9908B Active Prescription Equalizer Subassembly

contents

1. description and application

1.01   The 9908B Active Prescription Equalizer subassembly (figure 1) provides active slope-type or bump-type amplitude equalization for nonloaded or loaded cable facilities. This equalization is equivalent to that provided by the Western Electric 309B Prescription Equalizer and is adjusted via prescription-set slope, height, and bandwidth switches. The 9908B subassembly plugs onto a variety of Tellabs modules.

1.02   This practice section is reissued to cover the Issue 3 version of the 9908B subassembly (Tellabs part number **839908B**). The Issue 3 9908B is functionally identical to its Issue 2 counterpart but includes a bypass switch that allows its equalization circuitry to be electrically bypassed without removing the subassembly from its host module.

Note: *The Issue 3 version of the 9908B cannot be used on Tellabs Issue 1 441X and 442X-series Data Station Termination (DST) modules (Tellabs part numbers **81441X** and **81442X**). However, the Issue 3 9908B can be used on the Issue 2 versions of the Tellabs 4416X and 4418X DST's (Tellabs part numbers **824416X** and **824418X**).*

1.03   The 9908B subassembly is generally used to post-equalize the receive channel of a 4wire transmission path. It provides low-end slope equalization down to 404Hz and high-end bump equalization centered at 3250Hz. Degree of slope, height of bump, and affected bandwidth are controlled by the subassembly's two DIP switches. If, in a particular application or during testing, no equalization is desired, the 9908B can be excluded from the circuit (electrically bypassed) by means of a switch option on the subassembly. Removal of the subassembly from its host module is not required.

1.04   Figures 2 and 3 show typical response curves for the 9908B equalizer in the slope mode. Figure 2 shows the curves for nonloaded cable, while figure 3 shows the curves for loaded cable. For comparison purposes, all frequency-response curves in figures 2 and 3 are drawn with the same 0dB-gain reference point (1004Hz). Actually, all of these curves except for those for a SLOPE switch setting of 0 are raised above the 0dB level at 1004Hz by as much as 11.4dB. The exact amount by which a particular curve is raised depends upon
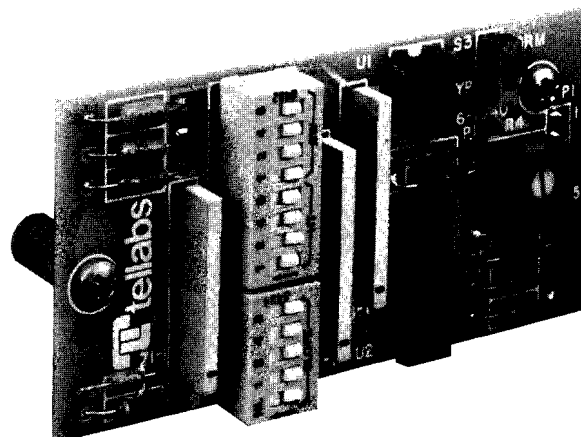

figure 1. 9908B Active Prescription Equalizer subassembly

the SLOPE and L/NL (loaded/nonloaded) switch settings selected. These amounts are listed in table 1.
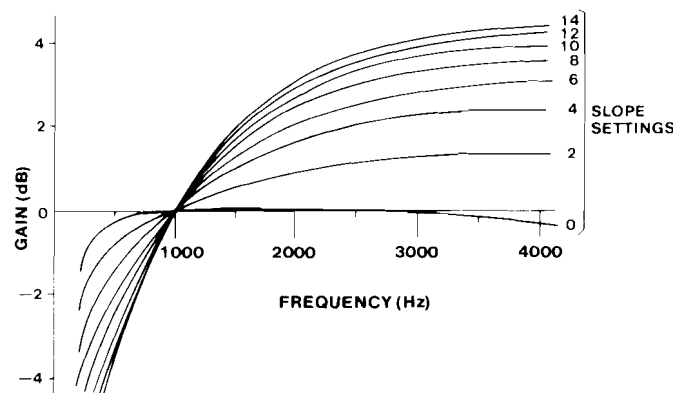

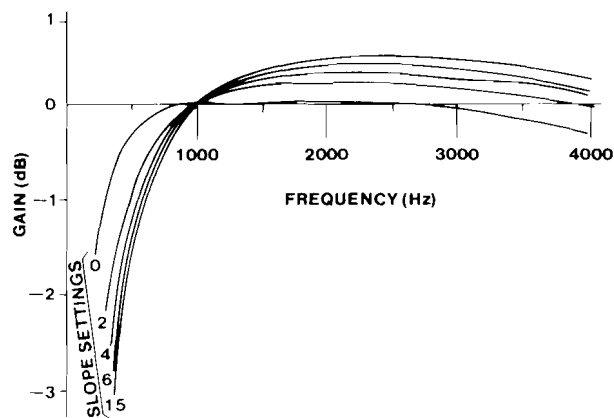figure 2. Typical response curves for 9908 in slope mode, nonloaded cable

figure 3. Typical response curves for 9908B in slope mode, loaded cable

SLOPE switch setting	L/NL (loaded/nonloaded) switch setting	
	L	NL
0 (slope disabled)	0.0dB	0.0dB
1	1.4	0.4
2	2.6	0.9
3	3.7	1.4
4	4.7	1.8
5	5.5	2.3
6	6.3	2.8
7	7.2	3.4
8	7.8	3.7
9	8.4	4.2
10	9.0	4.6
11	9.5	5.0
12	10.0	5.4
13	10.5	5.8
14	11.0	6.2
15	11.4	6.6

table 1. Equalized gain (in dB) at 1004Hz in slope mode

figure 4. Typical response curves for 9908B in bump mode, BW switch = 14

the SLOPE and L/NL (loaded/nonloaded) switch settings selected. These amounts are listed in table 1.

1.05   Figures 4 and 5 show typical response curves for the 9908B equalizer in the bump mode. Figure 4 shows the curves representing various height settings versus a wide bandwidth setting, while figure 5 shows the curves representing various height settings versus a narrow bandwidth setting. For comparison purposes, all frequency response curves in figures 4 and 5 are drawn with the same 0dB-gain reference point (1004Hz). Actually, all of these curves except those with an HT switch setting of 1 or 0 and/or with a BW switch setting of 5 or less are raised above the 0dB level by as much as 3.9dB. The exact amount by which a particular curve is raised depends upon the HT and BW switch settings selected. These amounts are listed in table 2.
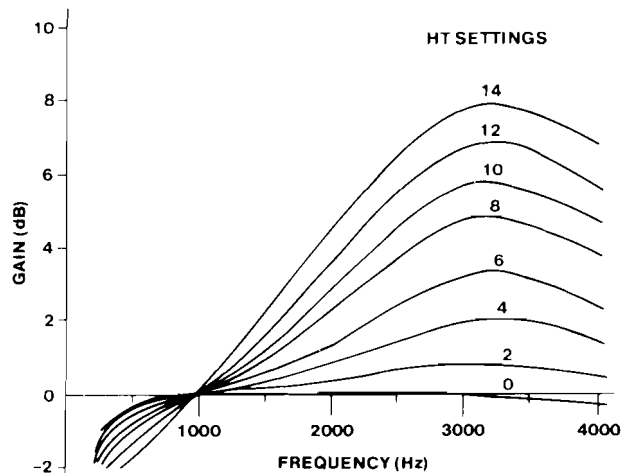

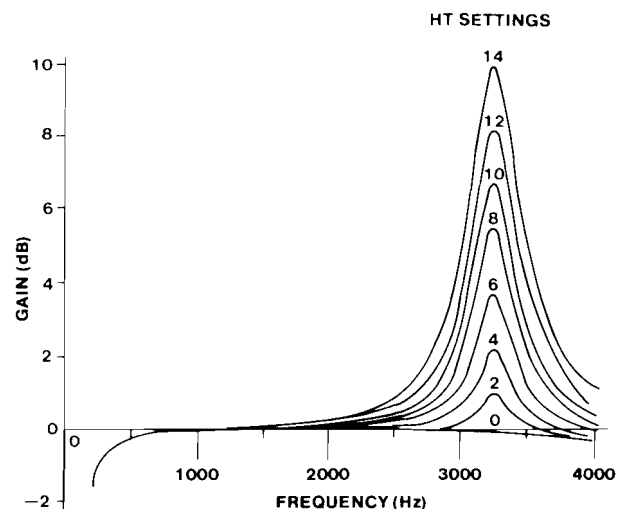figure 5. Typical response curves for 9908B in bump mode, BW switch = 3

HT switch setting*	BW switch setting**									
	6	7	8	9	10	11	12	13	14	15
2	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB	0.1dB	0.1dB	0.2dB
3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.3
4	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.4
5	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.5
6	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.7
7	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.5	0.9
8	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.7	1.2
9	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.5
10	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.6	1.0	1.7
11	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.7	1.2	2.0
12	0.1	0.1	0.2	0.3	0.3	0.4	0.6	0.9	1.4	2.4
13	0.1	0.2	0.3	0.3	0.4	0.6	0.8	1.1	1.7	2.8
14	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.3	2.0	3.3
15	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.7	2.5	3.9

*HT switch position 0 disables bump function. HT switch position 1 introduces 0.1dB of gain or less at 1004Hz.
**BW switch positions 0 through 5 introduce 0.1dB of gain or less at 1004Hz for all HT settings.

table 2. Equalized gain (in dB) re 1004Hz in bump mode

1.06 Input power is supplied to the 9908B sub-assembly via the host module. The 9908B adds a nominal 2mA (maximum) to the host module's current consumption, with 1.5mA maximum being typical in most applications.

1.07 The 9908B makes electrical and physical connection to its host module via a five-pin connector (male on the 9908B, female on the host module). The subassembly is further secured to the module by two standoff posts and screws.

2. installation

inspection

2.01 The 9908B Active Prescription Equalizer subassembly should be visually inspected upon arrival to find any damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the subassembly should be visually inspected again prior to installation.

mounting

2.02 The 9908B makes physical and electrical connection to its host module via five-pin male connector P1 on the subassembly and a five-pin female receptacle on the host module. Two standoff posts and screws further secure the subassembly to the host module.

option selection

2.03 The 9908B contains one option switch, S3, a two-position miniature slide switch whose location on the subassembly is shown in figure 6. Depending upon the setting of this switch, the 9908B's equalization circuitry is either inserted into the host module's transmission path or electrically bypassed, as desired. Set S3 as follows:

- To include the 9908B equalizer in the host module's transmission path, set S3 to the EQ (equalization) position. Then align the sub-assembly as directed below.
- To exclude the 9908B equalizer from the host module's transmission path when no equalization is desired, set S3 to the BYP (bypass) position.

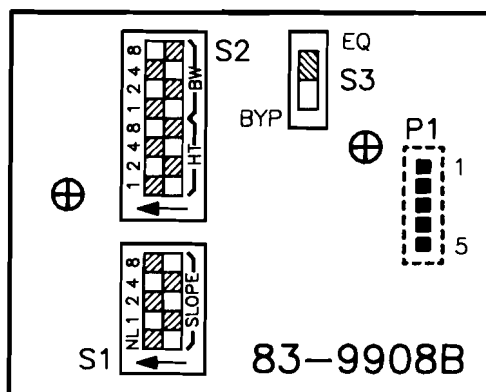figure 6. 9908B switch locations

alignment overview

2.04 The 9908B contains two alignment switches, S1 and S2, whose locations are shown in figure 6. Switch S1 is a five-position DIP switch that conditions the subassembly for use with nonloaded or loaded cable (SLOPE NL position) and also controls the degree of slope for the equalization introduced (SLOPE 1, 2, 4, and 8 positions). Switch S2 is an eight-position DIP switch that controls the height of bump of the equalization introduced (HT 1, 2, 4, and 8 positions) and also determines the bandwidth affected by that equalization (BW 1, 2, 4, and 8 positions). For each equalization parameter (slope, height, and bandwidth), the 1, 2, 4, and 8 switch positions are cumulative: the selected SLOPE, HT, or BW equalization setting is the sum of the respective 1, 2, 4, and 8 DIP-switch positions set to ON. Thus, for each equalization parameter, a setting of 0 to 15 is possible.

Note: *In the alignment procedures that follow, the* **ON** *setting for the* **SLOPE, HT,** *and* **BW** *DIP switches is toward the arrowhead on the switch body. The* **OFF** *setting is away from the arrowhead.*

alignment procedure

2.05 Because the 9908B is functionally equivalent to the Western Electric 309B Prescription Equalizer, alignment procedures for the 309B also can be used for the 9908B. Prescription alignment procedures can be found in Bell System Practice (BSP) section 332-912-232, while non-prescription alignment procedures are contained in BSP section 332-912-234.

2.06 If neither of the above practice sections is available, satisfactory results can often be obtained by aligning the 9908B as follows:

A. Initially set the 9908B's BW (bandwidth), HT (height), and SLOPE DIP switches as follows:
- For 7 kilofeet or less of nonloaded cable: SLOPE NL to ON, BW for 0, HT for 0, SLOPE for 0.
- For more than 7 kilofeet of nonloaded cable: SLOPE NL to ON, BW for 14, HT for 3, SLOPE for 0.
- For loaded (H88) cable: SLOPE NL to OFF, BW for 6, HT for 2, SLOPE for 0.

B. Make a frequency run in accordance with local practice, and optimize the 9908B switch settings as follows:
- To reduce loss above 1800Hz, adjust the HT DIP switch for a higher value.
- To reduce loss below 1800Hz, adjust the SLOPE DIP switch for a higher value.
- Further adjustment of the BW DIP switch is usually unnecessary.

3. circuit description

3.01 The 9908B Active Prescription Equalizer Subassembly is functionally identical to the Western Electric 309B Prescription equalizer. The amount of equalization introduced into the receive channel is controlled by the SLOPE, HT (height), and BW (bandwidth) DIP switches. An option switch on the 9908B allows its equalization circuitry to be electrically bypassed without removing the subassembly from the host module.

4.   specifications

Equivalent to those of the Western Electric 309B Prescription Equalizer.

5.   testing and troubleshooting

5.01   The *testing guide checklist* in this section may be used to assist in the installation, testing, or troubleshooting of the 9908B Active Prescription Equalizer Subassembly. The checklist is intended as an aid in the localization of trouble to a specific subassembly. If a subassembly is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute subassembly operates correctly, the original subassembly 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 9908B subassembly. Unauthorized testing or repairs may void the 9908B's warranty. Also, if the subassembly 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 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.*

5.02   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 atlantic region: (203) 798-0506
    US capital region: (203) 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

5.03   If a 9908B is diagnosed as defective, follow the *replacement* procedure in paragraph 5.04 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 5.05.

replacement
5.04   To obtain a replacement 9908B subassembly, 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 8X9908B part number that indicates the issue of the subassembly in question. Upon notification, we shall ship a replacement subassembly to you. If the subassembly in question is in warranty, the replacement will be shipped at no charge. Pack the defective 9908B in the replacement subassembly's carton, sign the packing slip included with the replacement, and enclose it with the defective subassembly (this is your return authorization). Affix the preaddressed label provided with the replacement subassembly to the carton being returned, and ship the subassembly prepaid to Tellabs.

repair and return
5.05   Return the defective 9908B subassembly, 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 subassembly's malfunction. Follow your company's standard procedure with regard to administrative paperwork. Tellabs will repair the subassembly and ship it back to you. If the subassembly is in warranty, no invoice will be issued.

testing guide checklist

test	procedure	normal result	if normal conditions are not met, verify:
equalization, HT	Ensure that host module's level controls (or switches) are set for zero gain or loss. Also ensure that *EQ/BYP* switch (*S3*) on 9908B is set to *EQ* to include equalizer in transmission path. Set all *BW* switches on 9908B to *ON*. Set all *SLOPE* and *HT* switches on 9908B to *OFF*. Arrange transmit portion of transmission measuring set (TMS) for 3250Hz tone output at −20dBm and at appropriate port impedance selected on host module. Connect this signal to appropriate input jack (if available) or to appropriate tip and ring pinouts on host module. Arrange receive portion of TMS for properly terminated measurement, and connect it to appropriate output jack (if available) or to appropriate tip and ring pinouts on host module. Set 9908B's *HT* switches to *ON* one at a time.	Output level of host module increases as equalization is added ☐.	Switch *S3* on 9908B set to *EQ* position ☐. TMS output level and frequency correct ☐. Terminating impedances correct ☐. Host module's level controls and option switches correctly set ☐. Replace subassembly and retest ☐.
equalization, BW	Maintain TMS connections as described above. Ensure that all *SLOPE* switches on 9908B are set to *OFF*. Set all *HT* and *BW* switches on 9908B to *ON*. Arrange transmit portion of TMS for 2500Hz tone output at −20dBm. Set *BW* switches to *OFF* one at a time.	Output level of host module decreases as equalization is added ☐.	Switch *S3* on 9908B set to *EQ* position ☐. TMS output level and frequency correct ☐. Terminating impedances correct ☐. Host module's level controls and option switches correctly set ☐. Replace subassembly and retest ☐.
equalization, SLOPE	Maintain TMS connections as described above. Set all *SLOPE*, *BW*, and *HT* switches on 9908B to *OFF*. Arrange transmit portion of TMS for 404Hz tone output at −20dBm. Set *SLOPE* switches to *ON* one at a time.	Output level of host module increases as equalization is added ☐.	Switch *S3* on 9908B set to *EQ* position ☐. TMS output level and frequency correct ☐. Terminating impedances correct ☐. Host module's level controls and option switches correctly set ☐. Replace subassembly and retest ☐.