

# 9924 2400/2600Hz International Line Signaling Tone Disabler Subassembly

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## 1. description and application

1.01 The 9924 2400/2600Hz International Line Signaling Tone Disabler plug-on subassembly (figure 1) is designed for optional use with Tellabs 6921A, 6921B, and 6921H Echo Canceller modules to render the transmit and receive channels of these modules transparent to 2400/2600Hz multi-frequency (MF) tone transmission in MF signaling environments.

**Note:** Although the low-profile 6921AL and 6921BL Echo Canceller modules can accept the 9924 subassembly, please be aware that installation of the 9924 on these modules will render them too wide for use in Tellabs 1624X Double-Density Mounting Shelves.

1.02 This practice section is revised to provide corrected optioning information concerning the host echo canceller module. In those parts of this practice that apply equally to the 6921A, 6921B, and 6921H Echo Canceller modules on which the 9924 subassembly is used, the three modules will, for convenience, be referred to collectively as the 6921X module.

1.03 In conventional applications, echo cancellers are located on the terminal-equipment side of MF signaling units and therefore do not have to contend with MF signaling tone. Certain applications, however, require that an echo canceller be located within an MF signaling link, where MF tone may be present in one or both directions. In such "end-link" applications, both the transmit and receive channel of the echo canceller must be disabled during MF tone transmission so that no interference occurs between MF signaling and echo cancellations.

1.04 The 9924 subassembly operates as follows: During periods of continuous MF tone transmission in either channel, tone detection circuitry in the 9924 causes the host module's echo-cancellation section and nonlinear processor to be disabled within  $100 \pm 25$ ms. The host module remains disabled during intermittent MF tone dropouts of up to  $30 \pm 5$ ms.

1.05 The 9924 monitors the host module's transmit input and receive input ports for the presence of 2400/2600Hz MF tone. When the 9924 detects

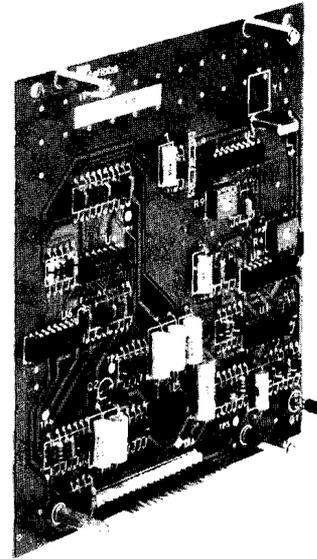


figure 1. 9924 2400/2600Hz International Line Signaling Tone Disabler subassembly

this tone, it completely disables both the echo-cancellation section and the nonlinear processor of the 6921X, thereby providing straight-through transmit and receive paths for the duration of the MF tone transmission. The 9924 subassembly, when active, lights the module's front-panel disable LED, resets and holds at zero the H register of the module's convolution processor, and disables the 9923 Analog Compander subassembly (if also present on the host module) for the duration of the MF tone transmission.

1.06 The 9924 places negative input battery through 47 kilohms on connector pins 19 and 20 of the host module whenever 2400/2600Hz MF tone is present in either the transmit or the receive channel (or both). In the absence of MF tone in both channels, these pins are at PNP-transistor ground. Although the 9924 constantly monitors both channels for the presence of MF tone, the subassembly's receive-channel traffic-monitoring outputs are always logic-ORed onto the 6921X's **transmit** traffic-monitoring lead (pins 19 and 20). The host module's **receive** traffic-monitoring lead (pins 21 and 24) is not enabled, and therefore provides no separate receive-channel traffic-monitoring indications, when the module is equipped with the 9924.

## 2. installation inspection

2.01 The 9924 2400/2600Hz International Line Signaling Tone Disabler subassembly should be

visually inspected upon arrival to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the subassembly should be inspected again prior to installation.

**installation on host module**

2.02 Ensure that the host module is properly switch-optional as follows to accept the 9924 subassembly:

- On Issue 3 6921A, 6921AL, 6921B, and 6921BL modules (Tellabs part numbers **836921A, AL, B, and BL**), set two-position miniature slide switches *S110* (transmit channel) and *S111* (receive channel) to the *OUT* position, i.e., away from *IN*.
- On Issue 2 6921A, 6921B and 6921H modules (Tellabs part numbers **826921A, B, and H**), set miniature push-pull switches *S10* (transmit channel) and *S11* (receive channel) to the *IN* or *down* position. (Push these switches downward, i.e., toward the main printed circuit board.)

2.03 Then install the 9924 on the host module by plugging 18-pin male connector *P3* on the 9924 into 18-pin female connector *J3* on the host module. (See figure 2 for the locations of *P3* and *J3*.) After plugging the 9924 onto the host 6921X, visually check the *P3*-*J3* connection to ensure that no pins are bent and, as a result, not properly inserted into their correct receptacles. Then install and tighten the four screws that secure the subassembly's standoff posts to the host module's main board. The 9924 has no option switches and requires no alignment.

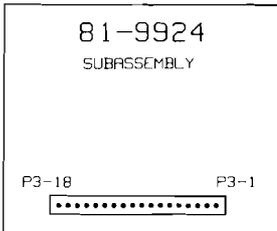


figure 2a. Component side of 9924

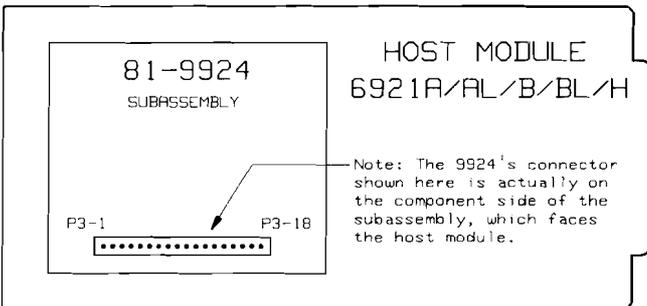


figure 2b. Orientation of 9924 on host 6921X module (9924's component side down, 6921X's component side up).

figure 2. 9924 connector location and positioning

**3. circuit description**

3.01 This circuit description is intended to familiarize you with the 9924 2400/2600Hz International Line Signaling Tone Disabler subassembly for engineering and applications purposes only.

Attempts to troubleshoot the 9924 internally are not recommended and may void its warranty. Troubleshooting procedures should be limited to those described in section 6 of this practice. Please refer to the block diagram, section 4 of this practice, as an aid in following the circuit description.

3.02 The receive and transmit input channels are summed by the *summing amplifier* and passed to the *high-pass filter*. The signal is passed through two notch filters, a *2400Hz notch filter* for 2600Hz detection and a *2600Hz notch filter* for 2400Hz detection. The signal then passes through the *signal-to-guard detector* circuits, one for the 2400Hz and one for 2600Hz. The signal also passes through a *bandpass filter* to derive the correct tones, after which the tones are inverted and added to the all passband to produce a notched bandpass filtered output. This allows the *signal-to-guard detector* circuit to compare the 2400Hz or 2600Hz energy to the total energies of the all pass minus the tone or tones to be detected. The circuits are then logic-ORed prior to timing and control of output level states.

**5. specifications**

*MF tone detection*

**detection level: -24dBm0 minimum**

**detection time: 100±25ms**

**signal-to-guard: 12dB typical**

*MF tone monitoring*

**pins 19 and 20 (xmt) on host 6921-family echo canceller module are at negative input battery through a 47-kilohm resistor during detection of MF tone in either or both channels and at PNP-transistor ground (100mA maximum) when no tone is detected in both channels**

*input power requirements*

**adds maximum of 25mA at -24Vdc operation (600mW) and maximum of 15mA at -48Vdc operation (720mW) to host module's current consumption**

*operating environment*

**32° to 131°F (0° to 55°C), humidity 5 to 95% (no condensation)**

*dimensions*

**5.8 inches (14.7cm) high**

**4.5 inches (11.4cm) deep**

**0.8 inch (2.0cm) thick (maximum)**

*weight*

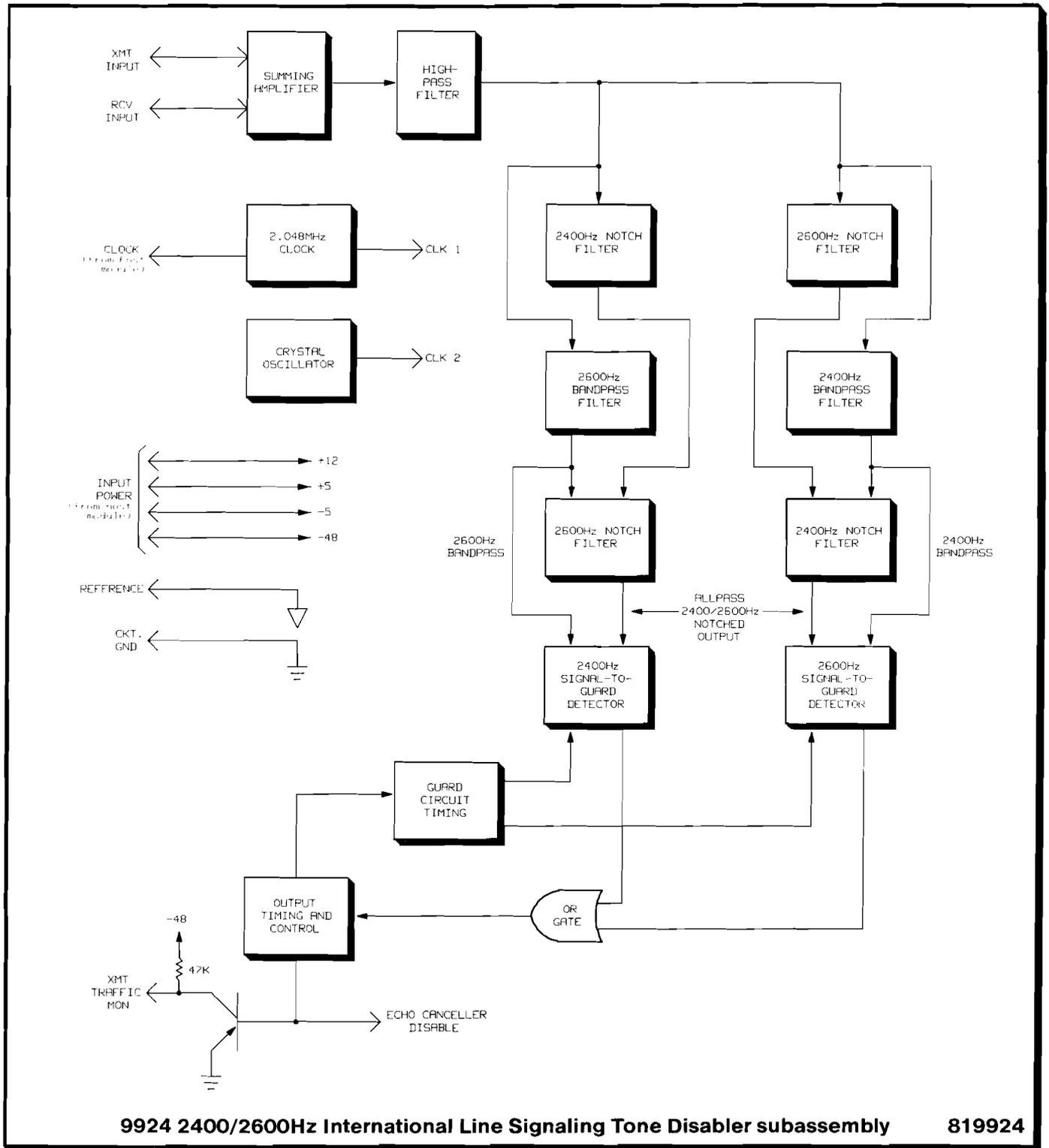
**4.0 ounces (113.2 grams)**

*mounting*

**plugs onto printed circuit board of Tellabs Issue 2 6921A, 6921B, and 6921H Echo Canceller modules and Tellabs Issue 3 6921A and 6921B Echo Canceller modules. Can also be mounted on Tellabs Issue 3 6921AL and 6921BL Echo Canceller modules, but width of 9924 eliminates double-density mounting capability of these modules.**

**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 9924 International Line Signaling Tone Disabler subassembly. The checklist is intended as an aid in the localization of trouble



**4. block diagram**

to the 9924. If a 9924 is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute 9924 operates correctly, the original 9924 should be considered defective and returned to Tellabs for repair or replacement. We strongly recommend that no internal (component-level) testing or repairs be attempted on Tellabs products. Instead a malfunctioning product should be returned to Tellabs for repair or

replacement as directed below. Unauthorized testing or repairs may void the product's warranty. Also, if the product is part of a registered system, unauthorized repairs will result in non-compliance with Part 68 of the FCC Rules and Regulations.

6.02 If a situation arises that is not covered in the checklist, 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 central region: (312) 969-8800
- US capital region: (703) 478-0468
- US Atlantic region: (203) 798-0506
- US southeast region: (305) 645-5888
- US western region: (702) 827-3400
- Canada: (416) 624-0052

6.03 If a 9924 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.

**Note:** *Warranty service does not include removal of permanent customer markings on 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.*

**replacement**

6.04 To obtain a replacement 9924, notify Tellabs via letter or telephone (see addresses and num-

bers below), or via TWX (910-695-3530 in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X9924 part number that indicates the issue of the subassembly in question. Upon notification, we shall ship a replacement subassembly to you. If the 9924 in question is in warranty, the replacement will be shipped at no charge. Pack the defective 9924 in the replacement's carton, sign the packing slip included with the replacement, and enclose it with the defective 9924 (this is your return authorization). Affix the preaddressed label provided with the replacement to the carton being returned, and ship the 9924 prepaid to Tellabs.

**repair and return**

6.05 Return the defective 9924 subassembly, shipment prepaid, to Tellabs (attn: repair and return).

in the USA: Tellabs Incorporated  
4951 Indiana Avenue  
Lisle, Illinois 60532

in Canada: Tellabs Communications Canada, Ltd.  
1200 Aerowood Drive, Unit 39  
Mississauga, Ontario, Canada L4W 2S7

Enclose an explanation of the 9924's malfunction. Follow your company's standard procedure with regard to administrative paperwork. Tellabs will repair the 9924 and ship it back to you. If the 9924 is in warranty, no invoice will be issued.

**testing guide checklist**

**Note:** *The testing procedure for the 9924 subassembly is most conveniently performed when a Tellabs 9807 Card Extender or an external jackfield is used to provide access to the appropriate points within the host 6921X module. Thus, the following procedure is based on the assumption that a card extender or jackfield will be used. Jack designations are those on the 9807.*

test	test procedure	normal condition	if normal conditions are not met, verify:
MF tone-monitoring output, transmit channel	Arrange xmt portion of the TMS for 2600Hz tone output at -9dBm0. (If TMS has separate impedance setting, select 600 ohms.) Connect this signal to 4W xmt drop or 2W in jack (opening jack, xmt input port). Arrange a VOM to measure up to 100Vdc. Connect one VOM lead to the host module's transmit traffic-monitoring lead (pin 19 or 20) and the other VOM lead to input battery ground (pin 25).	Xmt traffic-monitoring output level indicated on VOM is same as negative input battery*, indicating that 9924 is operating correctly <input type="checkbox"/> .	TMS level and impedance settings correct <input type="checkbox"/> . No double terminations at host 6921X module's xmt input port <input type="checkbox"/> . Replace 9924 and retest <input type="checkbox"/> .
MF tone-monitoring output, receive channel	Connect xmt portion of TMS, arranged as described for preceding xmt channel test, to rcv SF in jack (opening jack, rcv input port). Arrange a VOM to measure up to 100Vdc. Connect one VOM lead to the host module's transmit traffic-monitoring lead (pin 19 or 20) and the other VOM lead to input battery ground (pin 25).	Xmt traffic-monitoring output level indicated on VOM is same as negative input battery*, indicating that 9924 is operating correctly <input type="checkbox"/> .	TMS level and impedance settings correct <input type="checkbox"/> . No double terminations at host 6921X module's rcv input port <input type="checkbox"/> . Replace 9924 and retest <input type="checkbox"/> .

\* On Issue 2 and 3 6921X modules, negative input battery is -22 to -56Vdc.