9196 2Wire ARD Loop Start Access Trunk Circuit Module

contents

1. description and application

1.01   The Tellabs 9196 2Wire ARD Loop Start Access Trunk Circuit Module (figure 1) is designed specifically for use in the Tellabs 291 and 291R Conference/Alerting Systems. In the 291 System, it can be used in place of the Tellabs 9192 2Wire ARD Conference Access Trunk Circuit Module and/ or the 9195 2Wire ARD Remote Answer Trunk Circuit Module in applications where the System interfaces a CO or PBX that cannot provide ground-start or sleeve-lead control of line circuits. In either System, the 9196 provides automatic conference origination and/or remote conference access. *The 291 and 291R Conference/Alerting Systems are 2-wire multistation ringdown conference systems designed for emergency reporting and business conference applications. The Systems provide simultaneous conference access to up to 30 local stations from either a dedicated master telephone or any local telephone via a listed directory number.*

1.02   This Practice section is reissued to cover the Issue 2 version of the 9196 module (Tellabs part number 829196). The Issue 2 version provides features via option switches that had previously been available only via custom modifications to the Issue 1 module.

1.03   Unlike the 9192 and 9195 which are designed for ground-start operation only, the 9196 is designed for loop-start as well as ground-start opertion. The 9196 seizes the conference circuit in response to incoming ringing and disconnects upon a momentary opening of the loop when the distant end goes on-hook (ground-start operation) or upon return of dial tone when the distant end goes on-hook (loop-start operation). The CO or PBX must return dial tone to the terminating station or momentarily open the loop when the originating station goes on-hook for the 9196 to operate properly in the loop-start mode. The 9196 functions with ground-start circuits, regardless of whether dial tone is returned or not.

1.04   The 9196 provides the interface between the 291 or 291R System and any switching system arranged for loop-start operation or for operation with a mixture of loop-start and ground-start lines. The 9196 is used to initiate a conference call automatically by generating a start pulse to signal all
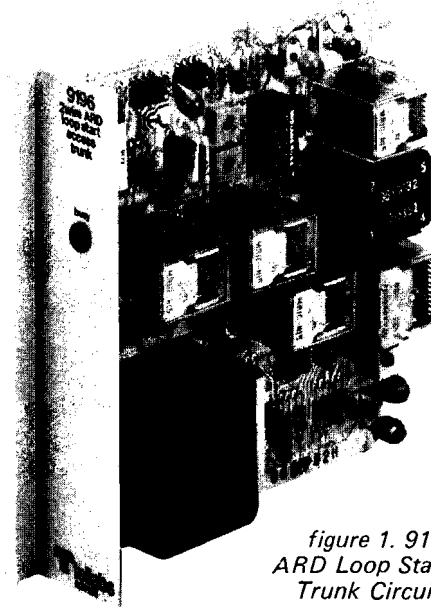

figure 1. 9196 2Wire ARD Loop Start Access Trunk Circuit Module

conference stations in response to either incoming ringing from an emergency-reporting connector number or a ground-start circuit in an electronic office.

1.05   The 9196 provides an interface between the 291 or 291R System and various types of CO line circuits to allow remote access to an established conference from any local telephone via a listed directory number. In this mode, the 9196 can only be accessed while a conference is in progress and the optional community siren has been activated. (A 9133 Long Interval Timer module is required for siren control in all remote-access applications of the 9196.) If the 291 or 291R System is equipped with two or three 9196 modules, the associated connector terminals should be arranged in a PBX trunk hunting group. This arrangement permits an incoming call to be routed to the second or third 9196 module if the first and second 9196's are busy.

1.06   One option switch conditions the 9196 to function either as an automatic conference originating trunk circuit or as a remote-conference-access trunk circuit. A second option switch determines whether a conference is held up by any station remaining off-hook or is terminated only when the 9196 disconnects. A *busy* LED on the 9196's front panel lights to indicate the active state of the module.

1.07   The 9196 operates on filtered, positive-ground-referenced −42 to −56Vdc input. Maximum current requirements range from 33mA at idle to 120mA when busy.

1.08 A Type 10 module, the 9196 normally mounts in one position (of positions 1 through 5) of the 291 or 291R System's prewired, connectorized common equipment shelf. (The number of 9196 modules used and their specific shelf positions depend upon the requirements of the particular application.) For additional information on the 291 and/or 291R Systems, refer to the Tellabs 291 and/ or 291R Conference/Alerting System Practices. The 9196 can also be mounted in one position of a standard Tellabs Type 10 Mounting Shelf, versions of which are available for relay-rack and apparatus-case installation. 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 used.

2. installation

inspection

2.01 The 9196 2Wire ARD Loop Start Access Trunk Circuit 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 Two 9196 modules can mount in positions 1 and 2 of the 291 or 291R System's common equipment shelf when the module is used for automatic-conference-origination applications. Up to three 9196 modules can mount in positions 3, 4, and 5 of the common equipment shelf when the module is used as a remote-access-trunk circuit. Each 9196 plugs physically and electrically into a 56-pin connector at the rear of its shelf position.

installer connections

2.03 When the 9196 module is supplied as part of the 291 or 291R System, 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 System wiring information.

2.04 When a 9196 module is to be installed in a conventional Type 10 Shelf, external connections to the module must be made. 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.

2.05 Table 1 lists external connections to the 9196 module. All connections are made via wire wrapping to the 56-pin connector at the rear of the module's mounting shelf position. Pin numbers are found on the body of the connector.

option selection

2.06 The 9196 module contains two option switches. Locations of these option switches on the module's printed circuit board are shown in figure 2. After these options are selected, no further optioning or alignment of the module is required.

connect:	to pin:
RING (ring lead)	47
TIP (tip lead)	49
STR (start lead)	25
C (control lead from 9133)	13
SL (lamp lead)	45
L1 (common audio bus No. 1)	37
L2 (common audio bus No. 2)	39
G1 (gain control lead No. 1)	21
G2 (gain control lead No. 2)	19
ANS (answer bus)	23
LG (locking ground)	15
—BATT (—42 to —56Vdc, filtered, positive-ground-referenced input)	35
GND (ground)	17

table 1. External connections to 9196

2.07 Set switch *S2* to the *A* position when the 9196 is used in automatic-conference-origination applications (mounted in position 1 or 2 of the 29X System's common equipment shelf). Set switch *S2* to the *B* position when the 9196 is used in remote-conference-access applications

figure 2. Switch options
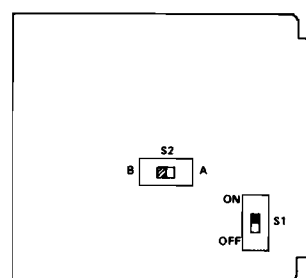
(mounted in position 3, 4, or 5 of the 29X System's common equipment shelf).

2.08 When the 9196 is used for automatic conference origination applications (switch *S2* set to *A*), switch *S1* determines whether a conference is held up by any station remaining off-hook, or is terminated only when the 9196's associated station goes on-hook. Set *S1* to the *ON* position where it is desired that a conference be held up by any off-hook conference station. Set *S1* to the *OFF* position where it is desired that the entire conference be terminated when the 9196 disconnects (when its associated station goes on-hook).

2.09 When the 9196 is used for remote-conference-access applications (switch *S2* set to *B*), the setting of switch *S1* does not matter since *S1* is non-functional in this application.

3. circuit description

3.01 This circuit description is intended to familiarize you with the 9196 2Wire ARD Loop Start Access Trunk Circuit Module for application and engineering purposes only. Attempts to troubleshoot the 9196 internally are not recommended and may void your warranty. Procedures for recommended testing and troubleshooting in the field are limited to those prescribed in section 6 of this Practice. Refer to the 9196 block diagram, section 4 of this Practice, as an aid in following this circuit description.

3.02 The 9196 module is designed to perform two separate functions in the 291 or 291R System. When mounted in shelf position 1 or 2, the 9196

serves as a conference-access trunk circuit. In this mode, the module can initiate a conference automatically when accessed via a CO line circuit. When mounted in shelf position 3, 4, or 5, the 9196 serves as a remote-answer trunk circuit. In this mode, the module allows the conference to be accessed remotely by dialing an unlisted number from any local telephone.

3.03   The 9196 can also replace the 9192 2Wire ARD Conference Access Trunk Circuit and/or the 9195 2Wire ARD Conference Remote Access Trunk Circuit Module in applications where Tellabs' 291 Conference/Alerting System interfaces loop-start lines or a mixture of loop-start and ground-start lines.

3.04   When the 9196 is used as a conference originating trunk circuit, switch S2 must be in the A position and S1 is normally set to ON. Incoming ringing causes the SR relay to energize. During the silent interval between incoming ringing, the SR relay is held in the activated state until the next ringing cycle. The time constant is approximately 5 seconds, which is long enough to carry over the 2-second-on, 4-second-off ringing cycle.

3.05   Once operated, the SR relay applies a ground to operate the SL relay. In addition, the SR relay applies ground to the STR lead (pin 25) to originate the conference and to prepare a partial operate path for the R relay. Operation of the SL relay applies a ground to the LG (locking ground) lead (pin 15), lights the front-panel busy LED and applies ground to the SL (lamp) lead (pin 45) for an external indication.

3.06   When the first conference station answers, a ground received on the ANS lead (pin 23) operates the ANS relay to complete the operate path for the R relay, which operates on the next ringing cycle. The R relay contact bridges the SR and ANS contacts. Operation of the R relay provides a 250-ohm loop closure to trip ringing and hold up the incoming line. The R relay locks in the energized state through its contacts and remains energized as long as the ringing and loop current detector is activated. Operation of the R relay allows the SR relay to release (after its release delay). The SL relay is held in the energized state by the R relay.

3.07   When the distant end goes on-hook, dial tone is connected to the loop-start line circuit. This dial-tone input is amplified by the operational amplifier (op amp) and applied to the phase-locked loop. This loop detects the 440Hz dial-tone component and causes the DT relay to operate. One contact of the DT relay immediately cuts the audio path to the conference to prevent dial tone from interrupting the conference. To prevent talk-off caused by possible erroneous detection of 440Hz, actual disconnect is accomplished in two steps. First, the DT relay operates. If the DT relay remains energized (as a result of actual dial tone and not a transient), the DDT relay operates. The DDT relay is slow to operate, but once energized, it locks to an energized contact of the SL relay. The DDT

relay also opens the −24V source path to the R relay, causing the R relay to release. This restores the 9196 to its idle condition.

3.08   If the phase-locked loop erroneously detects a 440Hz component, the DT relay operates momentarily and the DDT relay does not operate at all. The resultant momentary interruption in the audio path does not cause a complete disconnect.

3.09   When the 9196 is used as a remote-access trunk circuit, switch S2 is set to B. External wiring is configured so that the ANS relay does not operate unless the RAC relay of the 9133 Long Interval Timer Module used in the 29X System operates. In this application, no connection is made to either the LG lead or the STR lead, and operation of the SR relay in response to inadvertent calls has no effect. If the RAC relay is energized, the ANS relay operates and subsequent operation of the SR relay causes the R relay to operate. Disconnect is accomplished in the same manner as in the originating-trunk circuit mode.

3.10   The 9196 contains an integral power supply that provides all required internal voltages from any filtered supply voltage between −42 and −56Vdc. The module also provides a polarity protection diode.

5.   specifications

dial tone frequency
350 + 440Hz (other frequencies may be supplied upon request)

transformer impedance ratio
1:1

insertion loss
1.0dB at 1000Hz

frequency response
±0.5dB, 300 to 3500Hz, re 1000Hz

longitudinal balance
60dB minimum, 200 to 4000Hz

power requirements
input voltage: −42 to −56Vdc, filtered, positive-ground-referenced
input current: 33mA at idle, 120mA maximum when busy

operating environment
−20° to 130°F (−7° to 54°C), humidity to 95% (no condensation)

dimensions
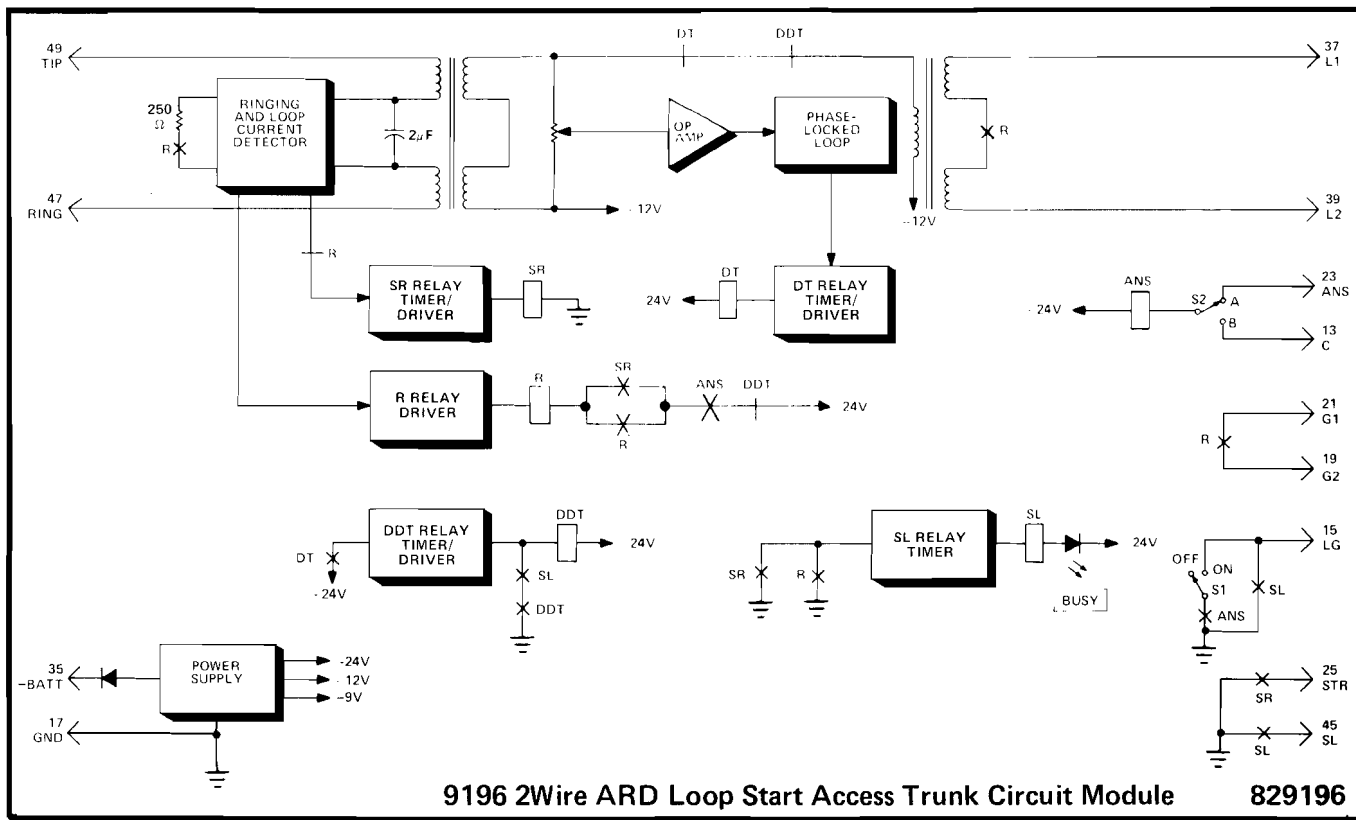**5.58 inches (14.17cm) high**
1.42 inches (3.61cm) wide
5.96 inches (15.14cm) deep

weight
20 ounces (567 grams)

mounting
position 1 or 2 (when used as a conference-access trunk circuit) or position 3, 4, or 5 (when used as a remote-answer trunk circuit) of the Tellabs 291 or 291R System's common equipment shelf. Relay-rack or apparatus-case mounting is also possible via one position of a Tellabs Type 10 Mounting Shelf.

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4. block diagram

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 9196 2Wire ARD Loop Start Access Trunk Circuit 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 9196 module. Unauthorized testing or repairs may void the module's warranty.

6.02   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.*

6.03   If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at your Tellabs Regional Office or at our Lisle, Illinois, or Mississauga, Ontario, Headquarters. Telephone numbers are as follows:

> US central region: (312) 969-8800
> US northeast region: (412) 787-7860
> US southeast region: (305) 645-5888
> US western region: (702) 827-3400
> Lisle Headquarters: (312) 969-8800
> Mississauga Headquarters: (416) 624-0052

6.04   If a 9196 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

6.05   To obtain a replacement 9196 module, notify Tellabs via letter (see addresses below), telephone (see numbers above), or twx (910-695-3530 in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X9196 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 9196 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

6.06   Return the defective 9196 module, 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 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

Note: *Because the connectorized backplate of the 291 or 291R System's common equipment shelf prevents access to the connector pins at the rear of most module positions, use of a Tellabs 9801 or 9802 Card Extender or equivalent is necessary for testing of this module in that system.*

trouble condition	possible cause (in order of likelihood)
incoming call does not initiate ringing and conference stations do not ring	1) Incorrect wiring from switching system to switching-system terminal block □. 2) Fuse associated with 9196 blown □. 3) 9196 not correctly optioned □. 4) Defective 9196; replace and retest □.
ringing does not trip upon answer of incoming call when conference stations are answered	1) Option switch S2 set incorrectly □. 2) Defective 9196; replace and retest □.
incoming call does not drop when distant end goes on-hook	1) Dial tone not returned to 9196 at termination of call □. 2) Dial tone is not precise dial tone (350 +440Hz) □. 3) 9196 not correctly optioned □. 4) Connector sleeve lead from switching equipment remains at ground □. 5) Defective 9196; replace and retest □.
when 9196 in remote-conference-access trunk circuit application, incoming call does not trip ringing	1) Subscriber's terminal block incorrectly wired. Ground not being applied to C lead. 2) 9133 module used in 29X System not activated □. 3) Option switch S2 not set to B position □. 4) Defective 9196; replace and retest □.