

9194 2Wire Conference Amplifier

contents

section 1	general description	page 1
section 2	application	page 1
section 3	installation	page 1
section 4	circuit description	page 2
section 5	block diagram	page 3
section 6	specifications	page 3
section 7	testing and troubleshooting	page 4

1. general description

1.01 The Tellabs 9194 2Wire Conference Amplifier module (figure 1) supplies controlled gain to maintain satisfactory transmission levels in 2wire telephone conference applications of up to 36 lines. The 9194 is primarily used in Tellabs' 291 and 291R Conference/ Alerting Systems (see paragraph 2.02).

1.02 A negative-impedance operational amplifier (op amp) permits the 9194 to maintain a maximum transmission level of +5dBm. Maximum bridging loss is 4dB for conferences involving 2 to 36 lines.

1.03 Front-panel *monitor* jacks bridge the input and output of the 9194's op amp to allow tone to be applied and transmission-level measurements to be made during initial alignment of the module. Two front-panel potentiometers, *level* and *gain ratio*, are included as a means of balancing the module's output during alignment. If system oscillation occurs, low gain is inserted and the front-panel *low gain* LED lights. When the oscillation is cleared, the 9194 automatically resets to a stable, normal gain condition.

1.04 Internal voltage regulation permits the 9194 to operate on filtered, positive-ground-referenced -22 to -56Vdc input. Current requirements range from 20mA in the idle state to 45mA at maximum output.

1.05 As a Type 10 module, the 9194 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, a maximum of 12 modules can be mounted across a 19-inch rack, and up to 14 modules can be mounted across a 23-inch rack. In either case, 6 inches of vertical rack space is used.

2. application

2.01 The 9194 2Wire Conference Amplifier module supplies controlled gain for 2wire conference applications of up to 36 participating lines. The 9194 maintains satisfactory transmission levels by automatically increasing gain as successive stations bridge the conference circuit. Maximum bridging loss is only 4dB, regardless of the number of stations (up to 36) accessing the conference.

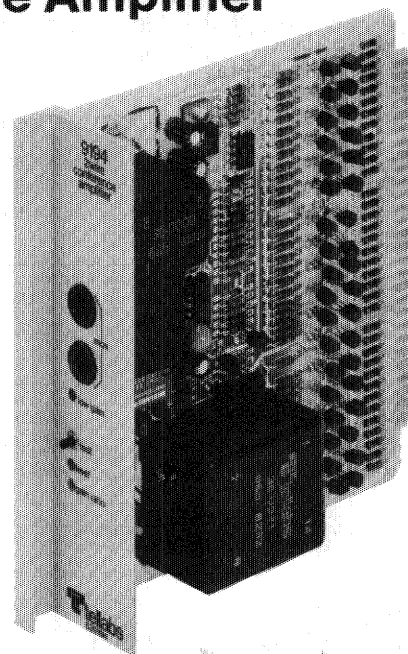


figure 1. 9194 2Wire Conference Amplifier Module

2.02 The 9194 is primarily used in the Tellabs 291 and 291R Conference/Alerting Systems. Each System is a multistation ringdown conference circuit that provides simultaneous access to up to 30 stations. The main difference between the 291 and 291R is that the 291 is designed for central-office applications, while the FCC-registered 291R (FCC registration no. BPX826-68172-KF-N) can only be used with an FCC-registered PBX. In the 291 and 291R Systems, the 9194 is capable of maintaining a maximum transmission level of +5dBm, regardless of the number of System stations participating in the conference.

2.03 In applications outside of the 291 and 291R Systems, the 9194 mounts in one position of a Tellabs Type 10 Mounting Shelf. When used in either the 291 or 291R System, the 9194 mounts in position 6 of the System's common equipment shelf. For specific information on use of the 9194 in the 291 or 291R System, refer to the appropriate Tellabs System Practice.

3. installation inspection

3.01 The 9194 2Wire Conference Amplifier 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

3.02 The 9194 module mounts in one position of a Tellabs Type 10 Mounting Shelf or in position 6 of

the 291 or 291R System's common equipment shelf. The module plugs physically and electrically into a 56-pin connector at the rear of the shelf.

installer connections

3.03 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 is completed.

3.04 Table 1 lists external connections to the 9194 module. All connections are made via wire wrap at the 56-pin connector at the rear of each module's mounting shelf position. Pin numbers are found on the body of the connector.

connect:		to pin:	
T (tip)		37	
R (ring)		39	
COMMON (reference voltage bus)		19	
-BATT (-22 to -56Vdc, filtered, positive-ground-referenced input)		35	
GND (ground)		17	

line circuit terminations

line circuit number:	pin:	line circuit number:	pin:
1	55	19	27
2	56	20	25
3	53	21	23
4	54	22	22
5	51	23	21
6	52	24	15
7	49	25	12
8	50	26	13
9	47	27	10
10	45	28	11
11	43	29	9
12	42	30	7
13	41	31	6
14	33	32	5
15	31	33	4
16	30	34	3
17	29	35	2
18	28	36	1

table 1. External connections to 9194

3.05 When the 9194 module is supplied as part of the 291 and 291R Systems, all intermodule wiring is factory-wired and external wiring is simplified through the use of connectorized cables. Refer to the 291 or 291R System Practice for more detailed information regarding wiring procedures and distributing frame terminations.

alignment

3.06 The *level* and *gain ratio* potentiometers on the 9194 are factory-set and may not require any adjustment. However, if transmission levels are too high or too low the *level* and *gain ratio* controls may have to be balanced in order to provide the exact amount of gain necessary to overcome the bridging loss as stations enter the conference. To perform this level adjustment, proceed as follows:

- Arrange the transmit portion of a transmission measuring set (TMS) terminated into 600 ohms, to output 1004Hz tone at -30dBm.
- Initiate a conference. Request all conference subscribers to leave their station instru-

ments off-hook for about 15 minutes while the circuit is being aligned. Inform subscribers that tone will be present during level measurements.

C. Disconnect the 25-pair J2 connectors (to the switching equipment) from the rear of all 291R System station equipment shelves. This will allow you to maintain control of the conference stations during alignment.

D. Place the TMS in the bridging mode and, using test cords equipped with type 310 plugs, connect the transmit and receive portions of the TMS to the parallel *monitor* jacks on the 9194.

E. Observe the receive level in the TMS. If this level is a steady -34 ± 4 dBm, proceed to step G. Otherwise, adjust *level* control and *gain ratio* controls fully counterclockwise.

F. TMS should indicate -50dBm. Adjust *level* control until a -45dBm level is reached. Adjust *gain ratio* control until a -42dBm (3dB higher) level is reached.

G. Using the TMS's frequency-selection control, sweep the 300-to-3000Hz frequency range and observe the level-reading portion of the TMS for the highest level (peak amplitude) within this frequency range. Do not adjust the output level of the TMS. Leave the frequency-selection control of the TMS set for the frequency at which the peak amplitude was observed.

H. Observe the receive level on the TMS and adjust the *level* control until a -33 ± 2 dBm level is reached.

Caution: Do not attempt to derive gain in excess of the original input level as the unit could go into self-oscillation.

I. Momentarily depress the front-panel test pushbutton and observe receive level. If this level decreases when pushbutton is depressed, adjust *gain ratio* control clockwise ($\frac{1}{2}$ turn maximum). If this level increases when the pushbutton is depressed, adjust *gain ratio* control counterclockwise ($\frac{1}{2}$ turn maximum).

J. Repeat steps H and I until the receive level remains at -33 ± 2 dBm before and while the test pushbutton is depressed.

K. When alignment is completed, reconnect J2 connectors to the station equipment shelves, and inform conference subscribers that alignment is completed.

4. circuit description

4.01 This circuit description is intended to familiarize you with the 9194 2Wire Conference Amplifier module for engineering and application purposes only. Attempts to troubleshoot the 9194 module internally are not recommended. Procedures for recommended troubleshooting in the field are limited to those prescribed in section 7 of this Practice. Reference to the block diagram, section 5, will aid in following this circuit description.

4.02 The 9194 module is designed for use in the 291 and 291R Conference/Alerting Systems or in other 2wire multistation telephone conference applications as a means of providing adequate transmission levels by reducing the bridging losses caused when multiple connections are made in parallel across two points.

4.03 The 9194 module contains an *operational amplifier (op amp)* with a totem-pole output stage arranged to return the *op amp's* output to the input in phase. As long as the *op amp's* gain remains less than unity, it will not oscillate or sing. Up to unity gain, the *op amp* acts as a negative-impedance amplifier, cancelling a portion of the bridging loss. As successive loads are bridged across the *op amp's* output, gain is increased to compensate for the lower impedance. Thus, the termination appears to remain at 600 ohms impedance, and the resultant audio level appears to remain constant.

4.04 If the system starts to oscillate, this is detected by the *high gain detection circuit*, low gain is inserted, and the front-panel *low gain* LED lights. When the oscillation is cleared, an automatic reset occurs which restores the circuit to a stable, normal gain condition.

4.05 A negative-feedback ratio, derived from the *level* and *gain ratio* potentiometers and the number of resistors connected in parallel with the *gain ratio* potentiometer controls the gain of the *op amp*. As each station accesses the conference, it provides a closure between *common* (the reference voltage bus, pin 19) and the gates of the *line circuit field-effect transistors (FET's)* on the 9194 module. Once activated, the *FET's* complete the circuit by bridging another resistor across the *gain ratio* potentiometer. As additional lines access the conference, the resistance between the inverted input

and the reference voltage diminishes, increasing the gain of the *op amp*. In this manner, *op amp* gain is switched in reference to the total number of lines accessing the conference at a given time. Careful adjustment of the *level* and *gain ratio* potentiometers can provide an increase in gain sufficient to offset the loss caused when each successive line bridges onto the conference. *Monitor* jacks are provided across the input and output of the *op amp* for measuring transmission levels and applying tone during initial alignment of the module.

4.06 The *power supply* integral to the 9194 contains its own internal voltage regulator, which allows operation from any source between -22 and -56Vdc . Maximum current requirement is 45mA .

6. specifications

maximum level

+5dBm at 36 lines

maximum bridging loss

4dB, 2 to 36 lines, 800 to 1000Hz

power requirements

input voltage: -22 to -56Vdc , filtered, positive-ground-referenced

input current: 20mA at idle, 45mA at full load

operating environment

-40° to $+140^{\circ}\text{F}$ (-40° to $+60^{\circ}\text{C}$), humidity to 95% (no condensation)

dimensions

5.58 inches (14.17cm) high

1.42 inches (3.61cm) wide

5.96 inches (15.14cm) deep

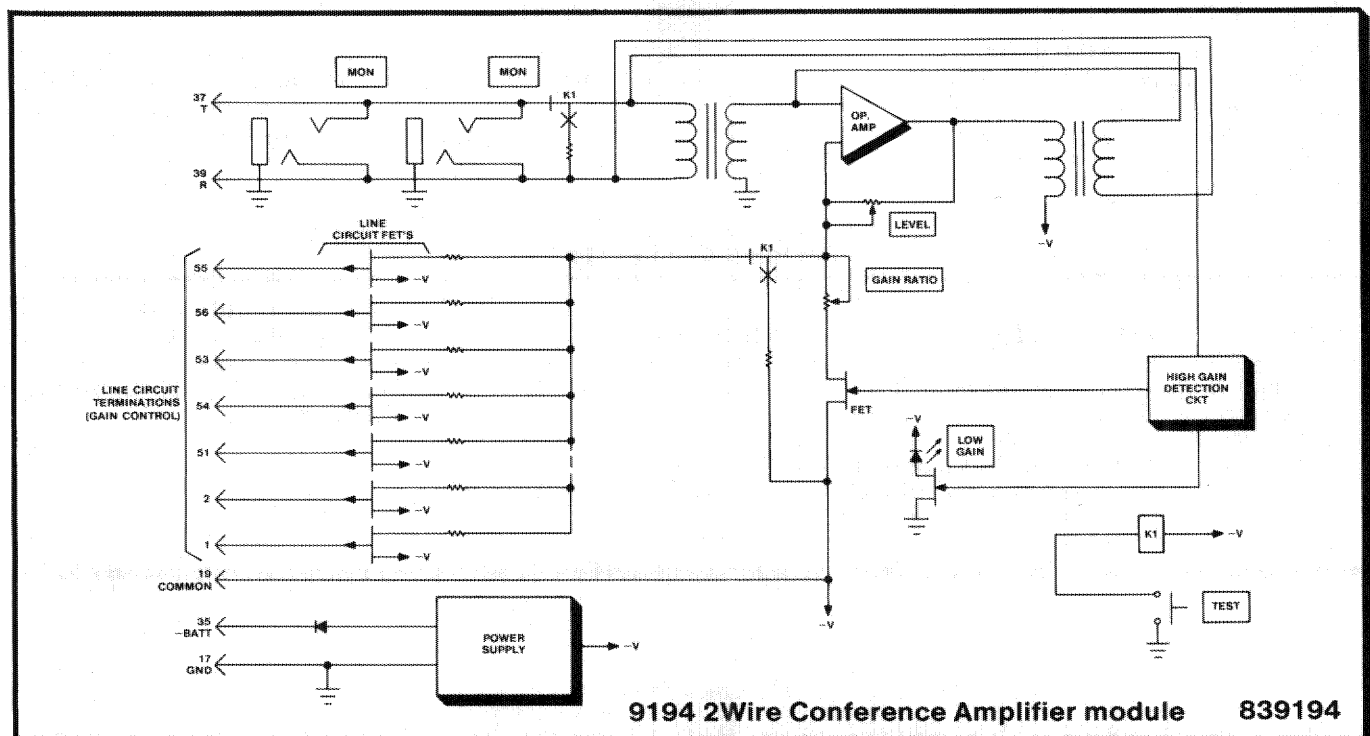
weight

15 ounces

(426 grams)

mounting

position 6 of common equipment shelf of 291 or 291R Conference/Alerting System, or relay rack or apparatus case via one position of a Tellabs Type 10 Mounting Shelf



7. testing and troubleshooting

7.01 The Testing Guide Checklist in this section may be used to assist in the installation, testing, or troubleshooting of the 9194 2Wire Conference Amplifier 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. We strongly recommend that no internal (component-level) testing or repairs be attempted on the 9194 module. Unauthorized testing or repairs may void the module's warranty.

7.02 Tellabs warrants this product to be free of defective components, workmanship, and design for a period of two years from the date of manufacture, when applied as outlined in our Practices, subject to handling and installation commensurate with industry standards for solid-state electronic equipment. If this product does not prove to be free of defective components, workmanship, and design under these criteria, Tellabs will replace or repair it free of charge.

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.*

7.03 If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at your Tellabs Regional Office (in Canada, at our Mississauga, Ontario, Headquarters). Telephone numbers are as follows:

US atlantic region: (203) 798-0506
 US capitol 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

7.04 If a 9194 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return*. Because it is more expedient, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

replacement

7.05 To obtain a replacement 9194 module, notify Tellabs via letter (see addresses below), telephone (see numbers below), or twx (910-695-3530 in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X9194 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 9194 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

7.06 Return the defective 9194 module, shipment prepaid, to Tellabs (attn: repair and return).

in the USA: Tellabs Incorporated
 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 checklist

test	test procedure	normal result	if normal conditions are not met, verify:
functional integrity and transmission level of 9194	Adjust 9194 for correct transmission level as instructed in paragraph 3.06. Caution: Do not attempt to derive gain in excess of the original input level as the unit could go into self-oscillation.	Level is $-33 \pm 2\text{dBm}$ □.	Power □. Wiring □. Replace 9194 and retest □.