9121 Tone Supply Module

Figure 1. 9121 Tone Supply Module

Contents

1. Description and Application

1.01   The 9121 Tone Supply module (figure 1) is a plug-in tone oscillator module that supplies three separate balanced-output supervisory tones: dial tone (350 + 440Hz), ringback tone (440 + 480Hz interrupted at 30ipm), and a switch-selectable choice of either busy tone (480 + 620Hz interrupted at 120ipm) or alerting tone (440 + 620Hz interrupted at 120ipm). The 9121 is an economical tone source generally used at a customer's location or at other locations where the use of central office tone is not practical.

1.02   This practice section is revised to provide additional specifications to the 9121 Tone Supply module.

1.03   The 25-ohm balanced output of each port permits multiple connections to be made to each port without a significant decrease in tone level. Tone levels are continuously adjustable from −30 to 0dBm via three potentiometers located on the component side of the 9121 module's printed circuit board.

1.04 The 9121 module is commonly used in the Tellabs 291, 291R, and 292R Conference/Alerting Systems as the primary tone supply. *(The 291X Systems are self-contained multipoint ringdown conference circuits designed for emergency reporting and conference applications.)* In the 29X System, the 9121 supplies ringback tone to the originating station until the first conference station answers, and also supplies alerting tone to any busy conference line to provide notification that a conference call is waiting.

1.05 As a Type 10 module, the 9121 mounts in one position of a Tellabs Type 10 Mounting Shelf, versions of which are available for relay-rack and apparatus-case installations. In relay rack applications, up to 12 modules can be mounted across a 19-inch rack, while up to 14 modules can be mounted across a 23-inch rack. In either case, 6 inches of vertical rack space is required.

1.06 The 9121 module contains an internally regulated power supply that permits operation on −22 to −56Vdc input. Current requirement is 20mA.

1.07 The 9121 module, when installed in the 29X System, is located in position 7 of the common equipment shelf (Tellabs 1012 Shelf). The common equipment shelf is factory-wired and equipped with a connectorized backplane. For detailed information on the 29X System, refer to the appropriate 29X System practice.

2. Installation

Inspection   2.01 The 9121 Tone Supply module should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the module should be visually inspected again prior to installation.

Mounting   2.02 Each 9121 module mounts in one position of a Tellabs Type 10 Mounting Shelf, which is available in configurations for both relay-rack and apparatus-case installation. The module plugs physically and electrically into a 56-pin connector at the rear of the shelf.

Installer Connections   2.03 Before making any connections to the mounting shelf, make sure that power is **off** and modules are **removed.** Modules should be put into place only **after** they are properly optioned and **after** wiring has been completed.

2.04 Table 1 lists external connections to the 9121 module. All connections are made via wire wrapping at the 56-pin connector at the rear of each module's mounting position. Pin numbers are found on the body of the connector.

Option Selection   2.05 The 9121 Tone Supply module must be switch-optioned to provide either alerting tone (440 + 620Hz interrupted at 120ipm) or busy tone (480 + 620 Hz interrupted at 120ipm). Refer to figure 2 for the location of option switch *AT/BT,* and set this switch to either the *AT* (alerting tone) or *BT* (busy tone) position as required.

Table 1.	*External connections to the 9121 module*

| connect:	to pin:
DIAL TONE	49 and 55
RINGBACK TONE	51 and 53
ALERTING/BUSY TONE	1 and 5
−BATT	35
GND	17

Alignment　　　2.06　　Alignment of the 9121 module consists of adjusting the tone output level of each port. This is accomplished by adjusting three potentiometers located on the component side of the printed circuit board (figure 2).

Note: *The following alignment procedure will be expedited if a Tellabs 9801 Card Extender is used. Otherwise, the 9121 module must be removed from the shelf to adjust the potentiometers.*

A. **Alerting or Busy Tone:** Connect a transmission measuring set (TMS) optioned for 600-ohm terminated measurement (or 600-ohm bridged measurement if used in a system environment under load) to pins 1 and 5, and adjust potentiometer R38 for the desired output level.

B. **Dial Tone:** Connect a transmission measuring set (TMS) optioned for 600-ohm terminated measurement (or 600-ohm bridged measurement if used in a system environment under load) to pins 49 and 55, and adjust potentiometer R10 for the desired output level.

C. **Ringback Tone:** Connect a transmission measuring set (TMS) optioned for 600-ohm terminated measurement (or 600-ohm bridged measurement if used in a system environment under load) to pins 51 and 53, and adjust potentiometer R28 for the desired output level.

Figure 2.	*Switch locations*
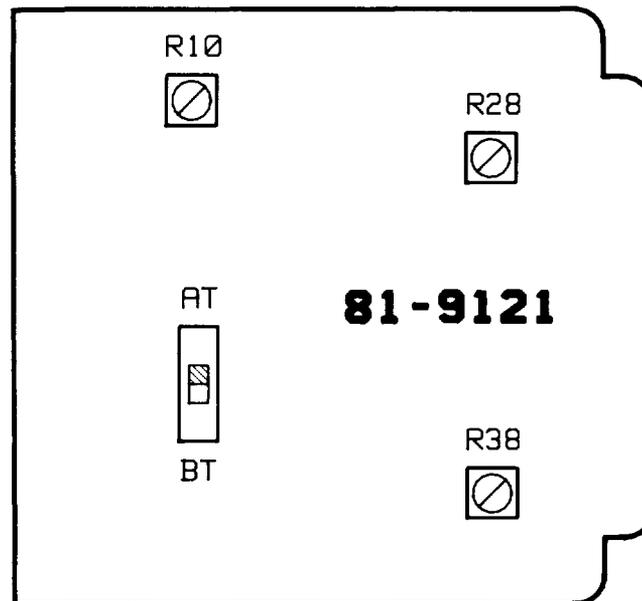
3. Circuit Description

3.01 This *circuit description* is intended to familiarize you with the 9121 module for engineering and application purposes only. Attempts to troubleshoot the 9121 internally are not recommended. Procedures for recommended trouble-shooting in the field are limited to those prescribed in section 6 of this practice.

3.02 The 9121 module provides 3 dual-frequency outputs consisting of dial tone (350Hz mixed with 440Hz), ringback tone (440Hz mixed with 480Hz and interrupted at a 30ipm rate), alerting tone (440Hz mixed with 620Hz and interrupted at a 120ipm rate), or busy tone (480Hz mixed with 620Hz and interrupted at a 120ipm rate). Each of the four discrete tones, 350Hz, 440Hz, 480Hz, and 620Hz is produced by two operational amplifiers arranged to operate as a frequency-dependent negative resistance (FDNR) converter in the oscillator (*OSC*) circuitry. The FDNR produces a very stable sine-wave output whose operating frequency is factory-set by the adjustment of a potentiometer. The relative output level is set by an individual oscillator level control that feeds its associated mixer circuit.

3.03 The dial tone *mixer and level cont.* circuitry mixes the outputs of the 350Hz and 440Hz oscillators at the input of an inverting operational amplifier. Adjustable negative feedback is used to control the output level of the combined tones. The operational amplifier is followed by an active *LP* (low pass) *filter* that removes high frequency harmonics and prevents the sum of the two input frequencies from affecting the output. This filter also drives an output transformer that provides a balanced output.

3.04 The ringback-tone and alerting/busy-tone circuits are identical except for the addition of an *AT/BT* switch on the alert/busy tone portion to select either the 440Hz or 480Hz input to be mixed with 620Hz. The ringback tone circuitry combines the outputs of the 440Hz and 480Hz oscillators, and feeds the combined signal through FET switches in the *30 IPM interrupter* circuitry. The FET switches are turned off and on at a 30ipm rate by an operational amplifier operating as a free running multivibrator. The alerting/busy tone circuitry mixes the output of the *440Hz oscillator* (alerting tone) or the output of the *480Hz oscillator* (busy tone) with the output of the *620Hz oscillator*. This combined signal is then switched off and on by FET switches at a 120ipm rate. Output transformers on both circuits provide balanced outputs.

3.05 The power supply circuitry, consisting of a series voltage regulator and an operational amplifier configured as a voltage follower, permits operation on any input voltage from −22 to −56Vdc.

4. Block Diagram

9121 Tone Supply Module 819121
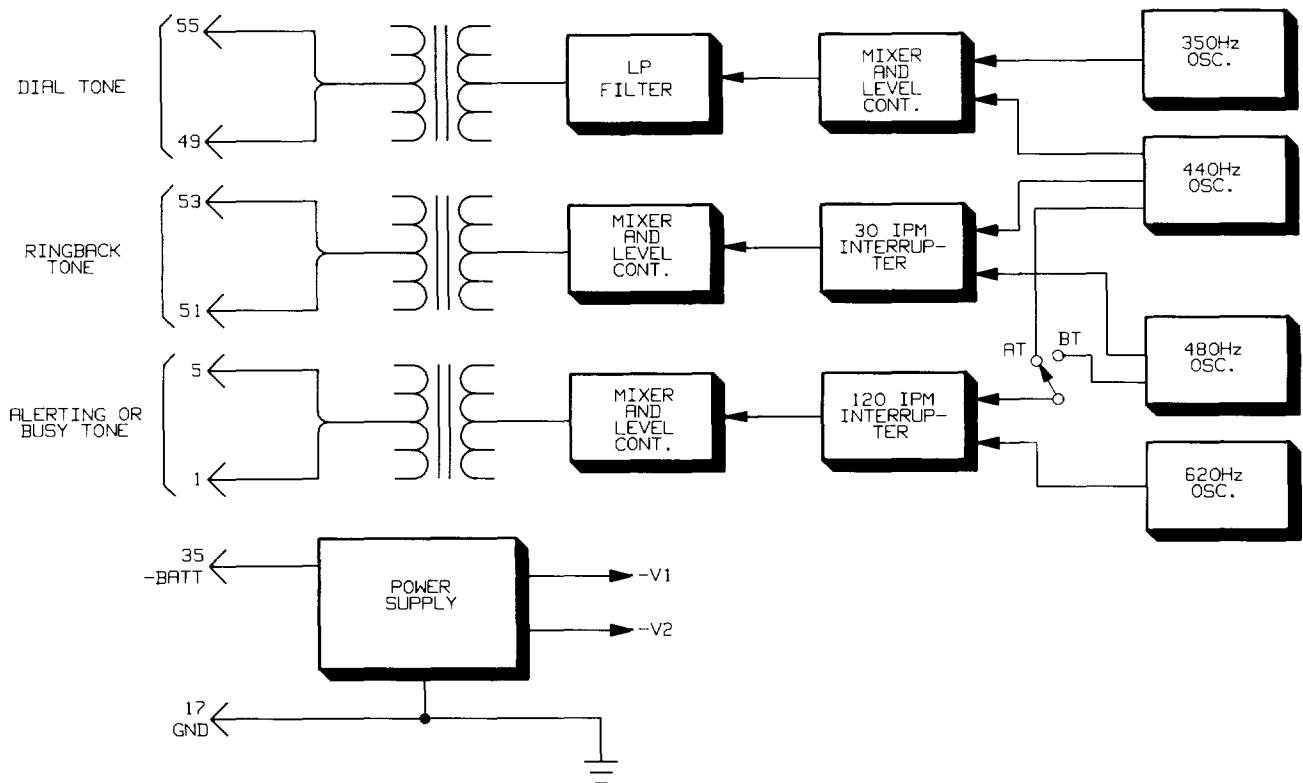
5. Specifications

alerting tone/busy tone (switch-selectable)	level adjustment: −30 to 0dBm alerting tone frequency and interruption rate: 440 + 620Hz ± 2Hz at 120ipm busy tone frequency and interruption rate: 480 + 620Hz ± 2Hz at 120ipm output impedance: 25 ohms, balanced
dial tone	level adjustment: −30 to 0dBm frequency: 350 + 440Hz ± 2Hz output impedance: 25 ohms, balanced
ringback tone	level adjustment: −30 to 0dBm frequency and interruption rate: 440 + 480Hz ± 2Hz at 30ipm output impedance: 25 ohms, balanced
power requirements	input voltage: −22 to −56Vdc, positive-ground-referenced input current: 20mA
operating environment	−40° to +140°F (−40° to +60°C), humidity to 95% (no condensation)
dimensions	5.58 inches (14.17cm) high 1.42 inches (3.61cm) wide 5.96 inches (15.14cm) deep
weight	17 ounces (482 grams)
mounting	relay rack or apparatus case via one position of a Tellabs Type 10 Mounting Shelf

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 9121 Tone Supply module. The checklist is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement as directed below. We strongly recommend that no internal (component-level) testing or repairs be attempted on the 9121 module. Unauthorized testing or repairs may void the module's warranty; in addition, if the module is part of a registered system, unauthorized repairs will void the FCC registration.

Note: *Warranty service does not include removal of permanent customer markings on the front panels of Tellabs modules, although an attempt will be made to do so. If a module must be marked* **defective,** *we recommend that it be done on a piece of tape or on a removable stick-on label.*

Telephone Assistance 6.02 If a situation arises that is not covered in the troubleshooting guide, contact Tellabs Customer Service as follows (telephone numbers are given 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) 645-5888
US southwest region: (214) 869-4114
US western region: (702) 827-3400
Canada: (416) 624-0052

Determining Need 6.03 If a 9121 module is diagnosed as defective, follow the replacement procedure in paragraph 6.04 when a critical service outage exists (e.g., when a system or a 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 module, 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 8X9121 part number that indicates the issue of the module in question. Upon notification, we shall ship a replacement module to you. If the module in question is in warranty, the replacement will be shipped at no charge. Pack the defective 9121 module in the replacement module's carton, sign the packing slip included with the replacement, and enclose it with the defective module (this is your return authorization). Affix the preaddressed label provided with the replacement module to the carton being returned, and ship the module prepaid to Tellabs.

Repair and Return   6.05   Return the defective module, 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 module's malfunction. Follow your company's standard procedure with regard to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.

testing guide ckecklist

test	test procedure	normal result	if normal conditions are not met, verify:
alerting tone/busy tone	Arrange receive portion of transmission measuring set (TMS) for 600-ohm terminated measurement (or 600-ohm bridged measurement if used in a system environment under load) and connect it to pins 1 and 5. Measure both level and frequency of module's alerting/busy tone output.	TMS indicates proper signal level as adjusted via potentiometer $R38$. TMS indicates 440 + 620Hz±2Hz at 120ipm (alerting tone) □, or 480 + 620Hz±2Hz at 120ipm (busy tone) □.	Power □. Wiring □. Potentiometer $R38$ adjusted correctly □. Operation switch AT/BT correctly set □. Replace 9121 and retest □.
dial tone	Arrange receive portion of transmission measuring set (TMS) for 600-ohm terminated measurement (or 600-ohm bridged measurement if used in a system environment under load) and connect it to pins 49 and 55. Measure both level and frequency of module's dial tone output.	TMS indicates proper signal level as adjusted via potentiometer $R10$. TMS indicates frequency of 350 + 440Hz±2Hz □.	Power □. Wiring □. Potentiometer $R10$ adjusted correctly □. Replace 9121 and retest □.
ring-back tone	Arrange receive portion of transmission measuring set (TMS) for 600-ohm terminated measurement (or 600-ohm if used in a system environment under load) and connect it to pins 51 and 53. Measure both level and frequency of module's ringback tone output.	TMS indicates proper signal level as adjusted via potentiometer $R28$. TMS indicates frequency of 440 + 480Hz±2Hz at 30ipm.	Power □. Wiring □. Potentiometer $R28$ adjusted correctly □. Replace 9121 and retest □.

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