COMMUNICATIONS CIRCUITS READY-REFERENCE

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Preface

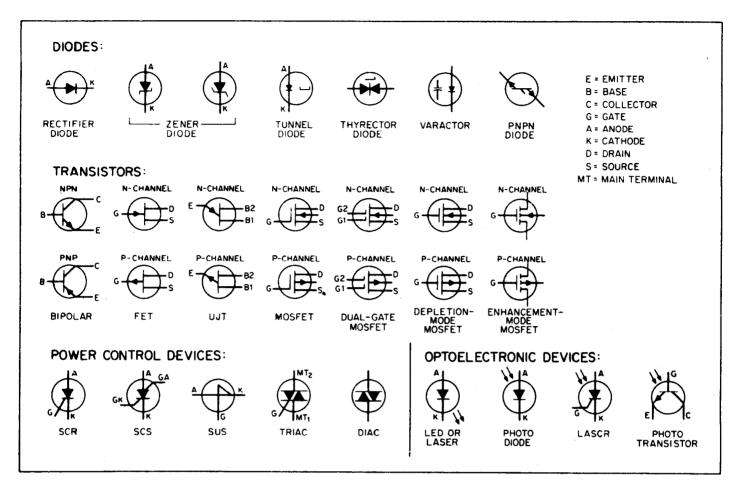
Communications Circuits Ready-Reference is one of five books in the Ready-Reference series. These books are the product of cover-to-cover searching of back issues of U.S. and foreign electronics periodicals, the published literature of electronics manufacturers, and recent electronics books, together filling well over 100 feet of shelving. This same search would take weeks or even months at a large engineering library, plus the time required to write for manufacturer literature and locate elusive sources.

Each circuit has type numbers or values of all significant components, an identifying title, a concise description, performance data, and suggested applications. At the end of each description is a citation giving the title of the original article or book, its author, and the exact location of the circuit in the original source.

To find a desired circuit quickly, start with the alphabetically arranged table of contents at the front of the book. Note the chapters most likely to contain the desired type of circuit, and look in these first. If a quick scan does not locate the exact circuit desired, use the index at the back of the book. Here the circuits are indexed in depth under the different names by which they may be known. Cross-references in the index aid searching. The author index will often help find related circuits after one potentially useful circuit is found, because authors tend to specialize in certain circuits.

To the original publications cited and their engineering authors and editors should go major credit for making this book possible. The diagrams have been reproduced directly from the original source articles, by permission of the publisher in each case.

Semiconductor Symbols Used



The commonest forms of the basic semiconductor symbols are shown here. Leads are identified where appropriate, for convenient reference. Minor variations in symbols, particularly those from foreign sources, can be recognized by comparing with these symbols while noting positions and directions of solid arrows with respect to other symbol elements.

Omission of the circle around a symbol has no significance. Arrows are sometimes drawn open instead of solid. Thicker lines and open rectangles in some symbols on diagrams have no significance. Orientation of symbols is unimportant; artists choose the position that is most convenient for making connections to other parts of the circuit. Arrow lines outside optoelectronic symbols indicate the direction of light rays.

On some European diagrams, the position of the letter k gives the location of the decimal point for a resistor value in kilohms. Thus, 2k2 is 2.2K or 2,200 ohms. Similarly, a resistance of 1R5 is 1.5 ohms, 1M2 is 1.2 megohms, and 3n3 is 3.3 nanofarads.

Substitutions can often be made for semiconductor and IC types specified on diagrams. Newer components, not available when the original source article was published, may actually improve the performance of a particular circuit. Electrical char-

acteristics, terminal connections, and such critical ratings as voltage, current, frequency, and duty cycle, must of course be taken into account if experimenting without referring to substitution guides.

Semiconductor, integrated-circuit, and tube substitution guides can usually be purchased at electronic parts supply stores.

Not all circuits give power connections and pin locations for ICs, but this information can be obtained from manufacturer data sheets. Alternatively, browsing through other circuits may turn up another circuit on which the desired connections are shown for the same IC.

When looking down at the top of an actual IC, numbering normally starts with 1 for the first pin counterclockwise from the notched or otherwise marked end and continues sequentially. The highest number is therefore next to the notch on the other side of the IC, as illustrated in the sketches below. (Actual positions of pins are rarely shown on schematic diagrams.)





Abbreviations Used

AC ampere CRO cathoda-ray F fared AC C AC or DC CROM control and read-only FET degree Fahrenheith electronistor AD C analoga-to-digital memory FEFO first-out first-out first-out memory AD C analoga-to-digital CT center tap Tour-pole double-out first-out first-out first-out memory AD D analoga-to-digital or converter CT center tap Tour-pole double-out first-out f						
AC or DC CROM control and read-only FET field-effect translator ADZ analog-to-digital CRT cathode-ray tube FM fielD (first-infrat-out requency or converter CT center tap modulation AD_A analog-to-digital, or digital-to-analog or processing CC converter throw or throw on throw or throw on throw or thro			CRO	•		
AD D. analog-to-digital converter CRT cathod-ray tube center tap converter FIFO frequency modulation converter CRT cathod-ray tube center tap center tap converter FIFO four-pole double-theow digital-to-analog digital-to-analog digital-to-analog digital-to-analog automatic frequency DAC digital-to-analog digital-to-analog digital-to-analog digital-to-analog automatic frequency 4PST four-pole aingle-theow throw digital-to-analog converter 4PST four-pole aingle-theow throw digital-to-analog digital-to-analog converter 4PST four-pole aingle-theow throw decibel above 1 without throw control 4PST four-pole aingle-theow throw decibels above 1 without throw fit frequency-shift decibels above 1 within 1 foot per minute decibes above 1 within 1 foot per minute decibes above 1 within 1 foot per minute frequency automatic gain did frequency-shift decibes above 1 within 1 foot per second within 1 foot		•		•	•	•
ADC		AC or DC	CROM	control and read-only	FET	
AD, DIA analog-to-digital, or digital-to-analog analog-to-digital, or digital-to-analog alto-manalog automatic data pocasing automatic data processing automatic data processing automatic data processing automatic frequency dBC decibel and processing automatic frequency dBC c-scale sound level FS full scale frequency and fine decibels above 1 mW from throw automatic data processing automatic fine processing processing processing processing automatic fine processing fine processing proc		analog-to-digital			FIFO	first-in first-out
A.D. D. A. D. D. A. D. D. A. D. D. D. A. D.	ADC	analog-to-digital		cathode-ray tube	FM	
ADP		converter	-	center tap		
ADP	A/D, D/A	analog-to-digital, or	CM	continuous wave	4PDT	four-pole double-
AF audio frequency dB deable FS full scale AFC autionatic frequency dBC deable FS full scale of the property o		digital-to-analog	D/A	digital-to-analog		and the second s
AFC audio frequency control control control control control control control in decibels accordance frequency shift keying dBV C-scale sound level pSK frequency-shift keying in decibels above 1 mW for frequency-shift keying dBV C-scale sound level pSK frequency-shift keying frequency-shift keying decibels above 1 mW fit in decibels above 1 mW decibels above 1 mW fit in foot per minute floor per minute floo	ADP	automatic data	DAC	digital-to-analog	4PST	
AFC sutomatic frequency of the control of the contr						
AFSK audio frequency-shift dBm decibels above 1 mW ft foot foot keying dBV decibels above 1 mW ft from foot per minute foot pe		• •			-	
AFSK keying dBV decibels above 1 mW ft foot weight for the foot of tuning automatic fine tuning DCDC direct current tuning DCDC direct current foot per minute foot per second sutomatic fine tuning DCDC DC to DC to DC automatic fine tuning DCDC direct current ft's source foot tuning DCDC DC to DC to DC to DC automatic gain DCTL direct-coupled FV frequency-to-voltage frequency overlage-to-voltage frequency overlage-to-voltage frequency frequency overlage-to-voltage frequency overlage-to-voltage frequency overlage-to-voltage frequency overlage-to-voltage frequency overlage-to-voltage frequency frequency overlage-to-voltage frequency overlage-to-voltage frequency frequency overlage-to-voltage frequency overlage-to-voltage frequency frequency overlage-to-voltage overlage-to-voltage frequency frequenc	AFC	• •	dBC		FSK	
AFT automatic fine DC direct current ft's foot per minute for tuning DC/DC DC to DC ft's square foot responsible for tuning DC/DC DC to DC ft's square foot ft's square foot ft's control tuning DC/DC DC to DC ft's square foot ft's square foot ft's square foot ft's control transitor logic F/V ff frequency-to-voltage frequency-to-voltage frequency or voltage-to-frequency ffeet frequency ffeet frequ		control				• •
AFT automatic fine DC direct current ft/s foot per second tuning automatic gain DCIDC DC to DC t	AFSK	audio frequency-shift		decibels above 1 mW		
AGC automatic galin control diac direct-coupled FV frequency-to-voltage, control diac diode AC switch transistor logic FV, VF frequency-to-voltage, or voltage-to-voltage, or voltage-to-voltage, or voltage-to-frequency arithmetic-logic unit DIP dual in-line package modulation access GHz gigshertz GMM direct memory G gigs- (107" gigshertz GMM MM digital multimeter G-M tube Gelger-Mueller tube hour type of logic circuit DPDT double-pole double- hour throw H henry control DPM digital panel meter HF high frequency oscillator DPST double-pole single- HFO high-frequency oscillator DTL diode-pole single- HFO high-frequency oscillator DTL diode-transistor logic Hz hertz capacitor DTL diode-transistor logic Hz hertz capacitor DVM digital voltmeter G-M tube hour throw H henry high-frequency oscillator DTL diode-transistor logic Hz hertz capacitor DVM digital voltmeter Frequency device under test IF intermediate frequency device under test IF intermediate frequency device under test IF intermediate frequency device deletinal MDM distant IMD dista		. •		decibels above 1 V	ft/min	•
AGC automatic gain control DCTL direct-coupled transistor logic F/V frequency-to-voltage fequency-to-voltage fequency arithmetic-logic unit DIP diode AC switch F/V, V/F frequency-to-voltage fequency or voltage-to or voltage-to frequency arithmetic-logic unit DIP dual in-line package F/V, V/F frequency or voltage-to frequency frequency or voltage-to frequency arithmetic or voltage-to frequency arithmetic or voltage-to frequency arithmetic or voltage-to frequency arithmetic or voltage-to frequency or vo	AFT	automatic fine				•
Ah amper-hour diac dode AC switch ALU arithmetic-logic unit DIP dual in-line package frequency ovoltage, or voltage-to-relation and the property of the package of the property of the propert		5		DC to DC		•
Abl ampleted diac diode AC switch amplitude amplitude amplitude modulation access GHz giga-(10 ^T) gigahertz gigahert gigahertz gigahert gigahert gigahert gigahert gigahert gigahert gigahert gigah	AGC	_	DCTL	•		
ALU arithmetic-logic unit DIP dual in-line package amplitude DMA direct memory G giga- (107" gigahertz g				_	F/V, V /F	
AM amplitude modulation access GHz giga- (10 7" gigahertz gigahert gigahertz gigahertz gigahertz gigahertz gigahertz gigahert		• "		diode AC switch		or voltage-to-
modulation DMM digital multimeter G-M tube Geiger-Mueller tube AND type of logic circuit DPDT double-pole double- AVC automatic volume control DPM digital panel meter HF high frequency bit bit DPST double-pole single- BCD binary-coded decimal BFO beat-frequency DSB double-pole single- bit DPST double-pole single- BCD binary-coded decimal BFO beat-frequency DSB double sideband hp horsepower oscillator DTL diode-transistor logic Hz hertz bs bit per second DTL/TTL DTL or TTL IC integrated circuit capacitance; DUT device under test IF intermediate frequency digital voltmeter frequency distance reception; degree Celsius; DX distance reception; IGFET insulated-gate FET degree Centigrade CATV cable television EAROM electrically alterable celtrically alterable device coupled EBCDIC extended binary-coded decimal in inch inch per second device centimeter ECL emitter-coupled line interchange code in insulated-gate FET transit time centimeter ECL emitter-coupled logic DP electronic data IR infrared CMOS complementary MOS complementary MOS complementary MOS complementary REM electronic data IR infrared rejection ratio rejection refer electronic data IR infrared rejection ratio rejection refer electronic data IR infrared coax coaxial cable ERP effective radiated keV kilobetto coax coaxial cable ERP effective radiated keV kilobetto relectronic video recording kW kilowatt kW kilowatt view of the processing centimeter second recording kW kilowatt view of the processing view of the power with kilowatt view of the power view of the power with kilowatt view of the power view of the view of the power view of		•	=	dual in-line package		• •
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AND type of logic circuit AVC automatic volume control DPM digital panel meter throw H henry high frequency be bit DPST double-pole single- HFO high-frequency oscillator bit observed and the pole single- throw oscillator bit observed decimal throw oscillator DPST double-pole single- HFO high-frequency oscillator DTL double-pole single- HFO high-frequency oscillator DTL throw oscillator DTL throw oscillator DTL double-pole single- HFO high-frequency oscillator DTL double-pole single- HFO high-frequency oscillator DTL throw oscillator DTL Trul DTL or TTL IC integrated circuit DTL DTL or TTL IC integrated circuit degree Celsius; DX distance reception; IGFET insultated-gate FFT degree Celsius; DX distance reception; DX distance reception; DX distance reception; DX device coded decimal in inches inches inches reception; DX device reception related reception recept		***************************************		access		• •
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Description	AVC					•
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	CPU			type of logic circuit		
on carnode ray NOK type of logic circuit LASCH light-activated SCR	CB			Annua addining the state of		•
	Ch	catnode ray	MOK	type of logic circuit	LASCK	iignt-activated 5CK

LC comment moderation NOR part part positive	LASCS	light-activated SCS	NMOS	N-channel MOS	QRP	low-power amateur
LOB	LC	inductance-	NOR	type of logic circuit		radio
LDR		capacitance	NPN	negative-positive-	R	resistance; resistor
Tesistor	LCD	liquid crystal display		negative	RAM	random-access
LED light-emitting diode NRZ nonreturn-to-zero RF radio frequency LIFO us fraguency NRZ inverted RFI radio-frequency LIFO last-in first-out inverted RFI radio-frequency LO local oscillator NTSC National Television RGB redigreenblue LO logarithmic amplifier NTSC National Television RGB redigreenblue LSI large-scale nW nanovotit Association of manifer integration RGM Association of manifer integration RGM resistance-	LDR	light-dependent	NPNP	negative-positive-		memory
LF				negative-positive	RC	resistance-
LFO last-in first-out in wested RFI radio-frequency LO local oscillator NTSC National Television RGB redigreemblue LO logarithmic amplifier System RIAA Recording Industry LSB least significant bit nV nanovolt RLA Recording Industry LSI large-scale nW nanovott RLC resistance-integration m meter: milli-(10°)* OEM organial equipment industrance-capacitance m meter: milli-(10°)* OR resistance-integration RRM registance-capacitance m meter: milli-(10°)* OR registance-capacitance read-only memory m meter: milli-(10°)* OR registance-capacitance read-only memory m motor p pc-(10°)* pm revolved-only memory motor p pc-(10°)* pm revolved-only memory MB medium frequency pA pbibli daddress RTL residence		light-emitting diode		nonreturn-to-zero		capacitance
Immen		low frequency	NRZI	nonreturn-to-zero-	RF	radio frequency
LO local oscillator logamp log	LIFO	last-in first-out			RFI	radio-frequency
logarithmic amplifier						
LP long play Committee Association of LSI Association of Pamerical integration integration integration integration of PM manuvalt. Americal resistance integration integration of PM manuvalt. Americal resistance integration manufacturer or manufacturer of pmanuvalt. Americal resistance capacitance operational amplifier of PM pmanuvalt. RMS protein capacitance capacitance capacitance capacitance operational amplifier of PM pmanuvalt. RMS protein capacitance capacitance capacitance capacitance capacitance capacitance capacitance capacitance manufacturer. Amount pmanuvalt. Amount pmanuva	· -		NTSC			•
LSI	• ,	•			RIAA	_
LS large-scale number		- · ·				
Integration OEM original equipment capacitanee		-				
M meter (milli-10 ²) meter (near unear) (instrument); OR populational amplifier (sinstrument); OR popico (10 ²) popico (10	LSI	•			RLC	
Mega (10%): meter (instrument); motor opa motor (instrument); motor op p pico (10 %) pico (10 %) pico (10 %) ROM policirezit (10 %) pico (10 %) read-only memory revolution per minute MA milliampere (MF) P peak; positive point medium frequency (MF) PA public address (Digital medium frequency (MF) PA public address (Digital medium frequency (Digital medium frequency (MF) PA public address (Digital medium frequency (Dig			OEM			
finstrument);						
motor	M					
mA milliampere P peak; positive minute minute resistor-transistor logic MF medium frequency PA public address RTL logic MHD medium frequency PA public address RTL logic MHD medium frequency PAM phase-alternation RTL registor-transistor logic MHZ magnetohydro-dynamics PAM pulse-amplitude RZ second MNZ min mile PCM printed circuit approximation register mike microphone PCM publise-douted register register min mine PCM publise-doutedon SAW surface acoustic min min minute modulator SAW surface acoustic monostable pF picofarad SCS Subsidiary MOS metal-oxide pF power factor scope sciliaco controlled modulator pressitive-regative psciliaco						
Mb megabit MF pA picoampere logic RTL logic resistor-transistor logic MF medium frequency millihearry PAL phase-alternation RTTY radioteletyte radioteletyte radioteletyte radioteletyte phase-alternation RTTY radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte approximation MHZ magnetohydro- millimers PAM publise-alternation RTTY radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte radioteletyte approximation MHZ megahertz modulation SAR successive approximation register mill millimer PCM publise-code sproximation register mike microphone millimeter PDM publise-duration SAW successive approximation modulator demodulator demodulator PEP pek exervelope power Cammunications MOST mono monostable pf picolared promono monostable pf picolared promono monostable pf picolared promono monostable pf picolared promono monostable pf picolared promonomonomonomonomonomonomonomonomonomo	A				rpm	•
MF medium frequency PA public address 1 jogic MHD magnetohydro-dynamics Ine RZ raturn-to-zero MHz megahertz modulation SAR successive-approximation mike PC printed circuit approximation mike PCD publise-addition SAR successive-approximation mike PCM publise-code register min mile PC publise-code register min mile PDM published yeard modulation SAW surface acoustic wave modulator PEP peak envelop power Communications modulator PEP peak revelop power Communications monostable pF poclarad Communications MOST metal-oxide PIN positive-intrinsie- scope scope semiconductor pM persament magnet; scope switch semiconductor pM		•			n=.	
nH millihenry PAL dynamics PAM pulse-amplitude RTTY radioteletype return-to-zero return-to-zero dynamics MHz megahertz mile PAM pulse-amplitude s second min mile PC printed circuit SAR successive-approximation register mike microphone microphone microphone min minute pCM pulse-code approximation register mm milimeter modulation SAW surface acoustic wave mm modulator PDM pulse-duration modulation SCA Subsidiary Communications Authorization moon demodulator PEP peak envelope power modulation SCA Subsidiary Communications Authorization MOS metal-oxide PF powe factor scope oscilloscope semiconductor phonograph phonograph SCR silicon controlled rectifier MOSTET metal-oxide PIN positive-intrisis- metal-oxide SCS silicon controlled silicon controlled semiconductor FET PIV peak inverse voltage SCS silicon controlled silicon controlled semiconductor MPU microprocessing unit PMOS P-channel MOS P-channel MOS SNR signal-to-noise ratio signal-to-noise ratio signal-to-noise ratio signal-to-most ratio signal-to-most ratio signal-to-most ratio signal-to-most ratio signal-to-most ratio positive-negative positive positive positive positive positive pos		Ţ	•	•	RTL	
MHD magnetohydro- dynamics Iline RZ return-to-zero MHz megahertz modulation SAR successive- second mil mile PC printed circuit approximation register min mile PCM pulse-code register min minute modulation SAW surface acoustic min mille PDM pulse-code vave min mille pp pulse-code register min mille pp pulse-code register min mille pp pulse-code register min mille pp picofarad committed wave monostable pF picofarad phonograph SCR silicon controlled MOSFET ptoxide pIN positive-intrinsic- scope oscilloscope MOST metal-oxide pIL phase-locked loop S-meter sjangl-strength ms microaccid		· · · · · · · · · · · · · · · · · · ·		•	DTTV	
MHz megahertz mile PAM pulse-amplitude modulation second MHz megahertz mile PC printed circuit mile approximation register min mile PC printed circuit mile approximation register min minute modulation SAW surface acoustic wave modem minute modulation SAW surface acoustic wave modem modulator demodulator demodulator demodulator PEP peak envelope power modulation SCA Subsidiary MOS mono monostable mono monostable mono monostable semiconductor demodulator PF power factor power factor scope oscilloscope silicon controlled semiconductor phono phonograph positive-intrinsic- rectifier SCR silicon controlled semiconductor MOST metal-oxide semiconductor PIV peak inverse voltage peak enveloped peak env			FAL	•		• •
MHz megahertz modulation SAR successive-approximation register mike mile PCM printed circuit approximation register mike microphone PCM pulse-code register min mitter PDM pulse-code wave modem millemeter PDM pulse-code wave modem modulator PEP peak envelope power Communications mono monostable pF plocfarad Authorization MOS metal-oxide PF power factor scope scilloscope semiconductor phono phono phonograph SCR silicon controlled semiconductor pll peak inverse voltage SCS silicon controlled semiconductor pMP peak inverse voltage SCS silicon controlled semiconductor pMP peak inverse voltage SCS silicon controlled semiconductor pMP peak inverse voltage SCS signal-strength <td>MILLÓ</td> <td></td> <td>PAM</td> <td></td> <td></td> <td></td>	MILLÓ		PAM			
mile mike mike mike mike mike mike mike mik	Mil-		· Oiti	•		
mike min minute microphone minute PCM modulation pulse-duration modulation SAW surface acoustic wave modulator demodulator modulator demodulator mono monostable power demodulator mono monostable power actors semiconductor phono phono phonograph positive-intrinsic-semiconductor phono phonograph positive-intrinsic-semiconductor phono phonograph positive-intrinsic-semiconductor plN positive-intrinsic-semiconductor plV peak inverse voltage power semiconductor plN permanent magnet; metal-oxide plL phase-locked loop permanent magnet; metal-oxide plL phase-locked loop permanent magnet; metal-oxide plL phase-locked loop permanent magnet; meter signal-strength metal-oxide plL phase-locked loop permanent magnet; meter signal-strength meter phase modulation plL plane modulation plL plL plane modulation plL		_	PC		SAN	
min mm minute mmm minute mmm mm minute mmm millimeter millimeter modulator demodulator dem				•		• •
mm millimeter modulator modulator PPDM modulation modulation SCA subsidiary communications mono modulator demodulator mono mono monostable MOS metal-oxide modulator semiconductor pF powe factor power picofarad semiconductor xauthorization MOSFET metal-oxide semiconductor FET metal-oxide semiconductor FET metal-oxide semiconductor PIN positive-intrinsic- rectifier semiconductor SCS silicon controlled semiconductor rectifier semiconductor MOST metal-oxide semiconductor retransistor PIV peak inverse voltage semiconductor phase modulation S/N signal-tronoise silicon controlled semiconductor semiconductor MPU microprocessing unit microprocessor positive-negative positive-negative single-pole double-throw positive-negative positive-negative single-pole singl		•	1 0111	•	CAM	_
modem modulator PEP pack envelope power picofarad positive-negative integration SCA communications Authorization oscilloscope			PDM		SAW	
mono demodulator PEP peak envelope power ploofarad Communications Authorization MOS metal-oxide semiconductor metal-oxide semiconductor semiconductor profiled semiconductor profiled semiconductor profiled semiconductor profiled semiconductor profiled profiled semiconductor profiled profil				•	SCA	
mono monostable metal-oxide pF proportion phono power factor semiconductor semiconductor proportion phono phonograph phonograph scR silicon controlled semiconductor peak inverse voltage semiconductor phase modulation phase modulation s/m signal-strength meter transistor phase modulation s/m signal-to-noise ratio signal-modulation s/m signal-to-noise ratio phase modulation s/m signal-to-noise ratio phase modulation s/m signal-to-noise ratio phase modulation s/m signal-to-noise ratio s/m signal-t	modem		PEP		JUA	•
MOS metal-oxide semiconductor metal-oxide PF pln pln pono phase positio pho pulse position pholulatio phose phono ph	mono			• •		
MOSFET metal-oxide metal-oxide semiconductor FET phono positive-intrinsic- semiconductor semiconductor FET PIN positive-intrinsic- rectifier semiconductor semiconductor semiconductor semiconductor semiconductor semiconductor transistor PIL phase-locked loop permanent magnet; meter signal-strength semiconductor semiconductor transistor PM permanent magnet; meter signal-strength semiconductor semiconductor semiconductor semiconductor phase modulation S/N signal-to-noise signal-to-noise semiconductor semico				•	scone	
MOSFET semiconductor semiconductor FET per PIV peak inverse voltage semiconductor semiconductor per T programmable NOST per MOST per MOST per MOST per MOST per MOST transistor per MOST p			· ·	* .	•	•
Semiconductor per property negative peak inverse voltage switch SCS switch switch silicon controlled switch MOST metal-oxide PLL phase-locked loop S-meter signal-strength signal-to-noise signal-to-noise ration MPU microprocessing unit PMOS P-channel MOS SNR signal-to-noise ration ms millisecond PN positive-negative SPDT single-pole double-throw MSB most significant bit PNP positive-negative SPST single-pole double-throw MSI medium-scale positive-negative SPST single-pole single-throw MSI microscale P.P peak-to-peak SSI small-scale M	MOSFET		•	• •	0011	
MOST FET metal-oxide semiconductor semiconductor PLL phase-locked loop plase-locked loop semiconductor S-meter signal-strength semiconductor meter transistor PM permanent magnet; meter millisecond plan positive-negative modulation positive-negative modulation positive-negative modulation positive-negative meter positive-negative meter positive-negative positive-negative microarpare peak-to-peak microarpare peak-to-peak integration plan-position plan-position plan-position plan-position plan-position plan-position plan-position pulse-position pu				•	SCS	
MOST semiconductor transistormetal-oxide semiconductor transistorPLL phase modulation phase modulationS.M Signal-to-noise ratio signal-to-noise ratio signal-to-noise ratio signal-to-noise ratio positive-negative SSB SSB single-pole double-throw throw throw throw throw throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole double-throw single-pole			PIV		000	
semiconductor transistor PM permanent magnet; phase modulation meter signal-to-noise signal-to-noise signal-to-noise ratio millisecond PMOS P-channel MOS SNR signal-to-noise ratio signal-to-noise ratio signal-to-noise ratio millisecond PMOS P-channel MOS SNR signal-to-noise ratio signal-to-noise ratio signal-to-noise ratio millisecond PNP positive-negative SPDT single-pole double-throw throw throw MSI medium-scale integration positive negative SPST single-pole single-throw throw MSI medium-scale integration positive-negative SSB single-pole single-throw throw MSI medium-scale integration positive-negative SSB single-pole double-throw MSI microardia positive-negative positive-negative SSB single-pole single-throw MA microardia positive-negative positive-negative SSB single-pole single-throw MA microardia positive-negative positive-negative SSI single-pole single-throw MA microardia PPI plan-position SSI small-scale integration MB microardia PPM	MOST	· · · · · · · · · · · · · · · · · · ·		· · ·	S-meter	
MPUmicroprocessing unit msPMOS PN PN Positive-negative PNP Positive-negative PNP Positive-negative PNP Positive-negative PNP Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative PNPN Positive-negative POSITIVE-Negative-Negative POSITIVE-Negative POSITIVE-Negative POSITIVE-Negative-Negative Nano fraction of the Negative POSITIVE-Negative POSITIVE-N		semiconductor	PM		·	
ms millisecond PN positive-negative positive-negative positive-negative- throw SPDT single-pole double- throw throw MSI medium-scale integration PNPN positive-negative- positive-negative- positive-negative positive-negative positive-negative positive-negative square meter SSB single sideband positive-negative square micro- square meter SSB single sideband positive-negative positive negative positive-negative positive-negativ		transistor		phase modulation	S/N	signal-to-noise
ms millisecond PN positive-negative positive-negative positive-negative throw SPDT throw single-pole double-throw MSI medium-scale integration PNPN positive-negative positive-negative positive-negative throw throw throw m² square meter pot potentiometer SSB single sideband μA micro-(10 ²) pot potentiometer SSI small-scale integration μA microampere P-P peak-to-peak integration μF microfarad PPI plan-position SSTV slow-scan television indicator μM microhenry positive-negative peak SWI shortwave integration μM microfarad PPI plan-position SSTV slow-scan television some scan television indicator SWI shortwave integration μM microsecond prulse-position SWR standing-wave ration sync synchronizing μV microsecond preamp preamplifier T tera-(10²²) μW microsecond preamp preamplifier T tera-(10²²) μW millivolt pulse repetition rate coefficient MVBR multivib	MPU	microprocessing unit	PMOS	P-channel MOS		•
MSI medium-scale integration PNPN positive positive negative positive-negative positive positive-negative positive-negative positive-negative positive positive-negative positive positive negative positive positi	ms	millisecond	PN	positive-negative	SPDT	single-pole double-
integration PNPN positive-negative- throw square meter positive-negative positive-negative SSB single sideband potentiometer SSI small-scale integration pot potentiometer SSI small-scale integration peak-to-peak integration plan-position SSTV slow-scan television indicator SW shortwave pum microfarad PPI plan-position SWI shortwave listener pum microprocessor pulse-position SWR standing-wave ratio modulation sync synchronizing preamp preamplifier T tera-(10¹²) preamp preamplifier T tera-(10¹²) preamp pulse repetition TC temperature coefficient puw millivolt PRR pulse repetition rate distortion mw milliwatt PRR pulse repetition rate distortion nano-(10 ²) ps picosecond TR transmit-receive NADB National Association PUT programmable UJT triac triode AC semiconductor switch nanofarad modulation TTL transistor-transistor	MSB	most significant bit	PNP	positive-negative-		throw
m²square meterpositive-negativeSSBsingle sidebandμmicro- (10 $^{\circ}$)potpotentiometerSSIsmall-scaleμAmicroampereP-Ppeak-to-peakintegrationμFmicrofaradPPIplan-positionSSTVslow-scan televisionμHmicrohenryrindicatorSWshortwaveμmmicrometerPPMparts per million; pulse-positionSWLshortwave listenerμSmicrosecondpreamppreamplifierTtera- (10 $^{\circ}$)μWmicrovoltpreamppreamplifierTtemperaturemVmillivoltPRFpulse repetitionTCtemperatureMVBRmultivibratorPROMprogrammable ROMTHDtotal harmonicmWmilliwattPRRpulse repetition ratedistortionnnano- (10 $^{\circ}$)pspicosecondTRtransmit-receiveNnegativePSKphase-shift keyingTRFtuned radionAnanoamperePTTpush to talktriactriode ACNANDtype of logic circuitPWMpicowattsemiconductornANDtype of logic circuitPWMpulse-widthTTLtransistor-transistor	MSI	medium-scale		positive	SPST	single-pole single-
μmicro·(10 °)potpotentiometerSSIsmall-scaleμAmicroampereP-Ppeak-to-peakintegrationμFmicrofaradPPIplan-positionSSTVslow-scan televisionμHmicrohenryindicatorSWshortwaveμmmicrometerPPMparts per million;SWLshortwave listenerμPmicroprocessorpulse-positionSWRstanding-wave ratioμSmicrosecondmodulationsyncsynchronizingμVmicrowattPRFpulse repetitionTCtemperaturemVmillivoltpreamplifierTtera- (10 °2)mVBRmultivibratorPROMprogrammable ROMTHDtotal harmonicmWmilliwattPRRpulse repetition ratedistortionnnano- (10 °2)pspicosecondTRtransmit-receiveNnegativePSKphase-shift keyingTRFtuned radionAnanoamperePTTpush to talkfrequencyNABNational AssociationPUTprogrammable UJTtriactriode ACof BroadcasterspWpicowattsemiconductorNANDtype of logic circuitPWMpulse-widthswitchnanofaradmodulationTTLtransistor-transistor		integration	PNPN	positive-negative-		throw
μAmicroampereP-Ppeak-to-peakintegrationμFmicrofaradPPIplan-positionSSTVslow-scan televisionμHmicrohenryindicatorSWshortwaveμmmicrometerPPMparts per million;SWLshortwave listenerμPmicroprocessorpulse-positionSWRstanding-wave ratioμsmicrosecondpreamppreamplifierTtera- (10²²)μWmicrowattPRFpulse repetitionTCtemperaturemVmillivoltfrequencycoefficientMVBRmultivibratorPROMprogrammable ROMTHDtotal harmonicmWmilliwattPRRpulse repetition ratedistortionnnano- (10⁻²)pspicosecondTRtransmit-receiveNnegativePSKphase-shift keyingTRFtuned radionAnanoamperePTTpush to talkTRFtuned radioNABNational AssociationPUTprogrammable UJTtriactriode ACNANDtype of logic circuitPWMpulse-widthsemiconductorNANDtype of logic circuitPWMpulse-widthswitch	m²	square meter		positive-negative	SSB	single sideband
μFmicrofaradPPIplan-position indicatorSSTVslow-scan television swμΗmicrohenryindicatorSWshortwaveμπmicrometerPPMparts per million; pulse-positionSWLshortwave listenerμΡmicroprocessorpulse-position modulationSWRstanding-wave ratioμνmicrovoltpreamp preamppreamplifierTtera- (1012)μWmicrowattPRFpulse repetitionTCtemperature coefficientmVmillivoltfrequencycoefficientMVBRmultivibratorPROMprogrammable ROMTHDtotal harmonicmWmilliwattPRRpulse repetition ratedistortionnnano- (10 3)pspicosecondTRtransmit-receiveNnegativePSKphase-shift keyingTRFtuned radionAnanoamperePTTpush to talkfrequencyNABNational AssociationPUTprogrammable UJTtriactriode ACof BroadcasterspWpicowattsemiconductorNANDtype of logic circuitPWMpulse-widthswitchnFnanofaradmodulationTTLtransistor-transistor	μ	micro- (10 °)	•	potentiometer	SSI	small-scale
μΗmicrohenryindicatorSWshortwaveμπmicrometerPPMparts per million; pulse-positionSWLshortwave listenerμΡmicroprocessorpulse-position modulationSWRstanding-wave ratioμνmicrovoltpreamp preamp preamplifierTtera- (1012)μWmicrowattPRFpulse repetition frequencyTCtemperature coefficientMVBRmultivibratorPROM multivibratorprogrammable ROM PRRTHDtotal harmonicmWmilliwattPRR pulse repetition ratedistortionnnano- (10 °)pspicosecondTRtransmit-receiveNnegativePSK Phase-shift keyingTRFtuned radio frequencynAnanoamperePTT push to talkTRFtuned radio frequencyNABNational Association of BroadcastersPUTprogrammable UJTtriactriode ACNANDtype of logic circuitPWMpulse-width modulationTTLtransistor-transistor	μ A	microampere		, · · .		_
μmmicrometerPPMparts per million;SWLshortwave listenerμPmicroprocessorpulse-positionSWRstanding-wave ratioμsmicrosecondmodulationsyncsynchronizingμVmicrovoltpreamppreamplifierTtera-(10¹²)μWmicrowattPRFpulse repetitionTCtemperaturemVmillivoltfrequencycoefficientMVBRmultivibratorPROMprogrammable ROMTHDtotal harmonicmWmilliwattPRRpulse repetition ratedistortionnnano- (10 ²)pspicosecondTRtransmit-receiveNnegativePSKphase-shift keyingTRFtuned radionAnanoamperePTTpush to talkfrequencyNABNational AssociationPUTprogrammable UJTtriactriode ACof BroadcasterspWpicowattsemiconductorNANDtype of logic circuitPWMpulse-widthswitchnFnanofaradmodulationTTLtransistor-transistor	μ F	microfarad	PPI		SSTV	
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	μP	microprocessor		•	SWR	standing-wave ratio
μWmicrowatt mVPRF millivoltpulse repetition frequencyTCtemperature coefficientMVBR mWmultivibrator mWPROM milliwattprogrammable ROM programmable ROMTHDtotal harmonic distortionnnano- (10 °)pspulse repetition rate picosecondTRtransmit-receiveNnegativePSK PSKphase-shift keying phase-shift keyingTRFtuned radionAnanoamperePTT push to talkfrequencyNABNational Association of BroadcastersPUTprogrammable UJTtriactriode ACNANDtype of logic circuitPWMpulse-width modulationswitch	•	microsecond		·	sync	synchronizing
mV millivolt frequency coefficient MVBR multivibrator PROM programmable ROM THD total harmonic mW milliwatt PRR pulse repetition rate distortion n nano- (10 °) ps picosecond TR transmit-receive N' negative PSK phase-shift keying TRF tuned radio nA nanoampere PTT push to talk frequency NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width nF nanofarad TTL transistor-transistor	•	microvolt				
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mW milliwatt PRR pulse repetition rate distortion n nano- (10 °) ps picosecond TR transmit-receive N negative PSK phase-shift keying TRF tuned radio nA nanoampere PTT push to talk frequency NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width nF nanofarad modulation TTL transistor-transistor		millivolt		•		
n nano- (10°) ps picosecond TR transmit-receive N negative PSK phase-shift keying TRF tuned radio nA nanoampere PTT push to talk frequency NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor	MVBR	multivibrator		· . •	THD	
N negative PSK phase-shift keying TRF tuned radio nA nanoampere PTT push to talk frequency NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor	mW	•		•		
nA nanoampere PTT push to talk frequency NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor		• •	•	•		
NAB National Association PUT programmable UJT triac triode AC of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor		-			TRF	•
of Broadcasters pW picowatt semiconductor NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor		·			_	•
NAND type of logic circuit PWM pulse-width switch nF nanofarad modulation TTL transistor-transistor	NAB			· . •	triac	
nF nanofarad modulation TTL transistor-transistor			•	•		
			PWM	•	·	= :
nanonenry Q quality lactor logic			•	= ::	HL	
	7 n	паполенгу	u	quanty ractor		logic

TTY	teletypewriter	V	volt	VSWR	voltage standing-
TV	television	VA	voltampere		wave ratio
TVI	television	VAC	volts AC	VTR	videotape recording
	interference	VCO	voltage-controlled	VTVM	vacuum-tube
TVT	television typewriter		oscillator		voltmeter
TWX	teletypewriter	VDC	volts DC	VU	volume unit
	exchange service	V/F	voltage-to-frequency	VVC	voltage-variable
UART	universal	VFO	variable-frequency		capacitor
	asynchronous		oscillator	vxo	variable-frequency
	receiver-	VHF	very high frequency		crystal oscillator
	transmitter	VLF	very low frequency	W	watt
UHF	ultrahigh frequency	VMOS	vertical metal-oxide	Wh	watthour
UJT	unijunction		semiconductor	WPM	words per minute
	transistor	VOM	volt-ohm-	WRMS	watts RMS
UPC	universal product		milliammeter	Ws	wattsecond
	code	VOX	voice-operated	Z	impedance
UPS	uninterruptible		transmission		
	power system	VRMS	volts RMS		

Abbreviations on Diagrams. Some foreign publications, including Wireless World, shorten the abbreviations for units of measure on diagrams. Thus, μ after a capacitor value represents μF , n is nF, and p is pF. With resistor values, k is thousand ohms, M is megohms, and absence of a unit of measure is ohms. For a decimal value, the letter for the unit of measure is sometimes placed at the location of the decimal point. Thus, 3k3 is 3.3 kilohms or 3.300 ohms, 2M2 is 2.2 megohms, $4\mu7$ is 4.7 μF , $0\mu1$ is 0.1 μF , and 4n7 is 4.7 nF.

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Delco Electronics, 700 East Firmin, Kokomo, IN 46901 Dialight Corp., 203 Harrison Place, Brooklyn, NY 11237 EDN, 221 Columbus Ave., Boston, MA 02116

Electronics, 1221 Avenue of the Americas, New York, NY 10020

Fle: tronic Servicing, 9221 Quivira Rd., P.O. Box 12901, Overland Park, KS 66212

Exar Integrated Systems, Inc., 750 Palomar Ave., Sunny-vale, CA 94086

Ham Radio, Greenville, NH 03048

Harris Semiconductor, Department 53-35, P.O. Box 883, Melbourne, FL 32901

Hewlett-Packard, 1501 Page Mill Rd., Palo Alto, CA 94304Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46206

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Motorola Semiconductor Products Inc., Box 20912, Phoenix, AZ 85036

Mullard Limited, Mullard House, Torrington Place, London WC1E 7HD, England

National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95051

Optical Electronics Inc., P.O. Box 11140, Tucson, AZ 85734 Popular Science, 380 Madison Ave., New York, NY 10017 Precision Monolithics Inc., 1500 Space Park Dr., Santa Clara, CA 95050

QST, American Radio Relay League, 225 Main St., Newington, CT 06111

Radio Shack, 1100 One Tandy Center, Fort Worth, TX 76102

Raytheon Semiconductor, 350 Ellis St., Mountain View, CA 94042

RCA Solid State Division, Box 3200, Somerville, NJ 08876 Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46206

73 Magazine, Peterborough, NH 03458

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Signetics Corp., 811 East Arques Ave., Sunnyvale, CA 94086

Siliconix Inc., 2201 Laurelwood Rd., Santa Clara, CA 95054 Sprague Electric Co., 479 Marshall St., North Adams, MA 01247

Teledyne Philbrick, Allied Drive at Route 128, Dedham, MA 02026

Teledyne Semiconductor, 1300 Terra Bella Ave., Mountain View, CA 94040

Texas Instruments Inc., P.O. Box 5012, Dallas, TX 75222 TRW Power Semiconductors, 14520 Aviation Blvd., Lawndale, CA 90260

Unitrode Corp., 580 Pleasant St., Watertown, MA 02172 Wireless World, Dorset House, Stamford St., London SE1 9LU, England

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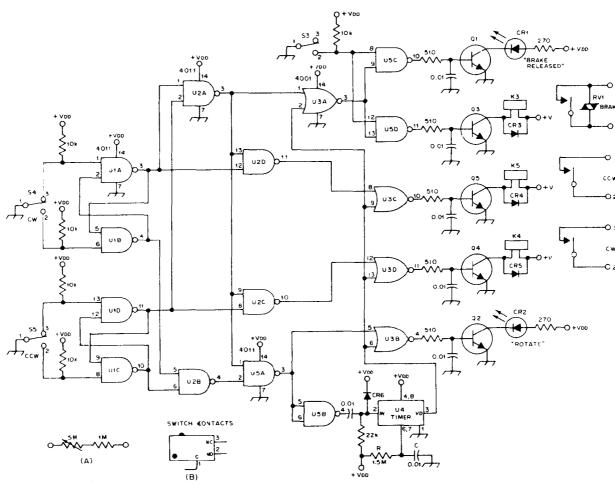
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CHAPTER 1

Antenna Circuits

Includes circuits for measuring and adjusting VSWR, field strength, earth conductivity for grounds, and impedance, as well as antenna motor controls, radio direction finders, sferics receiver, active antennas, RF attenuators, remote antenna switching systems, RF magnetometer, and far-field signal sources for tuning beam antennas. See also Receiver, Transceiver, and Transmitter chapters.



CR1, CR2 - Light-emitting diode, Motorola type MLED600 or equiv. CR3-CR6, incl. - Silicon signal diode, 1N914

or equiv. K3-K5, incl. — Switching relay, 12 V dc,

DELAYED BRAKE—Protects antenna rotator on high tower from damage by delaying brake action automatically after rotation and by disabling direction-selector switches so antenna system coasts to stop before rotation can begin

1200 ohms, 10 mA; contact rating 1 A; 125 V ac; Radio Shack 275-003 or equiv. Q1-Q5, incl. — Silicon npn transistor, 2N3904

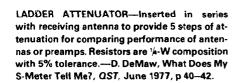
or equiv. RV1 – Varistor, GE 750 or equiv.

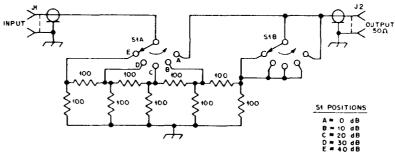
in other direction. For about 3-s delay in timer U4, use 2.2 megohms for R and 1 μ F for C instead of values shown. RV1 is commonly listed as V150LA20A by GE. S3-S5 are original brake release and direction switches in CDE Ham-II

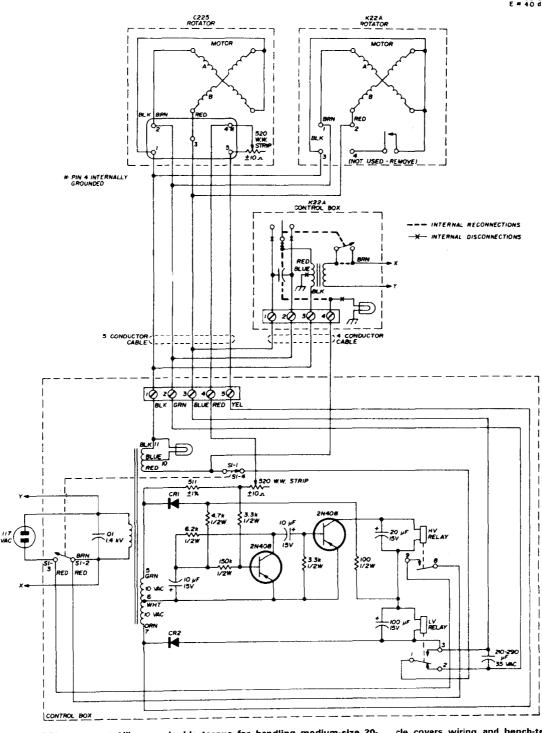
U1, U2, U5 — CMOS quad NAND gate IC, RCA CD 4011A or equiv U3 — CMOS quad NOR gate IC, RCA CD-

4001A, or equiv. U4 — Timer IC, 555 or equiv.

rotor system. Article covers construction and installation, including modifications needed in control unit.—A. B. White, A Delayed Brake Release for the Harn-II, *QST*, Aug. 1977, p 14–16.

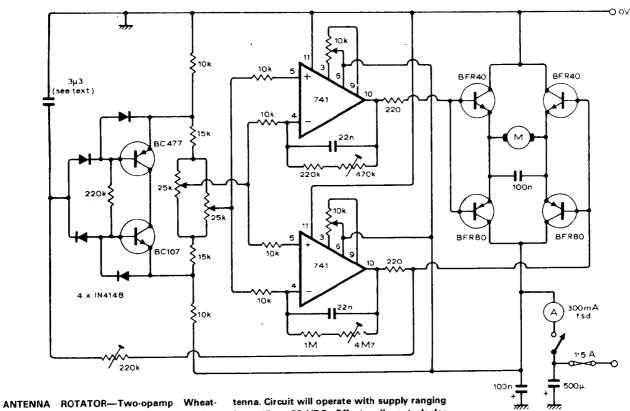






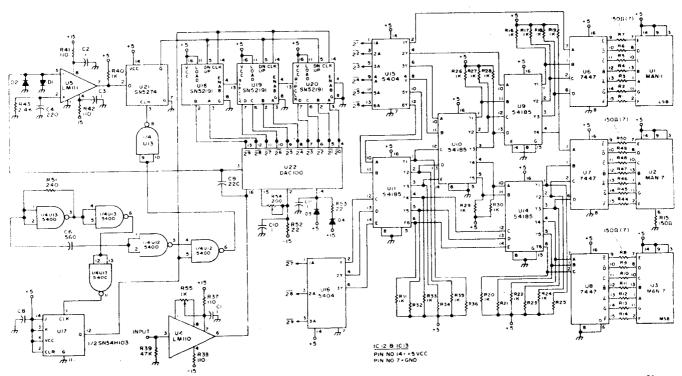
TWO-ROTATOR CONTROL—Low-cost Alliance C-225 TV antenna rotator and Alliance K22A rotator with control box are used with single transistorized-bridge control circuit. Rotators operate in tandem on same shaft to provide

double torque for handling medium-size 20meter amateur radio antennas. One arm of bridge is 520-ohm wirewound pot in which wiper position is proportional to heading. Article covers wiring and bench-testing of rotators.—F. E. Gehrke, Antenna Rotator for Medium-Sized Beams, *Ham Radio*, May 1976, p 48–



ANTENNA ROTATOR—Two-opamp Wheatstone bridge provides positive and negative error signals to give proportional control for 24-VDC motor used for remote positioning of antenna. Circuit will operate with supply ranging from 15 to 28 VDC. Offset null controls for opamps use 10K pots. Article describes operation and adjustment of circuit in detail. —D. J.

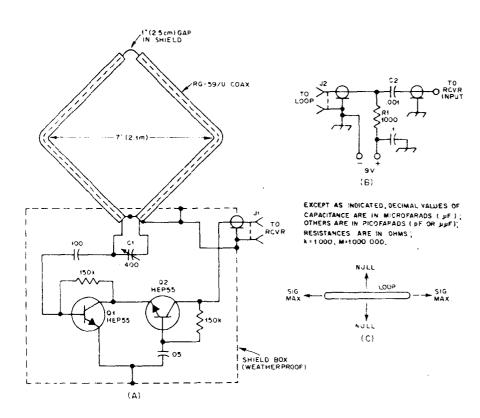
Telfer, An Aerial Rotator Servo, Wireless World, April 1975, p 177–181.



DVM FOR SWR—Converts voltage output from analog computer to drive for 3-digit LED display of standing-wave ratio. Circuit uses Precision Monolithics D/A converter A1MDAC-100CC-Q1.

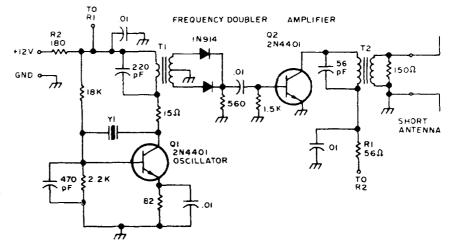
Requires regulated 5-VDC logic supply at 1 Afor digital display, along with \pm 15 V supplies for logic. Article gives alignment procedure. Acculo

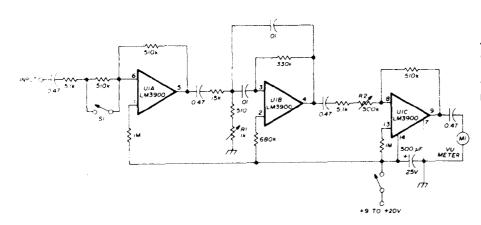
racy of digital reading is better than 0.1% over 0-8 V range.—T. Mayhugh, The Automatic SWR Computer, *73 Magazine*, Dec. 1974, p 86–87.



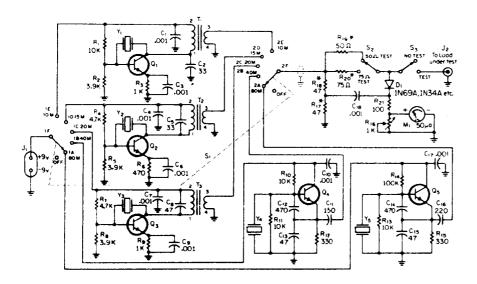
160-METER LOOP-PREAMP—Shielded 5-foot square loop and single preamp pull signals out of noise when propagation conditions make other antennas unsatisfactory. Operating voltage is supplied through coax feeder. R1 isolates signal energy from ground, and C2 keeps DC voltage out of receiver input. Nulls are off broad side of loop.—B. Boothe, Weak-Signal Reception on 160—Some Antenna Notes, *QST*, June 1977, p 35—39.

FAR-FIELD TRANSMITTER—Provides far-field signal source for tuning Yagi and other beam antennas used on amateur radio frequencies. Q1 is Pierce oscillator operating in fundamental mode of 7.06-MHz crystal to permit field-strength measurements at 14.12, 21.18, and 28.24 MHz for 20-, 15-, and 10-meter bands. Antenna uses two 5-foot lengths of wire connected as dipole. T1 is Amidon core T50-2 with 22 turns on primary and 20 turns center-tapped on secondary. T2 is same core with 22-turn primary and 5-turn secondary.—G. Hinkle, Closed Loop Antenna Tuning, 73 Magazine, May 1976, p 32–33.





VSWR METER—Simple, easily transported VSWR meter consists of high-gain amplifier, narrow-bandwidth (100-Hz) selective amplifier tuned to 1000 Hz, and variable-gain output amplifier driving low-cost VU meter. Ideal for nulling-type VSWR measurements. Draws only about 6 mA from 9-V transistor battery. Closing S1 increases gain about 100 times for low-level readings. R1 sets U1B to 1000 Hz, while R2 sets reference on VU meter.—J. Reisert, Matching Techniques for VHF/UHF Antennas, Ham Radio, July 1976, p 50–56.



SELF-EXCITED SWR BRIDGE—Portable bridge has built-in signal sources for each band from 80 through 10 meters, for tuning antenna on tower before transmission line is connected. Oscillators are crystal controlled at desired antenna tune-up frequencies. Separate oscillators for each band simplify switching problems, so only supply voltage from J, and oscillator outputs to meter circuit need be switched. Current drain from 9-V battery is maximum of 12 mA. R₁₇ and R₁₆ should be closely matched, while R₁₇ and R₁₆ should have 5% tolerance.—T. P. Hulick, An S.W.R. Bridge with a Built-In 80 Through 10 Meter Signal Source, CQ, June 1971, p 64–66, 68, and 99.

Q1-Q5-RCA 40245.

51—2 pole 6 position subminiature rotary switch. (Centerlab PA-2005).

S2-S.p.d.t. slide switch.

\$3-S.p.s.t. slide switch.

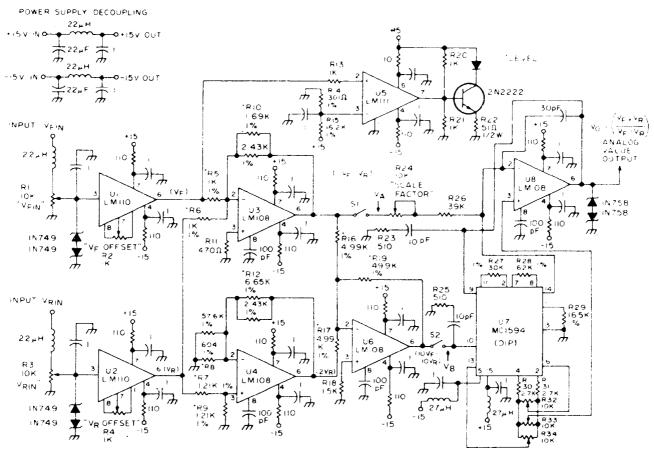
T₁-Pri.: 11 t. #36 e. Sec.: 3 t. #36 e. on Indiana General CF-101 Q2 toroid.

T₂—Pri.: 16 t. #36 e. Sec.: 4 t. #36 e. Same core as T₁.

T₃—Pri.: 20 t. #36 e. Sec.: 5 t. #36 e. Same core as T₁.

Y₁, Y₂, Y₃—Overtone crystals for 10, 15 and 20 meter bands respectively. HC-6U holders.

Y₄, Y₅—40 and 80 meter crystals respectively in HC-6U holders.



SWR COMPUTER—Automatically computes standing-wave ratio in 50-ohm coax feeding antenna and delivers analog voltage for driving meter or digital display. Inputs are forward

 (V_{FiN}) and reverse (V_{RiN}) voltages as conventionally measured for SWR checks. Requires regulated ± 15 VDC supply at 40 mA. Article gives construction details and covers adjustment of

critical resistors during alignment.—T. Mayhugh, A Digital SWR Computer!, *73 Magazine*, Nov. 1974, p 80–82, 84, and 86.

15 turns No. 2 close-wound on Miller form (purple slug).

2-pole 3-position wafer switch,

- 30 turns like L1. - 63 turns

scramble-wound.

- 39- and 10-pF silver micas in

66AO22-6

like L1, but

, C2 - 39- and 10-pF silver micas in parallel.

- 5 pF silver mica.

- 250-pF straight-line-wavelength variable (Hammarlund MC-250M).

- 365-pF miniature variable (Archer-Allied 695-1000).

2

RF BRIDGE FOR COAX—Simplifies adjustment of vertical antenna for 40, 80, and 160 meters. S1 in add-on LC unit switches coil for desired band. Values of C1-C4 and standard resistor R1 give range of 10 to 150 ohms for measurement of radiation resistance. Meter can be from 50 to 200 μ A full scale if 500 mW of power is available as signal source. For shorter-wavelength bands, change resistance in parallel with J1 to 5600 ohms and omit C6. L1 for 10 meters should then have 31/2 turns No. 18 spaced to occupy 1/4 inch on Miller 4200 coil form. L2 (15 meters) is 6 turns No. 16 enamel closewound on similar form, L3 (20 meters) is 11 turns No. 14 enamel on Miller 66A022-6 form.--J. Sevick, Simple RF Bridges, QST, April 1975, p 11-16 and 41.

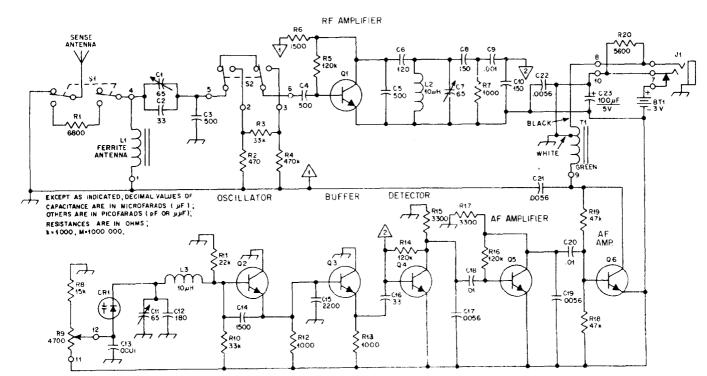
Ham SHIELD C1. C2 C5 CR1 — Germanium diode. J1, J2, J4, J5 — Coaxial receptacle. J3 — Phono jack. L1 — 15 turns No. 24 e

5-STEP ATTENUATOR-Applications include comparing performance of various receiving antennas and measuring gain of preamp used ahead of receiver. Dashed lines represent re-

quired shield partitions. All resistors are 1/4-W composition with 5% tolerance.-D. DeMaw, What Does My S-Meter Tell Me?, QST, June

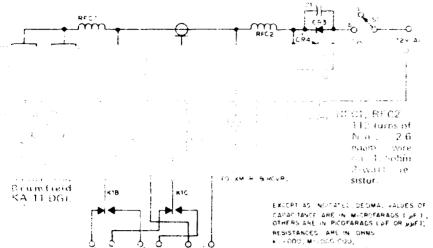
1977, p 40-42.

ATTENUATOR 12 dB 20 d B 20 dB

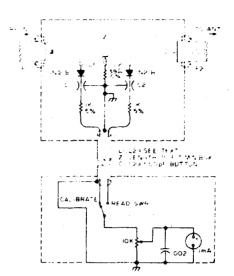


80-METER DIRECT-CONVERSION-Portable receiver with directional ferrod antenna and vertical sense antenna was developed for radio foxhunting at 1975 Boy Scout World Jamboree in Norway, in competitions for locating four low-power crystal-controlled transmitters hidden along 4-km course. Varactor-tuned oscilla-

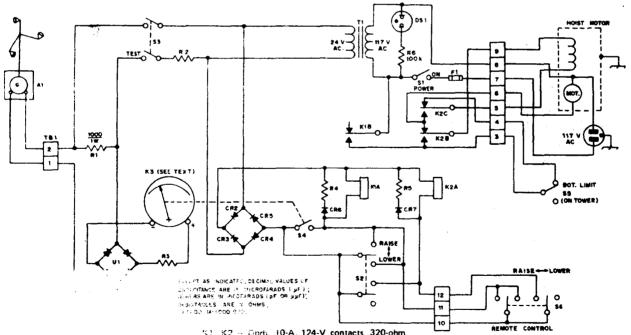
tor provides 20-kHz tuning range with R9, adequate for the frequency used-3.566, 3.585, 3.635, or 3.680 MHz. T1 is subminiature autotransformer with 8-ohm and 2000-ohm sections, for 8-ohm headphones. For high-impedance headphones, connect headphone jack J1 to jug 9 of T1. ON/OFF switch is not needed. L1 is 22 turns No. 28 enamel wound over two 10 \times 95 mm ferrite rods taped together. Q1-Q6 are NPN high-frequency small-signal transistors.— N. K. Holter, Radio Foxhunting in Europe, QST, Nov. 1976, p 43-46.



positive half-waves from 12-VAC supply operate relay K1 through CR1 and CR3, so antenna b' is energized. With S1 at c, K2 is energized through CR4 and CR2 for feeding c'.-- U. H. Lammers, A Ramote Antenna Switch, QST, Aug. 1974, p 41-43.



SWR TO 500 MHz-Permits measuring standing-wave ratio well above limits of many inexpensive indicators. For transmitters up to 2 W, coupling loop L1-L2 can be about 1 inch long. For high-power transmitters, loop length can be reduced to about % inch.-W. E. Parker, UHF SWR Indicator, 73 Megazine, June 1977, p 68-70



The section of the control of the co

3-ANTENNA REMOTE SWITCHING-Single RF

feed line serves for feeding transmitter power to tower and selecting desired one of three an-

tennas. With S1 at a, neither K1 nor K2 is ener-

gized. RF energy then passes through cable to

antenna terminals a' and GND. In position b,

WIND-ACTIVATED CONTROL-Anemometer feeding mater relay energizes control relay for antenna-tower hoist motor, to lower tower automatically when wind exceeds preset safe

- K2 Opdi, 10-A, 124-V contacts, 320-ohm coil (Automatic Electric PG 24809-B11.)
 K5 Meter relay, 100 μA (Weston No. S46707).
 H2, R3 Approximately 12,000 ohm, 1-watt; see
- text.
- S1 Spx: UBT No. MS-35058-22).

 S6 Padt center off (JBT, No. 35059-27).

 Dpdt normally off (JBT No. MS-35059-30).

speed and raise it again when wind drops well below danger level. When only K1 is energized, motor rotates in tower-lowering direction. When K1 and motor-reversing relay K2 are both

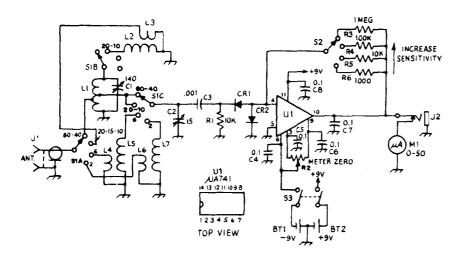
S4 - Part of K3.

- S4 Part of K3.

 S5 Spdt, bottom limit switch (Microswitch No. BZE6-2RN).

 T1 117-V primary, 24—v secondary, 300 mA U1 Bridge rectifier assembly (Bradley Labs. No. C014E4F).

energized, motor reverses and raises tower.-J. Bernstein, The Tower-Guard System, QST, Dec. 1974, p 25-28.



C1 – 140-pF variable.
C2 – 15-pF variable.
CR1, CR2 – 1N914 or equiv.
L1 – 34 turns No. 24 enam. wound on an Amidon T-68-2 core, tapped 4 turns from ground end.
L2 – 12 turns No. 24 enam. wound on T-68-2

core. L3 – 2 turns No. 24 wound at ground end of L2. L4 – 1 turn No. 26 enam, wound at ground end of

LINEAR FIELD-STRENGTH METER-Has sufficient sensitivity for checking antenna patterns and gain while positioned many wavelengths from antenna. Can be used remotely by connecting external meter at J2. L1 is tuned by C1 for 80 or 40 meters. For 20, 15, or 10 meters, 1.2 is switched in parallel with L1. L5 and C2 cover

L5 - 12 turns No. 26 enam, wound on T-25-12 core.

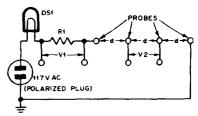
L6 – 1 turn No. 26 enam. L7 – 1 turn No. 18 enam, wound on T-25-12 core. M1 – 50 or 100 μA dc.

R2 - 10,000-chm control, linear taper.

S1 - Rotary switch, 3 poles, 5 positions, 3

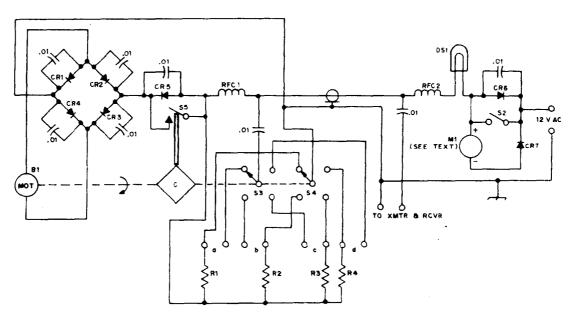
Rotary switch, 1 pole, 4 positions.
Dpst Toggle.
μΑ741. S2

about 40 to 60 MHz, while L7 and C2 cover 130 to 180 MHz. Band-switched circuits avoid use of plug-in inductors. At most sensitive setting of S2, M1 will detect signals from pickup antenna 38 weak as 100 µV.—L. McCoy, A Linear Field-Strength Meter, QST, Jan. 1973, p 18-20 and 35.



DS1 - 100-watt light bulb R1 — 14.6 ohms (5 watt). Probes — 5/8-inch dia (iron or copper); spacing, d = 18 inches; penetration depth, D = 12 inches. D = 12 mones.Earth conductivity = (21) × $\frac{V_1}{V_2}$ (millimhos/meter)

EARTH CONDUCTIVITY—Simple AC measurement technique gives 25% accuracy, adequate for siting amateur radio antennas and designing radial ground systems. Measured values will range from 1 to 5 millimhos per meter for poor soil, 10-15 for average soil or fresh water, 100 for very good soil, and 5000 for salt water.-J. Sevick, Short Ground-Radial Systems for Short Verticals, QS7, April 1978, p 30-33,



FOUR-POSITION MOTOR SWITCH-Single RF feed line also carries DC for 3-V permanent magnet DC motor B1 atop antenna tower, driving S3 and S4 for remote switching to antennas a, b, c, and d. Diagram shows switches set for feed to antenna a, with no drive applied to B1 since cam C has opened microswitch S5. CR5 and CR6 are now connected in series with opposite polarity, so neither positive nor negative halfwaves from 12-VAC supply can drive motor. If

S2 is closed, positive half-waves start B1. Once started, motor runs until cam opens S5; if S2 has not yet been released, motor continues running on positive and negative half-waves. Diode bridge CR1-CR4 makes motor rotate in only one direction for either drive polarity. If S2 is released, before S5 opens, motor stops. 6-V 1-A lamp DS1 comes on dimly when S2 is closed and brightens when S5 closes. If S2 is released now, B1 drives to next position and stops. If S2 is held down, switching continues. Meter M1 and CR7 identify position of switch. R1-R4, in range of 1K to 10K, are chosen to give 1/4, 1/2, 1/4, and full deflection of meter. Motor drives switch through 2860:1 reduction gears taken from alarm clock. All diodes are 50-PIV 1-A silicon such as 1N4001.-- U. H. Lammers, A Remote Antenna Switch, QST, Aug. 1974, p 41-43.