

3138 *Encyclopedia of*
**ELECTRONIC
CIRCUITS**

Volume 2

Rudolf F. Graf



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Introduction

Encyclopedia of Electronic Circuits—Volume 2, a companion to Volume 1 published in 1985, contains well over 1400 not-previously covered circuits organized into 108 chapters. For each reference, circuits are listed at the beginning of each chapter. The extensive index further enhances the usefulness of this new work. The browser, as well as the serious researcher looking for a very specific circuit, will be richly rewarded by the context of this volume. A brief explanatory text accompanies almost every entry. The original source for each item is also given so that the reader requiring additional data will know where to find it.

I am most grateful to William Sheets for his many and varied contributions to this book, and to Mrs. Stella Dillon for her fine work at the word processor. These friends and associates of long standing have my sincere thanks for contributing to the successful completion of this book.

1

Alarm and Security Circuits

The sources of the following circuits are contained in the Sources section beginning on page 694. The figure number contained in the box of each circuit correlates to the source entry in the Sources section.

Auto Burglar Alarm
Multiple Alarm Circuit
Differential-Voltage or Current Alarm
Trouble Tone Alert
Photoelectric Alarm System
Alarm Circuit

AUTO BURGLAR ALARM

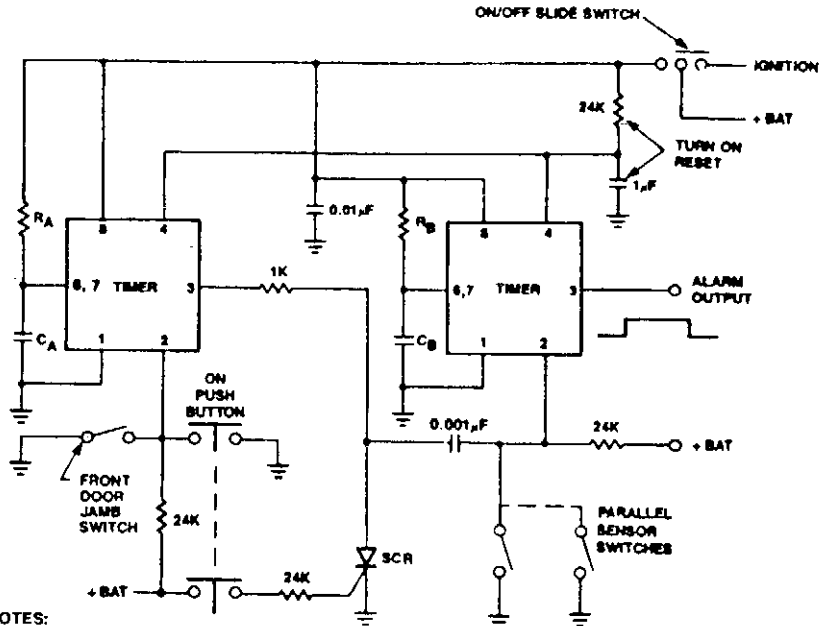


Fig. 1-1

SIGNETICS

NOTES:
Timer Signetics NE555
All resistor values in ohms

Circuit Notes

Timer A produces a safeguard delay, allowing the driver to disarm the alarm and eliminating a vulnerable outside control switch. The SCR prevents timer A from triggering timer B, unless timer B is triggered by strategically-located sensor switches.

MULTIPLE ALARM CIRCUIT

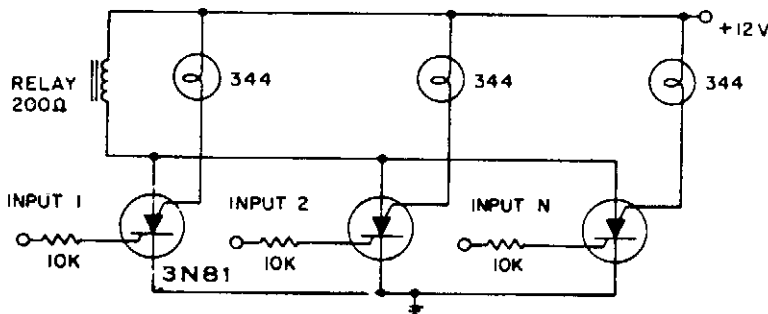


Fig. 1-2

GE

Circuit Notes

Any of several inputs pulls in the common alarm relay with lamps giving visual indication of triggering input. Low resistance lamps decrease input sensitivity.

DIFFERENTIAL VOLTAGE OR CURRENT ALARM

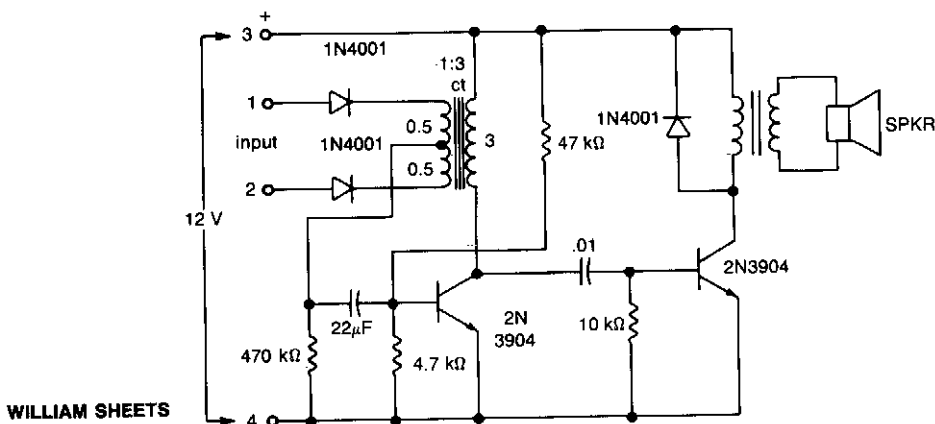


Fig. 1-3

Circuit Notes

The input may be dc or low frequency ac. The output is a distinctive series of audio beeps or a continuous tone, and occurs only when a selected polarity unbalance is present at the input.

TROUBLE TONE ALERT

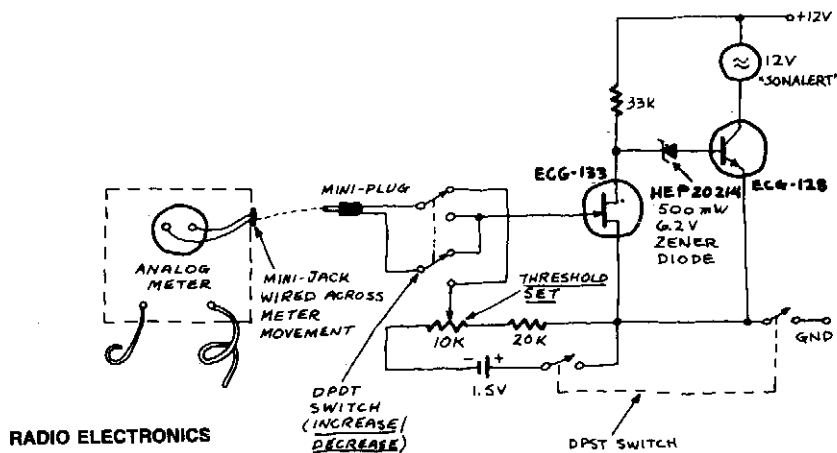


Fig. 1-4

Circuit Notes

The Trouble Tone Alert is intended for use with analog meters—just wire a “mini” earphone jack directly across the meter movement, plug it in, and you’re all set. This device reacts to the meter-movement driving voltage. It will respond to a change in ac or dc voltage, current, or in resistance. The circuit will respond to an increase or decrease selected by the DPDT switch and is adjusted with the threshold control until the tone from the Sonalert just disappears (with the meter in the circuit being tested, of course).

PHOTOELECTRIC ALARM SYSTEM

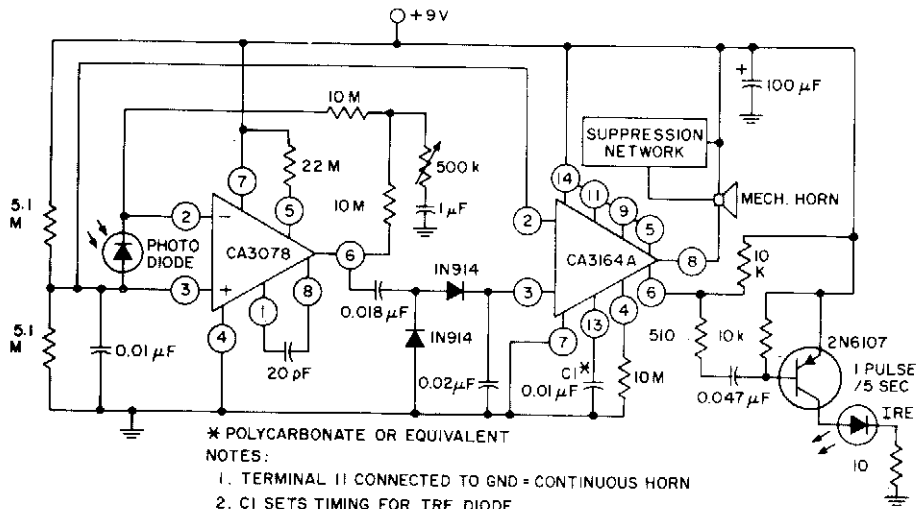


Fig. 1-5

GE/RCA

Circuit Notes

The CA3164A BiMOS detector alarm system and the CA3078 micropower op amp with a photodiode are used as an automatic switch for turning on a night light or sounding a mechanical horn.

ALARM CIRCUIT

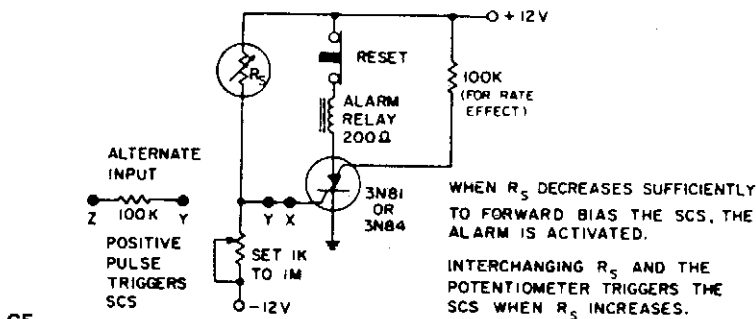


Fig. 1-6

GE

Circuit Notes

Temperature, light, or radiation sensitive resistors up to 1 megohm readily trigger the alarm when they drop below the value of the preset potentiometer. Alternately, 0.75 V at the input to the 100 k Ω triggers the alarm. Connecting SCS between ground and -12 V permits triggering on negative input to G_A .

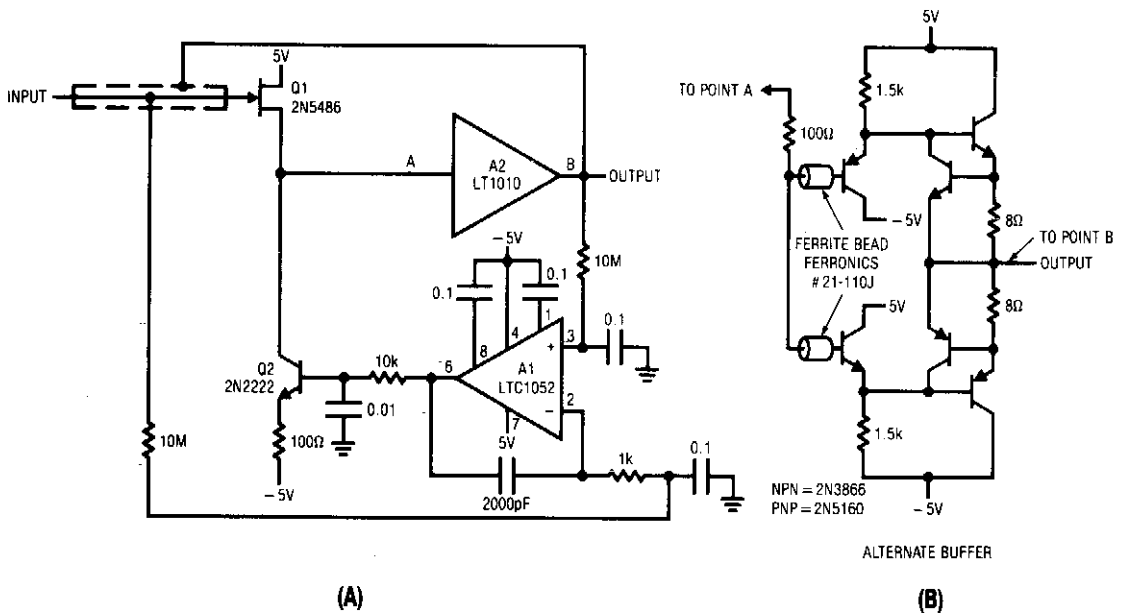
2

Amplifiers

The sources of the following circuits are contained in the Sources section beginning on page 694. The figure number contained in the box of each circuit correlates to the source entry in the Sources section.

Stable Unity Gain Buffer with Good Speed and High Input Impedance	Hi-Fi Comander
Chopper Stabilized Amplifier	Two-Wire to Four-Wire Audio Converter
Ultra-Low-Leakage Preamplifier	Thermocouple Amplifier
FET Input Amplifier	Low-Distortion Audio Limiter
Ultra-High Z_{in} ac Unity Gain Amplifier	Speech Compressor
Logarithmic Amplifier	Speaker Overload Protector
Composite Amplifier	Audio Automatic Gain Control
Stereo Amplifier with Gain Control	Voltage Controlled Attenuator
Precision-Weighted Resistor Programmable-Gain Amplifier	High-Input-Impedance Differential Amplifier
Power GaAsFET Amplifier with Single Supply	Audio Q-Multiplier
Linear Amplifiers from CMOS Inverters	Automatic Level Control
Current-Collector Head-Amplifier	Pulse-Width Proportional-Controller Circuit
	Op Amp Clamping

STABLE UNITY GAIN BUFFER WITH GOOD SPEED AND HIGH INPUT IMPEDANCE



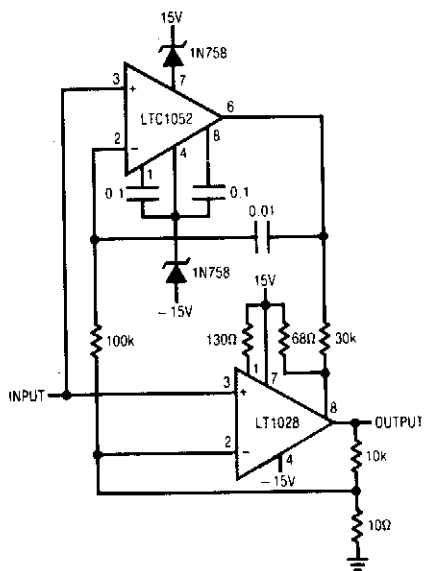
LINEAR TECHNOLOGY CORPORATION

Fig. 2-1

Circuit Notes

Q1 and Q2 constitute a simple, high speed FET input buffer. Q1 functions as a source follower, with the Q2 current source load setting the drain-source channel current. Normally, this open loop configuration would be quite drifty because there is no dc feedback. The LTC1052 contributes this function to stabilize the circuit by comparing the filtered circuit output to a similarly filtered version of the input signal. The amplified difference between these signals is used to set Q2's bias and hence Q1's channel current. This forces Q1's V_{GS} to whatever voltage is required to match the circuit's input and output potentials. The 2000 pF capacitor at A1 provides stable loop compensation. The RC network in A1's output prevents it from seeing high speed edges coupled through Q2's collector-base junction. A2's output is also fed back to the shield around Q1's gate lead, bootstrapping the circuit's effective input capacitance down to less than 1 pF. For very fast requirements, the alternate discrete component buffer shown will be useful. Although its output is current limited at 75 mA, the GHz range transistors employed provide exceptionally wide bandwidth, fast slewing and very little delay.

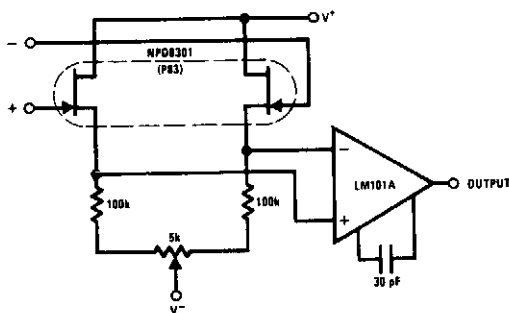
CHOPPER STABILIZED AMPLIFIER



LINEAR TECHNOLOGY CORP.

Fig. 2-2

FET INPUT AMPLIFIER



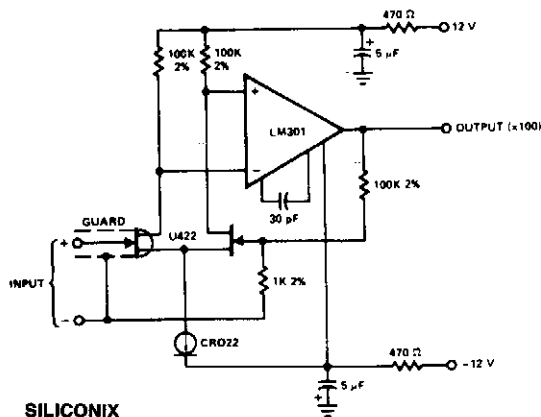
NATIONAL SEMICONDUCTOR CORP.

Circuit Notes

The NPD8301 monolithic-dual provides an ideal low offset, low drift buffer function for the LM101A op amp. The excellent matching characteristics of the NPD8301 track well over its bias current range, thus improving common-mode rejection.

Fig. 2-4

ULTRA-LOW-LEAKAGE PREAMPLIFIER



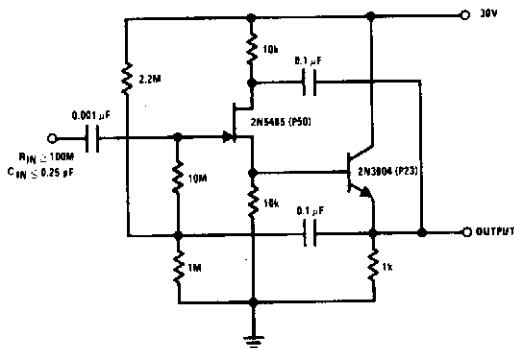
SILICONIX

Circuit Notes

The circuit has an input leakage of only 2 pA typical at 75°C and would be usable with 1 M ohm input resistance.

Fig. 2-3

ULTRA-HIGH Z_{in} AC UNITY GAIN AMPLIFIER



NATIONAL SEMICONDUCTOR CORP.

Circuit Notes

Nothing is left to chance in reducing input capacitance. The 2N5485, which has low capacitance in the first place, is operated as a source follower with bootstrapped gate bias resistor and drain.

Fig. 2-5

