

# ELECTRONIC DESIGN

## annual index of articles

### Careers & Management

About those crowded campuses .....EDIT p19 Jul 19  
 Compare your salary with the averages .....C&M p179 Mar 15  
 Confusion raised to the Nth power .....EDIT p19 Aug 2  
 Design Engineers should think international .....C&M p47 May 24  
 Engineering integrity .....EDIT p20 Mar 1  
 Engineering jobs ..C&M p80 Sept 13  
 Engineering obsolescence: its diagnosis and cure ....ART p70 Feb 15

### Subject listing

Careers & Management  
 Circuits, Mathematical Analysis  
 Communications, Navigation, Guidance & Interference  
 Components (See Microwaves, Semiconductors)  
 Computers, Data Processing and Auxiliary Devices  
 Consumer Electronics  
 Controls, Automatic  
 Human Factors  
 Materials  
 Measurements, Instruments and Test Equipment  
 Microelectronics  
 Microwaves  
 Missiles and Space  
 Packaging  
 Power Sources  
 Production, Processes and Cooling  
 Reliability  
 Research and Development  
 Semiconductors,  
 Solid-State Devices

First aid for ailing speakers .....C&M p62 Oct 11  
 If you can't beat 'em, join 'em .....EDIT p19 Sept 27  
 It's your turn at the rostrum—can you deliver a technical paper? ....C&M p54 Mar 15  
 More doors open for post-grad updating .....C&M p186 Mar 15  
 NSPE: the engineer's AMA? .....EDIT p31 Sept 13  
 Professional groups and personal liberties .....EDIT p19 Jul 5  
 Profiles of successful engineers .....C&M p182 Mar 15  
 Shortening the engineering-to-market time span .....C&M p46 Apr 12  
 The advent of the 'political' scientist .....C&M p188 Mar 15  
 The articulate engineer .....C&M p38 Aug 2  
 'The trouble with you is...' .....C&M p76 Sept 13  
 To err is human ... or is it? .....EDIT p19 Aug 30  
 What it takes to be a supervisor ..C&M p112 Jan 18

### Circuits, Mathematical Analysis

A blanket approach to a linear thermistor network .....ART (Part I) p20 Mar 29  
 A blanket approach to a linear thermistor network .....ART (Part II) p36 Apr 12  
 A Darlington improves monostable multi performance IFD p36 June 21  
 A logical approach to comparator design .....ART p50 Nov 11  
 A new tool for easier network synthesis .....ART p20 Feb 1  
 Adder differentiator measures thyristor response time IFD p160 Aug 16  
 All-pass filters accurately split the phase .....ART p38 Jan 18  
 Analog circuit impedance follows signal .....IFD p31 Mar 1  
 Analog long-time integrator employs transistor reset ...IFD p56 May 24  
 Astable blocking oscillators—they can be practical-Part I ART p21 Mar 1  
 Astable blocking oscillators—they can be practical-Part II ART p42 Mar 15  
 Balanced modulator transformer increase carrier suppression .....

.....IFD p46 Jan 18  
 Beam deflection tube oscillates at two frequencies .....IFD p48 Jul 5  
 Bootstrapping boosts pre-amp input impedance .....ART p22 May 10  
 Boxcar circuit provides pulse amplifier age .....IFD p83 Sept 13  
 Capacitor replaces transformer in low voltage power supply .....IFD p57 Apr 12  
 Cascaded UJT oscillators form stable frequency divider ..IFD p52 Nov 8  
 Complementary diode feedback produces nonlinear gain IFD p42 June 7  
 Complementary dual follower increases input impedance p58 Nov 8  
 Complementary transistors replace meter relay .....IFD p53 Apr 12  
 Conformal Invariants PT p79 Jan 4  
 Constant-current regulator range determined by reference transistor .....IFD p44 Apr 26  
 Curing interference in relay systems: Look at the source then suppress .....ART p37 Nov 29  
 Cylindrical Fields ...PT p31 June 21  
 Dc feedback symmetry control creates wideband doubler IFD p154 Aug 16  
 Dc load-voltage method simplifies gain calculation .....IFD p156 Aug 16  
 Delay-line sync separator improves video resolution ....IFD p60 Nov 22  
 Design of dc-coupled bistable circuits .....ART p26 Aug 2  
 Differential amplifier offers efficient dual outputs .....IFD p37 Jul 19  
 Differential amplifier provides improved common-mode rejection ....IFD p44 May 10  
 Differential comparator extends accuracy .....ART p50 Oct 25  
 Differentiator-divider network analyzes power-line transients .....IFD p52 Dec 6  
 Diode divider circuit provides ac gain control .....IFD p46 Apr 26  
 Double-coil relay simplifies AND circuit .....IFD p72 Nov 29  
 Dual emitter transistor clears integrator circuit .....IFD p41 June 7  
 Emitter-follower circuit protects against overloads ..IFD p61 Mar 15  
 Error-rate feedback generation in servomotor handled by toroid .....IFD p50 Apr 12

# ANNUAL INDEX

AN	Application Note
ART	Article
C & M	Careers and Management
DD	Design Decision
EDIT	Editorial
ENG DATA	Engineering Data
IFD	Ideas for Design
MAT	Materials
ME	Microelectronics
PF	Product Feature
PT	Practical Theorist
SR	Special Report

Feedback circuit converts pulse trains to staircase .....IFD p69 Oct 11  
 FET can be used to multiply two signals .....IFD p34 Mar 29  
 FET enhances parallel-T notch filter performance .....IFD p36 Jul 19  
 FET limits and resets operational amplifiers .....IFD p54 Nov 8  
 Filter amplifier maintains gain over wide bank .....ART p58 Oct 11  
 Filter out 60-cycle pickup in dc amplifiers .....ART p34 Dec 20  
 Find comb-filter frequencies fast .....ART p44 Dec 6  
 Flip-flop operation enhanced by resistor-diode input .....IFD p35 June 21  
 Flow graphs pinpoint frequency response .....ART p36 Nov 22  
 Four components make dc regulator .....ART p64 Feb 15  
 Four layer diode produces fast, high voltage pulses .....IFD p55 May 24  
 Four layer diode provides time delay with instant reset IFD p33 Mar 29  
 Gain-control circuit avoids dc shift .....IFD p28 Feb. 1  
 Gain-phase slide rule aids amplifier design .....ART p64 Sept 13  
 Graphical design for non-saturating Schmitt triggers ART p58 Feb 15  
 Graphics yield fast, low-cost printed circuit breadboard .....p.56 Nov 8  
 Graph speeds calculation of skin effect .....ART p51 Nov 8  
 Harmonic Generators: Is the step-recovery diode best? ART p28 Jan 18  
 High ratio pulse counter utilizes UJT switch .....IFD p58 Mar 13  
 Holding-coil switches form matrix monitor .....IFD p48 Dec 20  
 Hysteresis of bistable circuit is displayed on CRT .....IFD p50 Jan 18  
 If limiter—diode circuit is stable with temperature .....IFD p158 Aug 16  
 Improved squaring circuit is less temperature sensitive ..IFD p40 Jul 19  
 Inexpensive oscillator is temperature stable .....IFD p70 Oct 11  
 Inexpensive regulator uses transistors as breakdown diode .....IFD p33 June 21  
 Inexpensive relay drive from low-level signals .....IFD p44 Jul 5

Infinite Z out source for long linear sweeps .....ART p28 Jul 19  
 Locking monostable circuit immune to false triggering ....IFD p54 Dec 6  
 Low cost multilayer boards with feed-through jumpers IFD p155 Aug 16  
 Low cost 2 stage circuit forms versatile AM oscillator IFD p42 May 10  
 Low frequency FET amplifier has narrow bandpass ....IFD p72 Jan 4  
 Magnetic amplifier overcomes push-pull unbalance .....IFD p68 Oct 25  
 Mapping into a circle PT p33 Feb 1  
 Matched transistors passe for FET squarers .....ART p36 Nov 8  
 Microelectronics at \$18 operational amp gives long time delay .....IFD p48 May 10  
 Microvolt dc relay makes inexpensive thermocouple trip ..IFD p81 Nov 29  
 Modified astable multivibrator produces very long time delay .....IFD p48 May 10  
 Modified multi forms phantastron oscillator .....IFD p46 Jul 5  
 Modified multi forms voltage-controlled oscillator ...IFD p68 Oct 11  
 Modified multivibrator has elongated pulse output .....IFD p59 Mar 15  
 Monitor circuits measure transient phenomena and sounds .....IFD p38 Jul 19  
 More on Schwarz-Christoffel .....PT p35 Mar 29  
 MOS transistor provides sharp differential relay switching .....IFD p32 Mar 29  
 Multiple-reed relay acts as 2-frequency decoder .....IFD p71 Nov 29  
 Multiply phasors the easy way .....ART p34 Aug 2  
 Nand gates and UJT form stable hybrid monostable multi .....IFD p45 Apr 26  
 Neon-tube circuit forms one-shot pulse generator ....IFD p38 June 7  
 New circuitry withstands deep-sea pressures .....NEWS p6 Feb 1  
 Nixie driver flip-flop also stores information .....IFD p82 Sept 13  
 No standby power needed for one-shot circuit .....IFD p30 Feb 1  
 Nomograph: Rapid solution to bistable circuit design .....ENG DATA p38 Apr 26  
 NOR circuits easily convert to multipliers .....IFD p76 Feb 15  
 Operational amplifier has flat bandwidth to 12 Mc ....IFD p47 Aug 30  
 Operational amplifier theory can give answers .....ART p20 Apr 26  
 Out of lock detector for automatic phase control .....IFD p53 Nov 8  
 Out-of-lock detector performs digital frequency discrimination .....IFD p55 Dec 6  
 Phase lock harmonically unrelated signals .....ART p146 Aug 16  
 Plotting produces total astable design .....ART p60 Sept 13  
 "Pseudo" first stage makes self-clearing ring counter ....IFD p40 Aug 2  
 Pseudo-Schmitt approach to trigger logic .....ART p30 Nov 22  
 Pulse compression via active devices

.....ART p134 Aug 16  
 Pulse generator delivers a constant current .....IFD p63 Mar 15  
 Pulse height detector operates independently of dc input level .....IFD p32 Mar 29  
 Pulsed relay generates low-level step functions .....IFD p81 Nov 29  
 Pulse-sorter network detects, amplifies bi-polar signals ....IFD p48 Aug 30  
 Pulse-width discriminator uses mismatched delay line IFD p60 Mar 15  
 Raysistors find application in voltage multiplying, dividing .....IFD p58 Mar 15  
 Reference amplifier is versatile and temperature stable IFD p44 Aug 30  
 Relay provides simple reversal of dc motor .....IFD p78 Nov 29  
 Remote switching technique reduces system .....IFD p78 Feb 15  
 Reset circuit independent of amplitude, polarity .....IFD p70 Oct 25  
 Resistor stabilizes frequency of transistorized oscillator IFD p53 May 24  
 Resonant reed controls timed latching relay .....IFD p80 Nov 29  
 Resonant reed-relay produces pulsed tone .....IFD p74 Nov 29  
 Resonant reed stabilizes audio oscillator frequency ....IFD p76 Nov 29  
 Ripple suppression circuit solves space-limit problem IFD p35 Mar 1  
 Rule of thumb simplifies maximum power calculations IFD p74 Feb 15  
 Saturable core detects small current difference .....IFD p44 July 5  
 SCR and UJT form time-delay switch .....IFD p82 Sept 13  
 Self-starting voltage regulator is short-circuit regulated .....IFD p79 Feb 15  
 Sensitive static relay detects resistance limits .....IFD p75 Nov 29  
 Series-parallel connection produces high-level pulses ...IFD p52 Dec 6  
 Shaft-position generator provides zero references .....IFD p64 Mar 15  
 Simple circuit improves stepping switch performance IFD p47 Jan 18  
 Simple circuit measures tube transconductance .....IFD p62 Mar 15  
 Simple circuit starts tubes automatically .....IFD p44 Jan 18  
 Simple techniques to measure high-power pulses .....ART p46 Oct 11  
 Signal rejection accomplished by optical isolator .....NEWS p18 Jul 19  
 Solid-state current-limiter functions as circuit breaker IFD p59 Mar 15  
 Start-up circuit insures initial state of flip-flop .....IFD p31 Feb 1  
 Static switching circuit transfers power automatically ...IFD p74 Feb 15  
 Strain gage output amplifier produces modulated pulse signal .....IFD p52 May 24  
 Streamlined capacitor charge circuits .....ART p40 Mar 15  
 Sub-audio sinusoids by integrator feedback loop ....IFD p38 June 7  
 Symmetry amplifier compensated by FET current-sources IFD p70 Oct 25  
 Tabular technique solves harmonic problems .....ART p36 Aug 2

Tabular technique solves harmonic problems .....ART p150 Aug 16

Telephone dial controls rotary stepping switch .....IFD p75 Nov 29

Temperature varies bandwidth to improve trigger sensitivity .....IFD p77 Jan 4

The Backward Monostable: A time delay switch .....ART p58 Jan 4

Thermal relay forms simple stepped voltage regulator ..IFD p80 Nov 29

The Schwarz-Christoffel mapping .....PT p33 Mar 1

Three relays form low-speed, inexpensive power divider IFD p42 June 7

Time-delay relay protects against inrush currents .....IFD p80 Nov 29

Time-delay words with bi-polar voltage .....IFD p30 Feb 1

Time-delay relays sequentially switch motor starting system .....IFD p71 Nov 29

Transformer delivers 5 Kw pulses for 10 nsec .....DD p48 Mar 15

Transistor, diode form bidirectional synchronous clamp IFD p84 Sept 13

Transistorized switch provides AC signal gate .....IFD p49 Jan 18

Triac time-delay circuit switches 1.2 kw of ac power .....IFD p44 Jul 5

Tunnel diode circuit offers non-distorted delayed pulse IFD p46 May 10

Tunnel diode and UJT produce ultrafast trigger output ..IFD p40 Jan 7

Tunnel diode level detector is ultrasensitive .....IFD p73 Jan 4

Two-dimensional mapping .....PT p45 May 24

Two phase-locked oscillators improve linearity .....DD p24 June 21

Two R-L network limits surge to low-starting loaded SCR .....IFD p52 Apr 12

Two relays form bistable trigger circuit .....IFD p71 Nov 29

Two-stage circuit improves hf signal generator's output IFD p71 Oct 11

Two-stage transistor replaces precision operational inverter .....IFD p54 Apr 12

UJT oscillator makes simple FM modulator .....IFD p47 May 10

UJT oscillator provides negative voltage pulses .....IFD p55 May 24

Ultrasensitive relay forms precise temperature controller .....IFD p76 Nov 29

VCO frequency control via balanced-bridge mixer .....ART p48 Nov 22

Voltage detector uses solidstate relays .....IFD p30 Mar 1

Voltage regulator circuits permit decentralized operation PF p94 Jan 4

Why not an avalanche diode as an RF noise source? .....ART p32 Apr 12

Widerange multivibrator varies frequency from 8Kc to 3Mc .....IFD p50 Apr 12

Zener diode aids chopper in demodulator application .....IFD p56 Apr 12

Zener diodes provide high-level limiting .....IFD p77 Feb 15

Zig-Zag nomograph to equivalent resistance ..ENG DATA p30 Aug 30

## Communications, Navigation

Balanced modulator transformer increases carrier suppression .....IFD p46 Jan 18

Direction finder for re-entry works in S-band .....NEWS p17 June 7

Frequency control techniques seen meeting ssb need NEWS p10 May 24

Mobile air control permits tactical emergency landings .....NEWS p10 Oct 11

Navy communications looks toward the '70's .....NEWS p12 Jul 5

Simple techniques to measure high-power pulses .....ART p42 Nov 8

Spawning salmon counted by sonar .....NEWS p19 Oct 11

Tradeoffs in choosing radar frequency .....ART p54 Oct 25

## Components

AC or dc excitation: which is best for transducers? .....ART p26 June 7

An outside look at inside coil temperature .....ART p54 Oct 11

Avoiding shorted-coil failures .....SR ART p54 Feb 15

Batch fabrication: new roads to system design .....NEWS p6 Apr 12

Bounceless switch unit acts as relay/chopper .....PF p88 Sept 13

Ceramic capacitors maintain  $\pm 2\%$  temperature stability .....PF p74 Apr 12

Ceramic capacitors nearing glass-dielectric stability ....PF p72 Dec 20

Coax ribbon transmits highspeed data .....PF p62 Jul 5

Commutated relay spearheads new switching technique ART p18 Nov 29

Comparing the three most popular temperature sensors .....ART p62 Jan 4

Conductor specification data .....SR ART p36 Feb 15

CRT data display to aid liquor industry .....NEWS p24 Oct 11

Curing interference in relay systems: Look to the source, then suppress .....ART p37 Nov 29

Designing with relays is more subtle than you think .....ART p30 Nov 29

Determining effect of loading on a potentiometer's linearity .....ART p68 Feb 15

Don't dismiss the relay for data processing systems ART p24 Nov 29

Double-coil relay simplified AND circuit .....IFD p72 Nov 29

Electromechanical relays spar with solid state .....NEWS p6 June 7

Five Gc coaxial cable drops 10 db per 100 ft .....PF p100 Feb 15

Four factors influence cable harness design .....SR ART p42 Feb 15

Functional specification speeds coaxial-cable selection .....ART p48 Feb 15

Guidelines for invading foreign markets .....EDIT p31 May 24

Have semiconductors relegated relays to a second-class status? .....ART p14 Nov 29

How much delay from a delay line? .....ART p48 Sept 27

Inexpensive relay drive from low-level signals .....IFD p44 Jul 5

Integrated circuit protected by reed relay-diode combination .....IFD p78 Nov 29

International Exhibition of Electronic

Components ...NEWS p22 May 24

Is db passe for component noise? .....ART p32 Apr 26

Make sure switch you order is switch you want ....SR ART p44 Sept 13

Methodical approach leads to right coax switch ..SR ART p38 Sept 13

Microvolt dc relay makes inexpensive thermocouple trip IFD p81 Nov 29

Mil-spec coax crimp connectors assemble in half a minute .....ME PF p72 May 24

Modular power supplies are narrow, efficient .....PF p42 Mar 1

Modular switch saves wiring time by disassembling .....PF p60 Nov 8

Modular VCO design "Customizes" from stock .....PF p76 Oct 25

Multi-Pin connector approaches cable diameter .....PF p102 Feb 15

Multiple-reed relay acts as 2-frequency decoder .....IFD p71 Nov 29

OR circuits simplified with double-coil relays .....IFD p77 Nov 29

Passive miniature circulator operates at vhf .....PF p52 Aug 30

Pin coaxial-cable specs to your needs .....ART p56 Sept 27

Pinpoint your relay needs by writing complete specifications .....ART p52 Nov 29

Pulsed relay generates low-level step functions .....IFD p81 Nov 29

Relay provides simple reversal of dc motor .....IFD p78 Nov 29

Resonant reed controls timed latching relay .....IFD p80 Nov 29

Resonant reed-relay produces pulsed tone .....IFD p74 Nov 29

Resonant reed stabilizes audio oscillator frequency .....IFD p76 Nov 29

Ribbon cables show their versatility .....SR ART p32 Feb 15

Save \$ in specifying TC wirewounds .....ART p36 Aug 30

Selecting and specifying trimming potentiometers .....ART p34 Jan 18

Selecting the right insulation for hook-up wire .....SR ART p46 Feb 15

Self-coiling metal tape permits compact design .....ART p56 Oct 11

Self-regulating ovens cap TO-5 and DO-7 cans .....PF p48 Aug 2

Sensitive static relay detects resistance limits .....IFD p75 Nov 29

Shunt diodes protect polarized capacitors .....IFD p64 Nov 22

Simple circuit improves stepping switch performance IFD p47 Jan 18

Six points to simplify rotary wafer selection .....SR ART p48 Sept 13

Sliding disks simplify switching .....DD p66 Jan 4

Special Report on Switches .....p33 Sept 13

Standardized relay terminology simplifies selection and aids usage .....ART p45 Nov 29

Stepping relay establishes matrix selector control .....IFD p70 Nov 29

Switching needs dictate contact material, geometry .....SR p34 Sept 13

Table speeds RC network design for relay contact protection .....IFD p77 Nov 29

Tantalum capacitor "price war" levels off .....NEWS p12 Mar 29

## ANNUAL INDEX

Telephone dial controls rotary stepping switch .....IFD p75 Nov 29  
Thermal relay forms simple stepped voltage regulator ...IFD p80 Nov 29  
Thin-film thermistor fits on silicon chip .....PF p96 Mar 15  
Three relays form low-speed, inexpensive power divider IFD p42 June 7  
Time delay relay protects against inrush currents ....IFD p80 Nov 29  
Time delay relays sequentially switch motor starting system .....IFD p71 Nov 29  
Transformer core selection—quick as a wink .....ART p46 Dec 20  
Transformer delivers 5Kw pulses for 10nsec .....DD p48 Mar 15  
Transistor switching regulates power supplies .....PF p42 Mar 1  
Two relays form bistable trigger circuit .....IFD p71 Nov 29  
Ultrasensitive relay forms precise temperature controller .....IFD p76 Nov 29  
Voltage detector uses solid state relays .....IFD p30 Mar 1  
Which relay is right for you? Here's help in deciding ...ART p57 Nov 29  
Wire and Cable ....SR p31 Feb 15

### Computers, Data Processing and Auxiliary Devices

AF wind tunnel has computer that handles Mw inputs NEWS p10 Aug 2  
A logical approach to comparator design .....ART p50 Oct 11  
Analog circuit impedance follows input signal .....IFD p31 Mar 1  
Batch-fabricated memory reported at NAECON meet ...NEWS p8 June 7  
Case history: diode design boosts DTL speed ....ME ART p36 Feb 1  
Computer design of microelectronic circuits .....ART p26 Jan 4  
Computer-driven real-time display projects 4 colors NEWS p18 Oct 25  
Computer picks semiconductors .....NEWS p17 May 10  
Computer produces realistic musical instrument sound NEWS p18 Nov 22  
Computer service offered for design and circuit analysis .....NEWS p25 Oct 11  
Computer speeds design reviews .....NEWS p12 Feb 15  
Computer system to position Mohole ocean-drilling platform .....NEWS p16 Feb 15  
Control Data to add two super computers .....NEWS p16 Jan 18  
Design at Wescon Part 3 p20 Aug 30  
Differential amplifier provides improved common-mode rejection .....IFD p44 May 10  
Don't dismiss the relay for data-processing systems ART p24 Nov 29  
Eight-Mc IC computer serves as learning tool .....NEWS p6 Aug 2  
Electronic gearing drives tape .....DD p28 Mar 1

Electronics invades the accounting department .....NEWS p12 Dec 20  
Good rocket computers come in tough packages .....DD p68 Jan 4  
Flip-flop operation enhanced by resistor-diode input ...IFD p35 June 21  
FJCC: Faster cores vie with TF memories .....NEWS p6 Dec 20  
Hybrid-IC memory can be produced for 7-14¢ per bit ...NEWS p11 Aug 30  
Industrial control by digital computers .....ART p54 Jan 4  
Low-cost time-share computer debuts .....NEWS p23 Oct 11  
Magnetics advanced by computer needs .....NEWS p6 May 24  
Moderately priced amplifier gives 100-volt swing .....PF p58 June 21  
Modular design adds flexibility to IC computer ...ME NEWS p40 Feb 1  
Module line offered to do-it-yourselfers .....NEWS p11 May 24  
NAND gates and UJT form stable hybrid monostable multi .....IFD p45 Apr 2  
New data terminal for top computers .....NEWS p18 Jul 5  
NOR gates generate non-clocked output pulse .....IFD p50 Dec 20  
Operational amplifier response—shape counts .....ART p36 Jul 5  
Operational amplifier response—stage by stage .....ART p24 Jul 19  
Operational amplifier theory can give answers .....ART p20 Apr 26  
OR circuits simplified with double-coil relays .....IFD p77 Nov 29  
Out-of-lock detector performs digital frequency discrimination .....IFD p55 Dec 6  
Passive computer systems increase efficiency .....IFD p74 Jan 4  
Pen and tablet input to computer made for sale ...NEWS p22 Jan 18  
Pick off multiphase signals from a disk .....ART p20 Jul 19  
Remote terminal works off computer 6000 miles away ...NEWS p22 Jan 4  
Sample-and-hold circuit for A/D converter .....IFD p44 Aug 2  
Self-correcting memory .....ART p28 Aug 30  
Seamless belt stabilizes tape motion in transport .....NEWS p10 Nov 8  
Sonar computers ...NEWS p10 Aug 16  
Tables speed design of sampled-data systems ..Part I ART p28 May 10  
Tables speed design of sampled-data .....Part II ART p40 May 24  
Table speeds RC network design for relay contact protection .....IFD p77 Nov 29  
Temperature programmers follow analog functions ....PF p86 Nov 22  
Three easy ways to evaluate digital circuits ....ME NEWS p50 Jul 5  
Threshold logic provides complete complementary output .....IFD p50 May 24  
Tunnel diodes simplify shift-register construction .....IFD p29 Feb 1  
Univac 1230 unit named for real-time Apollo data analysis .....NEWS p21 Aug 16  
Western Union greatly expands data facilities .....NEWS p18 Jan 4

## Consumer Electronics

Audio engineers spotlight innovations .....NEWS p12 May 24  
Silicon and germanium battle at hi-fi show .....NEWS p6 Oct 25  
TV, stereo sound systems find new airline market ...NEWS p12 Feb 1

## Human Factors

Can you put your ideas across?....C&M p46 Dec 6  
Eighteen ways to save time .....C&M p48 Nov 8  
Gremlin-proofing: answers to nature's tricks .....ART p42 Nov 22

## Industrial Electronics

A special report on Industrial Design .....SR p21 Nov 8  
Ac or dc excitation: which is best for transducers? .....ART p26 June 7  
Analog fields simplify design .....DD p29 June 21  
Automated traffic systems picking up speed .....NEWS p6 Jan 18  
Auto safety programs turn to electronics .....NEWS p6 Jul 7  
Blackout sheds light on system faults .....NEWS p6 Dec 6  
Chemical instruments seek more electronics .....NEWS p6 July 7  
Complexity limits adaptive systems' uses .....NEWS p12 Oct 25  
Electromechanical relays spar with solid state .....NEWS p6 June 7  
Electronic gearing drives tape .....DD p28 Mar 1  
Error-rate feedback generation in servometer handled by toroid .....IFD p50 Apr 12  
FETs, power types join economy trend .....NEWS p12 Aug 30  
Industrial control by digital computers .....ART p54 Jan 4  
Industrial conversion: new hope, new wrinkles .....NEWS p6 Feb 15  
Industrial Design Awards ...Wescon USA .....pW124 Aug 16  
Industrial users switch relays for solid state .....NEWS p6 Aug 16  
Magnetics advanced by computer needs .....NEWS p6 May 24  
ME linear circuit modules meet many servo and control needs .....PF p46 Mar 29  
Operational amplifier response—shape counts .....ART p36 Jul 5  
Operational amplifier response—stage-by-stage .....ART p24 Jul 19  
Out-of-lock detector for automatic phase control .....IFD p53 Nov 8  
Pentagon speeds shift to uhf telemetry .....NEWS p6 Jul 19  
Photo-emitter-sensor controls feedback system .....ART p32 Aug 30  
Servo unit converts metric to digital readout .....PF p62 Apr 26  
Solid-state integrator combines low duty cycle with low ripple .....DD p42 Apr 12  
Switch-selector arrangement controls motor's revolutions IFD p40 Aug 2  
Tables speed design of sampled-data systems Part I ..ART p28 May 10  
Tables speed design of sampled-data systems Part II ..ART p40 May 24

Triac optimizes static control of ac power .....ART p32 May 24  
Viscous effect simulated by servo damping system ....IFD p43 Aug 2

## Materials

Adhesives .....MAT pM14 Jul 19  
Composite design materials-basic concepts .....MAT p64 Jan 18  
Design advantages of gas dielectrics .....MAT p152 Aug 16  
Epoxy bond can be severed without cutting .....IFD p78 Jan 4  
High strength conductor alloys .....MAT ART p210 Mar 15  
Improve reliability via physics of failure .....MAT p70 Sept 13  
Insulation .....MAT pM40 Jul 19  
Laser materials ..MAT pM29 Jul 19  
Magnetic materials MAT pM48 Jul 19  
Material for power sources .....MAT pM4 Jul 19  
Materials problems in contact design .....MAT p60 May 10  
New techniques in radiation studies .....MAT p52 June 7  
Plastics .....MAT pM22 Jul 19  
Special purpose wire and cable .....MAT pM52 Jul 19  
Solvent dissolves epoxy encapsulation .....NEWS p11 Nov 8  
Wear—basic materials problem .....MAT p66 Apr 12

## Measurements, Instruments and Test Equipment

A guide to the selection of multimeters .....ART p6 May 3  
Analog fields simplify design .....DD p29 June 21  
Chemical instruments seek more electronics .....NEWS p6 Jul 5  
Complementary transistors replace meter relay .....IFD p53 Apr 12  
Design at Wescon Part 3 .....ART p20 Aug 30  
Differential comparator extends accuracy .....ART p50 Oct 25  
Diode improves voltmeter's linearity and stability .....IFD p65 Nov 22  
DVM accuracy—the factors that influence it .....ART p40 May 3  
DVM merges dual modes; maintains accuracy and speed ..PF p100 Mar 15  
Efficient wave analyzer gets around IF .....ART p22 Feb 1  
Electroluminescent meters operational .....NEWS p24 Nov 22  
Electronic counter accuracy—three factors that influence it .....ART p106 May 3  
Europe challenges U.S. instrument designers .....NEWS p6 Oct 11  
FET used for unity gain, high impedance scope probe ..IFD p46 Aug 30  
Field strength meter can double in brass .....ART p136 May 3  
Inductance measurement of low-frequency coils .....ART p26 Feb 1  
Inexpensive pattern generator simulates teletype code IFD p66 Oct 11  
Infinite  $Z_{out}$  source for long linear sweeps .....ART p28 Jul 19  
IR scanner displays thermal "map" in just 2.5 seconds NEWS p24 Apr 12  
Miniature timing devices indicate up to 10,000 hours ME PF p72 May 24

Monitor circuits measure transient phenomena and sounds .....IFD p38 Jul 19  
N-decade count-rate meter .....ART p34 Mar 15  
Nothing replaces the slotted line .....ART p144 May 3  
Oscilloscope Progress—A tool with many faces .....ART p20 May 3  
Oscilloscope sweep displays microcircuit transfer curve IFD p36 Jul 19  
Phase lock harmonically unrelated signals .....ART p146 Aug 16  
Plug-in and go: instant counting to 8Gc plus .....PF p58 Dec 20  
Polarity selector follows pulsed or dc commands .....IFD p34 June 21  
Precise frequency tripler uses 400 cps standard source ....IFD p61 Nov 22  
Programmable generators speed complex operations .....PF p60 June 7  
Pulse compression via active devices .....ART p134 Aug 16  
Pulse generator is controlled by pinboards .....PF p100 Jan 4  
Purpose dictates choice of phase meter .....ART p128 May 3  
RF "stethoscope" locates latent circuit faults .....NEWS p23 Oct 25  
Scope method measures broad RF phase shifts .....IFD p42 Aug 2  
Separate frequencies with a spectrum analyzer .....ART p64 May 3  
Servo unit converts metric to digital readout .....PF p62 Apr 26  
Shaft-position generator provides zero reference ....IFD p64 Mar 15  
Simple CRO set-up finds FET's zero temperature coefficient .....IFD p48 Apr 26  
Simple route to multi-purpose pattern generator .....ART p32 June 7  
Simple techniques to measure high-power pulses .....ART p43 Oct 11  
Six digit DVM offers absolute accuracy .....PF p46 Feb 1  
Strip-chart recorder uses single servo system .....PF p70 Jan 18  
Test pattern checks step-and-repeat accuracy .....ART p54 Sept 27  
The modern VSWR amplifier .....ART p152 May 3  
The three main types of VTM's: How they differ .....ART p74 May 3  
Thermoelectric probe performs in-circuit components test PF p98 Mar 15  
Tunnel-diode curve tracing lowers oscillation tendency ..IFD p31 Mar 1  
Unbalanced bridge simplifies phase measurements .....DD p52 Mar 15  
Universal bridge measures from one femtofarad .....PF p78 Nov 8  
VLF to VHF noise generator delivers 0.05 db stability ....PF p46 Feb 1  
Volt-ohmmeter achieves one Meg/v sensitivity .....PF p98 Mar 15  
Voltmeter spans 1 Kc to 1 Gc using random sampling .....PF p58 Dec 6  
Wavemeters—The high frequency tools .....ART p88 May 3

## Microelectronics

Adapt your curve tracer for MOS display .....ART ME p50 May 10  
Aging/breadboarding aided by test sockets .....ART ME p52 June 21  
Answering some "unanswered questions" .....ART ME p62 May 24  
Bright future predicted for TTL logic

circuits .....NEWS p86 Feb 15  
Build a differential amplifier from logic gates .....ART ME p50 Apr 26  
Can logic arrays be kept flexible? .....ART ME p58 May 24  
Carriers help microcircuit handling .....NEWS ME p90 Jan 4  
Case history: diode design boosts DTL speed .....ART ME p36 Feb 1  
Complementary logic boasts 5-nsec speed .....PF p38 Mar 1  
Computer design of microelectronic circuits .....ART p26 Jan 4  
Computer picks semiconductors .....NEWS p17 May 10  
Costs spur renewed interest in screened-film techniques .....NEWS ME p48 June 7  
Design at Wescon-Part 3 .....ART p20 Aug 30  
Design with integrated circuits at 60 Mc .....ME Part 1 p32 Jul 19  
Design with integrated circuits at 60 Mc .....ME Part 2 p30 Aug 2  
3 easy ways to evaluate digital circuits .....NEWS ME p50 Jul 5  
Eighteen dollar operational amp gives 70 db gain to 100 kc ..PF p70 Nov 8  
Embedded packages can be repairable .....SR ART p30 Jul 5  
8 flat packs get EIA nod .....NEWS ME p50 June 21  
Functional packaging for tomorrow's Navy .....SR ART p44 June 7  
Graph speeds film-resistor layout .....ART ME p44 June 7  
Hybrid IC memory can be produced for 7-14¢ per bit ..NEWS p11 Aug 30  
Integrated amplifiers are flexible at high frequencies ..PF p64 Apr 12  
Integrated circuit protected by reed relay-diode combination .....IFD p78 Nov 29  
Integrated circuits spawn problems for systems suppliers .....NEWS ME p56 Apr 26  
Integrated devices—What will be in your black box? ....ART p34 Oct 25  
IR testing of microelectronics surges .....NEWS p6 Apr 26  
Low-power efficiency with tunnel-diode limiters NEWS ME p46 June 21  
Machine-tool makers eye integrated circuits .....NEWS p12 Jul 19  
ME designers explore GaAs, new insulators .....NEWS p12 June 21  
ME linear circuit modules meet many servo and control needs .....PF p46 Mar 29  
Microcircuit offers inexpensive crystal-controlled oscillator IFD p30 Mar 1  
Microcircuits used in driver/decoder modules .....PF p92 Mar 15  
Microelectronics '65 ..ART p82 Jan 4  
Microelectronics at Wescon .....NEWS ME pW48 Aug 16  
Microelectronics comes down to earth .....SR p33 Oct 25  
Modular design adds flexibility to IC computer ...NEWS ME p40 Feb 1  
Molecular circuits used in lightweight radar transponder .....NEWS p16 May 10  
Monolithic chips—should you roll your own? .....ART p48 Oct 25  
Monolithic vs. hybrids: battle or wedding? .....NEWS p44 Mar 29  
MOS complements pierce microwave micropower logic NEWS p10 Apr 26

### Free reprints of E/D index

A single copy of this index of articles can be obtained by circling number 399 on the Reader-Service card.

One dozen ways to cut cost in film circuits .....ART ME p36 Mar 1  
One wafer—one logic array .....ART ME p66 Mar 15  
Optical scanner draws integrated circuit mask .....NEWS ME p56 Jul 5  
Oscilloscope sweep displays microcircuit transfer curve IFD p36 Jul 19  
Packaging—how do you juggle the tradeoffs? .....ART p44 Oct 25  
Prototyping—how closely can you approach reality? .....ART p40 Oct 25  
Semiconductor directory .....SPECIAL INSERT May 10  
Simple technique speeds J-K counter design .....ART p52 Sept 13  
Skirting thin film design problems .....ART p38 Aug 30  
Tantalum films, new phase found .....NEWS p11 Aug 16  
Test pattern checks step-and-repeat accuracy .....ART p54 Sept 27  
The integrated operational amplifier: six uses .....ART p40 June 21  
Thermal plots check circuits .....NEWS ME p58 Jan 18  
Thick films—how and when to use them .....ART ME p58 Apr 12  
Thin-film kit is desk-top lab .....PF ME p60 Jan 18  
Thin-films may boost integrated's performance .....NEWS ME p70 Mar 15  
Thin-film monolithic circuits—how and when to use them? Part 2 .....ART ME p52 Jan 18  
Time-savers for breadboarding integrated circuits ART ME p38 Mar 29  
Unanswered questions on integrated circuits .....ART p82 Feb 15  
Using feedback pairs in integrated circuits .....ART p36 Dec 20  
Variable threshold integrated logic immune to noise NEWS p10 Mar 29  
Voltage regulator circuits permit decentralized operation PF p94 Jan 4

### Microwaves

Airborne laser to give better tracking data .....NEWS p14 Jan 4  
A quick way to find radar range .....ART p41 Jul 5  
Argon cw laser yields 10-second hologram exposure NEWS p16 Sept 13  
C-scan landings sought by carriers .....NEWS p20 May 10  
Dual frequency maser emission achieved at IBM NEWS p9 Sept. 27  
Electron beam focusing .....NEWS p24 Aug 16

## Special Reports 1965

Focus '65 .....p25, Jan 4  
Computer design of microelectronic circuits .....p26  
Optoelectronics—key to isolation .....p30  
Transistors invade microwave design .....p36  
New horizons in applied superconductivity .....p42  
Semiconductors: ready for 1 Kw at 1 Ge .....p48  
Industrial control by digital computers .....p54  
Wire and Cable .....p31, Feb 15  
Ribbon cables show their versatility .....p32  
Conductor specification data .....p36  
Four factors influence cable-harness design .....p42  
Selecting the right insulation for hook-up wire .....p46  
Functional specifications speed coaxial-cable selection .....p48  
Avoiding shorted-coil failures .....p54  
Semiconductor Directory—Special insert, May 10  
Packaging .....p20, July 5  
Functional packaging for tomorrow's Navy .....p22  
Low-cost mock-ups make good sense .....p26  
Embedded packages can be repairable .....p30  
Give your modules that 'finished' look .....p34  
Materials .....insert, July 19  
Materials for power sources .....pM4  
Adhesives .....pM14  
Plastics .....pM22  
Laser materials .....pM29  
Insulation .....pM40  
Magnetic materials .....pM48  
Special purpose wire and cable .....pM52  
Switches .....p33, Sept 13  
Switching needs dictate contact material, geometry .....p34  
Methodical approach leads to right coax switch .....p38  
Make sure switch you order is switch you want .....p44  
Six points to simplify rotary-wafer selection .....p48  
Solid-state sources—Their place in the microwave spectrum p21, Sept 27  
From many varieties—Which microwave source is for you? .....p22  
Reflex klystron or solid-state—When to use which source? .....p28  
Semiconductor sources—What are the main design features? .....p36  
Solid-state sources—How should you approach their design? .....p42  
Electronics expands vision of sky spies .....p26, Oct 11  
Microelectronics comes down to earth .....p33, Oct 25  
Integrated devices—What will be in your black box? .....p34  
Prototyping—How closely can you approach reality? .....p40  
Packaging—How do you juggle the tradeoffs? .....p44  
Monolithic chips—Should you roll your own? .....p48  
Industrial design .....p21, Nov 8  
Industrial design ... for the home or industry .....p22  
Industrial design ... for the lab technician/engineer .....p28  
Industrial design ... for a broad market/low production .....p32

Five Ge coaxial cable drops 10 db per 100 ft .....PF p100 Feb 15  
High-power laser produces long, spikeless pulses .....NEWS p16 Mar 1  
High-power radar works on two bands .....ART p20 June 21  
High-power subharmonic varactor frequency divider .....IFD p64 Sept 27  
Ionized argon laser produces 18 watts .....NEWS p17 June 7  
Laser materials .....MAT pM29 Jul 19  
Laser polarimeter to detect twists in ship's hull .....NEWS p18 Aug 2  
Laser sensor needs no optics .....NEWS p25 Feb 15  
Laser transmission made practical by light detector .....NEWS p15 Nov 8

Lasers converted to single-line mode .....NEWS p15 May 24  
Metal-plasma laser will yield 100 watts .....NEWS p24 Oct 11  
Microwave oven cheaper, simpler .....NEWS p17 Sept 13  
MOS complements pierce microwave micropower logic NEWS p10 Apr 26  
Optoelectronics—key to isolation .....ART p30 Jan 4  
Passive miniature circulator operates at vhf .....PF p52 Aug 30  
PIN-type diode modulates gigacycle carrier by injection .....NEWS p22 Oct 25  
Plasma arc pump increases output of common lasers .....NEWS p10 Oct 25

Plug-in and go: instant counting to 8Gc plus .....PF p58 Dec 20

S-band, L-band transmitters fill 12 cubic inches .....NEWS p10 Sept 13

Simple techniques to measure high-power pulses .....ART p42 Nov 8

Sizing up antennas ART p58 Nov 22

Slotted antenna arrays can be smaller .....ART p34 May 10

Solid-state devices challenge microwave tubes .....NEWS p12 Nov 22

Solid-state laser operates at cw with external cavity NEWS p18 Aug 30

Solid-state microwave design surges ahead .....NEWS p6 Mar 15

Solid-state source reaches 2 mw at 60 Gc .....PF p72 Sept 27

Solid-state sources .....SR p21 Sept 27

Solid-state—the designers probe the problems .....NEWS p12 Mar 15

Super cooled tin 'sandwich' emits 9 Gc microwaves .....NEWS p18 Sept 27

Tiny antennas have built-in systems .....ART p30 Dec 20

Transistors invade microwave design .....ART p36 Jan 4

Waveguide performs well as dispersive device .....IFD p42 Apr 26

X-band delay amp promises low-cost, simple systems .....NEWS p14 Jul 19

YIG resonators yielding practical low-noise devices .....NEWS p16 Dec 20

## Missiles and Space

Apollo: system 'go' countdown continuing .....NEWS p12 Oct 11

Electronics expands vision of sky spies .....SR p26 Oct 11

First Surveyor launch slips into early 1966 .....NEWS p6 Nov 8

Military electronics step-up evident at Wescon .....NEWS p6 Sept 13

Latest flight of Stratoscope II fails to deck .....NEWS p12 Aug 16

NASA designing radio-astronomy satellite .....NEWS p12 Sept 27

NASA library file stores documents on magnetic tape NEWS p16 Apr 12

Phased-orbit system vies for Comsat job .....NEWS p6 Mar 1

Space needs stimulate environmental testing .....NEWS p16 May 24

Suitcase receiver seeks satellites .....NEWS p18 Oct 11

## Packaging

Aging/breadboarding aided by test sockets .....NEWS ME p52 June 21

8 flat packs get EIA nod .....NEWS ME p50 June 21

Give your modules that 'finished' look .....SR ART p34 Jul 5

Functional packaging for tomorrow's Navy .....SR ART p22 Jul 5

Low-cost mock-ups make good sense .....SR ART p26 Jul 5

Low-power efficiency with tunnel diode limiters .....ART ME p46 June 21

## Power Sources

Capacitor replaces transformer in low voltage power supply IFD p57 Apr 12

Dc to dc converter does not use tapped transformer .....IFD p43 June 7

Fuel-cell power advances to 5-kw level .....NEWS p6 June 21

High temperatures restore solar cells after radiation .....NEWS p22 Nov 22

Material for power sources .....MAT pM4 Jul 19

NiCd battery filters, regulates supplies .....NEWS p14 May 24

R & D grows in rechargeable batteries .....NEWS p12 Sept 13

Success of fuel cells speeds non-space uses .....NEWS p6 Sept 27

Tunnel diode detects battery voltage levels .....IFD p44 Aug 30

## Production, Processes and Cooling

Aging/breadboarding aided by test sockets .....ART ME p52 June 21

Answering some "unanswered questions" .....ART ME p62 May 24

Avoiding shorted-coil failures .....SR ART p54 Feb 15

Carriers help microcircuit handling .....NEWS ME p90 Jan 4

Circuit cards speed system prototyping .....ART p52 Sept 27

Conductor specification data .....SR ART p36 Feb 15

8 flat packs get EIA nod .....NEWS ME p58 June 21

Four factors influence cable harness design .....SR ART p42 Feb 15

Functional specifications speed coaxial-cable selection .....SR ART p48 Feb 15

Good rocket computers come in tough packages .....DD p68 Jan 4

Graph speeds film-resistor layout .....ART ME p44 June 7

Industrial control by digital computers .....ART p54 Jan 4

Low-power efficiency with tunnel-diode limiters NEWS ME p46 June 21

Machine-tool makers eye integrated circuits .....NEWS p12 Jul 19

Monolithic vs hybrids: battle or wedding? .....NEWS p44 Mar 29

Ribbon cables show their versatility .....SR ART p32 Feb 15

Selecting the right insulation for hook-up wire .....SR ART p46 Feb 15

Sliding disks simplify switching .....DD p66 Jan 4

Time-savers for breadboarding integrated circuits ART ME p38 Mar 29

Wire and cable .....SR ART p31 Feb 15

## Reliability

di/dt failures in SCR circuits .....ART p140 Aug 16

Improved reliability via physics of failure .....MAT p70 Sept 13

Reliability specifications essential for power supplies .....IFD p65 Sept 27

## Research and Development

Biomedical Institute: a little closer .....EDIT p31 Aug 16

Deep sea technology gains sharply in Thresher's wake NEWS p12 Jan 18

Eight-kw cryo supply uses armature at room temperature NEWS p14 May 10

First 'natural' neutrinos detected in 2-mile-deep mine .....NEWS p17 Oct 11

Flying standards set world's clocks

.....NEWS p12 Apr 26

Fun under the sea .....EDIT p19 June 7

Ionosphere study aided by 'phase interaction' radio NEWS p18 Sept 13

New circuitry withstands deep-sea pressures .....NEWS p6 Feb 1

New horizons in applied superconductivity .....ART p42 Jan 4

New tools to gather data from the oceans .....NEWS p6 May 10

Pavlov experiments now go electronic, and with cats, too NEWS p22 Oct 11

Shockley calls for more respect for basic science .....NEWS p23 Mar 15

VLF upsurge boosted by new military needs .....NEWS p6 Mar 29

## Semiconductors, Solid-State Devices

Semiconductors, Solid-State Devices

A blanket approach to a linear thermistor network .....ART p20 Mar 29

Achieve optimum noise performance for FETs .....ART p40 Oct 11

Acoustic amplifier uses CdS wafer at room temperature NEWS p16 Oct 11

Aging/breadboarding aided by test sockets .....NEWS ME p52 June 21

Bootstrapping boosts pre-amp input impedance .....ART p22 May 10

Box car circuit provides pulse amplifier age .....IFD p83 Sept 13

Cascaded UJT oscillators form stable frequency divider .....IFD p52 Nov 8

Charge-depletion technique yields low-frequency carriers .....IFD p49 Dec 20

Complementary dual follower increases input impedance .....IFD p58 Nov 8

Design of de-coupled bistable circuits .....ART p26 Aug 2

di/dt failures in SCR circuits .....ART p140 Aug 18

Economy SCRs are plastic encapsulated .....PF p44 Jul 19

8 flat packs get EIA nod .....NEWS ME p50 June 21

Full-time calculations of clamped transistor switches .....ENG DATA p38 May 24

FET as voltage-variable resistor .....ART p66 Sept 13

FET can be used to multiply two signals .....IFD p34 Mar 29

FET gives linear, uniform gain, zero or 180 deg phase shift IFD p31 Mar 3

FET limits and resets operational amplifiers .....IFD p54 Nov 8

FET used for unity gain high impedance scope probe .....IFD p46 Aug 30

FETs improve line on voltage amplifiers .....ART p24 Dec 20

FETs, power types gain economy trend .....NEWS p12 Aug 30

Field-effect devices enjoy wider markets, new uses NEWS p16 Aug 16

Field-effect diodes provide current reference .....PF p68 May 10

Four components make dc regulator .....ART p64 Feb 15

Four layer diode ground switch controls core memory IFD p67 Sept 27

Four-layer diode produces fast, high-voltage pulses .....IFD p55 May 24

Four-layer diode provides time delay with instant reset .....IFD p33 Mar 29

From many varieties—which microwave source is for you .....

.....SR p22 Sept 27  
 Graphical design for non-saturating Schmitt triggers ..ART p58 Feb 15  
 Graphics yield fast, low-cost printed-circuit breadboard ..IFD p56 Nov 8  
 Hall-effect multiplier simplifies polar display .....DD p24 Mar 29  
 Harmonic generators: is the step-recovery diode best? ..ART p28 Jan 18  
 Have semiconductors relegated relays to a second-class status? .....ART p14 Nov 29  
 High-power subharmonic varactor frequency divider ....IFD p64 Sept 27  
 High-ratio pulse counter utilizes UJT switch .....IFD p58 Mar 15  
 How to choose the right Hall crystal .....ENG DATA p30 Mar 29  
 Industrial users switch relays for solid-state .....NEWS p6 Aug 16  
 Instability plagues thin-film transistors .....NEWS p12 May 10  
 Low-frequency FET amplifier has narrow bandpass ...IFD p72 Jan 4  
 Low-power efficiency with tunnel diode limiters NEWS ME p46 June 21  
 Matched transistors passe for FET squarers .....ART p36 Nov 8  
 MOS transistor provides sharp differential relay switching IFD p32 Mar 29  
 MOS FET "quiet" at uhf: 12 db gain with 4 db noise .....PF p68 Dec 6  
 Nixie driver flip-flop also stores information .....IFD p82 Sept 13  
 Occurrence generator uses Shockley diode .....IFD p64 Nov 22  
 100 Mc logic tunnel-diode ready to go .....NEWS p12 Mar 1  
 One wafer—one logic array .....ART ME p66 Mar 15  
 Oxide barrier boosts dual-transistor performance .....PF p76 Oct 10  
 Pin-type diode modulates gigacycle carrier by injection NEWS p22 Oct 25  
 Planar-passivated FETs yield low noise .....PF p46 Jul 19  
 Power transistor delivers 1 w at 1 Gc fundamental .....PF p94 Mar 15  
 Radioactive source energizes 10 watt silicon solar cells NEWS p18 Dec 20  
 Reflex klystron or solid-state—when to use which source SR p28 Sept 27  
 SCR gives dc motor synchronous capability .....ART p20 Dec 6  
 SCR pulse-follower circuit alternates latching relay .....IFD p51 Dec 20  
 SCR-UJT circuit monitors transients, indicates faults ...IFD p37 June 21  
 SCR relay circuit makes flip-flop or interval timer .....IFD p39 June 7  
 SCR and UJT form time-delay switch .....IFD p82 Sept 13  
 Self-regulating ovens cap TO-5 and DO-7 cans .....PF p48 Aug 2  
 Semiconductor coding is not a sacred cow .....EDIT p33 Mar 15  
 Semiconductor Directory .....SPECIAL INSERT May 10  
 Semiconductor sources—what are the main design features? .....SR p36 Sept 27  
 Semiconductors: Ready for 1 kw at 1 Gc .....ART p48 Jan 4  
 Semiconductors—si-junction rectifiers reach 6-kv wvdc .....PF p92 Oct 25  
 Shortcut to design of diode-resistor network .....ART p58 Oct 25  
 "Should we improve the method of cod-

ing transistors" "yes" .....ART p46 Mar 15  
 Silicon and germanium battle at hi-fi show .....NEWS p6 Oct 25  
 Simple circuit starts beam tubes automatically .....IFD p44 Jan 18  
 Solid-state sources—how should you duty cycle with low ripple .....DD p42 Apr 12  
 Solid-state sources—how should you approach their design? .....SR p42 Sept 27  
 Solid-state source reaches 2 mw at 60 Gc .....PF p72 Sept 27  
 Solid-state—the designers probe the problems .....NEWS p12 Mar 15  
 Solid-state microwave design surges ahead .....NEWS p6 Mar 15  
 Step-recovery diode efficiency soars .....NEWS p12 June 7  
 Step recovery diodes show marked efficiency gains .....PF p94 Mar 15  
 Tetrode FET hits 8000 mho at 1.4 pf max reverse capacitance .....PF p74 Nov 22  
 The wonderful world of the thyristor .....NEWS p12 Dec 6  
 Thin-films may boost integrated's performance ...NEW ME p70 Mar 15  
 Transistor, diode form bidirectional synchronous clamp IFD p84 Sept 13  
 Transistorized switch provides ac signal gate .....IFD p49 Jan 18  
 Transistors invade microwave design .....ART p36 Jan 4  
 Transistor switching regulates power supplies .....PF p42 Mar 1  
 Triac optimizes static control of ac power .....ART p32 May 24  
 Triac suppresses motor switching noise .....IFD p154 Aug 16  
 Tunnel diode and UJT produce ultrafast trigger output IFD p40 June 7  
 Tunnel diode circuit offers non-distorted delayed pulse ...IFD p46 May 10  
 Tunnel-diode-curve tracing lowers oscillation tendency ..IFD p31 Mar 1  
 Tunnel diode detects battery voltage levels .....IFD p44 Aug 30  
 Tunnel-diode level detector is ultra-sensitive .....IFD p73 Jan 4  
 Tunnel diode provides fast current-overload detection IFD p62 Nov 22  
 Tunnel diodes simplify shift-register construction .....IFD p29 Feb 1  
 Turn to the tetrode FET for hf design .....ART p20 June 7  
 Two R-L network limits surge to low-starting loaded SCR .....IFD p52 Apr 12  
 UJT and multivibrator form brushless dc motor .....IFD p67 Oct 11

UJT oscillator forms simple digital phase-locked loop IFD p33 June 21  
 UJT oscillator makes simple FM modulator .....IFD p47 May 10  
 Why not the avalanche diode as an RF noise source? ....ART p32 Apr 12  
 Zener diode aids chopper in demodulator application ...IFD p56 Apr 12  
 Zener diodes provide high level limiting .....IFD p77 Feb 15

## Editorials

A new face for ED banishes your pet peeve .....EDIT p18 Dec 6  
 A vote for bull sessions .....EDIT p19 June 21  
 About those crowded campuses .....EDIT p19 Jul 19  
 An intelligent machines program .....EDIT p21 May 10  
 Applied brainpower EDIT p27 Jan 18  
 Biomedical institute: a little closer .....EDIT p31 Aug 16  
 Confusion raised to the Nth power .....EDIT p19 Aug 2  
 Engineering integrity EDIT p20 Mar 1  
 Fun under the sea EDIT p19 June 7  
 Guidelines for invading foreign markets .....EDIT p31 May 24  
 Have a look at our editorial plans for 1965 .....EDIT p24 Jan 4  
 How not to teach engineering .....EDIT p28 Feb 15  
 If you can't beat 'em, join 'em .....EDIT p19 Sept 27  
 Legalized murder on the highways .. .....EDIT p23 Dec 20  
 Let's not put our best foot forward .....EDIT p29 Nov 22  
 Needed: A medical technology institute .....EDIT p19 Apr 26  
 'Never have so few given so little to so many' .....EDIT p31 Oct 25  
 NSPE: The engineer's AMA? .....EDIT p31 Sept 13  
 Professional groups and personal liberties .....EDIT p19 Jul 5  
 Semiconductor coding is not a sacred cow .....EDIT p33 Mar 15  
 The engineering license—is it worth it? .....EDIT p18 Nov 8  
 The right track ...EDIT p19 Feb 1  
 The urban-engineering challenge .....EDIT p39 Oct 11  
 To err is human—or is it?.....EDIT p19 Aug 30  
 It's New York's turn .....EDIT p19 Mar 29  
 Will engineers be on the spot? .....EDIT p31 Apr 12

## Special Reference Issues 1965

### Test Equipment Reference Issue.

Compilation of 12 technical articles pertaining to test equipment plus a master cross-index of manufacturers and categories. Test equipment covered in this issue includes: Multipliers, Oscilloscopes, Digital Voltmeters, Spectrum Analyzers, VTVMs, Frequency Meters, Waveguide Frequency Meters, Frequency Counters, Phase Meters, Field Strength Meters, Slotted Lines and SWR Meters.

### Relay Applications Reference Issue.

Contains eight technical articles, relay data chart showing manufacturers and their product lines plus a listing of MIL and NASA specifications. Included in this special issue is a compilation of useful relay-circuit ideas.

Both special issues are available at \$5.00 per copy or \$1.00 per copy in quantities exceeding 50.