

Overtoltage Protection for AC Generators

This simple project can prevent expensive Field Day equipment damage!

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Most hams look forward to the challenges of Field Day: setting up and operating around the clock under less-than-ideal conditions. Gathering such items as antennas, coax, tables, chairs and tents is easy. Hams are reluctant to loan transceivers and computers, though, because of the possibility of damage by human error, such as coffee or soda spills.

And then, there are the generators. Using portable generators, there is always a possibility of damage to expensive equip-

ment as a result of generator failure, especially from overvoltage.

A Field Day team operating in Class 3A (three transmitters plus a Novice/Technician station) could very easily have over \$5000 worth of equipment in use. If the generator supplying power to this equipment puts out too much voltage, you run the risk of burning up power supplies or other electronic components. This article addresses the problem of increased volt-

age, not lower voltage or surges and spikes lasting for a few microseconds.

Using a portable generator overvoltage protection device (PGOVPD) 120-V circuit and ground-fault circuit interrupter (GFCI) is good insurance. *This overvoltage protection device must be used in conjunction with a GFCI at each station!*

Circuit Description

Refer to Figure 1 for this description.

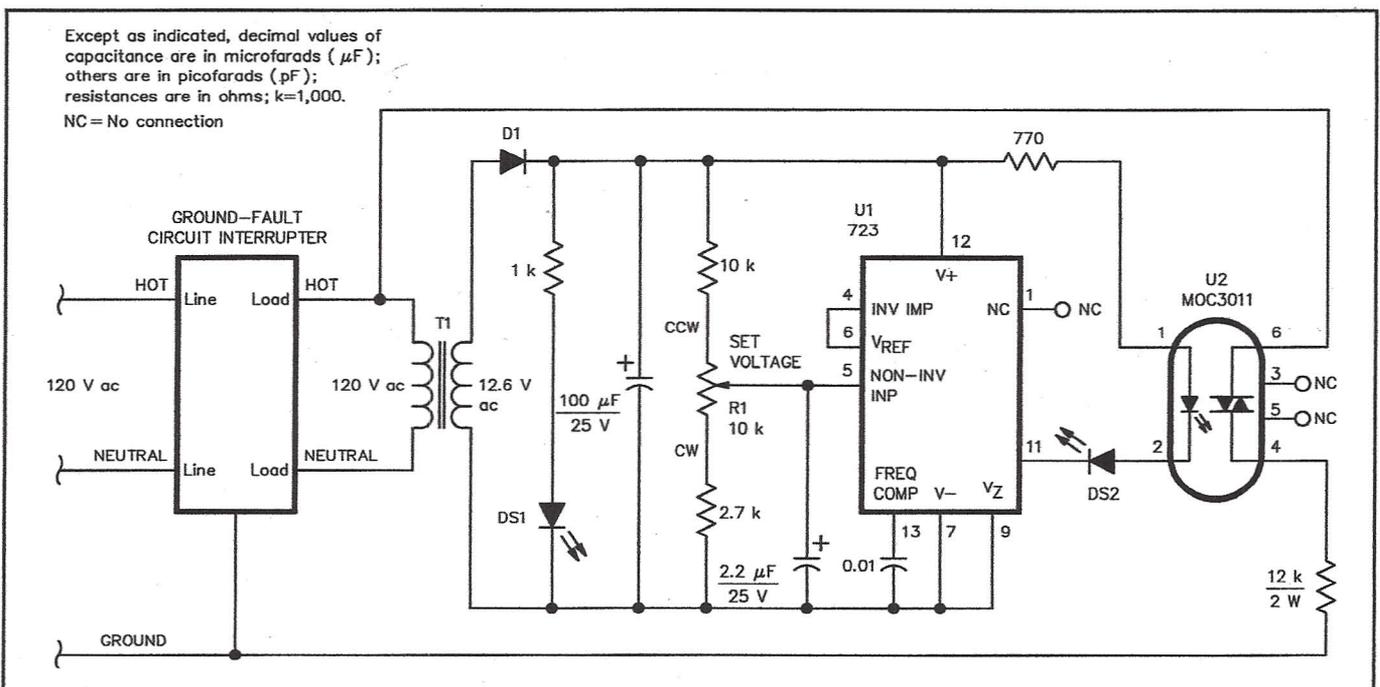


Figure 1—Schematic of the Field Day equipment overvoltage-protection circuit. This circuit must be used in conjunction with a ground-fault circuit interrupter (GFCI). A separate GFCI must be installed at each station. Resistors are $\frac{1}{4}$ -W, 5% tolerance, unless otherwise specified.

D1—200 PIV, 1 A diode; 1N4003 or equivalent.
DS1, DS2—Small LEDs.

R1—10-k Ω board-mounted, multiturn potentiometer.
T1—12.6-V ac transformer (see text).
U1—723 adjustable voltage regulator IC.

U2—Optoisolator with triac output; Isocom MOC3011, MOC3021 or MOC3041, or equivalent.
(All parts available from Digi-Key, 1-800-344-4539; FAX: 218-681-3380).

R1 places an intentional fault on the load side of the GFCI. With the value resistor used, the fault is limited to 100 mA. (The normal tripping threshold of a GFCI is 5 mA.) This current forces the GFCI to trip in just a few milliseconds. This circuit will not function at all without the use of a GFCI. A GFCI must be used at each station. If a single GFCI were used at the generator, rather than one at each location, premature tripping could occur. Several hundred feet of extension cords could have enough leakage to trip the GFCI.

You can see that the GFCI has separate lines (inputs) and loads (outputs). GFCI input terminals must be connected to the generator output. The GFCI ground must be tied to the ground of the generator. The load (computers, radios, etc.) will plug into the GFCI or are wired to the load side of the GFCI. Likewise, this over-voltage protection device must be connected to the load side of the GFCI via a standard 3-conductor plug and can be mounted in a separate box.

T1 can be any 120 to 12.6 V transformer capable of delivering 100 mA or more. Mounting of this transformer varies depending on the type used. All remaining components mount on a circuit board. D1

What's a GFCI?

Article 100 of the National Electrical Code, published by the National Fire Protection Association (NFPA) says: "The ground-fault circuit interrupter is 'A device intended for the protection of personnel that functions to deenergize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.'" The GFCI can be purchased from any electrical supply house or most hardware stores that carry electrical equipment and usually costs about \$10.

rectifies the ac from T1; the 100- μ F capacitor filters the dc. This voltage provides the power to the 723 voltage regulator.

Two fixed resistors and a potentiometer form the voltage-divider network supplying voltage to the LM723 input, pin 5. R1,

the board-mounted¹ potentiometer, has only three leads, but there are four pads on the circuit board, to accommodate different styles of pots. The 2.2- μ F capacitor provides a slight delay, to prevent false tripping when the circuit is powered up. The 0.01- μ F capacitor from pin 13 of the 723 to the negative supply bus should always be used. When the pin 5 voltage goes higher than the reference voltage at pins 4 and 6, pin 11 goes low, turning on the external LED and the LED inside the optical coupler. LED current is limited by the 1-k resistor. The optical coupler turns on the triac, which places a 10-mA fault between the hot wire and ground of the GFCI.

Adjustment

Adjustment is simple. You'll need a variable ac transformer (*Powerstat* or *Variac*). Turn R1 fully clockwise and use the variable transformer to adjust input to 130 V ac. Turn the pot counterclockwise until the GFCI trips.

¹PC-board templates are available from ARRL. Send a self-addressed, stamped envelope to: Technical Department Secretary, 225 Main Street, Newington, CT 06111-1494. Ask for the Overvoltage Protection template from June 1994 QST. 

New Books

JUST WHEN TOM HAD JEAN CONVINCED THAT HIS FRIENDS WERE NORMAL, HE TOOK HER TO A HAMFEST!

By Tom Irwin, AAØME

The Grandpa Press, 1023 Kirkwood Ave, Iowa City, IA 52240; tel 319-337-9986. First edition, 1994. 103 pp, B&W cartoons. 8x5½ inches. Retail price \$8.95, plus \$2 sh. ISBN 0-9640636-0-3.

Reviewed By Brian Battles WS1O
QST Features Editor

Horrible as it may sound, there are people who consider ham radio a hobby. They think the purpose of becoming a licensed radio amateur, and building and operating radios is to have fun in their spare time. They see it as a recreational pursuit! For such fools, jokes and gag cartoons relating to the noble Amateur Radio service are appropriate, although "serious" hams know better. Keep them away from *Just when Tom had convinced Jean that his friends were normal...* By Tom Irwin, AAØME.

Tom, who lives in Iowa City, Iowa, was born in 1936 and has been a ham since 1957 (until his nonrenewable one-year Novice ticket expired; he was relicensed as WDØBNO in the early 1970s), and he's been drawing since childhood. After earning a journalism degree, and several years of cartooning for newspapers and magazines, he's turned his sights on the solemn subject of Amateur Radio.

Over the years, a relatively few "regulars"

have represented the field of ham cartooning. QST often presented the work of Bandel Linn, K4PP, in the 1960s and '70s; Harry Hick (ex-1ESS) drew gags and covers from before WW I to the 1960s. More recently, Jim Massara, N2EST, did cartoons and amusing illustrations for QST and ARRL books, and today Bob Beasley, K6BJH, is probably the most widely published ham cartoonist, producing gag panels for the ARRL, *WorldRadio* and other publications. There's a frustrating scarcity of hams who are professional cartoonists. Although someone occasionally mails in a random, awkward sketch, we QST editors wish more pros would send us high-quality original work for possible publication. The few submissions we see are generally doodles by radio amateurs who aren't professional artists. It's refreshing to find a ham who has a sense of humor and can draw. Also, unlike others who shall remain nameless, Tom doesn't make an embarrassing attempt to copy the unique style of the late, legendary Phil "Gil" (W1CJD) Gildersleeve, W1CJD, whose classics were a QST trademark and a *de facto* standard for ham cartoons for five decades.*

Tom brings a rare breath of fresh air in the

*Although it went out of print a year or two ago, the ARRL published an anthology of Phil Gildersleeve's best work in a paperback called *Gil: A Collection of Classic Cartoons from QST*.

ham book marketplace. This collection of 100 Amateur Radio-related cartoons offers hearty chuckles, and even a guffaw or two. Veteran hams, newcomers, and long-suffering nonham spouses and family members will get a charge out of many of the single-panel gags. Is Tom the next Bob Beasley or Gil? Probably not; although the cartoons are clever and neat, his artwork doesn't have Bob's crisp, clean lines or Gil's quaint, artistic style. Tom's material is less formal and sometimes weak in composition, but it has an appeal that places it several notches above much of the work you might find in a typical local club newsletter. Tom's technique reminds me of the simple, hasty-looking drawings done by humorist James Thurber during the 1930s through the '60s for the *New Yorker* and his many books.

There's no doubt that few hams will be able to resist photocopying Tom's cartoons to hang on their ham shack walls next to their FCC licenses, DXCC certificates and QSL cards. This paperback is sure to disrupt the proceedings at many ham club meetings as it's passed around during the treasurer's report or reading of the minutes. But that's okay because sometimes we need a good reason to laugh at our chosen avocation—and ourselves. At 11 cents a cartoon, *Just when Tom had Jean convinced that his friends were normal...* looks like a good value. 