absorbent paper (Scotch Type Cleaner, IBM Part No. 451529), which when used together, with the ribbon removed, will remove virtually all residue. Therefore, the first step in improving character legibility was the establishment of a standard operating procedure whereby the chain is always cleaned prior to printing camera-ready copy. However, additional steps were needed. Even with a clean chain to start with, in printing an index of any size, some build-up of ink on the type will occur. This could be eliminated by replacing the fabric ribbon with Mylar ribbon (Keelox Special Mylar 1403 Printer Ribbon). With this ribbon, the type never came in contact with ink, and no build-up could occur.

A second major problem was the quality and compatibility of paper and ink. For camera-ready copy which is going to be reduced, the impressions must be dense and sharp, and provide high contrast with the paper. The rag content and finish of the paper must be balanced with the penetration of the ink to produce an imprint which will neither smear nor bleed. The ink must be as dark as possible, and the paper as white as possible but without a gloss which results in an image-destroying glare. After testing several samples, Documentation Incorporated chose a high-rag content, semi-gloss paper (20 pound, 25% Rag, 14-7/8 x 17) which was compatible with the Mylar ribbon.

None of the foregoing is effective unless the type is sound and the printer properly adjusted. Working closely with the IBM customer engineers, Documentation Incorporated tested and modified the chain and the hammer adjustment until a consistent, clear imprint was obtained for any character in any position. This balance was crucially important to the achievement of the boldface effect.

Boldface

One of the more frequent complaints about computer-printed indexes is that the index headings tend to get lost among the entries. Conventionally printed indexes avoid this by printing index headings in large bold type. The computer printer could not be made to produce a larger type, but a boldface effect could be achieved by overprinting. However, there are a number of problems. The IBM 1403 Printer normally cycles to the next print line immediately after execution of a WRITE command, so it was necessary to procure a special option (now standard) which would permit suppression of this cycle. With this option on the printer, it was then possible to program to reprint in the same location information which had been tagged in the computer as index headings. Each overprint results in a darker and thicker image (i.e., bolder), but it increases the tendency to fill in. At the same time, the characters which are not overprinted must be sufficiently dark to provide a clear image. The problem reduces to one of determining the optimum number of overprint cycles that will produce a sharp contrast with the single-printed data without excessive fill-in. This number is also a function of initial hammer pressure, paper weight and finish, and ribbon inking, and the overprint requirement strongly influenced the choice of paper and ribbon discussed above. After considerable experimentation, it was determined that with the printer, paper, and ribbon chosen, two overprint cycles (three impressions total) produced the best result.

One further problem remained to be solved. Small errors in print hammer timing which would be virtually undetectable in a normal printout can result in an unacceptable image when the variation occurs during an overprint cycle. The timing of the IBM 1403 Printer is sufficiently precise so that the problem seldom occurs, but when it does occur on camera-ready copy, it must be corrected. To avoid reprinting an entire index, or page of an index, a simple program was prepared to print the required information either single or overprint from punched cards. Each camera-ready index was overviewed immediately after printing. If there are any unacceptable headings the required information is punched into cards and correction lines are generated. These correction lines are then cut into the original copy by the Journal Preparation Section.

Operation

Finally, the quality of the end product is the responsibility of the computer operator. It would be useful if it were possible to specify standard settings and procedures which would permit the operator to set up the equipment, punch a button, and go out for coffee, but this is never the case. Variations in line voltage may affect the print hammer stroke, or equipment may wear and alter settings. In order to produce high-quality camera-ready copy from a computer, the operator must test and adjust until the images and contrast are consistent and satisfactory. Even after the initial settings are made, he must continually monitor the output and be able to spot and correct variations in quality before they exceed acceptable limits. At Documentation Incorporated, only highly trained and motivated operators are assigned to the production of camera-ready copy. This policy has paid off in the consistently high quality of the STAR indexes.

Upper and Lower Case

Early in 1964, Documentation Incorporated received a special 120-character print chain, with upper and lower case, serif type, and the most frequently used special characters.

After thorough production testing on several projects, it was recommended for use on the principal journals. This recommendation was implemented with the first journal issues for 1965 (Figure 5).

Because the 120-character chain has only two sets of characters (compared to five on a standard 48-character chain), the effective speed of computer printing with this chain is only about a third of that with the standard chain, but the elimination of line spacing which the use of upper and lower case characters permits results in a reduction of 25% in the pages required for each journal index. This is a significant factor in the production of a journal with the distribution of STAR. The savings from printing, collating, binding, and shipping fewer pages more than compensates for the increased processing costs from using the 120-character chain.

Additional experiments in improving computer printing were discontinued (for the present, at least) when, in the summer of 1965, it was demonstrated that the computer tapes generated to produce journal indexes could be converted to drive the GRACE (GRaphic Arts Composing Equipment) at the National Library of Medicine (see section on Photo-composed Indexes).

PULSE HEIGHT
Single electron counting characteristics of multiplier phototubes - Pulse height distribution of windowless multiplier
NASA-CR-67378 N65-35843 24-09
PULSE RATE /BIOL/
Construction of device for recording blood pressure, pulse, respiration, and mechanograms on oscillographs
NASA-TT-F-9581 N65-35782 24-04
PULSE RECORDER
Normal standards of sphygmogram, and pulse wave velocity in peripheral blood vessels
NASA-TT-F-9578 N65-36751 24-04
PULSED RADIATION
Signal velocity of masers, and microwave phonon attenuation and pulsed heat radiation in single crystal semiconductors
REPT.-8 N65-36734 24-26
PUMP IMPELLER
Centrifugal pump and compressor impellers, gas and steam turbine rotors, and rotating disks - annotated bibliography
BIB-17 N65-36379 24-32
PUNCHED CARD
Implementation of programs for conversion of paper tape information to IBM 7090/94 magnetic tape, punched cards, and printed page
NASA-CR-67509 N65-36399 24-08
PURIFICATION
Purification of carrier-free manganese-54 for in-pile irradiation of iron
EUR-1641.I N65-36375 24-24
PYROCERAM
Physical and chemical properties of new ceramic material - sitall
FTD-TT-65-58/1 N65-35901 24-18
PYROLYSIS
Pyrolytic conversion of aromatic pyromellitimide polymer into semiconductor material - electron paramagnetic resonance, absorption, specific resistivity, weight loss, and composition
TG-615 N65-35812 24-06
Pyrolysis of polymers and carbohydrates - bibliography
MLM-1271 N65-36214 24-06
Silicon film deposition by silane pyrolysis and silicon vacuum evaporation
AFCRL-54-574 N65-36263 24-15
PYROLYTIC GRAPHITE
Metallography of pyrolytic carbon coated and uncoated uranium carbide spheres
N65-36093 24-15
Effects of pyrolytic-graphite structure on thorium diffusion coefficients
ORNL-TM-1080 N65-36448 24-17

Q

QUADRATURE APPROXIMATION
Generalized Legendre polynomial for quadrature approximation
MRC-TSR-569 N65-36232 24-19
QUADRUPOLE
Quadrupolar effects on energy levels in mesmic manganese atom
NP-15089 N65-36415 24-24
QUALITATIVE ANALYSIS
Thin-layer chromatography analysis of polyphenyl mixtures
EUR-2236.N N65-36354 24-06
QUALITY CONTROL
Overstress test-to-failure techniques for reliability measurement of electronic equipment
ADR-09-14-64.1 N65-36450 24-15
QUANTITATIVE ANALYSIS
Mass spectrometry for quantitative analysis of minute admixtures and design of two stage mass
QUANTUM MECHANICS
Quantum mechanics and field theory of meson-nucleon interactions, parity, and elastic and inelastic scattering cross sections
JINR-P-1793 N65-36355 24-24
Quantum mechanics - radiative cascade theory between continuum and states of hydrogen-like ion structures
AFCRL-65-152 N65-36795 24-25
QUANTUM THEORY
Excited state spin, radiative capture of neutrons, electron-neutron interaction, S-state interactions and nuclear coupling schemes, quantum measurement theory, and graphite jet
ANL-6877 N65-36143 24-24
QUARTZ
Thickness-shear resonance and bending anharmonic vibrations of partially plated, quartz crystal plates - electronic equipment
TR-3 N65-36743 24-32
QUENCHING
Metastable constitution of gold-germanium alloys quenched from melt
CALT-221-9 N65-36539 24-17

R

RADAR
Radar determination of velocity data from observatory satellite
DI-82-0447 N65-36165 24-07
RADAR DATA
Field-aligned irregularity investigation using backscatter radar data from three observation points
AD-618698 N65-36182 24-13
RADAR ECHO
Radar observations on echo cross sections of ice-water mixtures
REPT.-3461 N65-36703 24-20
RADAR MEASUREMENT
Three-dimensional analysis of precipitation-free, sea-breeze front during hurricane Ginny by radar, TIROS, visual, and mesosynoptic data - Radiometeorology
AD-619202 N65-36194 24-20
Intensity of radio wave scattering from sea surface covered with ice, measured using radar device
JPRS-32378 N65-36285 24-07
RADAR RESOLUTION
Device for increasing resolving power of radar stations
FTD-TT-65-963/1+2 N65-36166 24-07
RADAR TRACKING
Monopulse tracking antenna and noise analysis for narrow band signals - monopulse tracking receivers for adaptive phased array control
RADC-TR-65-66, VOL. II N65-35848 24-07
Statistical problems of tracking target by radar from observatory satellite - estimation and confidence limits for location, speed, and heading of target
D1-82-0390 N65-36861 24-07
RADIAL DISTRIBUTION
Velocity components and radial pressure distributions in vortex contained in short cylindrical chamber
NASA-TN-D-3072 N65-35840 24-12
RADIAL FLOW
Wave mechanics considered as special case of classical mechanics - Radial oscillations in nucleus of ground state electron
REPT.-641/XVIII/PP/ N65-36636 24-24
RADIATION
Radiation problem and impurity contribution to optical absorption in alkali halides
N65-35896 24-26

Note an almost 25% increase in the number of items on the page as compared to Figure 4 without loss of legibility, and with improved appearance.

Figure 5. Portion of Star Index Page (120-Character Chain)

For preparing the announcement section of the journals, a standard Photon Model 200 phototypesetting machine was procured by Documentation Incorporated. The Photon was chosen as representing the optimum combination of versatility, quality, and speed for the needs of the NASA Scientific and Technical Information Facility. This device is capable of setting type in up to 16 different fonts and twelve point sizes. Copy is proportionally spaced and justified automatically. The output is a positive image of the set copy on either paper or film.

Equipment Description

The heart of the Photon is a rapidly rotating (480 rpm), glass disc on which the characters of each font are engraved in 16 semi-circular arcs (8 rings) around the periphery. A 4-microsecond flash from a stroboscopic light source projects a character image through an aperture and one of twelve lenses, which enlarge or reduce the image to the correct point size, and to a traveling prism mirror which directs the image to the photo-sensitized material, either paper or film, to produce a positive image of the character. Point size changes are accomplished by rotation of the lens turret, on signal, to place the appropriate lens in front of the aperture. Font changes are accomplished by an eccentric cam which changes the position of the disc axis to bring the correct ring in front of the aperture, and by the timing device which selects the character from the selected portion of the ring.

When a key is struck on the keyboard, the character code is stored in a mechanical pin register storage device, along with its escapement value for the font and point size which are established by "gearshift" settings. Space bar strokes are recorded as variable escapement values without the character code. As each character or space bar is struck, the escapement value is subtracted from the line length, which is established by pushbutton controls on the console. When a line has been completed, as indicated by a signal light and a line balance counter, the operation of the carriage return causes an internal computing mechanism to distribute the remaining unused line length among the interword spaces used in the line, producing a justified line. An electrical contact reader scans across the pin register sensing the stored codes. The character codes are converted by a decoding system to a binary code which activates the stroboscopic light source as the required character is centered in the aperture of the optical system. The 4-microsecond duration of the light pulse optically stops the motion of the spinning disc. As each character is exposed, the stored escapement value of the character activates a combination of slip clutches to move the traveling prism mirror the required distance, as determined by the stored escapement value, to place it in position for the next character. The projection of characters takes place at the standard rate of eight characters per second, but this has been successfully boosted to ten characters per second.

Modifications

Since quality is essentially built into the Photon itself, efforts were concentrated on improving its efficiency and the quality and efficiency of peripheral operations.

Print Size. The first step in this direction was a change in initial operational procedure. The specifications for the journal called for 8-point type for the body material, and the first issues were set in this size. However, to increase both the accuracy and the productivity of the proofreaders, and to simplify the cutting-in of corrections and copy make-up, this was changed, to 12-point type, and the printer was instructed to reduce the copy 30% when making the page negative. Since the negatives, and subsequently the plates, are made photographically anyway, this entailed no increase in printing cost, and, working with the sensitized paper in the Photon, the increase in material cost was slight. The economies, however, are significant.

Superior and Inferior Characters. In a scientific journal such as STAR, the occurrence of superior and inferior characters in the text is fairly high. In the normal configuration of the Photon, each occurrence of superior or inferior characters requires an additional line setting. For example, to set a line having both inferior and superior characters, the operator must first set a complete line suppressing the exposure lamp for all except the superior characters; he then sets the main line, suppressing inferior and superior characters, and so on. If the line includes super-superior and sub-inferior characters as well—not an uncommon occurrence—five complete line sets are required. The problem can be dealt with by having the characters engraved on the disc in their various inferior or superior positions, but this would require sacrificing additional characters necessary to the basic fonts of type. However, since almost any character or special symbol may occur as superior or inferior in technical reports, a more general solution is required. The solution for the Facility was a modification of the lens turret. The Model 200 Photon is delivered with lenses to produce 5, 6, 7, 8, 9, 10, 11, 12, 14, 18, 24, and 28-point type. Since the 5, 7, 9, and 11-point sizes are least used, the Facility replaced these lenses with two offset 10-point lenses for superior and inferior characters and two offset 8-point lenses for super-superior and sub-inferior characters, the sizes being chosen to complement the basic 12-point size of journal text. These lenses are set in the turret at a slight angle to offset the character image. This modification enables the operator to set any character in any font as a superior, inferior, super-superior, or sub-inferior character without additional line setting, and with a considerable increase in efficiency.

Short Line Kill. The operator can correct a mis-keyed character by "back-spacing" to reset the pins in the register and re-keying the correct character, or, if more than three or four characters must be "back-spaced," by a "line kill." The line kill activates the reading head to move across the pin register, cancelling the registered codes for the entire line. Normally, in response to a line kill command, the reading head moves across all 100 positions of the pin register. Since this operation consumes 10 to 12 seconds, time is wasted when only a partial line has been set and the reading head moves across the remainder of the line. As all character positions set, including spaces, result in the entry of codes in the pin register, Documentation Incorporated was able to modify the wiring so that when a position without codes was sensed, the line kill cycle terminated. This resulted in savings of from 2 to 10 seconds, depending

upon the number of characters set, for each line kill cycle. While this may seem minor, the cost is small and non-recurring, and over a period of time, the savings become quite substantial.

Automatic Leading. Another time-consuming operation is the leading-out of galleys. The paper supply for the Photon is a 175-foot roll in a large magazine. The paper is fed from the magazine, past the exposing area, to a small cassette sized to hold an individual galley. When a galley—which may range from 1 to 3 feet in length—has been completed, it is necessary to advance the paper approximately 6 inches to insure that the last line set is inside the cassette before opening the equipment to remove the cassette for development of the copy. Normally, to accomplish this, the operator must push an advance (leading) button and hold it down, watching a leading counter until the correct advance has been completed. This requires about 36 seconds during which the operator is fully occupied. To free him for other tasks, such as getting copy for the next galley assembled, recording statistics, etc., a solenoid with an automatic timer was inserted in the leading circuit. Once the leading circuit has been activated by pushing the button, the solenoid holds it closed until the pre-set timer opens the circuit. The operator need only set the timer and push the button momentarily. He can then devote his attention to other duties while the cycle is under way. This again results in an incremental saving which becomes appreciable over a period of time.

Signal Light Relocation. A less readily measurable but nonetheless significant improvement in efficiency was achieved by relocating the line length counter and the justification signal lights. The Model 200, in addition to the copy holder located over the keyboard, has a page-size make-up panel located to the left of the operator with the center at eye level. The signal lights are located in a panel at the top of this make-up panel. In setting straight copy, the operator must shift his eyes to the left and up to check the signals. Since the make-up panel is used almost exclusively for setting irregular or advertising-type copy from an artist's layout, it is seldom used by the Facility. To improve the location of the signal lights for straight copy work, the make-up panel was dismounted and inverted to bring the signal lights down to a level only slightly above the keyboard, well within the range of normal peripheral vision. The relocation of these signal lights produced a noticeable increase in speed and reduction of fatigue for most operators.

Paper Supply. The paper supply container for the Photon is a light-tight magazine housing a metal reel sized for 10-inch width paper. This reel has a 2-inch outside diameter core with 4-1/2 inch flat, perforated flanges. It will accommodate approximately 175 feet of paper, but suppliers normally ship the paper in 300-foot rolls. Transferring the paper from these rolls to the reel was not only time-consuming (15 to 20 minutes), but there were substantial problems with accidental exposure, paper damage, and uneven paper feed due to improper winding of the tape on the reel. To solve this problem, one flange was removed from the reel, and additional slots were cut in the flange to accept matching keys which were machined on the end of the core. The supplier was then asked to stock paper in 175-foot lengths, wound on a cardboard core with a 2-inch inside diameter. These rolls can be forced onto the reel core, the flange replaced, and the reel placed in the magazine, where the tension springs (and keys and slots) hold the flange in position. The 2-inch inside diameter of the cardboard core provides a force fit which prevents the roll from slipping, and an empty core can easily be removed with a single knife cut. This modification not only reduced a 20 minute operation to two, but resulted in a measurable reduction in paper waste.

As the workload increased, the photocomposition operation became operator bound. The Photon is capable of producing 8 to 10 characters per second, but an operator at the keyboard cannot average this rate because of the necessity of making decisions about font and point-size changes, locating special characters, etc. In the Facility's experience, an operator at the keyboard can be expected to achieve between 30 and 40 percent of the maximum rate. However, by operating the machine from a paper tape input, the maximum rate can be very closely approached. To this end, Documentation Incorporated began working with Friden and Photon to modify the existing system to a tape-driven Photon operation to meet the Facility's special needs.

The major problems of conversion to tape operation were escapement compatibility, code compatability, and multiple control signals. The first of these was by far the most difficult problem to solve.

Escapements and Type Faces. Font and point-size changes on the Photon are accomplished by a pair of mechanical "gear-shifts." One of these controls escapement values for the style of type being set, and the other controls escapement values for the point size selected. Movement of one of these levers enters a style or lens change code in the pin register, and physically moves a carriage which carries printed-circuit cards, coded with the appropriate escapement factors, opposite the reading contacts. At any given position of a "gear-shift," two sets of escapement values can be accessed by the reading contacts. Lens or disc changes can be accomplished by electrical signals, but carriage shifts require the manual movement of one of the "gearshifts." As a result, tape operation of the Photon must be limited to two sets of character escapement values and two sets of point-size factors. Input keyboard considerations (see below) further limit the choice to a single set of character escapement values. Since the journal text requires bold, medium and italic characters, the first requirement for tape operation was the selection of a family of type with escapement ratios which were relatively compatible. That is, the differential between the escapement of a character in the bold face and the escapement of the same character in the medium face must be as small as possible. The Univers style of type was selected as the most attractive type meeting these requirements. The overall ratio of bold to medium is approximately 1.1 to 1.

The next step was the selection of escapement and set values which would produce good copy with any of the three fonts. The initial approach was the use of the Univers Medium character escapement values with point size escapement values for 12.5 points, instead of 12 points. It was felt that this would provide adequate spacing for the bold face without spreading the medium face characters too far apart. After encountering some difficulties with odd escapements, this was discarded in favor of the simpler method of using the Univers Bold escapement values and the true set ratio for the 12-point size being used. A set ratio of 10 was chosen for the second set of point-size escapement factors and these are automatically selected whenever any of the offset lenses are used.

The limitation to a single set of character escapement values has a secondary effect on the design and placement of the characters for the Greek alphabet and other special characters. Since each key can produce only two escapement values (upper

and lower case) for the basic font, the Greek alphabet and other special characters must be designed—and located on the disc and keyboard—to be compatible with the basic escapements. As an example, the upper case Eta is keyed (after an appropriate disc change) by striking the character W in lower case. The lower case Eta is keyed by striking the character G in lower case. On the other hand, the lower case Gamma is keyed by striking an upper case S.

Having determined the type family to be used on the Photon, the next step was selecting a type face for the tape producing machines (Friden LCC Justowriters) which had escapements compatible with the Univers family. Modifying the Justowriters to Univers escapement values is not difficult, but since it was intended that the Justowriters be used for producing camera-ready copy directly for less formal publications, it was necessary to choose a type-font escapement combination which would satisfy both requirements. For this purpose, the Justowriter 12-point Galvin type was selected. The escapements of this type font have an approximate average ratio of 1.26 to 1 to the Univers Bold, and the resulting copy is neither too loose nor too tight on either the Photon or the Justowriter.

Control Signals and Keyboard Compatibility. The modification of the Justowriters to produce basic character codes compatible with the Photon was not in itself difficult, but it was necessary to provide some 30-odd control signals for such things as font and lens changes as well as additional special character codes. The latter necessity arises from the fact that the Photon has 45 character keys while the Justowriter has only 42. Counting upper and lower case, the Photon thereby has a capability of 6 more characters than the Justowriter. Both of these problems were solved by providing a second translation device on the Photon and a Control Shift level on the Justowriters.

The translation device on the Photon is a diode assembly wherein the hole-position signals from the tape reader are converted to a pattern of electrical impulses which activate the pin register. A second diode assembly was added, as well as a switching device which transfers the tape reader signals to the second diode assembly when the unique Control Shift signal is sensed. The second diode assembly is wired to enter the appropriate control signal and special character codes into the pin register. When a Control Unshift signal is sensed by the tape reader, the switch returns to its normal position. In use, when the operator strikes the Control Shift/Unshift Key while in normal operation, the Justowriter simultaneously punches the Control Shift code into the paper tape and lights a red indicator. The operator strikes the keys for the required control signal(s) and/or special character(s), and then strikes the Control Shift/Unshift key again. This punches the Control Unshift code into the tape and turns off the indicator.

It should be noted that in any font only six characters will be set in the Control Shift mode. The use of the Control Shift mode for special characters is limited to three character key positions and serves only to provide compatibility between the 42-character Justowriter keyboard and the 45-character Photon keyboard.

Debugging. During initial tests of the tape system, it was determined that additional modifications were necessary. As originally installed, the control signals would operate only when the keyboard was in lower case. The additional keying necessary to downshift for the control signal and then shift up again if the line was being set in upper case reduced speed and increased the operator error rate. This was eliminated by

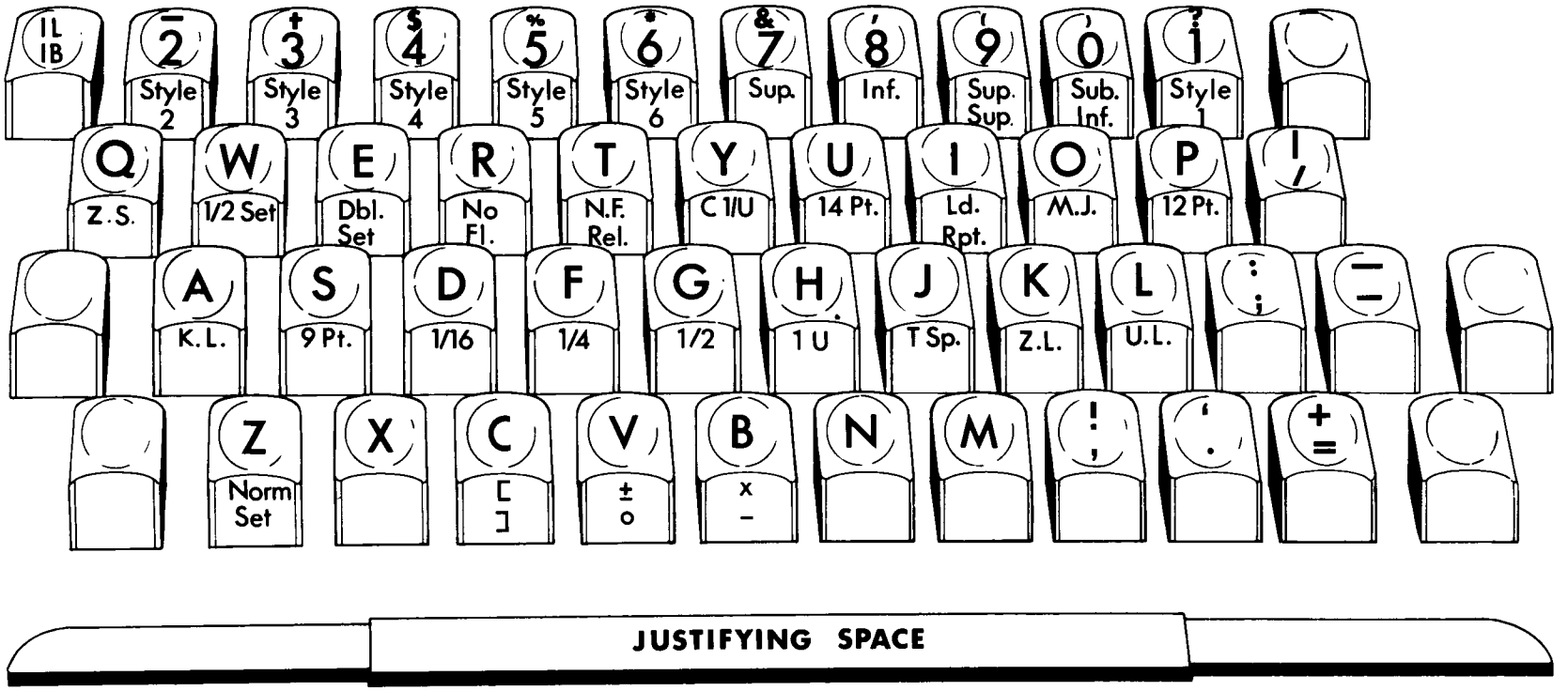
rewiring the control signal portion (but not the special character section) of the diode assembly so that control signals would be read in either upper or lower case.

The second problem was somewhat more involved. When the Photon is operated from its own keyboard, font and set changes and other control signals are activated by "gearshifts," or by momentary switches which return to normal when released. In tape operation, however, control signals actuate relays which hold the signaled condition until another control signal changes it. Under these circumstances, either operator failure or a relay malfunction could result in a ruined galley unless the tape operation monitor could detect the abnormal operation of the Photon. A trained operator can spot most of these malfunctions by observing the existing signals on the Photon, but during the training phase, Documentation Incorporated found it useful to add red warning lights to the Photon Console for the three most troublesome controls: No Flash; Half Set; and Small Set (offset lens). These lights are wired to ground through the relays so that they will light whenever the relays are closed. Since these controls are seldom used for more than one or two characters, the lights should, in normal operation, flash on only momentarily. If they stay on for any appreciable length of time, the monitor knows that there has been either an error or a malfunction, and he can stop the tape and take corrective action, saving machine time, development time, and materials that might otherwise be wasted.

Training. To assist in the training process, the control signal and "control shift" special character keys were identified by engraving on the vertical faces of the keys (Figure 6). The special character identifications were valid only for the Univers fonts. For other fonts, keyboard layouts for each font were prepared which identified the keys to be used for each character (Figure 7).

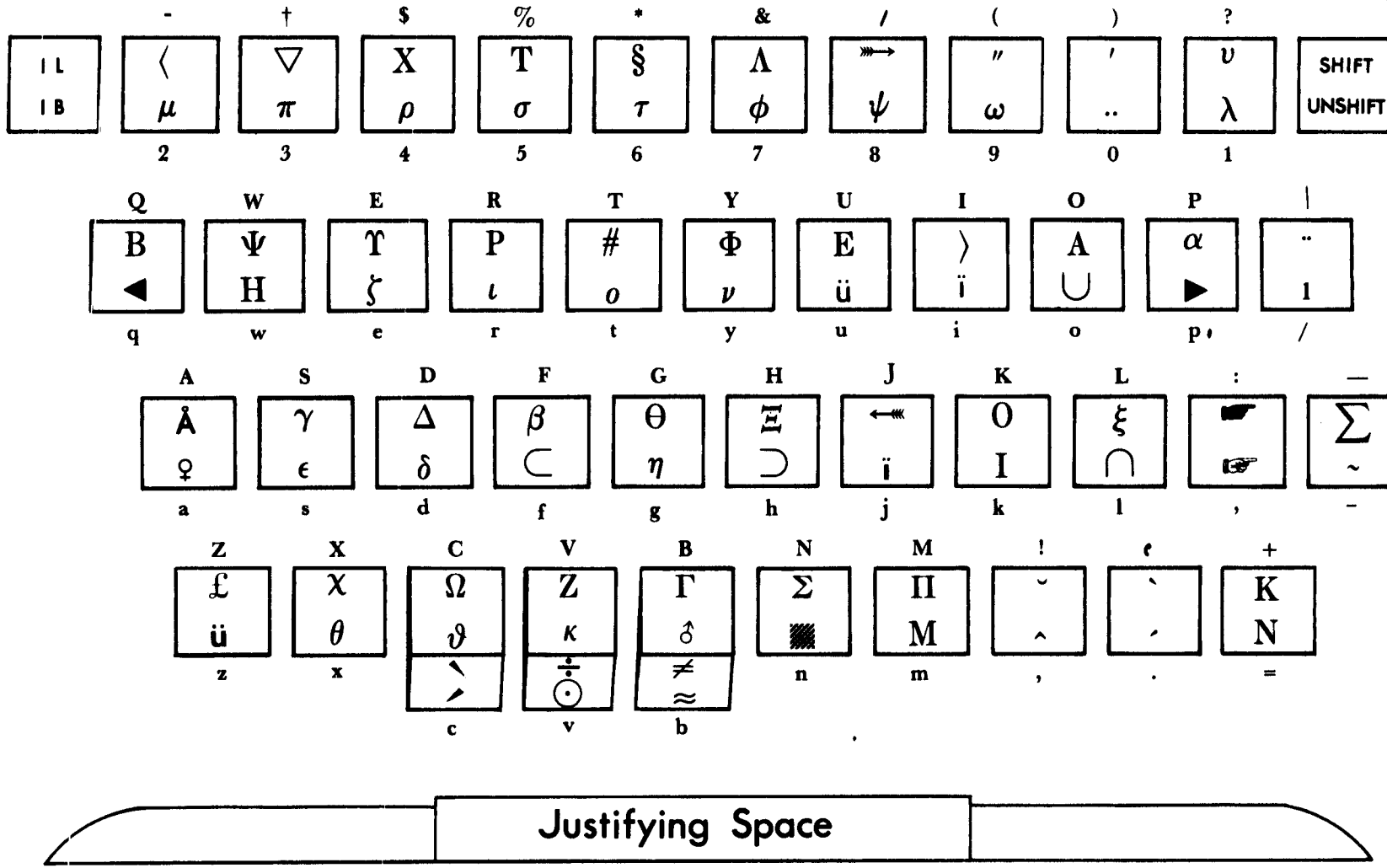
As additional aids, wall charts were prepared for the composing room. One of these showed all characters, in all fonts, upper and lower case, and control shift or unshift condition. Another showed the Greek alphabet in order, both upper and lower case, with the font, case, and the character on the Justowriter keyboard to be stroked. These proved to be an invaluable aid in the training program. The same source documents from which previous issues of the journals were composed were used for practice material, thereby enabling the operators to gain valid experience without interfering with current schedules.

Changeover. Converting from Photon keyboard operation to tape operation is not a step to be taken overnight. Documentation Incorporated spent better than six months testing the equipment, training operators, and implementing a gradual changeover. Live composition via tape began with the smaller of the two journals photocomposed by the Facility. Over several issues the proportion of the journal composed from tape was increased until full tape production of the small journal was achieved, and then composition of the larger journal was similarly phased over to full tape production. "Full tape production," incidentally, does not preclude the use of the Photon keyboard. Abstracts which contain complex mathematical expressions or which make extensive use of special characters are still set on the Photon keyboard. While most of these can be set with tape, Documentation Incorporated has found that composition time is much greater and the error rate much higher for this type of material. Since this comprises only a very small percentage of the workload, it can be set directly on the Photon without significantly affecting total capacity.



Note that control signals and special characters available only in Control Shift condition are engraved on the vertical faces of the keys.

Figure 6. Keyboard Modified LCC-Justowriter



Reference charts are necessary because special characters must be positioned to match key escapement of basic font rather than in any logical arrangement. Note that Greek characters are not located on the keys corresponding to the English equivalents, nor are the upper and lower case of the same character on the same key.

Figure 7. Special Character Reference Chart - LCC Justowriter

After the conversion was completed and refined, evaluation showed that by acquiring four Justowriters and converting to tape operation, the Facility had approximately tripled its photocomposition capacity at less than half the equipment cost of adding a single on-line photocomposition machine.

PHOTOCOMPOSED INDEXES

Meanwhile, the MEDLARS (MEDical Literature Analysis and Retrieval System) project at the National Library of Medicine (NLM) was getting underway. By 1963, Index Medicus was being produced by computer print-out. At first, this was straight upper case chain, but early in 1964, NLM was using an upper and lower case chain, and by August of that year, had implemented the full GRACE (GRaphic Arts Composing Equipment) system.

GRACE is a high-speed photocomposition device with a magnetic tape input. Instead of a rotating disc, it utilizes a fixed grid with a maximum of 227 characters, each with its own light source. Normalization of characters to the center line is accomplished by multiple reflection of the character images between a pair of parallel mirrors. Placement of characters on the line being set is accomplished by an oscillating lens. In operation, GRACE reads the information required for a line of type from the magnetic tape into storage, and calculates the sequence and interval for flashing the required characters. Then, as the lens moves across the line, each character is flashed at the instant when the lens is in the position where it will focus the character image on the appropriate spot on the photographic medium (paper or film). This is accomplished at the rate of 1-1/2 full-page lines per second, or for six-point type approximately 300 characters per second. The quality closely approaches that of letterpress; however, it is not fully justified.

Within a few months after the initial implementation of GRACE, studies and negotiations were under way to determine the technical and administrative feasibility of using GRACE for the production of STAR indexes. By the summer of 1965, Documentation, Inc. had demonstrated the technical feasibility by using actual production tapes to produce sample indexes on GRACE, and shortly thereafter, NASA and the National Library of Medicine had worked out an arrangement for the regular production of STAR Indexes on GRACE. This agreement went into effect with the first issue of STAR for 1966 (Figure 8).

The proportional spacing of the GRACE type font permitted the use of a three-column format in the indexes, and another net saving of 25% in the number of pages required for each index.

shaft seals - pump seals
[AECL-2249] c15 N66-13673
PUMPING
Chemical pumping of lasers - eye damage in monkeys from laser irradiation
[U-3259] c16 N66-13799
Unconventional methods for influencing fluid flow - thermal pumping devices using capillarity, thermocapillarity, osmosis, and thermoosmosis
[AFAPL-TR-64-133, PT. III] c33 N66-14025
PURIFICATION
Preparation and purification of tritiated geranyllinalol on silica gel
[EUR-2531.F] c06 N66-13590
Study of segregation behavior of inorganic fluoride impurities in lithium fluoride to appraise zone melting methods for obtaining high purity lithium fluoride
[ORNL-3658] c06 N66-13884
Uranium purification by floating zone method - metallurgy
[CEA-R-2767] c06 N66-13925
Glove box argon atmosphere purification plant capable of very low impurity levels
[AERE-M-1491] c11 N66-14165
PYROLYSIS
Silicon epitaxial film fabrication by pyrolytic decomposition of silicon tetrachloride
[TG-731] c06 N66-14019
PYROLYTIC GRAPHITE
Irradiation testing of spherical fueled-graphite element containing pyrolytic carbon-coated fuel microspheres
[ORNL-P-1507] c22 N66-13910
Metal diffusion in pyrolytic graphite
[LMSC-6-75-65-27] c17 N66-14209

Q

QUALITATIVE ANALYSIS
Flame photometric determination of palladium - qualitative chemical analysis
[JEN-148-DQ/I-49] c06 N66-13863
QUALITY CONTROL
Probabilistic modeling and stochastic process investigations to provide measures of quality of performance and reliability for systems engineering - Chebyshev approximation
[NASA-CR-68700] c19 N66-13505
Product development, quality control of crystal mixers and semiconductor diodes
[QPR-1] c09 N66-13615
Quality control and reliability of rotary hydrostatic and hydrodynamic face-type shaft seals - pump seals
[AECL-2249] c15 N66-13673
Environmental testing - analysis of spacecraft failures during thermal vacuum testing - quality assurance and spacecraft reliability c31 N66-14120
QUANTITATIVE ANALYSIS
Measurement errors and empirical dependencies
[TT-65-50008] c23 N66-13442
Polarography, electrochemistry, and quantitative analysis of sulfhydryl, disulfide and thiocyanate compounds used as radiation protective agents
[REPT.-241] c06 N66-13616
Atomic absorption spectroscopy of cadmium in stainless steel - quantitative analysis
[ARL/MET-244] c06 N66-14081
Quantitative analysis of plutonium by potentiometric titration of cermet samples
[AERE-R-4975] c06 N66-14166
QUANTUM MECHANICS
Path integrals in dynamics - quantum mechanics and classical wave motion in one dimension
[REPT.-1] c16 N66-14317
QUARTZ
Modification of quartz crystal unit test set
[ECOM-2618] c09 N66-13796
Design of guartz crystal filters for high frequency and very high frequency application in electronic equipment
[ECOM-2615] c09 N66-14314
QUARTZ TRANSDUCER
Quartz and lead zirconate transducers for quantitative measurements of weak detonations
[ISL-T-16/63] c14 N66-13533
QUENCHING
Method for estimating atmospheric noise amplitude and phase error distribution in quenched very low frequency receiving circuits
[AFCRL-65-678] c07 N66-14318
QUEUE
Single line queueing system with losses for use in information processing c07 N66-13307

R

RADAR
Abstracts of U.S.S.R. radio electronics - radar, receivers, interception devices, antennas data transmission systems, noise, telemetry, and range and direction finders
[AID-U-64-15] c07 N66-13751
RADAR ALTIMETER
Feasibility of generating microwave signals from solid state sources and design of varactor multipliers for use in development of solid state radar altimeter
[NADC-AE-6510] c14 N66-13685
RADAR BEAM
Radar beam refraction correction based on approximate solution to differential equation for ray path
[WRE-TN-TRD-13] c07 N66-13502
RADAR CHAFF
Feasibility of using radar chaff for stratosphere temperature measurements
[ECOM-5012] c20 N66-13602
RADAR DISPLAY
Frequency modulated sweep integrator for quantitative radar displays
[RR-37] c07 N66-13803
RADAR OBSERVATION
Rotation of planet Mercury from radar observation explained by solar gravitational torque on tidal deformation and equatorial plane asymmetry
[NASA-CR-68703] c30 N66-13573
Radar studies of seasonal and daily variations of concentration, intensity, and other properties of echoes from clear sky
[T-R-460] c13 N66-13748
RADAR REFLECTOR
Relation of liquid water content and intensity of precipitation to radar reflectivity of meteorological entity with various parameters of drop-size distribution
[T-R-481] c20 N66-13749
RADIATION
Exact solution for radiation from parallel plates and corrugated surfaces excited by waveguide using Fourier transform and periodicity properties of unknown functions
[AFCRL-65-653] c07 N66-13579
Method for reducing radio frequency interference resulting from radiation at spurious frequencies by utilizing frequency sensitivity of grating reflectors
[RADC-TR-65-186, VOL. V] c07 N66-13808
RADIATION ABSORPTION
Wheeler-Feynman absorber theory of radiation
[AFCRL-65-752] c23 N66-13584
Fission-fragment irradiation effects on stainless steel and Zircaloy 2
[BMI-X-10134] c22 N66-13961
Radiation induced decomposition of millimolar concentrations of hydrogen peroxide in aerated pure water
[USNRDL-TR-903] c06 N66-14004
Effects of ionizing X-and gamma radiation on deoxyribonucleic acid
[EUR-2471.F] c04 N66-14092
Electrical and optical properties of semiconductors - irradiation effects, and low temperature studies of semiconductors
[AD-623397] c09 N66-14185
RADIATION EMISSION
Airborne measurement of microwave radiation emission from earth surface and atmosphere c13 N66-14149
RADIATION EXPOSURE
Radiation damage in silicon and germanium induced by exposure to high energy electrons and protons
[NASA-CR-68567] c26 N66-13643
RADIATION FIELD
Computation of flow of receding radiation from atmosphere by means of artificial satellite measurements - anisotropy of radiation field c13 N66-13781
Energy transportation by reflected, surface wave, and radiation fields during excitation of dominant transverse magnetic surface wave on axial-cylindrical reactive surface
[NASA-TN-D-3180] c07 N66-14152
RADIATION HAZARD
Shielding problems in manned space flight - hazards of solar flares
[NASA-CR-68578] c29 N66-13635
Chemical pumping of lasers - eye damage in monkeys from laser irradiation
[U-3259] c16 N66-13799
RADIATION MEASUREMENT
Counters for detecting plutonium in human lungs - multiwire proportional counters for measuring particles inhaled at plutonium 239 fueled nuclear reactor sites - radiation measurement
[AEEW-M-526] c14 N66-14095
RADIATION PROTECTION
Polarography, electrochemistry, and quantitative analysis of sulfhydryl, disulfide and thiocyanate compounds used as radiation protective agents
[REPT.-241] c06 N66-13616
RADIATION RESISTANCE
Chemical synthesis of polyimidazopyrrolones, radiation resistant polmers
[NASA-TM-X-57034] c06 N66-13499
RADIATION SHIELDING
Annotated bibliography on charged particle motion in magnetic fields and on space radiation magnetic shielding
[NASA-CR-68657] c25 N66-13563
Shielding problems in manned space flight - hazards of solar flares
[NASA-CR-68578] c29 N66-13635
RADIATION SOURCE
Negative ion radio frequency source with ion beam energy approaching duoplasmatron type sources
[AWRE-NR-1/65] c25 N66-13591
Evaluation of six foot spherical integrator as wide angle source for calibration of radiometers in Tiros satellite c14 N66-14104
Carbon arc testing program - high powered arc used as solar simulator source
[AEDC-TDR-64-13] c11 N66-14168
RADIATION SPECTRUM
Rigidity response of ionization chambers in upper atmosphere and deep space - rigidity dependence of solar cycle modulation of primary cosmic ray spectrum c29 N66-13356

Produced on GRACE by inter-agency agreement between NASA and the National Library of Medicine. Proportional spacing permits three-column format and greater density of entries. Compare with Figures 4 and 5.

Figure 8. Portion of Star Index Page

PHOTON 713

With the continued growth of the number and size of announcement media produced by the Facility, even the expanded capabilities of the paper-tape driven Photon 200 were soon stretched to the limit—even more capacity was needed. After considerable study and investigation, Documentation, Inc. procured a Photon 713 for use at the Facility. This device is less versatile than the Photon 200, having the capacity for only eight fonts and eight point sizes (against 16 and 12 respectively for the 200) but it is three to five times faster. Further, the model procured is capable of operating from either paper or magnetic tape.

Equipment Description

The Photon 713 is essentially a compromise between the Photon 200 and GRACE, employing some of the principles of both. The point size lenses are in a rotatable turret as in the 200, but the rotating disc of the 200 has been replaced by a cylinder, with character matrixes on film strips. Normalization to the center line is accomplished by a combination of mirrors and a beam splitter. While the 713 uses a travelling mirror for character placement, the mirror moves in fixed-length increments of approximately 5 character widths. Placement of characters within these increments is accomplished by varying the timing of the flash impulse as in the GRACE, except that in the 713, it is the movement of the cylinder rather than the lens which shifts the optical axis.

In operation, the 713 reads data from the tape (paper or magnetic) a line at a time into storage, decodes it, makes justification and spacing computations, encodes the data into its own codes and commands the flash, window, travelling mirror, and leading mechanism at the appropriate times. Normally, this is accomplished at a rate of approximately 30 characters per second, but, by cutting the number of fonts to four and providing two sets of characters for each font (thereby reducing the average time required to bring a given character into position), this can be increased to 50 characters per second.

Implementation

Since the character codes for the 713 are not compatible with the codes for the 200, the first step in putting the equipment to use was preparing a computer program to convert paper tape prepared on the LCC's for the 200 to paper tape for the 713. This is essentially an "idiot" conversion (character-for-character), which will make it possible to use either machine without changing either the input devices (LCC's) or keying instructions.

The second phase of implementation involves taking advantage of the capabilities of the computer to accomplish at least the following:

a. Free the operator of the necessity of making end-of-line decisions (computer hyphenation) to increase keying speed.

b. Provide the ability to proof and correct copy from computer printouts (using the upper and lower case chain), to eliminate the costly cutting-in of corrections on photocomposed galleys.

c. Strip and compose citations from data on the Document Data magnetic tape file to eliminate double-keying.

d. Accept magnetic tape input from other sources for photocomposition.

NASA-Langley, 1966 CR-62031