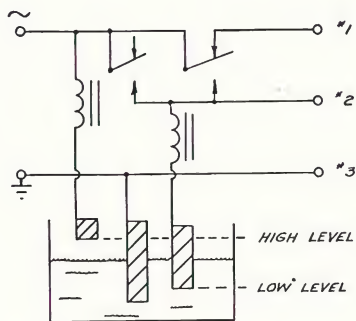


# A simple, economical way to control liquid levels within prescribed limits.



POWER FOR FILL TERMINALS 1-3

POWER FOR DRAIN TERMINALS 2-3

The circuit shown, utilizing a Sigma Series 5 relay, represents one of the simplest ways to control liquid levels in applications such as water treatment, chemical processing and the protection of immersion pumps in artesian wells.

As can be seen, the liquid level is sensed by immersion electrodes, a convenient and economical method when the liquid is sufficiently conductive. These electrodes can be arranged to give independently controlled high and low lim-

its, and to operate for either filling or draining.

Depending on the size and spacing of the electrodes, the purity of the water, or the type of solution, the equivalent resistance between the electrodes can vary from 100 to 100,000 ohms. In the circuit shown, the Sigma Series 5 relay would be suitable for almost any anticipated resistance. A refinement of the circuit would permit control of solution strength of soap, caustic or acid, between prescribed values.

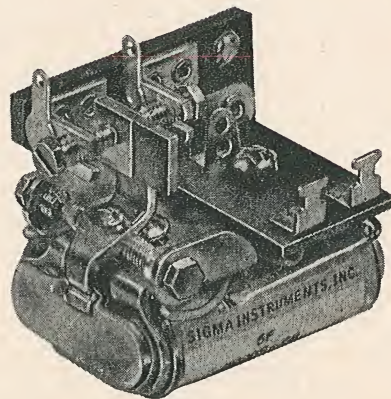
If you have a relay idea, or can improve this one, we'd like to hear from you. Your idea could be the next one we publish.

# Versatile SPDT Series 5 relay responds precisely to signals as small as 1 mw.

The Sigma Series 5 relay is one of the most versatile relays on the market today. Its 10,000 variations are performing in applications ranging from air navigation systems and liquid level controls, as shown on the left-hand page, to burglar alarms and meter protection equipment. It is particularly useful as an overload or underload device that reacts without amplification to minute changes or differences from normal values.

With the Sigma Series 5, adjustments to 1 mw are standard. Yet, its design enables it to have unusually high contact forces even at these low inputs. Some other reasons why this relay is in such widespread use are:

1. Narrow differential—Drop out to pick up ratios extending to 80% because of easily adjustable fixed contacts and spring force. 2. Accuracy—Trip values can be set readily to within  $\pm 5\%$ , with micrometer-type screw contacts. 3. Stability—Trip points will not



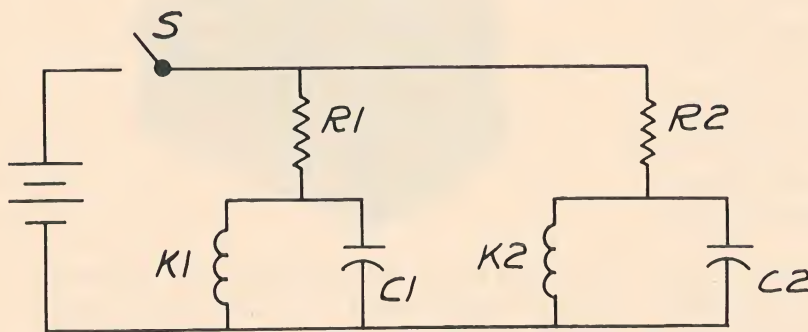
vary more than  $\pm 2\%$  throughout life, in the absence of contact erosion, as a result of low friction needle point bearings. 4. Ruggedness—Withstands 100 G's shock without damage, and heavy coil overloads of up to 30-to-1 for voltage or current. 5. Long life—Five million operations, barring contact damage by transients.

Try the Sigma Series 5 for yourself—free of charge. Just send for the Sigma Series 5 bulletin and a free relay redemption certificate.

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ON READER-SERVICE CARD CIRCLE 70

# A dual keying circuit that switches one load only when a second load is fully energized.



This simple dual keyer utilizing two Sigma Series 41 relays, assures connection and disconnection of one load during the interval that a second load is on. For example, in keying a transmitter, it energizes the oscillator permitting it to stabilize in frequency before the final amplifier is switched on or off.

Time constants for the circuit are chosen so that when S is closed, the contacts of relay K1

close before the contacts of relay K2; and when S is opened, the contacts of K1 open after the contacts of K2. C1 is large and R1 is small so that relay K1 has a fast pick-up and a slow drop-out. C2 is small and R2 is large, so that C2 has a slow pick-up and a fast drop-out.

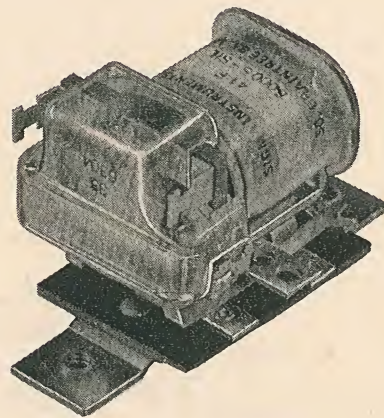
If you have a relay idea or can show us how to improve this one, we'd like to hear from you. Your idea could be the next one we publish.

# Built to last 30 years. Rugged industrial relay with pivotless hinge construction.

The Sigma Series 41 SPDT relay assures extra long service life in general purpose applications ranging from airport lighting systems to smoke detection controls. Its mechanical life is rated at 1 billion operations minimum. That's equivalent to 1 operation per second, 24 hours a day for over 30 years.

One reason why it can last so long is its pivotless hinge construction and extra long beryllium copper spring arm. Another is "balanced design" which includes the following characteristics and benefits:

1. High coil overload capacity: operates efficiently at control voltages 4 to 6 times rated coil input.
2. Extended contact life: heavy-duty design of stationary contacts minimizes effects of contact erosion.
3. Broad load carrying capacity: from dry circuit to as high as 10 amps.
4. Clean switching: small mass of armature contact minimizes contact bounce.
5. Versatility: wide variety of enclosures, adjustments, con-

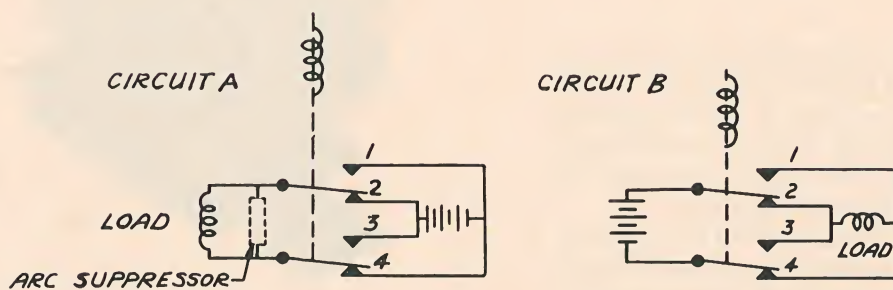


tact materials, coil resistances and operating characteristics to meet all kinds of industrial conditions and applications. 6. UL listed.

Test all of these "balanced design" features—free—and prove for yourself that the Sigma Series 41 will outperform any other comparable relay in your industrial applications. Just send for the Sigma Series 41 bulletin and a free relay redemption certificate.

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ON READER-SERVICE CARD CIRCLE 71

# How to avoid short circuits when reversing polarity of inductive loads.



Circuits A and B are both commonly used for reversing polarity, but circuit A has an advantage not often recognized.

When reversing the polarity of a difficult load, such as a motor, a slight contact weld might delay the transfer of one pole while the other pole completes transfer. In circuit B this will short circuit the power supply resulting in catastrophic failure.

In circuit A a non-synchronous transfer would only short circuit the motor terminal. This is not harmful, and can be done deliberately with some relays, such as the

Sigma Series 42. Short circuiting the motor, known as "slugging," stops the motor more quickly, allowing faster reversals.

Neither circuit will prevent catastrophic failure if an arc is drawn across the contact gap, because this would short circuit the power supply.

Where arcing may be a problem, arc suppressors can be used.

If you have a relay idea or can show us how to improve this one, we'd like to hear from you. Your relay idea could be the next one we publish.

# DPDT relay with 100 mw sensitivity has mechanical life of 1 billion operations.

The Sigma Series 42 is designed for a wide range of general purpose applications—from alarm and control systems to demand meters and timing circuits. It combines sensitivity and long mechanical and electrical life with stability, high insulation between circuits and high coil overload capacity. Check all of its features and ratings:

Long mechanical life—1 billion operations—due to pivotless hinge construction where the motion is rolling rather than sliding, thus reducing wear.

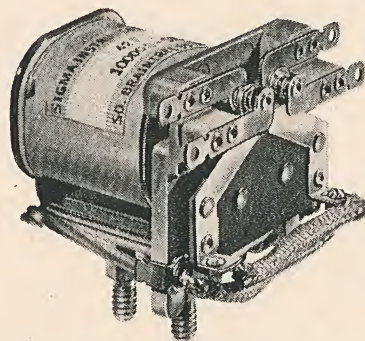
Long life under load—1,000,000 operations—due to small armature mass that reduces bounce, and controlled contact wipe that prevents circuit induced sticking.

100 mw sensitivity—minimizes coil load in circuits with limited load handling ability.

High stability—due to beryllium copper contact springs and return springs.

High circuit insulation—due to glass alkyd contact base.

High coil overload capacity—handles control voltages 4 to 6 times rated coil input.

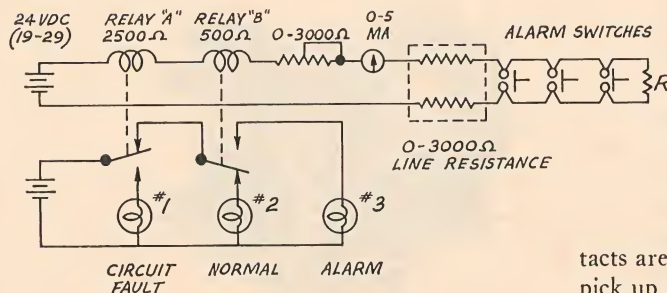


Test the U. L. listed Series 42 for yourself—free—against the type you may now be using. Just send for the Sigma Series 42 bulletin and a free relay redemption certificate.

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ON READER-SERVICE CARD CIRCLE 72

# A self-monitoring long-distance alarm circuit that assures a state of constant readiness.



You may be able to use or adapt this relay idea. It's an alarm indicating circuit with fail-safe features that will operate over long wires from a central station. It uses two sensitive relays, such as the Sigma 4 or 26, to indicate by lights or signals, three conditions: 1. Normal condition—system functional. 2. Alarm condition—as a result of contact closure. 3. Fault condition—circuit resistance high or open.

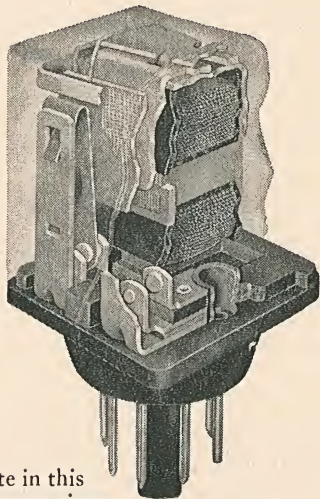
Where the circuit is in the normal standby condition, current flow is sufficient to energize Relay A, but not Relay B. Lamp #2 is on, indicating NORMAL conditions. If any alarm con-

tacts are closed, circuit current is high enough to pick up both relays, causing lamp #3 to indicate an ALARM. An audible signal or any automatic device such as a fire extinguishing system can also be wired for simultaneous actuation. If the circuit is accidentally opened or has been tampered with, Relay A drops out, energizing lamp #1 which indicates circuit FAULT.

Typical applications include protection against fire, intrusion, high or low water level, excess pipe line pressure, or any industrial hazard where the chances of accidental circuit opening or penalty for failure are high.

If you have a relay idea—or can show us how to improve this one, we'd like to hear from you. Your relay idea could be the next one we publish.

# New 10 amp DPDT relay with no internal switch wiring. Result: Longer life.



Note in this cutaway view—

1. Complete absence of internal switch wiring. 2. Long contact blades. 3. Switch, coil and frame assemblies mounted directly on the octal plug. These features result in an extra rugged, heavy-duty general purpose relay.

The new Sigma Series 46B general-purpose relay eliminates internal switch wiring and uses heavier switch members, to provide lower circuit resistance. At 10 amperes less than  $\frac{1}{2}$  watt is dissipated in the switch.

Long, flexible moving contact blades reduce stress and add to the durability of the 46B. Rated life of both the AC and DC versions ranges from 500,000 operations on a 10 amp, 115 VAC resistive load, to 10 million operations with a 1 amp, 28 VDC resistive load.

46B is rugged. Switch, coil and frame assemblies are solidly fixed to the octal plug-in base, instead of the plastic dust cover. This unitized design enables it to withstand severe industrial conditions of shock and vibration.

Test and compare the Sigma 46B—free of charge—against the make you are now using. Just send for the new Sigma Series 46B Bulletin and a free relay redemption certificate. Fill out the certificate upon receipt, return it to us, and we will send your free Sigma Series 46B to you.

SIGMA DIVISION



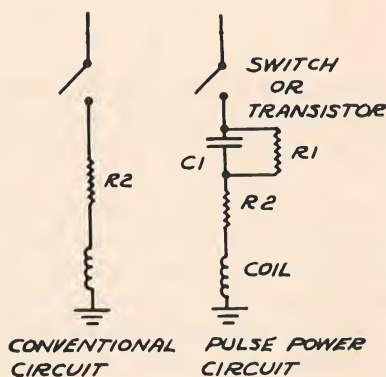
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ON READER-SERVICE CARD CIRCLE 73



# How pulse power can be effectively used to operate non-latching relays.



Pulse power, commonly used to operate latching relays, can also be used advantageously to operate non-latching relays, both polar and non-polar.

For example, with the pulse power circuit shown, a Sigma 33VG relay can be switched in 2 milliseconds, using the required 2.5 watts of power, without damaging the relay coil or other circuit components. With a conventional circuit, the relay coil would overheat and the control transistor would be overloaded.

The pulse power circuit allows the flow of 2.5 watts only momentarily and then reduces it to a normal value by providing enough continuous current to hold the relay above drop-out. In addition, it holds the amount of inductive energy absorbed by the switch or transistor to a minimum.

Values for the coil and R2 are determined by speed requirements. C1 is large enough to momentarily pass 2.5 watts. The value of R1, based on rated operate current, is just enough to provide minimum holding current.

If you have a relay idea or can show us how to improve this one, we'd like to hear from you. Your relay idea could be the next one we publish.

# Compact polarized SPDT relay with microwatt sensitivity repeats 500 pps.

The Sigma Series 72 SPDT relay is one of the most popular switching devices in the broad Sigma line. It is being used in equipment ranging from data processing systems and servo controls to differential controls and telemetering equipments. It is particularly useful in modern telegraphy applications.

A main reason for its wide use is its sensitive yet precise, distortion-free response. This is made possible by its unique design. With a very small armature mass and a very high resonant frequency, contact transfer time is at a minimum and contact bounce is virtually eliminated.

There are more benefits from the exclusive design and construction features of the Series 72:

Polar switching—safely switches plus or minus 120 volts.

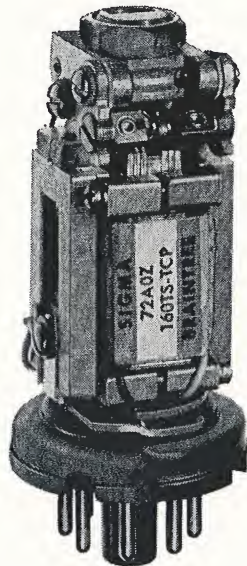
Versatile mounting—unaffected by gravity, adjacent relays or socket orientation.

Long life—rated at 500 million operations.

High sensitivity—to 160 microwatts.

Easy contact replacement—doubles life expectancy.

Small size— $1\frac{1}{16}$ " in diameter,  $2\frac{3}{8}$ " high.



The Series 72 operates for many hundreds of millions of cycles in applications involving high speed switching, telegraphy, or pulse repetition.

You are invited to try out all the advantages of the Sigma Series 72 for yourself—free of charge. Just send for the Sigma Series 72 bulletin and a free relay redemption certificate.

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ON READER-SERVICE CARD CIRCLE 74