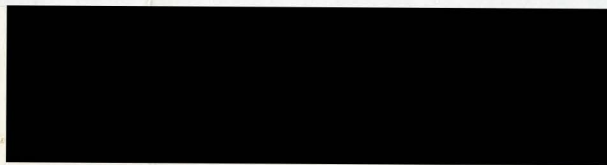


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SUNDAY JANUARY 25, 1970

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Hot Vapors Provide Low-Cost Laser Light

Heated mixtures of metal vapor and helium gas are being used at Bell Telephone Laboratories to make ultraviolet, visible, and infrared lasers. The new continuous-wave lasers are among the most efficient presently available and yet their simple construction could make their costs comparable with those of the least expensive existing lasers.

The new lasers use vapors of cadmium, tin, and zinc, and operate at temperatures ranging from 200° C to 1000° C. The main component of the lasers is a simple glass or quartz discharge tube such as is used in helium-neon lasers. Metal pellets placed in smaller side tubes attached to the discharge tube supply the required vapor.

Cadmium vapor is used to generate ultraviolet and blue laser lights. Tin vapor produces red and zinc produces infrared light. Possible applications for the ultraviolet laser include photochemistry, Raman spectroscopy, and photobiology.

The blue continuous-wave cadmium laser could offer high performance at low cost, having produced 150 mW in a one-meter-long cavity at an efficiency of 0.05 percent. Holography, Raman spectroscopy, and the pumping of parametric oscillators are some immediate uses for this laser. It also shows possibilities for use in color television.

Lasers using the vapors of tin and zinc were produced to show that excitation mechanism is not limited, or unique, to cadmium but can be created in many other metals.

What the Technical Manager Ought to Do

Every once in a long time, a meeting sponsored by a group is so outstanding that all those who attend feel that the IEEE members who didn't bother have really missed a great opportunity.

This was the case at the Engineering Management meeting on December 10. About 30 members attended to hear William Maas, president of Technology Communication, Inc., and founder of The Innovation Group Program talked on "What the Technical Manager Ought to Know to be as Important as He Should Be." Where was the rest of the Engineering Group members? Or the rest of the section? No matter—those of us who attended learned a great deal at the most interesting talk I have attended in several years. The meeting formally adjourned at 8:30 p.m.; by 9:30, most people had started to drift out of the room—the informal talk with Bill Maass was so compelling it was hard to leave. A group of us die-hards adjourned to the Haymarket Lounge in the Hilton to continue the subject. Those who did not come missed a great meeting!

But don't despair. You can receive some of Bill Maass's stimulating thinking if you join The Innovation Group. This program is set up for those who are professionally concerned with the effective management of advancing technology. Included in the dues is a subscription to the journal *Innovation*, and 12 monthly issues of *The Innovation Group Newsletter*. Members also go to seminars, confer with experts via long-distance phone on problems confronting your company, and take in Conference/Tours,

such as one to Japan in 1970.

If you are interested—and all who are managers or wish to become one should be—write for further information to: William Maass, president, Technology Communication, Inc. 265 Madison Ave., New York, New York 10016.

Remember that continuing education takes all forms. This is one of the most informative and the best.

Ruth L. Oldfield
Executive Editor

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IEEE calendar

Jan. 12: Calumet Subsection

"Hazardous Areas—Problems and Answer," by R. Loewe, Sargent and Lundy. Dinner and meeting at Phil Smidt's Restaurant, 1205 Calumet Ave., Hammond, Ind. Social hour, 5:30 p.m.; dinner, 6:30 p.m.; meeting, 7:30 p.m. For reservations, phone Cleo (219) 659-0025 or (312) 768-6686.

Jan. 15: Engineering Management

"Simplified Project Planning and Control," by T. D. Puckorius, Booze, Allen & Hamilton. All you can eat smorgasbord at Nielsen's Restaurant, 6475 Mannheim Road, Rosemont, Ill. Call Mina Mershon, Allen-Bradley Company, 922-9302, for reservations.

Jan. 20: Microwave Theory and Techniques

"Some Technical Aspects of Microwave Radiation Hazard," by W. W. Mumford, Bell Telephone Laboratories. Social hour, 6:00 p.m.; dinner, 6:30 p.m., at King's Palace Restaurant, 4315 Lincoln Ave., Lisle, Ill. (Highway 53 and East-West Tollroad). Meeting at 8:00 p.m. at Bell Telephone Laboratories, East-West Tollroad and Naperville Road.

Jan. 25: Showtime

"Everybody Loves Opal" with Martha Raye, at the Martinique Restaurant, Drury Lane Theatre. See advertisement, p. 2.

Jan. 15: ComTech

"Memory Systems," by J. P. Shuba, at Automatic Electric Laboratories, 400 N. Wolf Road, Northlake, Ill. Prime rib dinner, 6:30 p.m.; cost, \$4.50. Meeting, 7:30 p.m. Call ComTech, ES9-4300, ext. 653 for reservations.

Jan. 22: Chicago Section

"Small Computers," by A. H. Michels, Digital Equipment Corp., at Old Orchard Country Club, Rand and Euclid Roads, Mt. Prospect, Ill. Social hour, 5:30 p.m.; dinner, 6:30 p.m.; paper, 7:30 p.m. For reservations, call the Electronic Secretary, (312) 764-5000.

Jan. 22: Electrical Insulation

"Solid Dielectrical for High Voltage Insulation," by E. E. McIlveen, The Okonite Company. At Nielsen's Restaurant, 6475 Mannheim Road, Rosemont, Ill. Dinner, 6:30 p.m.; meeting, 7:30 p.m. Call W. R. Hayes, YA 7-1420, or R. A. Gregory, 973-6367, for reservations.

CHICAGO SECTION REGULAR MEETING: JANUARY 22

Architecture and Applications of Small Computers

A. H. MICHELS

A multiple of small general purpose computers exist today, each having both size and cost properties that render them ideal for dedicated operations that heretofore were not cost-justified. In addition, the large number of diverse machines currently available sometimes confuses and generally makes difficult selecting a computer for traditional applications.

Of principal importance in selecting a small computer the following:

1. Cost
2. Architecture
3. Program ability and supporting hardware
4. Speed
5. Size
6. Machine and supplier reliability

From the standpoint of these criteria, machines such as the PDP-8, PDP-11, PDP-12, and PDP-15 will be evaluated and compared for typical applications, to provide an overview of mini- and medi-computers.

A small computer will be set up and demonstrated, and a copy of the Digital Equipment Corporation *Application Handbook for Small Computers* will be distributed to all who attend.



MICHELS

The paper will be presented by Allen H. Michels, sales manager of the Chicago district for Digital Equipment Corporation. Michels is a graduate of Illinois Institute of Technology, where he majored in mathematics and physics. Prior to joining DEC, he was marketing manager for the Magnetic Recording Division of Ferroxcube Corporation, a subsidiary of N. V. Phillips. Before that, he was with Nuclear-Chicago Corporation, first as an applications engineer and then as manager of marketing and prod-

uct planning for physical science.

The meeting will be held on January 22 at the Old Orchard Country Club, Rand and Euclid Roads, Mount Prospect, Illinois (about one mile northwest of the Randhurst Shopping Center). Social hour, 5:30 p.m.; dinner, 6:30 p.m.; paper, 7:30 p.m. For reservations, call the Electronic Secretary at (312) 764-5000.

Those members who are trying to organize a Northwest Subsection should really turn out for this meeting, which has been scheduled right in their territory.

JANUARY 22

Electrical Installation Group

The Electrical Insulation Group will meet on January 22, 1970, at Nielsen's Restaurant, 6475 Mannheim Road, Rosemont, Ill. Speaker will be E. E. McIlveen, The Okonite Company, who will speak on "Solid Dielectrics for High Voltage Insulation."

Extra high voltage power transmission (345 to 700 kilovolts) sets severe requirements for the solid and composite dielectrics used in underground power transmission. McIlveen will discuss selection of these dielectrics.

E. E. McIlveen is an engineering graduate from Rutgers University, and has done subsequent work for a higher degree in mechanical engineering at the Polytechnic Institute of Brooklyn. After a brief period with Western Union Telegraph Company, he joined The Okonite Company in 1941 as a research engineer. He was appointed to his present position of vice president, engineering, in 1968.

McIlveen is a member of many technical societies, including IEEE and the Insulated Power Cable Engineers Association, and the author of numerous technical papers on high voltage insulation technology.

Dinner with the speaker will be served at 6:30 p.m., with the talk following at 7:30 p.m. As the size of the meeting determines the meeting room, everyone who plans to attend, with or without dinner, is asked to notify either William R. Hayes, YA 7-1420, or Richard A. Gregory, 973-6367, as early as possible.

JANUARY 20

Microwave Radiation Hazards

Man's ability to generate microwave power has been increasing at the rate of about 15 db per decade. Experiments performed by subjecting animals to high power indicate that hazards to personnel could exist if appropriate safety measures are not adopted and observed.

William W. Mumford, Bell Telephone Laboratories, will review the history of the recognition of this potential hazard and will describe the safety measures adopted by the Bell System, the USASI, and others to protect personnel. He will show that heat stress in humans due to r-f radiation shows a reasonable relationship between the radiation protection guide limit and the temperature humidity index.

Mumford's (A '30, SM '46, F '52) contributions to the microwave field include filters, directional couplers, wideband coaxial-to-waveguide transitions and the gas-discharge noise generator. He co-authored the books *Radar Systems and Components* and *Noise Performance Factors in Communications Systems* and was a contributor to the Reinhold *Encyclopedia for Electronics*.

Mumford received the IEEE Morris E. Leeds Award in 1967 and an alumni citation from Williamette University in 1968.

Cocktail hour, 6:00 p.m.; dinner, 6:30 p.m.—both at the King's Palace Restaurant, 4315 Lincoln Ave., Lisle (Highway 53 and the East-West Tollroad). Meeting, 8:00 p.m. at Bell Telephone Laboratories, Naperville. Reservations must be made by January 19 by calling Dr. P. P. Toullos, 225-9630, ext. 4014.

JANUARY 15

ComTech Meets MEMORY SYSTEMS

On January 15, all members of IEEE are invited to a ComTech meeting at Automatic Electric Laboratories to hear J. P. Shuba discuss "Memory Systems."

Present research and development efforts in memory technology will not, except in certain special cases, have any immediate, dramatic effects on computer memory hierarchy and, in turn, on the computer users. Instead, developments will continue in an evolutionary manner with present techniques being gradually displaced by more economical ones. In general, memory speeds and capacities will increase, costs will decrease, and bit densities will be greater.

Patrick Shuba will discuss memory systems that are now available or potentially available in the near future. In particular, important memory systems that are now in or near production will be considered, including some of the more promising memories still in the research and development phase. Cost influencing parameter such as storage capacity, speed, power, and reliability will also be discussed.

J. P. Shuba received his BS in electrical engineering from the University of Illinois. After graduation, he worked in the Advanced Development and Defense Electronics Products Division at RCA. In December, 1957, he joined the Applied Research Laboratory of Automatic Electric, and was engaged in the development of line and ringing circuitry for electronic switching systems. Shuba is now manager in the Electronic Switching Techniques Section of the Materials and Apparatus Laboratory, where he is responsible for memory development. He is a member of IEEE and a Registered Professional Engineer in Illinois.

Meeting will be held at Automatic Electric Laboratories, 400 N. Wolf Road, Northlake, Ill. Prime rib dinner, will be served at 6:30 p.m.; cost, \$4.50. Meeting starts at 7:30 p.m. For reservations, call ComTech, ES 9-4300, ext. 653. Coordinator for this meeting is Mel Jacobs.

The Calumet Subsection

Hazardous Areas—Problems and Answers

Robert Loewe, Sargent and Lundy, will address the Calumet Subsection on January 12, 1970, on "Hazardous Areas—Problems and Answers." He will discuss methods available to meet the requirements of the National Electrical Code in designing electrical installations for various types of hazardous areas. Loewe will examine the advantages and disadvantages of explosion-proof housings, intrinsic safety, purging and pressurization, physical isolation, etc. He will also suggest how to proceed when substances not listed in the National Electrical Code are encountered.

Loewe is eminently qualified to cover this subject. At present, he is head of the Electrical Specifications Department, Sargent and Lundy, Engineers. A partial listing of his extensive experience includes administrative and engineering positions with Argonne National Laboratory, Allis-Chalmers Manufacturing Company, and Commonwealth and Southern Corporation.

His technical society affiliations include senior member, IEEE, and a member of the Manufacturing Subcommittee of Petroleum and Chemical Industry Committee; senior member, ISA; member IES; associate member, NFPA; and member, ISPE and NSPE.

Loewe is a Registered Professional Engineer in Wisconsin, Illinois, and Indiana. He earned his BS and MS in electrical engineering at the University of Wisconsin.

Meeting will be held at Phil Smidt's Restaurant, 1205 Calumet Ave., Hammond, Ind. Social hour, 5:30 p.m.; dinner, 6:30 p.m.; meeting, 7:30 p.m. For dinner reservations, phone Cleo (312) 768-6686 or (219) 659-0025.



LOEWE

Engineering Management

The Engineering Management Group will meet January 15 at Nielsen's Restaurant, 6475 Mannheim Road, Rosemont, Ill. Speaker will be by Theodore D. Puckorius, Booze, Allen & Hamilton, who will discuss "Simplified Project Planning and Control."

During the last ten years, specialized project planning and control techniques have been developed and installed in the aerospace and construction industries. These PERT and CPM techniques have generally been disappointing in the commercial manufacturing environment because they are too complex, too slow to respond, and too expensive. As a result their disadvantages outweigh their usefulness.

A new technique has been developed matching the advantages of network systems with the requirements and environments of manufacturing companies. This new technique involves the application of sound industrial engineering principals to the planning process and is based on six basic tasks: simplified organization; project breakdown structure; standard networks; specialized computer processing; automatic adjustment of priorities; and reports specifically tailored to management's needs.

Puckorius will review basic tasks to be performed and outline the overall systems objectives, method of accomplishment, and benefits of this method.

Puckorius, a vice president is managing officer of the Project Management and Control Division of Booz, Allen & Hamilton, Inc.

Make reservations by calling Mina Mershon, Allen-Bradley Company, 922-9302.

Dr. John V. N. Granger Elected IEEE president

Dr. John V. N. Granger, chairman of the board of Granger Associates at Palo Alto, California, has been elected president of IEEE for 1970.

Dr. Granger succeeds Dr. F. Karl Willenbrock, Provost of the Faculty of Engineering and Applied Sciences at the State University of New York, Buffalo. He will preside over the activities of the world's largest engineering society, having some 160,000 members located throughout the world.

Dr. James H. Mulligan, Jr., executive secretary of the National Academy of Engineering in Washington, D.C., was elected vice president for 1970. When the Institute's Annual Assembly meets in January, 1970, two additional vice presidents for 1970 will be elected.

Dr. Granger has been a teaching fellow in Physics and Communications at Harvard University, instructor in the pre-radar school for Army and Navy officers, and was also a project engineer in the Radio Research Laboratory there, worked on UHF search and intercept receivers and on development of airborne VHF direction finders and homing systems for missiles. During World War II he served the U.S. Ninth Air Force and the First Tactical Air Force in planning and evaluating radar countermeasures. Returning to Harvard, he became a group leader in the Electronics Research Laboratory, writing his doctoral thesis on low frequency aircraft antennas.

Dr. Granger is the author of numerous published papers on aircraft antennas and airborne communications. He received the Eta Kappa Nu award as the "Outstanding

APRIL 7-9 NEPCON in Midwest

The National Electronic Packaging and Production Conference (NEPCON) previously on the east and west coasts, will present a conference in Chicago. Called NEPCON 70 CENTRAL, it will be held April 7 to 9 at the Sherman House.

This Midwest version of NEPCON will provide Midwest engineers with the opportunity to see first-hand, the machines, materials, and methods for prototype development and production. Technical sessions will emphasize circuit packaging and production techniques involved in consumer, industrial, and computer electronics.

NEPCON 70 CENTRAL will feature 300 exhibits of machines, tools, materials, hardware, and supplies needed to produce electronic equipment. In addition, over 100 technical papers will be presented. Three "Professional Advancement Courses" will each provide a three-session intensive education on electronic manufacturing techniques.

For early information, and complimentary tickets, call or write to Industrial and Scientific Conference Management, 222 W. Adams Street, Chicago, Ill. 60606, (312) 263-4866.

Young Electrical Engineer" for 1952, and the IRE "Pacific Electronics Achievement Award" for 1955. He is a Fellow of IEEE and a Fellow of the Electronics Institution of East Africa.

He joined Stanford Research Institute in 1949 to organize and supervise the antenna research program. At his resignation to form Granger Associates in 1956, he was assistant director of the engineering division.

Survival in the Seventies

The Engineering Manager, a new 154-page book featuring the theme "Survival in the Seventies" is now available from the Instrument Society of America (ISA).

The book comprises proceedings of the 17th Annual Joint Engineering Management Conference, held October 1969, in Montreal, Canada. Hosted by The Engineering Institute of Canada, the conference was co-sponsored by ISA and four other technical/engineering societies.

The 16 papers in the book present a rational and systematic look at the engineering manager's challenges and opportunities in the 1970's. Four areas are covered: *Challenges of the Changing Environment* deals with the role which environmental considerations play in the growth of the electric utility industry, union trends in engineering, the influence of government on standards, and a new professionalism for engineering management. *Challenges of Exploding Technology* focuses on the communications and computer technologies, bridging the knowledge gap, creative dissemination of technical information, and transferring new technology from laboratory to market. *Challenges of Emerging Individualism* discusses people and approaches in engineering education, recruitment and development of technical manpower, the credibility gap, and motivation and utilization of technical manpower. *Restructuring for the Seventies* entails the PERT computerized review technique, a universal approach to complex system design, the engineering manager's social responsibilities, and a new philosophy for engineering management.

Seven commentary papers presenting different viewpoints are also included.

The Engineering Manager is priced at \$5.00. A limited supply of the '68 volume, Computer Impact on Engineering Management, encompassing methods utilized by engineering managers to effectively use the computer as well as future aspects of computer utilization, is also available at the same price.

Send check, money order, or company purchase order to: Instrument Society of America, Publications Department, 530 William Penn Place, Pittsburgh, Pa. 15219.

IEEE Launches Cassette Recording Program

A new program, entitled "Cassette Colloquia" has been inaugurated by the IEEE. This program is designed to fill an existing gap in techniques used by the Institute to keep its members abreast of rapid changes in technology, while simultaneously augmenting many of its present programs.

This continuing series will stress tape recordings in Cassette form of special seminars, workshops, sessions, and the like conducted by IEEE, the contents of which appear to have immediate value to a wide audience and for which most likely no other permanent record will exist.

The first offering in this continuing series is a recording of a workshop entitled "Industrial Programming Languages" or IPL-'69. A group of distinguished panelists, led by author and contributor Eric Weiss, took a hard look at the current status of languages for process control and suggested numerous ways in which improvements could be made in both specifying languages and designing new systems.

The IPL-'69 cassette uses electronic speech compression (a technique which, in effect, "speeds up" the delivery of the speaker without changing the pitch of his voice). The Question and Answer session that follows was kept at "normal" delivery rate. This approach in conjunction with editing, permitted the "packaging" of approximately 2½ hours of material into about 75 minutes of final cassette.

In addition, the Institute plans to offer a coordinated package of taped commentary and visual material. Current plans include offerings to be made in conjunction with the IEEE 1970 International Convention and Exhibition. Selected subjects from the technical program will be recorded during the Convention, and offered, shortly thereafter, in conjunction with a complete set of the authors' visual material as published in the Convention Digest. Other possibilities are also under review.

"Cassette Colloquia" has been initiated by the Educational Activities Board of IEEE as part of its Continuing Education Services.

Cassettes are available from IEEE through: Cash Receipts, IEEE, 345

Medical Data Retrieved via Pushbutton Telephone

Two investigators in the Division of Computer Research and Technology at the National Institutes of Health have reported that the pushbutton telephone makes an effective and inexpensive computer terminal for retrieving biomedical information. The scientists, Dr. Scott Allen and Michael Otten, described the application of a Touch-Tone telephone and of a portable acoustic coupler that converts any telephone into a pushbutton terminal.

An example was described in which a physician must give emergency fluids to a two-year-old burn victim. The physician punches information into his telephone, including age of the child, weight, height, type of burn (scald or flame), and the percentage of the body surface burned. The computer almost immediately tells him how much colloid, saline, and dextrose in water to administer, and furnishes other information about treatment. Thus the physician does not need to refer to a bookshelf and avoids computational errors. Other illustrative programs include differential diagnosis of certain diseases of calcium and phosphorous metabolism, and information on incompatibility of intravenously administered drugs.

In the audio response or voice answerback service described, possibly a practicing physician who has subscribed to the computer service places a telephone call to a computer center. He uses the pushbutton telephone tones to send a simple coded message. He may be aided by automatic dial plastic cards containing codes for a specific program. The computer answers in a normal speaking voice.

When the portable pushbutton pad is used to convert a dial telephone to a computer terminal the telephone's handset is placed above the coupler to be used as a receiver. The major advantages of the telephone terminal over the electric typewriter is that it is cheap, readily available, and easy to use.

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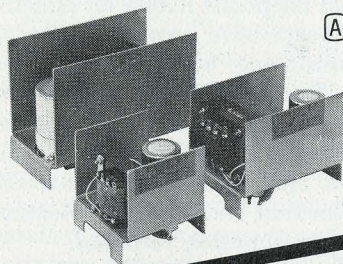
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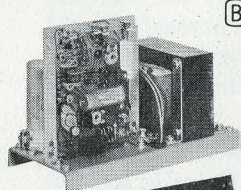
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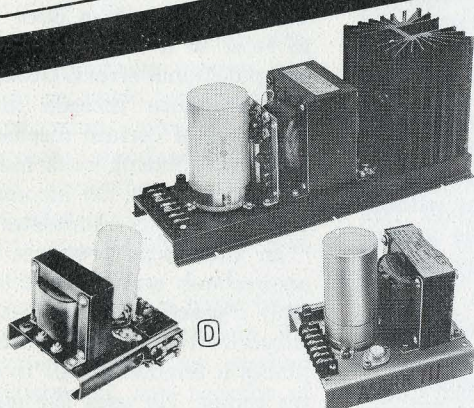


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(C)

MODEL C214-OEM DC SUPPLY (FIG. D)

Specially designed for driving relays, solenoids, motors and other surge-type loads. Provides DC output of 28 volts at 2.5 amps. **AC Input:** 115/230 VAC ($\pm 10\%$), single-phase, 50/60 Hz. **Line and Load Regulation:** $\pm 2\%$. **Ripple:** 0.1% rms + 10 mV. **Operating Temperature:** 0° to 40° C; can be used up to 70° C with derating. **Size:** 6" w. x 5" d. x 5.5" h. **Weight:** 7 lbs.

Wanlass Model	Output Volts	Net Each, Lots of			
		1-9	10-24	25-49	50-99
C214-OEM	28 VDC	\$46.00	\$43.50	\$41.50	\$39.00

MARK III PRECISION REGULATED ECONOMY DC SUPPLIES (FIG. E)

Economy DC power supplies feature excellent regulation and ripple, plus: Adjustable automatic current limiting; overload and short circuit protection; adjustable overvoltage crowbar. Available in nominal DC outputs of 5, 12 and 24 volts; adjustable $\pm 10\%$ with derating. Input and output are through a terminal strip on the open-type chassis, with clear anodized finish. **AC Input:** 115/230 VAC ($\pm 10\%$), single-phase, 47-400 Hz. **Line Regulation:** $\pm 0.1\%$ or 10 mV. **Load Regulation:** $\pm 0.1\%$. **Ripple:** 0.01% rms or 1 mV. **Size:** 6" w. x 5" d. x 5.5" h. **Weight:** 6 lbs.

Wanlass Model	DC Output	Net Each, Lots of			
		1-9	10-24	25-49	50-99
III-OEM5-5	5 V at 5 amps	\$89.50	\$85.00	\$80.50	\$76.00
III-OEM12-5	12 V at 5 amps	89.50	85.00	80.50	76.00
III-OEM24-2.5	24 V at 2.5 amps	89.50	85.00	80.50	76.00

REGULATED DC POWER SUPPLIES (FIG. A)

DC power supplies in ratings of 30, 60 or 120 watts. Feature automatic short circuit protection, floating output grounding (either positive or negative may be grounded), open chassis type construction. Choice of four models in each power rating, with transformer taps and voltage adjustment potentiometer for selection of output voltages from 3.6 to 60 VDC. **AC Input:** 105-125 V, 57-63 Hz, single-phase (47 to 440 Hz with derating). **Regulation:** $\pm 1\%$ for $\pm 10\%$ line change; $\pm 1\%$ for no-load or full load. **Ripple:** 0.1% rms (± 10 mV). **Size:** Model 30-OEM, 5" x 5" x 5"; 60-OEM, 6" x 5" x 7"; 120-OEM, 7" x 5" x 10". **Shipping Weight:** 30-OEM, 5 lbs.; 60-OEM, 7 lbs.; 120-OEM, 12 lbs. 30 OEM-30W or 2.5 A. Max., 60 OEM-60W or 5 A. Max., 120 OEM-120W or 10 A. Max.

Wanlass Model	Voltage Range	Net Each, Lots of			
		1-9	10-24	25-49	50-99
30-OEM-1	3.6-9 VDC	\$46.00	\$43.75	\$41.50	\$39.00
30-OEM-2	9-17 VDC	46.00	43.75	41.50	39.00
30-OEM-3	17-30 VDC	46.00	43.75	41.50	39.00
30-OEM-4	30-60 VDC	46.00	43.75	41.50	39.00
60-OEM-1	3.6-9 VDC	57.50	54.50	51.75	49.00
60-OEM-2	9-17 VDC	57.50	54.50	51.75	49.00
60-OEM-3	17-30 VDC	57.50	54.50	51.75	49.00
60-OEM-4	30-60 VDC	57.50	54.50	51.75	49.00
120-OEM-1	3.6-9 VDC	86.25	82.00	77.75	73.50
120-OEM-2	9-17 VDC	86.25	82.00	77.75	73.50
120-OEM-3	17-30 VDC	86.25	82.00	77.75	73.50
120-OEM-4	30-60 VDC	86.25	82.00	77.75	73.50

DUAL OUTPUT 24 AND 5V DC POWER SUPPLY (FIG. B)

Regulated power supply, ideal for applications using lamps, relays, motors, etc. Also ideal for use with integrated circuits, transistors requiring a separate 5 VDC source of well-regulated power. The 5 VDC output includes an overvoltage crowbar for applications, has temperature coefficient of .05%/°C. **AC Input:** 100-130 VAC, single-phase, 47-63 Hz. **DC Output:** 24 VDC at 2 amps; 5 VDC at 1 amp. **Regulation:** 24 VDC output, $\pm 1\%$ line and $\pm 1\frac{1}{2}\%$ no-load to full-load; 5 VDC output, $\pm 0.1\%$ line and $\pm 0.1\%$, half to full-load. **Ripple:** 150 mV peak-to-peak for 24 VDC; 10 mV peak-to-peak for 5 VDC. **Response Time:** 0.2 msec. **Size:** 8 $\frac{1}{4}$ " w. x 4" d. x 5 $\frac{1}{4}$ " h. **Weight:** 9 lbs. max.

Wanlass Model	DC Output Volts	Net Each, Lots of			
		1-9	10-24	25-49	50-99
D-OEM-1	5 and 24	\$109.00	\$103.50	\$98.00	\$92.50

SERIES IC AND HPIC ALL SILICON DC POWER SUPPLIES (FIG. C)

All silicon solid state power supplies, specially designed for powering integrated circuits, operational amplifiers and MOS circuits. Available in ratings from 3.6 to 60 volts, 1 to 25 amps. Output voltage is adjustable, $\pm 5\%$ minimum, from nominal output. Features "foldback" current limiting and remote sensing. **AC Input:** 100-130 VAC, 47-63 Hz, single-phase. **Ripple:** 5 mV rms maximum. **Recovery Time:** 50-100 μ sec. **Line and Load Regulation:** Standard type IC, $\pm 0.25\%$; high performance type HPIC, $\pm 0.05\%$. **Size:** 60-IC, 11.5" w. x 5.2" d. x 6.0" h.; 120-IC, 15.5" w. x 5.2" d. x 6.3" h.; 200-IC, 17.0" w. x 6.2" d. x 8.0" h. **Weight:** 60-IC, 11 lbs.; 120-IC, 16 lbs.; 200-IC, 27 lbs. For Overvoltage Protection Crowbar, add \$20.00 to price.

STANDARD SERIES IC

Line and load regulation, $\pm 0.25\%$.

Wanlass Model	DC Output Volts	Output Watts	Net Each, Lots of			
			1-9	10-24	25-49	50-99
60-IC-1	3.6-6.3	7.5 A *	\$125.00	\$118.75	\$112.50	\$106.50
60-IC-2	12-15-18	60	125.00	118.75	112.50	106.50
60-IC-3	24-28-36	60	125.00	118.75	112.50	106.50
60-IC-4	48-60	60	125.00	118.75	112.50	106.50
120-IC-1	3.6-6.3	15 A *	170.00	161.50	153.00	144.50
120-IC-2	12-15-18	120	170.00	161.50	153.00	144.50
120-IC-3	24-28-36	120	170.00	161.50	153.00	144.50
120-IC-4	48-60	120	170.00	161.50	153.00	144.50
200-IC-1	3.6-6.3	25 A *	225.00	213.50	202.50	191.50
200-IC-2	12-15-18	200	225.00	213.50	202.50	191.50
200-IC-3	24-28-36	200	225.00	213.50	202.50	191.50
200-IC-4	48-60	200	225.00	213.50	202.50	191.50

HIGH PERFORMANCE SERIES HPIC

Line and load regulation, $\pm 0.05\%$.

Wanlass Model	DC Output Volts	Output Watts	Net Each, Lots of			
			1-9	10-24	25-49	50-99
60HPIC-1	3.6-6.3	7.5 A *	\$150.00	\$142.50	\$135.00	\$127.50
60HPIC-2	12-15-18	60	150.00	142.50	135.00	127.50
60HPIC-3	24-28-36	60	150.00	142.50	135.00	127.50
60HPIC-4	48-60	60	150.00	142.50	135.00	127.50
120HPIC-1	3.6-6.3	15 A *	195.00	185.50	175.50	166.00
120HPIC-2	12-15-18	120	195.00	185.50	175.50	166.00
120HPIC-3	24-28-36	120	195.00	185.50	175.50	166.00
120HPIC-4	48-60	120	195.00	185.50	175.50	166.00
200HPIC-1	3.6-6.3	25 A *	250.00	237.50	225.00	212.50
200HPIC-2	12-15-18	200	250.00	237.50	225.00	212.50
200HPIC-3	24-28-36	200	250.00	237.50	225.00	212.50
200HPIC-4	48-60	200	250.00	237.50	225.00	212.50

*Maximum output current.

WANLASS ELECTRIC COMPANY

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