

APPLICATION INFORMATION SUMMARY--BLACK MAGIC TELEPHONE RINGING GENERATOR

Black Magic Telephone Ringing Generators convert a d.c. input to the low-frequency alternating current (in the United States and Canada typically 20 Hz) required to activate the ringer in a standard analog telephone set or the ring-detect circuit in comparably connected equipment such as facsimile machine, answering machine or modem. A ringing generator is typically part of an "analog line interface". Basic references on the theory of operation of such circuits, equipment and systems are the following two sources:

1. A. Michael Noll, *INTRODUCTION TO TELEPHONES AND TELEPHONE SYSTEMS*, available from Artech House, 685 Canton Street, Norwood MA 02062, telephone +1 781 769-9750.
2. Stephen J. Bigelow, *UNDERSTANDING TELEPHONE ELECTRONICS*, available from SAMS Computer Publishing Division of Prentice Hall.

More advanced circuit theory and design practices are available in the following references:

3. "Direct Connection: Interfacing to the Telephone Network," *Application Note 102*, available from Compliance Engineering Inc., telephone +1 310-445-4200, facsimile +1 310-445-4299.
4. "FCC Part 68 Requirements for Connecting to the U.S. Phone Network" downloadable at <<http://www.ce-mag.com/99ARG/Gubish233.html>>.
5. *TELECOM DESIGN SOLUTIONS*, available from Teltone Corporation, 22121 20th Avenue SE, Bothell WA 98021, telephone +1 206 487-1515, facsimile +1 206 487-2288; see especially Application Note SC-1: "Applications for DTMF and Pulse Telephone Dialing," which provides a comprehensive overview of switched network interface standards, methods, and typical circuits.
6. *TELECOM DESIGN TRICKS*, downloadable from <<http://www.camblab.com/lit/lit.htm>>. This document provides a detailed analysis of power, ringing and talk-battery circuitry.

Users are cautioned to pay close attention to the datasheet specifications of the ringing generator selected for use, in particular:

INPUT POLARITY must be observed as devices are not polarity-protected.

INPUT VOLTAGE must be within the range specified and for best performance should be at the nominal nameplate voltage. Best design will power the unit off when not ringing a load; this power must be switched with a semiconductor, not a relay, due to high inrush currents.

LOAD: Black Magic Sine (SN) and Mini (MN) Square Wave models have inbuilt overload protection; however Micro Square (LN), Micro Sine (LS) and P-BMR models lack this feature. A properly designed analog line interface circuit will contain 300 ohms or more of series resistance, used to sense the change to off-hook status, and will switch off ringing within 200 milliseconds of the transition. Such operation protects models not equipped with short-circuit protection. During e.g. prototyping or experimentation, when this function is not implemented, these models should be protected by adding 1,000 or more ohms of series resistance between their output and the load, to protect against damage e.g. when a ringing phone's handset is lifted while in the ringing state.

Users are invited to submit further questions to Cambridge Electronics Laboratories via facsimile to +1 617 623-1882 or e-mail to <camblab@attglobal.net>.