

they even work toasted!

At 25°, almost any pot can be a hero! But push them right on up to their ambient limits — and design begins to tell. The test-bench engineers will tell you that ACEPOTS have an endearing habit of running with 25°C-reliability at 165°C! That's why they're specified when high temperature operation is important.

Here are ACEPOTS' special design features: a molded insulating bond between contact and shaft to eliminate any play or change

in wiper pressure; an improved higher temperature-resistant winding card, which never changes shape with heat; superior insulation between case and resistance element; and chemical and thermal stabilizing procedures at high temperature prior to final sealing which cure all elements. Which is why, simply, at high temperature — ACEPOTS work. See your ACErep and try them for yourself!



This ¾"ACEPOT®, designed for conservative operation to 165°C, typifies ACEPOTS' utmost reliability throughout full temperature cycling.



ELECTRONICS ASSOCIATES, INC.

99 Dover Street, Somerville 44, Mass.

SOmerset 6-5130 TMX SMVL 181 West. Union WU

Acepot® Acetrim* Aceset® Aceset® CIRCLE 180 ON READER-SERVICE CARD

*Reg. Appl. for

Index Of Articles

January 4 through June 21

All articles are indexed under one or more of the basic categories listed below:

Automatic Control, Servos
Circuits, Mathematical Analysis
Communications, Methods and Equipment
Components (except microwave components, tubes and semiconductors)
Computers, Data Processing, Auxiliary

Devices
Detection, Techniques and Equipment
Human Factors

Industry, General Materials

Measurements, Instrumentation, Tes

Medical Electronics
Microwave Components, Techniques
Navigation and Guidance Techniques
Packaging Techniques, ElectromechanicalTinermal Design, Production Processes
and Equipment
Personal Data
Power Sources
Reliability
Semiconductors, Solid-State Devices
Systems

The kind of article is identified by the following reference keys:

Telemetering

Tubes

ART Article (bylined by an authority)

DD Design Decision

DIG Digest

DYF Designing Your Future

ED Engineering Data

EDN ELECTRONIC DESIGN News

GA German Abstract

IFD Idea for Design

PF Product Feature

RT Russian Translation

AUTOMATIC CONTROL, SERVOS

Flip flops, fluid, when should you use them?.ART p56 June 7 Guidance computer, microminiature, to use 2-D approach..................EDN p8 April 26 Input lever, predetermined, cuts off transistor, sets output......IFD p160 April 26 Nomogram speeds rates, acceleration calculations. ...ED p139 June 21 Pattern recognition, advanced concepts studied...ART p28 March 1 Predictive control, next in computer systems?.EDN p12 March 29 Pulse, short trigger, turns on SCR, fires flash deviation range...........IFD p161 April 26 Servos can be designed corner by cornerART p32 May 24

CIRCUITS, MATHEMATICAL ANALYSIS

Circuits for calculating the functions $U_1 \sqrt{U_2...}$RT p188 June 7 De transmission, low-impedance lines minimize Decimal-counting units made faster by five-binary counting technique ART p34 Jan 18 Detector, circuits, for sequential checkout systemsART p60 March 1 Detector-zero-crossing, feedback helps flip output Diode, ordinary, protects vtvm from overload... Emitter-follower input increased by bypassed Filters, constant envelope-delay ... GA p192 June 7 Generator, square-wave, has 3.3-10 mc range... Hi-Q at low frequencies provided by active filterGA p204 March 1 Lamps, separate, controlled over single line... Limiters, simple phase stable designART p52 June 7 Modified multi generates output gate with each Network properties, incremental-a generalized compensation theoremGA p240 May 10 Networks, all-pass-part 3, their use for highquality delay linesART p44 Feb 15 Networks, all-pass-part 4, reduce ripple and rise Numbers, squares short-cut, rapidly on sightIFD p138 May 24 Phantastrons, step-by-step design. ART p40 May 10 Phase equalizers in a transmission systemGA p168 Jan 18 Phasors simplify differentiating integrating equations of exponentially damped sinusoidsART p66 June 7 Pulse-selection system uses analog techniques.IFD p126 March 29 Pulse generator, a random type .. IFD p197 April 12 Pulse, short trigger, turns on SCR, fires flash bulb...... IFD p157 April 26 Pulse train, continuous, maintains constant output signal IFD p198 April 12 Pulses, clock, bistable switch gates to counting Pulses, transistor trigger, fire tube and blocking Pulsing capacitor eliminates false triggers due to Rf amplifiers, doublers and triplers, calculating the performance ofART p34 Feb 1 Relay-Zener circuit, protects nickel-cad batteries Screen resistor replaced by VR tube in push-pull output stageIFD p226 May 10 Sine- and square-wave outputs provided by feedback around filter IFD p196 April 12 Sine waves converted from square waves by low-Straight line graph yields logs to base 2 quickly ...IFD p172 June 7 Tank circuit, helps stabilize quick-starting gates oscillatorIFD p128 March 29 Transistor switching circuit design, graphical procedureART p40 Feb 15 Tunnel diode, calculator aids amplifier design... Unmatched transformer response determined with aid of curveIFD p170 June 7

COMMUNICATIONS, METHODS AND EQUIPMENT

Antenna arrays, steered, sought for communica-
tionsEDN p4 Feb 1
Antenna ratio, axial: is read out automatically
IFD p134 May 24
Breaking the spectrum strangle-key to microwave
growthART p137 Jan 18
Communications—Design '61, a survey
ART p52 Jan 4
Com system would use variable data rate
EDN p18 Feb 1
Communications, global, gains cited
EDN p4 June 7
Communications, wide-band: designers shifting to
Generator, character, two synchronized crt's used
in EDN p8 Feb 15
Pcm system, new, to sync missile telemetry data
EDN p6 May 24
Receiver calculations aided by sensitivity-noise
figure nomogramsEDN p207 May 10
Telegraph distortion monitor ordered by AF
EDN p26 April 12
Telephone systems, development trends in
DIG p242 May 10
Transmitter, am: demodulator helps measure dis-
tortion
Tropo-link, angle-diversity, to work at 8 Gc
EDN p6 March 29
Troposcatter, air-portable system, to aid missile
TV, digital, to be orbited by NASA
IV, digital, to be orbited by NASA
Space communication, sunlight-modulated, found
feasible
Walkie-talkie, invisible light used
EDN p16 Jan 4

COMPONENTS

(except microwave components, tubes and semiconductors)

Accelerometer uses novel solar-cell sensing
EDN p6 April 26
Air clutch boosts torque, cuts size
PF p60 April 26
Batteries, workhorses of portable equipment
ART p52 Feb 15
Blowers, small, multistable, cool densely packed
miniature equipmentPF p48 Feb 1
Cable capacitance, underground shield reduces ef-
fectiveness
Components limit converter performance how much
ART p52 June 21
Capacitor, "precision", grind your own
IFD p137 May 24
Capacitors, new film, head for market
EDN p8 June 7
Circuit breaker, high speed, adjustable, protects
wide range transistor circuits PF p50 Feb 1
water anige transmission circuits Fr pour col

NEW! Solid State time/delay/relays



...with traditional AGASTAT® reliability!

Now available . . . solid state time/delay/relays with the accuracy essential for critical missile and computer applications! These new AGASTAT relays are the result of over 25 years' time delay engineering and manufacturing experience . . . specialized experience which has made AGASTAT the standard of reliability throughout industry.

Advanced design combines specially selected semiconductors and other components in a "modular-sandwich" configuration. Result: the standard modules mean flexibility; uniformity; and rapid delivery of "custom" produced prototypes. The solid state AGASTAT is hermetically sealed . . . resistant to vibration and shock. Special circuitry protects against input polarity reversal, provides immunity to voltage transients and continuously modified

What are your requirements? These solid state relays are only 1-5/16" sq. ... available in six standard types, with delay on pull-in or drop-out; timing ranges from 0.01 sec. to 10 hours, fixed or adjustable. Operation-18-32 vdc; -55c to 125c; load capacity to 5 amperes. Write Dept. S1-46 for data sheet. Or ask for a quotation on your special application requirements.

TIMING INSTRUMENTS

ELASTIC STOP NUT CORPORATION OF AMERICA **ELIZABETH DIVISION • ELIZABETH, NEW JERSEY**

IN CANADA: ESNA CANADA, LTD., 12 GOWER ST., TORONTO 16, ONTARIO, CANADA

CIRCLE 181 ON READER-SERVICE CARD



Molded mylar* capacitors offering maximum performance and reliability in the smallest practical size. Outstanding stability, and low dissipation factor.



Advanced design miniature mylar capacitors prepared under "white room" environmental conditions. Capacity range: .0015 to .47 mfd. Voltage range: 50, 100, 200, 400 and 600 WYDC.

SIMPLICITY OF DESIGN FOR EFFICIENCY, VERSATILITY



Integrated electronic components providing reliable, compact and economical assemblies with component densities up to 500,000 parts per cubic foot.



A flat-plate resistor assembly of from 2 to 6 resistors in popular values and ratings. Tolerance—5%, 10% and 20%: Power rating—2 watts per assembly.

MAXIMUM PERFORMANCE RELIABILITY AND ECONOMY

* * DUPONT

PAKTRON PACKAGED ELECTRONICS 1 t DIVISION OF ILLINOIS TOOL WORKS 1321 LESLIE AVENUE ALEXANDRIA, VA.

CIRCLE 182 ON READER-SERVICE CARD

INDEX OF ARTICLES

Coaxial switch operates under full waveguide power
Commutators, electromechanical, a survey
ART p44 March 29
Commutators, electronic, a survey
Commutators, representative manufacturers of elec-
tronic and electromechanical types
ART p58 March 29
Commutators, telemetering, a guide to selecting.
ART p40 March 29
Component firms warned of failures in assembly
EDN p22 May 24
Components, Design '61, a survey .ART p58 Jan 4
Connector, microphone, potted in three sections for easy disconnectIFD p194 April 12
Cryostat, tiny, new, cools to 4.2 K, fits in 1 cu
ftEDN p54 March 1
Electrolytic capacitors, de aluminum, application
notes on ripple current ratings ART p46 June 21
Filters, coaxial, low-pass, rapid design of
ART p174 April 12
Filters, harmonic absorption, uses "leaky wall"
principle
EDN p12 Feb 15
Potentiometer, precision, yielded by salvaged tank
coilIFD p192 March 1
Potentiometer that uses light beam for pick off is
headed for productionEDN p24 May 10
Potentiometer's incremental transfer function, how to measureART p42 June 21
Potentiometers, precision linear, how to specify
noise
Printed-circuit boards, damped, reduce vibration
effectsPF p58 April 12
Printed circuits, new, closing a gap in design
EDN p4 April 12
Relay contacts, why do they Fail? DIG p144 May 24
Sockets, transistor test, feature reversible contacts
Switch, high-speed rotary, uses rotating magnet to
close reeds DD n219 May 10
Transformer, frictionless rotary, designed
EDN p12 May 10
Transformer turns-ratio in shock-excited converter
circuits
Wiring block, modular terminal panel
PF p62 April 26

COMPUTERS, DATA PROCESSING,

Analog-digital unit proposed by NBS
DIG p214 March 1
Analog divider, broadband, designed for radars and
analog computersEDN p36 April 12
Analog-to-digital converters, how to evaluate
Card reader, microsecond, at IBM employs capaci-
tive-coupling systemEDN p24 Feb 1
Computer concepts, advanced, reaching hardware
EDN p4 Jan 4
Computer, guidance, also directs ground checks
EDN p14 Feb 15
Computer, guidance, microminiature, to use 2-D
approachEDN p8 April 26
Computer plans, peripheral gains featured at EJCC
EDN p8 Jan 4
Computer systems: next-predictive control?
EDN p12 March 29
Computers, Design '61, a survey ART p64 Jan 4
Computers, designing 3 classes of products
EDN p24 March 29
Computers, use of, noted in design
EDN p18 March 1
Converter, BCD-to-decimal, solid state; available
at low costPF p64 March 15
Converter performance, how much do components
limit ART p52 June 21
Cryostat, tiny, new; cools to 4.2 K, fits in 1 cu ft
Data access console offers simple control of com-
puterEDN p24 March 15
Data channels, 400, handled by raster display
EDN p12 March 15

Decimal-counting units made faster by five-binary
counting techniqueART p34 Jan 18
Disk file, high speed, large, parallel-access, cuts
storage costsPF p82 March 1
Drum memories, 100,000-bit, for sale at \$750
PF p70 Jan 4
Fixed digital memory uses thin silicon wafers
EDN p5 Jan 18
Generator, attache-cased, rounds characters for high
legibilityPF p68 June 7
Logic nets in transistor cans: for designers
EDN p4 March 29
Magnetic-tape strips simplify torque measurements
Memory, IBM associative, uses masking cores
EDN p34 Feb 15
Memory planes, thin-film, marketed by Burroughs
New display system passes LFE initial tests
EDN p20 Feb 1
Nonlinearities, accurate simulation of
ART p38 June 21
Optical reader uses 35-point photocell matrix
EDN p8 Jan 18
Pattern recognition, advanced concepts studies
EDN p28 March 1
Plotter locates to 0.001 in. over 48-in. area
PF p50 Jan 18
Program control, automated, had by simulator for
B-58 stationEDN p28 April 26
Pulse-selection system uses analog techniques
IFD p126 March 29
Punched tape, read any colored tape with photo-
cells from one silicon slab DD p164 June 7
Scanner, selective 25-channel, programs output de-
vice for each inputPF p66 June 7
Switch, bistable, gates clock pulses to counting cir-
cuitry IFD p138 May 24
Tape-recording density boosted by new technique
Transistor switching circuit design, graphical pro-
cedure
Transistor-switching circuits, optimum design
ART p38 Jan 18

DETECTION, TECHNIQUES AND EQUIPMENT

Infrared, Design '61ART p30 Jan 4
Infrared device built to detect any vegetation on
Mars
Maser, IR, offers first cw source of coherent light
EDN p20 Feb 15
Pattern recognition, advanced concepts studied
ART p28 March 1
Radio beacon system pinpoints space vehicles in
sea landings EDN p36 March 29

HUMAN FACTORS

Case for instruments, new designs
DD p162 June 7
Design review, a check list, part 1
Design review, a check list, part 2 .ART p60 June 7
Maintainability drive, measurement snarls plague
EDN p28 Feb 1
Packages, maintainable modular, are discussed
EDN p16 Feb 1
Solder connectors, two hinged doors give access to
Staggered columns identify printed data easily

INDUSTRY, GENERAL

 Electronic developments, Japanese fast to adoptEDN p28 March 29 Exports, tables compare German and Japanese Fm stereo, industry preparing for push inEDN p6 May 10 Hi-fi amplifier, no tubes, no transistors, just di-......DD p216 May 10 Industrial electronics, Design '61, a surveyART p37 Jan 4 IRE, automation to be added to 1961 conventionEDN p20 March 15 IRE Show, 1961, a panorama of glittering products . . . speech . . . people . . EDN p16 April 12 Japanese continue push for more new productsEDN p30 Feb 15 Marine electronics, slow but steady growth seen Markets, Design '61, a surveyART p28 Jan 4 New clerk in nation's offices, electronics branch-Quantum electronics, a key to future designART p26 March RFI, Design '61, a surveyART p38 Jan 4 Radar, altitude, commercial push intensifying.EDN p4 March 1 Robot, industrial, learns complex job proceduresEDN p32 March 29 Sensor, relative humidity, measures full range.PF p52 May 24 TV applications, digital, pushed by industryEDN p10 Feb 1 TV, shifting trends? FCC acts on pay TV, uhf-X-ray performance is boosted for industry ...

MATERIALS

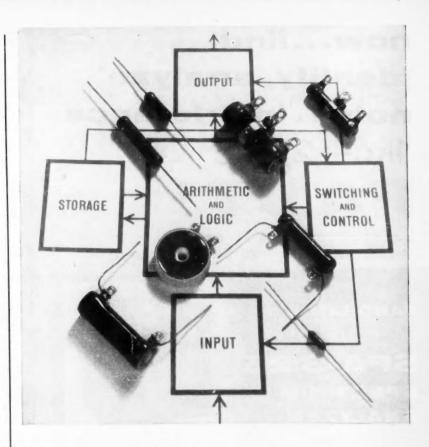
MEASUREMENTS, INSTRUMENTATION, TEST EQUIPMENT

Analog computer accuracy, indirect methods for Checkout systems, sequential, detector circuits forART p60 March 1 Counter, transistorized, provides constant delayPF p78 March 1 Decimal-counting units made faster by five-binary counting techniqueART p34 Jan 18 Demodulator helps measure distortion in am transmittersIFD p216 Feb 15 Generator, a random, pulseIFD p197 April 12 Generator, attache-cased, rounds characters forPF p68 June 7 high-legibility . Generator, random pulse, simple designIFD p218 Feb 15 Generator, square-wave, tunnel diodeART p36 April 26 High-voltage testing can be nondestructive Instruments, describe new case designsDD p162 June 7 Lag or lead determined by Z-axis blankingIFD p199 April 12 Measurement crisis. NBS advances helping to ease mounting EDN p8 March 15 Measurement frontiers; practical, outline state of ART p64 March 1 Meter, ultra-fast switching time, reads six parameters simultaneously PF p50 May 24 Network, locus plotter, displays transfer functionGA p140 May 24

Noise figure measurements techniques Nomogram for the calculation of mismatch quan-Nomogram on sensitivity-noise figure aid and receiver calculationsED p207 May 10 Nomograms to correct rise-time measurementsPF p46 Jan 18 Oscilloscope, low-cost, traces transistor character-Oscilloscope measures propagation delay in asyn-Plotter locates to 0.001 in. over 48-in. areaPF p50 Jan 18 Pressure cooker, porosity tests speeded with house-energy from 200 to 10,000 mc PF p66 Jan 4 Ratio, antenna axial, is read out automaticallyIFD p134 May 24 Ripple indicated by out-of-boundsIFD p196 April 12 Rubidium frequency standard, portable, has stability of 2 parts in 10 billion ... PF p76 March 1 Scanner, selective 25-channel, programs output device for each inputPF p66 June 7 Sensor, relative humidity, measures full range Servos, temperature control, all-solid-state, proportional-control, can be simpler, betterART p56 March 15 Short pulses recorded magnetically with pulsed biasRT p166 Jan 18 Simulator for B-58 ECM station has automated program controlEDN p28 April 26 Slide-rule accuracy, five techniques for improvingART p42 Jan 18 Spectrum analysis error nomogram ED p155 June 7 Spectrum analyzer, high-resolution, offers wide dynamic rangePF p60 April 12 Standards, microwave, closing the gap inART p167 April 12 Twt periodic-permanent-magnet stack evaluated automaticallyART p184 Feb 15 Tantalum capacitors rapidly measured by RC dis-Tape recorders, novel techniques boost performance, cut size and powerDD p204 Feb 15 Test equipment design is shaping up at beginning Three-D functions, a device for observingRT p186 June 7 Torque measurements simplified with magnetic Transistor, biased, pair monitors within set limitsIFD p127 March 29 Transistor characteristic curves traced by low-cost Transistor, power, dc parameter measured by pulse Vibration tests speeded with electrostatic fixtureDD p169 June 7

MEDICAL ELECTRONICS

MICROWAVE, COMPONENTS, TECHNIQUES



In modern digital computers

PERFORMANCE IS THE PAY-OFF

A big, modern digital computer may cost as much as \$10-million to buy outright. Even rental may run as high as \$50,000 a month.

With money like that involved, computer-makers can't take a chance on substandard components. They want, and get, the best components.... the best resistors. Where wire-wound power resistors are required, they frequently specify Ward Leonard VITROHMS.

There's another reason, too, why computer manufacturers want only the best: They're shooting for 99.99...% statistical reliability of components, and the more "9's" the better. Computer components—say, resistors—are numbered in the tens of thousands, and they have to have this kind of performance to get 99.8% reliability in their final product. For this reason, computer makers insist on, and get, performance—as continuous and reliable as the state of the art permits. And again, where wire-wounds are required, they are likely to specify Ward Leonard VITROHMS.

If you want maximum quality and maximum reliability in your product, follow the lead of outstanding digital computer manufacturers—like IBM, Remington Rand, and Burroughs—and specify W/L VITROHMS. You'll find full information in catalog D130. Write for your copy, and the name of your nearest VITROHM distributor, today. Ward Leonard Electric Co., 77 South Street, Mount Vernon, New York. (In Canada: Ward Leonard of Canada, Ltd., Toronto.)



RESULT-ENGINEERED CONTROLS SINCE 1892

WARD LEONARD ELECTRIC CO. MOUNT VERNON NEW YORK

RESISTORS • RHEOSTATS • RELAYS • CONTROLS • DIMMERS
CIRCLE 183 ON READER-SERVICE CARD

now...find, identify, analyze for occurrent noise interference 1kc-25mc

FASTI

... just one of the many ways to use





Widely used for high-speed location, identification and analysis of random and discrete signals, the SPA-3/25 automatically separates and measure the frequency and amplitude measure the frequency and amplitude signals in spectrum segments up to 3mc le, selectable anywhere between 1 kc and 25mc (usable down to 200 cps). Direct read-outs of frequency distributions and amplitudes of signals are provided respectively on cali-brated X and Y axes of a 5" long-persistence CRT. The SPA-3/25 samples the spectrum at

PANORAMIC presentation of the Model SPA-3/25

1. permits quick location of signals, minimizes chances of missing weak signals or holes in the spectrum

2. speeds up measurements by eliminating tedious point-by-point plots

3. enables fast, reliable detection of com-paratively low level discrete signals pres-ent in random spectra through use of adjust-able narrow IF bandwidths and correlation

identification and subsequent alysis of dynamic characteristics of modulated signals and noise.



Formerly Panoramic Radio Products, Inc.

Naise spectrum analysis using internal video smoothing filter presents noise envelope aver-age versus frequency in readily appreciated form. Internal marker pips are 500kc apart.

SPECIFICATIONS:

Frequency Range: 1 kc-25mc in 2 bands Sweepwidth: Variable, calibrated from 0 to 3mc Center frequency: Variable, calibrated from 0 to

Markers: crystal controlled, 500kc and harmon-ics to 25mc

Resolution: Variable, 200 cps to 30 kc Sweep rate: Variable, 1 cps to 50 cps Amplitude Scales: 20 db linear, 40 db log, 10 db square law (gower) High sensitivity: 20 µv full scale deflection

Attenuator: 100 db calibrated

Response Flatness: ± 10% or ± 1 db
Input Impedance: 72 ohms. High impedance
probe-PRB-1—Optional

probe-PKB-1—Uptional
The SPA-3/25's great flexibility makes it a
valuable tool in a wide range of applications.
Write, wire or phone NOW for detailed speci-Write, wire or phone NOW for detaile fications and NEW CATALOG DIGEST. Put your name on our mailing list for "THE PANORAMIC ANALYZER," featuring applica-

524 So. Fulton Avenue, Mount Vernon, N.Y. Phone: OWens 9-4600. TWX: MT-V-NY-5229

Cables: Panoramic, Mount Vernon, N.Y. State



INDEX OF ARTICLES

ECM station, B-58: simulator for, has automated
program controlEDN p28 April 26
Filters, coaxial, low-pass, rapid design of
ART p174 April 12
Filters, harmonic absorption, use "leaky-wall" principle
principlePF p66 April 15
Maser breakthroughs herald coherent-light systems
EDN p18 Jan 4
Maser resonator from Bell Telephone shows low
losses
Microwaves, Design '61, a survey ART p32 Jan 4
Microwaves, Design 61, a surveyART p32 Jan 4
Microwave phase shiftersGA p196 June 7
Microwave standards, closing the gap in
ART p167 April 12
Microwave tests in swept-frequency: improved
method cuts errorsART p136 June 7
Microwave trends—quantum-electronics devices ex-
tending microwave spectrum
EDN p158 March 15
Millimeter-wave devices for equipment not yet
"born"EDN p16 March 1
Millimeter-wave generators, approaching pay-off
stage
Nomogram: excess noise figure ART p140 June 7
Nomograph for designing tunable coaxial cavity
ART p180 May 10
Nomograph for determining surface areas of para-
boloid devicesART p168 March 15
Oscillator, pencil tube-and-cavity, for compact air-
borne equipment
Parametric amplifiers, a survey ART p170 March 15
Plasma noise generator uses air-cooled neon tube
ART p144 Jan 18
Radar, altitude, commercial push intensifying
EDN p4 March 1
Radar, coherent light, needs no shutter
EDN p18 March 29
Radiation detector responds to all electromagnetic
energy from 200 to 10,000 mc PF p66 Jan 4
Radio beacon system pinpoints space vehicles in
sea landingsEDN p36 March 29
Radar-beacon tracking used for Discoverer sat-
ellitesEDN p16 Feb 15
Rubidium frequency standard, portable, has stabil-
ity of 2 parts in 10 billionPF p76 March 1
Traveling-wave tube, experimental, makes use of
liquid-cooled helixEDN p25 March 15
Sulfamate nickel: boon to electroformed microwave
componentsART p140 Jan 18
Three-dimensional radar shipboard. Navy discloses
details onEDN p4 Jan 18
Traveling-wave tubes cryogenically cooled
EDN p6 June 7
Tropo-link, angle-diversity, to work at 8 Gc
EDN p6 March 29
Twt periodic-permanent-magnet stacks evaluated
automaticallyART p184 Feb 15
Waveguide power: operated by coaxial switch han-
dles full waveguide powerPF p64 March 29 Waveguides, pressurized, with ribs; design of
ART p164 March 15
maich 15

NAVIGATION AND GUIDANCE TECHNIQUES

Air-traffic control, U. S. faces difficult decision
onEDN p4 May 10
Guidance computer, microminiature, to use 2-D
approachEDN p8 April 26
Ship antenna system, "oceanated" roof simulates
sea for
Solar cell sensing used in novel accelerometer
EDN p6 April 26

PACKAGING TECHNIQUES, ELECTROMECHANICAL THERMAL DESIGN, PRODUCTION PROCESSES AND EQUIPMENT

Air	elutch	boosts	torque,	cuts	size			
					PF	p60	April	26

Antenna, dual-channel, improved, standard joints used IFD p159 April 26 Buoy, oh buoy, buttered popcorn . . DD p221 May 10 Circuits, half-disk mounted, save space, provide Cooling, fluorochemical, for high heat dissipationART p40 May 24 Design review, a check list, part 1ART p36 May 24 Design review, a check list, part 2ART p60 June 7 Electronic packaging, high-density, part 1, designEDN p5 Jan 18 Heat-conducting wafers dissipate heat in micromodulesIFD p224 May 10 Hoods, dust, and boxes, dry, engineer's guide ART p72 March 1
Instruments, the case forDD p162 June 7 Metal foil sticks to tube, conducts heatIFD p129 March 29 Microdiodes given storage temperature of 300 C by passivationEDN p14 March 15 Micromin survey topped by welded, imbedded cir-...EDN p16 Jan 18 Microminiaturization, Design '61 ... ART p60 Jan 4 Module layout and design, high-density electronic packaging, part 2 ART p44 May 10 Packages, in-transit bouncing, studied by Air Force . DIG p202 June 7 Packages, maintainable modular, are designed . Packaging, high-density electronic, resistance weldingART p44 May 24 Printed circuits, new, closing a gap in designEDN p4 April 12 Printed-wire "plug-in" cards reduce numbers of Production snags cut with washerless transistor Selection guide for low cost enclosure material Shield, ungrounded, reduces effective cable capacitanceIFD p156 April 26 Solder connectors, two hinged doors give access toDD p166 June 7 Sulfamate nickel, boon to electroformed microwave componentsART p140 Jan 18 Tube, metal foil sticks to, conducts heatIFD p219 Feb 15 Wiper lifts wire in infinite-resolution pot

PERSONAL DATA

"Career center", should you register?
Design hints lost, stop hunting! DYF p150 May 24
Employment ad, if you answer, don't be disappoint- ed by a form-letter reply . DYF p130 March 29
Engineers' salaries still start high, end low, but some EE's are breaking out of the mold DYF p202 April 12
Perfection, it doesn't payDYF p212 June 7
Reading time cut in half, part 1 DYF p150 Jan 14
Reading time cut in half, part 2 DYF p172 Jan 18
Reading time cut in half, part 3 DYF pl08 Feb 1
Reading time cut in half, part 4 DYF p244 Feb 15
Soviet engineer, how he learns, how he trains how he works

POWER SOURCES

Batteries, nickel-cad, protected by relay-Zener Batteries-workhorses of portable equipmentART p52 Feb 15 Converter, thermionic, develops 23 wPF p48 May 24 Energy sources. Design '61ART p53 Jan 4 Fuel cells, direct conversion of chemical to electrical energyART p62 Feb 15 Regulator, ac, holds voltage despite changes in load, line, or frequencyPF p52 May 10 Solar cells, silicon, tapping power from the sunART p68 Feb 15 Thermoelectric unit, design details outlined

RELIABILITY

Relay contacts, why do they fail? .DIG p144 May 24 Reliability, Design '61ART p46 Jan 4 Reliability, electronic equipmentGA p206 March 1 Reliability promised higher by new redundancy schemes Unreliability, design plans called top causeEDN p12 Feb 1

SEMICONDUCTORS. SOUD-STATE DEVICES

Amplifier, solid-state carrier, improves control with Cooler, Hughes IR Peltier, operates on low current ...EDN p10 Feb 15 Cooler, thermoelectric spot, low cost, for sale off Circuit, tri-stable flip-flop, how it works, how to design itART p38 Feb 1 Diode construction, 19 layers, new approach toEDN p20 April 12 Diodes, latest Defense Dept. list .ART p56 April 26 Epitaxial silicon transistor now in mass productionPF p74 Feb 15 Semiconductors, Design '61, a survey ... ART p56 Jan 4 Semiconductors, organic, pyrolytic graphite investigated as new material EDN p8 May 10 Solar cells, silicon, tapping power from the sun ART p68 Feb 15 Solid-state circuits, devices to date scrutinized by designers EDN p8 March 1 Solid state cited for international advancesEDN p10 March 1 Solid state emerging from infancy with impressiveEDN p8 April 12 Transistor audio amplifiers, designing low noise ..DIG p210 March 1 Transistor, biased, pair monitor within set limits ...IFD p127 March 29 Transistor can, with logic nets, for designersEDN p4 March 29 Transistor, field effect, first now availablePF p66 March 29 Transistor, power dc parameter, measured by pulse .. IFD p188 March 1 technique Transistor switches using junction types ... GA p228 Feb 15 Transistor switching circuit design, graphical pro-.ART p40 Feb 15 cedure Transistor switching circuits, optimum design . ART p38 Jan 18 Transistor switching speed from base storage charges and their lifetimes, part 1 . ART p52 March 15 Transistor switching speed from base storage charges and their lifetimes, part 2 ..ART p50 April 12 Transistor-tunnel diode combinationART p48 April 26 Transistor two-port networks, matrix tableRT p228 May 10 Transistors, complementary, used by high-gain pulse amplifierIFD p222 May 10 Transistors, cross modulationGA p192 June 7 Transistors, recommended, for use in Signal Corps developmental equipment ... ART p44 April 12 Triode-pentode tubes currently availableART p50 June 21

Tunnel diode amplifier calculator, a slide ruleART p52 April 26 Tunnel diode amplifiers, low-frequency, practical aspectsART p42 April 26 Tunnel diode circuits, what's new in Japanese EDN p16 March 15 Tunnel diode performance in an oscillator circuitART p30 Jan 18 Tunnel diode square-wave generatorART p36 April 26 Tunnel diodes, titanium, operate without coolingEDN p6 March 1

SYSTEMS

Checkout equipment, Design '61, a survey ART n48 Jan 4 Computer concepts, advanced, reaching hardware Design review, a check list, part 1 ART p36 May 24 Design review, a check list, part 2 ART p60 June 7 Discoverers use radar, beacon tracking ..EDN p16 Feb 15 Explorer VIII, painted checks and stripes help coolDD p218 May 10 FAA adopts 3-pulse beacon system ...EDN p12 April 26 Radio astronomy satellite to measure vlf energy ..EDN p10 Jan 18 Ground support equipment, Design '61, a surveyART p41 Jan 4 Satellite, 1-lb, designed for space missionsEDN p12 June 7 Satellites, commercial, design approaches vary for ...EDN p6 Feb 15 Skybolt using magnetic shift registerEDN p12 Feb 15 Space simulators, Chance-Vought building threeEDN p50 March 15 Stratoscope II uses TV, photomultipliers Systems, Design '61, a surveyART p47 Jan 4 Systems staff report, seven supersystems analyzed .ART p27 June 7 U.S. space man relies on advanced systems designEDN p16 May 10

TELEMETERING

Commutators, electromechanical ART p44 March 29 Commutators, electronic ART p52 March 29 Commutators, representative manufacturers .. ART p58 March 29 Telemetering commutators, guide to selecting ...ART p40 March 29 Telemetry conference stresses PCM Telemetry, Design '61 .. ART p49 Jan 4 Telemetry, new PCM system to sync missile data EDN p6 May 24 Telemetry units, impact studies of, yielding new design cluesEDN p34 April 12

TUBES, ELECTRON

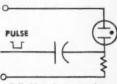
Decade-counter tube, Swiss, offers high counting ...DIG p232 Feb 15 Image orthicons, low light, have many potential uses EDN p8 March 29 Microwave plasma noise generator uses air-cooled Nuvistor tubes, tetrode, has new dark heater . ..EDN p10 March 29 Pentode, double-frame-grid, yields high gain-band-.....PF p56 April 12 Phantastrons, step-by-step design of ... ART p40 May 10 Rf amplifiers, doublers and triplers, calculating theART p34 Feb 1 Storage tube, half-tones written and erasedEDN p12 March 1 Tubes, cold cathode, new uses for .. PF p54 May 10

4 ways to use

General Electric Glow Lamps as Circuit Components



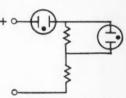
1. As a MEMORY DEVICE, because of the differential between starting and operating voltages. Both the General Electric NE-96 and NE-97 are well suited for switching circuits and counters where they can function as transfer elements and as indicators of state or sequence.



G-E Glow Lamp used in Memory Circuit



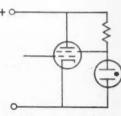
2. As a VOLTAGE INDICATOR. because of their critical starting voltage. The G-E NE-76 and the NE-81 are stabilized and selected for close tolerance on starting voltage. Both find use in gating circuits, logic matrices, switching circuits or as an indicator of input or output levels.



G-E Glow Lamps as Multiple Voltage Indicators



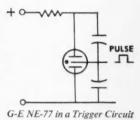
3. As a VOLTAGE REGULATOR. because of their constant operating voltage range. The General Electric NE-68 and its "first cousin", the G-E NE-80 (closer tolerance), function effectively wherever voltage regulation is required. (Glow Lamps for higher current applications are NE-68 NE-80 also available.)



G-E Glow Lamp used as a Voltage Regulator



A low current signal applied to the trigger (third electrode) starts this lamp, permitting conductance of peak current surges up to 100 m.a. in the power circuit. It can be used in counting circuits or as a control device with photocells, thermostats or moisture sensors in trigger circuit.



For more information, write for: Specification Sheet #3-092 "G-E Glow Lamps for Circuit Component Use". General Electric Co., Miniature Lamp Dept. M-126, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product



CIRCLE 185 ON READER-SERVICE CARD