

8103 Ringing Generator

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1. description and application

1.01 The 8103 Ringing Generator (figure 1) provides switch-selectable 96Vac (nominal) sine-wave ringing voltage, at 20 or 30Hz, from a nominal -48Vdc power source. This output is capable of ringing 10 high-impedance telephone ringers simultaneously. In machine-start applications, the 8103 can be switch-optional to accept an external enable (ground) signal to activate the ringing output. Another switch option on the unit selects either continuous ringing or 2-second-on, 4-second-off interrupted ringing. Designed for direct plug-in installation in one module position of a Tellabs Type 10 Mounting Shelf, the 8103 can also be mounted in an apparatus case via KTU-type rails.

1.02 This practice section is reissued to cover the Issue 2 version of the 8103 Ringing Generator (Tellabs part number **828103**). The Issue 2 8103 is identical to the Issue 1 unit except for the addition of a second card-edge connector-pin appearance (on pin 37) for the machine-start enable lead.

1.03 The 8103 offers the following features:

- Single-slot Type 10 Shelf mounting or apparatus-case mounting via KTU-type rails (brackets and a plug-in terminal strip for KTU-type mounting and wiring are supplied with the unit).
- Shielded case that minimizes EMI (electromagnetic interference) and high-voltage hazards.
- Nominal 96Vac ringing output from -48 to -56Vdc input.
- 10-watt continuous sine-wave output.
- Switch-selectable 20 or 30Hz output frequency.
- 0.5A maximum input current (at maximum load).
- Transient and overload protection.
- DC ring-trip path if unit is disabled.
- Switch-selectable floating or battery-biased ringing output.
- Switch-selectable ringing-generator output control either control via an external enable lead (in machine-start applications) or no external control.
- Switch-selectable continuous or interrupted ringing.
- Front-panel output-voltage (*ringing*) indicator LED.
- Operating temperature: 32° to 122°F (0° to 50° C).
- Maximum current consumption of 0.5A with a 10-watt load.

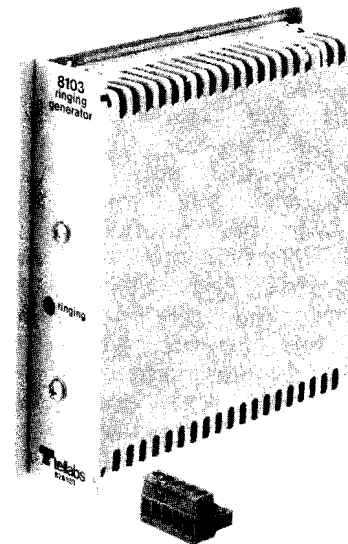


figure 1. 8103 Ringing Generator

1.04 The 8103 is designed primarily for use in network-terminating applications, especially those involving the Tellabs 262 and 262U Network Terminating Systems, and in other customer-premises applications where larger ringing generators would be impractical.

1.05 The 8103's card-edge pinouts are configured for installation in Tellabs' prewired network channel terminating equipment (NCTE) mounting assemblies. Typically, ringing is required in NCTE applications involving foreign-exchange station-end (FXS) modules and in applications involving off-premises-station (OPS) service where loop signaling repeaters (LSR's) are used. The 8103 can be installed in a Tellabs 262 or 262U NCTE Mounting Assembly without additional wiring or strapping. This allows ringing to be quickly and easily added or deleted, depending upon application requirements. The 8103's KTU rail-mounting feature allows the unit to be installed in apparatus cases that do not have a Type 10 mounting position available.

2. installation inspection

2.01 The 8103 Ringing Generator should be visually inspected upon arrival to find any possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the unit should be visually inspected again prior to installation.

ventilation and temperature

2.02 Ventilation is an important consideration when choosing a location for the 8103. Air entry at the top and air exit at the bottom of the unit **must be unobstructed**. Choose a site that allows at least 1/2 inch of top and bottom clearance. Stacking multiple 8103's without following these ventilation guidelines is not recommended. Incoming air at the bottom of the unit must be cooler than 122°F (50°C).

mounting

2.03 **Type 10 Shelf Mounting.** To mount the 8103 in one module position of a Tellabs Type 10 Shelf, proceed as follows:

- A. Ensure that power is not applied to the 8103's module slot in the shelf at this time.
- B. Ensure that the plug-in terminal strip is removed from the 8103's rear panel. This terminal strip is not required in shelf-mount applications.
- C. Set the 8103's four rear-panel option switches as directed in table 1 (see paragraph 2.05).
- D. Insert the 8103 into its module slot as you would any ordinary Type 10 module. Then proceed to paragraph 2.06.

2.04. **Apparatus-Case Mounting via KTU-Type Rails.** To mount the 8103 in an apparatus case via KTU-type rails, proceed as follows:

- A. Remove input power (if present) to the 8103.
- B. Install the KTU mounting brackets on the 8103 as shown in figure 2. Appropriate no. 4 x 1/2-inch sheet-metal screws are supplied with the 8103.
- C. Using appropriate hardware (not supplied), attach the 8103 to the KTU rails.
- D. Ensure that the plug-in screw-terminal strip is removed from the 8103's rear panel (see **caution** below). Then connect all required wiring to the terminal strip. Refer to the legend on the 8103's rear panel (see figure 3) and/or to table 1 (see paragraph 2.05) for the correct wiring order.
- E. Set the 8103's option switches as described in table 1 (see paragraph 2.05).
- F. Ensuring that it is oriented correctly, plug the terminal strip into the rear panel of the 8103. Power may now be applied.

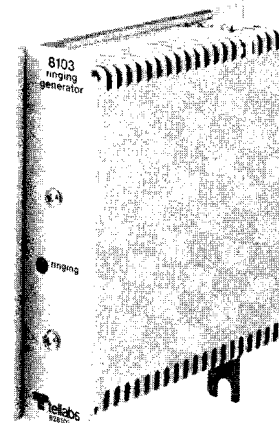


figure 2. 8103 with KTU rail-mounting brackets installed

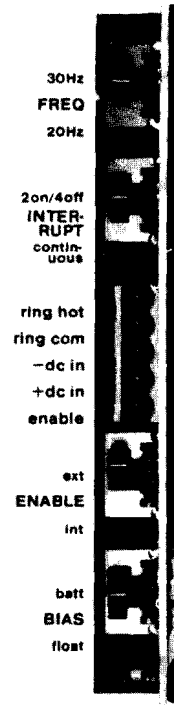


figure 3. Rear panel of 8103

switch	selection	setting	checklist
FREQ	20Hz sine-wave ringing	20Hz	
	30Hz sine-wave ringing	30Hz	
INTERRUPT	continuous ringing	continuous	
	2-second-on/4-second-off ringing interruption	2 on/4 off	
ENABLE	internal: no outside control of ringing output	int	
	external: in machine-start applications, pin 30, pin 37, or TB1-1 (enable lead) is tied to positive terminal of dc power source (i.e., ground) to enable ringing output.	ext	
BIAS	floating: ringer voltage is not referenced to input voltage.	float	
	battery bias: ringer output common (pins 12 and 48 or TB1-4) are tied to battery negative (pin 35 or TB1-3).	batt	

table 1. 8103 option switch summary and checklist

Caution: Do not apply screwdriver force to the plug-in terminal strip when the terminal strip is plugged onto the 8103, or the male connector on the 8103 may be damaged.

switch options

2.05 Table 1 summarizes the four option switches located on the rear of the 8103 and also provides a convenient optioning checklist. Set these switches as required for your particular application.

installer connections for Type 10 Shelf mounting

2.06 If the 8103 is installed in a standard Type 10 Shelf, connections are made by wire-wrapping to the 56-pin connector at the rear of the 8103's module position in the shelf. Table 2 lists all required pin connections. For reference purposes, the corresponding terminals on the plug-in terminal strip (used for KTU rail-type mounting only) are also listed in the table. Before making any connections to the Type 10 Shelf, ensure that power to the shelf is **off** and modules (including the 8103) are **removed**. Modules (and the 8103) should be inserted into their positions only **after** they are properly optioned and **after** wiring is completed.

connect:	to pin:	corresponding TB1 terminal:
-DC IN (input battery negative)	35	TB1-3
+DC IN (input battery positive)	17	TB1-2
RING HOT (ringer hot)	45 and 46*	TB1-5
RING COM (ringer common)	12 and 48*	TB1-4
ENABLE (machine-start enable lead)	30 and 37*†	TB1-1

* Pin pairs indicated are electrically connected within the 8103.
† Optional; used in machine-start applications only.

table 2. External connections to 8103

3. circuit description

3.01 This circuit description is intended to familiarize you with the 8103 Ringing Generator for engineering and application purposes only. Attempts to troubleshoot the 8103 internally are not recommended. Procedures for recommended testing and troubleshooting in the field are limited to those prescribed in section 6 of this practice. Please refer to the 8103 block diagram, section 4 of this practice, as an aid in following this circuit description.

3.02 The 8103 provides ringing voltage by operating a sine-wave power source from an isolated high-voltage supply. All circuitry associated with the ringing output floats.

power conversion

3.03 Nominal -48Vdc input is passed through a fuse and a reverse-polarity protection diode. A power inverter provides high-frequency ac to the primary winding of a small transformer. A noise filter prevents inverter-generated noise from reaching the dc source.

3.04 Transformer secondaries provide input to two rectifier-filter circuits: the *high-voltage power supply* and the *housekeeping power supply*. The *high-voltage power supply* provides filtered dc for the *class-B amplifier* power output stage. The

housekeeping power supply provides low voltage for operational amplifiers (op amps) and logic circuitry.

Note: A 1-1/3-ampere Bussman GMT-type fuse (Tellabs part number 60-0065) is provided with the 8103 to accommodate the unit's current requirements. If the fuse that protects the 8103's module position is of a lower rating than 1-1/3 amperes, **replace** that fuse with the 1-1/3-ampere fuse supplied.

sine-wave oscillator

3.05 The 8103's *sine-wave oscillator* provides undistorted, switch-selectable 20 or 30Hz sine-wave reference, which is later amplified to provide the ringer output. The *oscillator* runs continuously at either 20 or 30Hz, as selected via the *FREQUENCY* option switch.

analog switch

3.06 An *analog switch* driven from the enable circuitry couples the sine-wave reference to the *class-B power amplifier*.

enable logic

3.07 The logic driving the *analog switch* operates as follows:

- The *analog switch* is off unless the *ENABLE* switch is set to *int* (internal) or unless pin 30, pin 37, or TB1-1 is tied to the positive supply voltage (ground in -48V systems).
- If the 8103 is enabled as described above, the state of the *analog switch* is determined by the *INTERRUPT* option switch: either on continuously, or on for 2 seconds and off for 4 seconds, as controlled by the internal *ringing interrupter*.

class-B amplifier

3.08 A *class-B amplifier* provides the ringer output. The *amplifier* incorporates extensive protection for its output transistors, including bipolar foldback current limiting (see figure 4). This enhances the ringing supply's ability to drive resistive and resistive/capacitive loads, to carry dc current while driving loads, and to survive short-term overloads and faults. Figures 5 through 9 show current/voltage graphs that illustrate the aforementioned load-handling characteristics. The ringing supply output may float up to 150V off ground, provided that the common terminal is within 150V (peak) of the positive dc source and the *BIAS* switch is set to float.

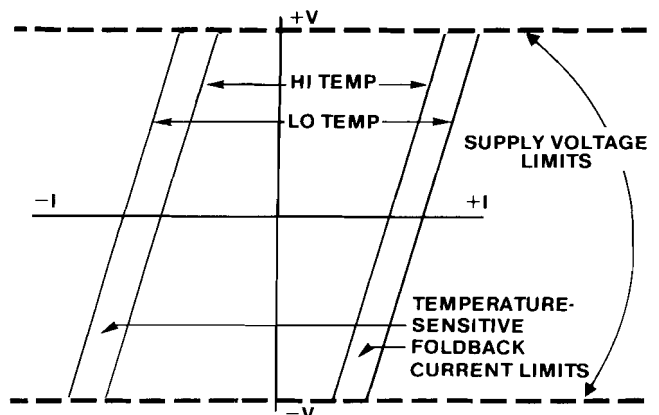


figure 4. Ringing-supply output foldback current limiting

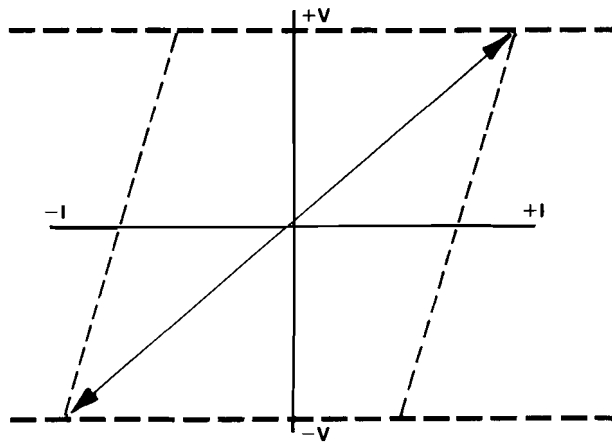


figure 5. Ringing-supply resistive loading

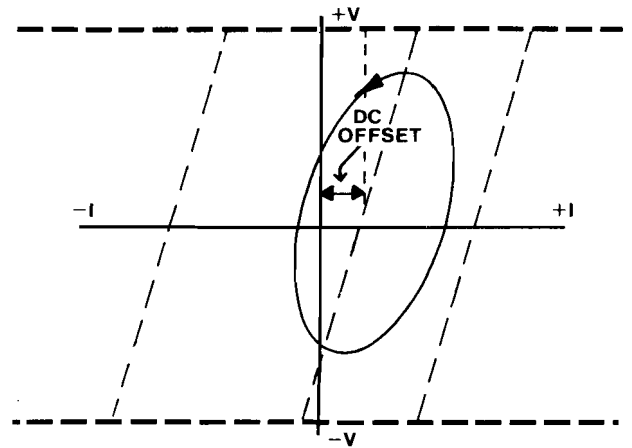


figure 8. Ringing-supply resistive/capacitive loading with dc current

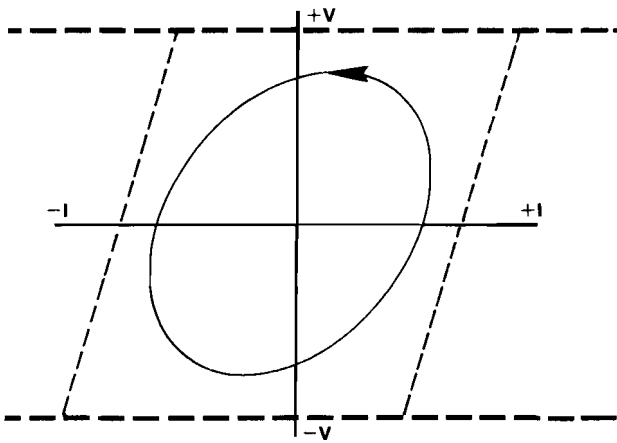


figure 6. Ringing-supply resistive/capacitive loading

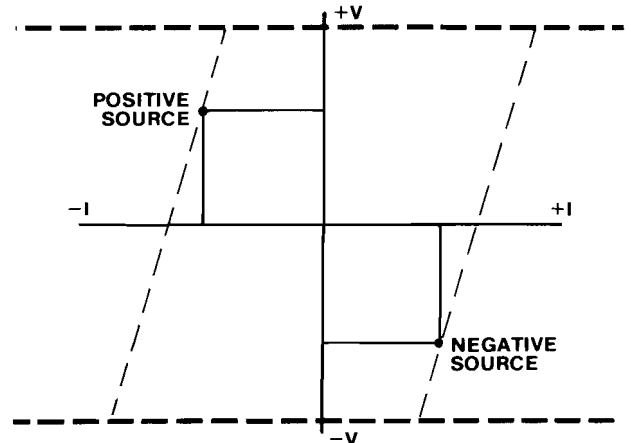


figure 9. Ringing-supply fault to dc source

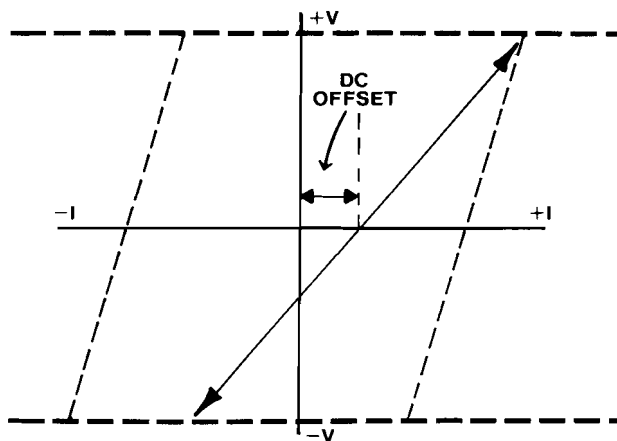


figure 7. Ringing-supply resistive loading with dc current

5. specifications

output voltage

for input voltage between -48 and -56Vdc :

nominal: 96Vrms

minimum: 86Vrms

maximum: 150V peak (less than $\pm 0.5\text{V peak}$ when disabled or interrupted)

for input voltage at 42Vdc :

minimum: 80Vrms (at full load)

output power with input at -48 to -56Vdc

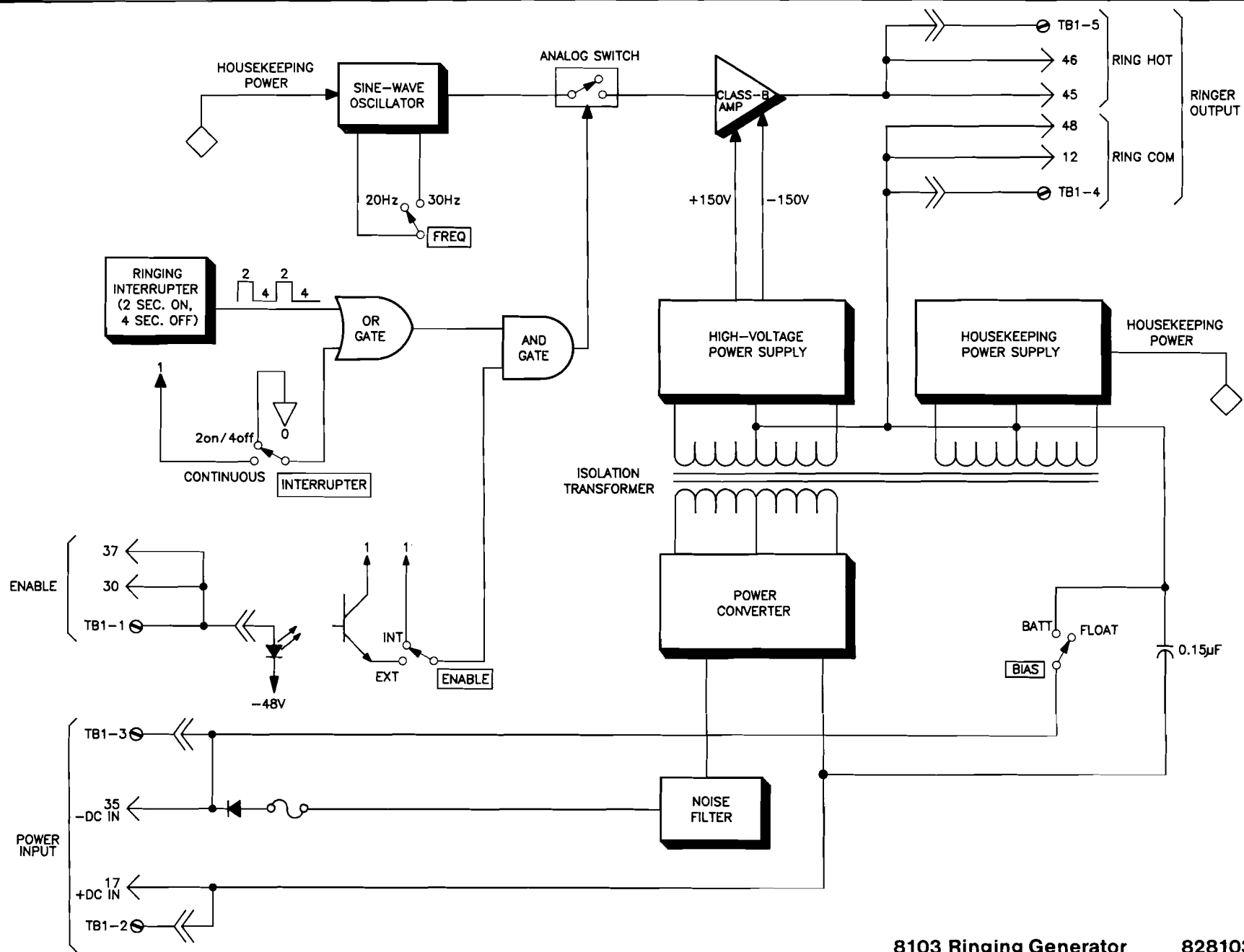
with resistive load: 12 watts minimum

with resistive/capacitive load: 10 watts resistive, $4\mu\text{F}$ (30Hz) or $6\mu\text{F}$ (20Hz) capacitive (12VA total)

frequency

20Hz or $30\text{Hz} \pm 1.0\text{Hz}$, switch-selectable

specifications continued on page 6



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4. block diagram

distortion

less than 3% with input at –48 to –56Vdc, with no frequency component greater than 1.0Vrms from 300 to 4000Hz (clipping of sine-wave peaks may occur with –42Vdc input)

dc component of load (battery-biased ringing)

**during sine-wave output: 40mA minimum
with interrupted or disabled output: 100mA minimum**

short-term fault protection

will survive application of a short circuit or up to 60Vdc (either polarity) to the ringing output for up to 5 minutes without internal damage

interrupter (enabled, 2/4 interrupted ringing selected)

**ON period: 1.6 to 3.0 seconds
OFF period: 3.2 to 6.0 seconds**

protective circuitry

**reverse-battery protection: withstands direct application of FCC part 68 transients
short-term overload protection: protected against static discharge to case**

input current

**no load: 0.15A maximum
10-watt load: 0.50A maximum
short circuit: 0.7A maximum**

operating environment:

**–20° to +50°C (–4° to +122°F),
humidity to 95% (no condensation)**

dimensions

**7.00 inches (17.8 cm) high
(including mounting ears)
1.35 inches (3.43 cm) wide
5.95 inches (15.11 cm) deep**

weight

13 ounces (0.37kg)

mounting

relay rack or apparatus case via one module position of a Tellabs Type 10 Mounting Shelf; can also be mounted in an apparatus case (KTU rail-type mounting) by means of supplied brackets

6. testing and troubleshooting

6.01 The *testing guide checklist* in this section may be used to assist in the installation, testing, or troubleshooting of the 8103 Ringing Generator. The checklist is intended as an aid in the localization of trouble to the 8103. If an 8103 is suspect of being defective, a new one should be substituted and the test conducted again. If the substitute operates correctly, the original should be considered defective and returned to Tellabs for repair and replacement. We strongly recommend that no internal (component-level) testing or repairs be attempted on the 8103. Unauthorized testing or repairs may void the unit's warranty. Also, if the unit is part of a registered system, unauthorized repairs will result in noncompliance with part 68 of the FCC Rules and Regulations.

Note: *Warranty service does not include removal of permanent customer markings on the front panels of Tellabs products, although an attempt will be made to do so. If a product must be marked defective, we*

recommend that it be done on a piece of tape or on a removable stick-on label.

6.02 If a situation arises that is not covered in the checklist, contact Tellabs Customer Service as follows (telephone numbers are listed below):

USA customers: Contact Tellabs Customer Service at your Tellabs Regional Office.

Canadian customers: Contact Tellabs Customer Service at our Canadian headquarters in Mississauga, Ontario.

International customers: Contact your Tellabs distributor.

US Atlantic Region: (203) 798-0506

US Capital Region: (703) 478-0468

US Central Region: (312) 357-7400

US Southeast Region: (305) 834-8311

US Southwest Region: (214) 869-4114

US Western Region: (714) 850-1300

Canada: (416) 624-0052

6.03 If an 8103 is diagnosed as defective, follow the *replacement* procedure in paragraph 6.04 when a critical service outage exists (e.g., when a system or critical circuit is down and no spares are available). If the situation is not critical, follow the *repair and return* procedure in paragraph 6.05.

replacement

6.04 To obtain a replacement 8103, notify Tellabs via letter or telephone (see addresses and numbers below) or via TWX (910-695-3530) in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X8103 part number that indicates the issue of the unit in question. Upon notification, we shall ship a replacement to you. If the 8103 in question is in warranty, the replacement will be shipped at no charge. Pack the defective 8103 in the replacement unit's carton, sign the packing slip included with the replacement, and enclose it with the defective unit (this is your return authorization). Affix the preaddressed label provided with the replacement 8103 to the carton being returned, and ship the unit prepaid to Tellabs.

repair and return

6.05 Return the defective 8103, shipment prepaid, to Tellabs (attn: repair and return).

in the USA:

Tellabs, Inc.

4951 Indiana Avenue

Lisle, Illinois 60532

telephone (312) 969-8800

in Canada:

Tellabs Communications Canada, Ltd.

1200 Aerowood Drive, Unit 39

Mississauga, Ontario, Canada L4W 2S7

telephone (416) 624-0052

Enclose an explanation of the unit's malfunction. Follow your company's standard procedure with regard to administrative paperwork. Tellabs will repair the unit and ship it back to you. If the unit is in warranty, no invoice will be issued.

testing guide checklist

test	test procedure	normal condition	if normal conditions are not met, verify:
no-load operation	Ensure that no load is connected to 8103's ringing outputs and that 8103's option switches are set as follows: <i>FREQ</i> to 20Hz, <i>INTERRUPT</i> to continuous, <i>ENABLE</i> to int, <i>BIAS</i> to float. Connect VOM, set for 250Vac scale, across pin 45 (or 46) and pin 12 (or 48) or across <i>TB1-1</i> and <i>TB1-4</i> (ringer hot and ringer common).	Front-panel <i>ringing</i> LED flashes at 20Hz rate <input type="checkbox"/> . Output voltage between 86 and 106Vac <input type="checkbox"/> .	Input power -48 to -56Vdc <input type="checkbox"/> . Option switches properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
<i>FREQUENCY</i> switch	Maintain VOM connections and <i>INTERRUPT</i> , <i>ENABLE</i> , and <i>BIAS</i> , switch settings as above. Set <i>FREQ</i> switch to 30Hz.	Same as above except front-panel <i>ringing</i> LED flashes at 30Hz rate <input type="checkbox"/> .	<i>FREQ</i> switch properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
<i>INTERRUPT</i> switch	Set <i>INTERRUPT</i> switch to 2 on/ 4 off. Maintain VOM connections and other switch settings as in preceding test.	Front-panel <i>ringing</i> LED flashes at selected ringing frequency for 2 seconds on, 4 seconds off <input type="checkbox"/> . Ringing voltage on for 2 seconds and off for 4 seconds as indicated by VOM <input type="checkbox"/> .	<i>INTERRUPT</i> switch properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
no external enable lead connected	Maintain VOM connections. Set option switches as follows: <i>FREQ</i> to 20Hz, <i>INTERRUPT</i> to continuous, <i>BIAS</i> to float, and <i>ENABLE</i> to external. Ensure that no connection is made to pin 30, pin 37, or <i>TB1-1</i> .	No ringing output <input type="checkbox"/> . VOM indicates less than 1Vrms <input type="checkbox"/> . <i>Ring</i> LED off <input type="checkbox"/> .	<i>ENABLE</i> switch properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
external enable lead connected	Remove input power. Set option switches as in preceding test. Connect pin 30, pin 37, or <i>TB1-1</i> to ground (positive supply terminal). Apply input power.	Ringing output (86 to 106Vac) present <input type="checkbox"/> . Front-panel <i>ringing</i> LED flashes at 20Hz rate <input type="checkbox"/> .	<i>ENABLE</i> switch properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
<i>BIAS</i> switch	Remove input power. Connect VOM, arranged to measure resistance, across <i>TB1-3</i> and <i>TB1-4</i> or across pin 35 and either pin 12 or 48. Set <i>BIAS</i> switch to float.	No continuity, i.e., VOM indicates 10 kilohms or greater <input type="checkbox"/> .	<i>BIAS</i> switch properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .
	Set <i>BIAS</i> switch to batt.	Continuity exists, i.e., VOM indicates approximately 1 ohm or less <input type="checkbox"/> .	Same as above <input type="checkbox"/> .
full-load operation	Remove input power. Set option switches as follows: <i>FREQ</i> to 20Hz, <i>INTERRUPT</i> to continuous, <i>ENABLE</i> to int, <i>BIAS</i> to float. Connect 1000-ohm resistor (10W or greater) across pin 45 (or 46) and pin 12 (or 48), or across <i>TB1-5</i> and <i>TB1-4</i> (ringer hot and ringer common). Also connect VOM, set for 250Vac scale, across these same pins or terminals. Reapply input power.	Front-panel <i>ringing</i> LED flashes at selected ringing frequency <input type="checkbox"/> . Output voltage between 86 and 106Vac <input type="checkbox"/> .	Input power <input type="checkbox"/> . Option switches properly set <input type="checkbox"/> . Replace 8103 and retest <input type="checkbox"/> .