

## Addendum: 9296 2Wire ARD Trunk Access Module

1.01 This addendum to practice section 819296, revision A (dated 1 August 1982), is issued for the following reasons:

- To clarify use of the 9296 module in certain applications not covered in the practice.
- To update two specifications in section 5 of the practice.
- To provide a corrected 9296 **block diagram**, section 4 of this practice.

1.02 This addendum section is revised to include the corrected block diagram.

### additional application information

1.03 Contrary to what is stated in several paragraphs of the 9296 practice, the standard 9296 module **cannot be used** in a dry-loop (typical E&M) application. However, this application can be accommodated with modified versions of the 9296. Where Type II E&M operation is required, use the modified modules indicated below. Both of these modifications can be provided by Tellabs upon request. Please be aware that the standard 9296 **can be used** in most sleeve-lead (or C-lead) applications. If you have questions or need additional information concerning use of the 9296 in your particular application, contact your Tellabs Regional Office.

model	application
9296M1	When used for system origination, mount in slots 1 and 2 of the Common Control Shelf
9296M2	When used for system remote access, mount in slots 3, 4, and 5 of the Common Control Shelf

### updated specifications

1.04 To update the *longitudinal balance* specification, replace the existing specification with the following:

*longitudinal balance*

**60dB minimum, 200 to 1000Hz**

**40dB minimum, 1000 to 4000Hz**

1.05 To update the *power requirements* specification, replace the existing specification with the following:

*power requirements*

**input voltage: -42 to -56Vdc,**

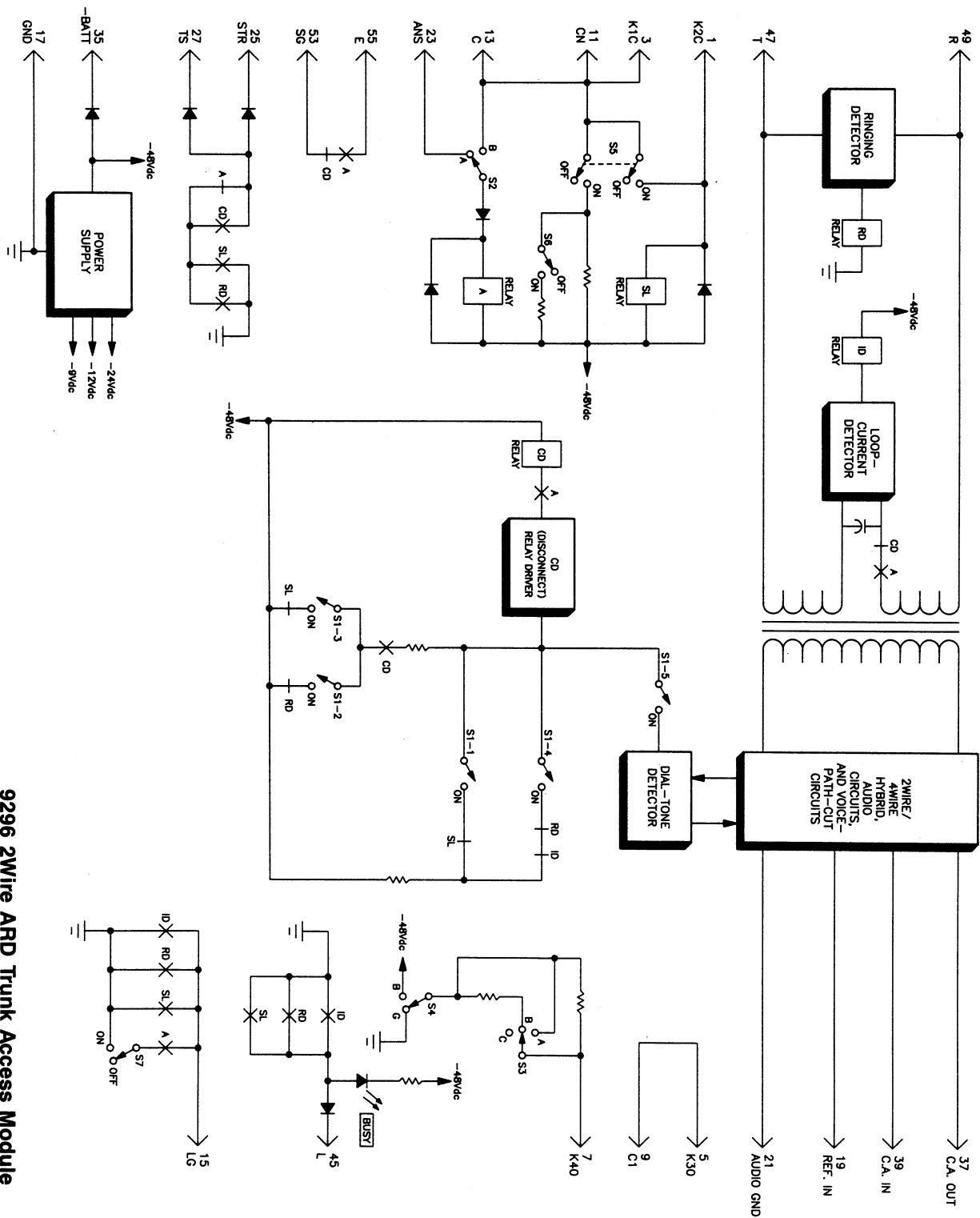
**positive-ground-referenced**

**input current: 60mA maximum at**

**idle, 125mA maximum when busy**

### corrected block diagram

1.06 The **block diagram**, section 4 of the 9296 practice, contains several errors. Therefore, please refer to the corrected block diagram on page 2 of this addendum instead of that in the practice.



4. block diagram

9296 2Wire ARD Trunk Access Module

819296

# 9296 2Wire ARD Trunk Access Module

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## 1. description and application

1.01 The Tellabs 9296 2Wire ARD Trunk Access Module (figure 1) is designed specifically for use in the Tellabs 292R Conference/Alerting System. *The 292R System is a 2wire multistation ringdown conference system designed for emergency reporting and business conference applications. The System provides simultaneous conference access to up to 60 local stations from either a dedicated master telephone or any local telephone via a listed directory number.* In the 292R System, the 9296 module provides the interface between the 292R System and the switching equipment. The 9296 can accommodate the following: any SxS, No. 1 EAX, No. 2 EAX, X-Bar, or DMS-100 switching system equipped for sleeve-lead or C-lead control, a DMS-10 system using Type II E&M signaling interface, or any loop-start or ground-start electronic system. The 9296 module (when mounted in position 1 or 2 of the 292R's common equipment shelf) can initiate a conference automatically when accessed by a central-office line circuit. The 9296 (when mounted in position 3, 4, or 5 of the 292R's common equipment shelf) can also function as a remote-answer trunk circuit.

1.02 In the event that this Practice section is reissued, the reason for reissue will be stated in this paragraph.

1.03 When the 9296 is used in position 1 or 2 of the common equipment shelf, it provides a start pulse to signal all stations when a conference is initiated. The start pulse is generated in response to a grounded sleeve lead or C lead in an electro-mechanical office or EAX-type electronic office, to incoming ringing across the tip and ring leads in offices that do not provide C-lead or sleeve-lead control, or to a contact closure across the M and MB leads in a DMS-10 office. This pulse directs the 292R System to apply ringing to all idle conference lines and, depending upon System optioning, to either apply alerting tone to all busy conference lines or to cut off all calls in progress and automatically transfer these lines into the conference.

1.04 When the 9296 is used in position 3, 4, or 5 of the common equipment shelf, it functions as a remote-answer trunk circuit. In this mounting configuration, the 9296 can be accessed by any associated telephone via an unlisted telephone number.

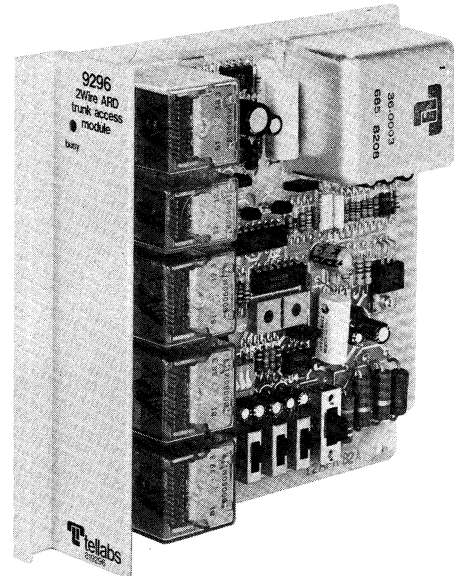


figure 1. 9296 2Wire ARD Trunk Access Module

In this mode, which is operational only when a conference is activated and the community siren is on, any emergency personnel away from their homes can dial an unlisted number and be connected to the conference. When a conference is not in effect and the siren is not activated, the 9296's associated line circuit is marked busy to all incoming lines by the 292R System's 9133 module via the RAC relay.

1.05 When the 292R System is used in emergency-reporting applications, it is advisable to use two 9296 modules (in shelf positions 1 and 2) as a hunt group. It is also strongly recommended that one conference telephone location be supplied with a two-position switch. This switch, depending on position, deactivates one 9296 (or the other) and busies out the associated connector circuit at the central office. This arrangement ensures that one 9296 is always available to initiate a conference because, if a conference is held up by a caller failing to go on-hook (e.g., forgetting to hang up when abandoning a burning building), the emergency crewman need only set the switch to the other position to release the active 9296 (which drops the conference in progress) and to activate the other 9296 (which readies the System for future emergency calls). If the means of transferring to the second 9296 were not available, a conference held up as described would be activated indefinitely and subsequent emergency calls would not be able to be completed. Also, with only one 9296 module active at a time, two simultaneous emergency calls result in one being cut through while the other receives busy tone, both of which are necessary System functions. If both 9296's were active at the same time, two simultaneous emergency calls would

result in both being connected to the conference, possibly creating confusion among both the callers and emergency personnel.

1.06 The 9296 module can also be used in conjunction with a 9293 2Wire ARD Conference Originate Line Circuit Module to permit the 292R System to operate in a combined manual/automatic arrangement. This arrangement is used when the conference master station used in manual conferencing arrangements (see the 292R System Description Practice, section 81292R-1) can only be manned on a part-time basis. While the master station is manned, the manual conferencing mode is enabled, and while the master station is unmanned, the automatic conferencing mode is enabled. The conferencing modes are selected by a two-position switch (not supplied) that busies out either the 9296 or 9293 module when the other module is enabled.

1.07 Up to three 9296 modules (positions 3, 4, and 5 of the common equipment shelf) can be connected to a line-hunting connector group to provide up to three emergency personnel with simultaneous access to an ongoing conference. This arrangement permits an incoming call to be routed to the second and third 9296 modules if the first and second 9296 modules are busy.

1.08 The disconnect sequence of the 9296 module is initiated either by removal of sleeve-lead ground, by momentary interruption of loop current, or by return of dial tone, depending upon option switch settings.

1.09 The 9296 operates on filtered, positive-ground-referenced  $-42$  to  $-56\text{Vdc}$  input. Maximum current requirements range from  $30\text{mA}$  at idle to  $125\text{mA}$  when busy.

1.10 A Type 10 module, the 9296 normally mounts in one position (of positions 1 through 5) of the 292R System's prewired, connectorized common equipment shelf. (The number of 9296 modules used and their specific shelf positions depend upon the requirements of the particular application.) The 9296 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 9296 2Wire ARD Trunk Access 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 9296 modules mount in positions 1 and 2 of the 292R System's common equipment

shelf when the module is used for automatic conference origination applications. Three 9296 modules mount in positions 3, 4, and 5 of the common equipment shelf when the module is used as a remote-answer-trunk circuit. Each 9296 plugs physically and electrically into a 56-pin connector at the rear of its shelf position.

## installer connections

2.03 When the 9296 module is supplied as part of the 292R System, all intermodule wiring is factory-wired and external wiring is simplified through the use of connectorized cables. Refer to the 292R System Installation Practice, section 81292R-2, for System wiring information.

2.04 When a 9296 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 9296 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.

connect:	to pin:
T (tip lead) . . . . .	47
R (ring lead) . . . . .	49
C.A. OUT (common amplifier output) . . . . .	37
C.A. IN (common amplifier input) . . . . .	39
K1C (transfer key, normally closed) . . . . .	3
K2C (transfer key, normally closed) . . . . .	1
K3O (transfer key, normally open) . . . . .	5
K4O (transfer key, normally open, MB-DMS-10) . . . . .	7
CN (C-lead input) . . . . .	11
C1 (C-lead input) . . . . .	9
C (C-lead bias when rewired) . . . . .	13
ANS (answer lead) . . . . .	23
E (E lead with Type II E&M interface) . . . . .	55
SG (E-lead return with Type II E&M interface) . . . . .	53
LG (locking ground) . . . . .	15
STR (start lead) . . . . .	25
TS (tone-start lead) . . . . .	27
L (lamp lead) . . . . .	45
REF IN (reference supply input from common amplifier) . . . . .	19
-BATT ( $-42$ to $-56\text{Vdc}$ , filtered, positive-ground-referenced input) . . . . .	35
GND (ground) . . . . .	17
AUDIO GND (audio ground from common amplifier) . . . . .	21

table 1. External connections to 9296

## option selection

2.06 The 9296 module contains seven option switches. Locations of these option switches on the module's printed circuit board are shown in figure 2, and their functions are summarized in tables 2 and 3. After these options

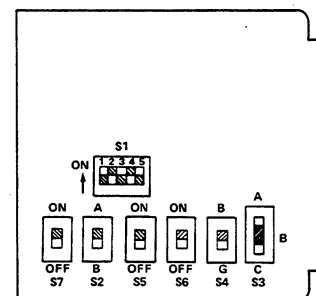


figure 2. 9296 option switch locations

are selected, no further optioning of alignment of the module is required.

**Note:** The switch settings described in paragraph 2.07 are valid for all module mounting positions.

2.07 When the 9296 is used in offices that provide sleeve-lead control (seizure and release in response to the sleeve lead), set switches *S1-1* and *S1-3* to *ON* and set switches *S1-2*, *S1-4*, and *S1-5* to *OFF*. When the 9296 is used in applications where seizure upon incoming ringing is required (i.e., in electronic offices that do not provide sleeve or C-lead control), set switch *S1-2* to *ON* and set switches *S1-1* and *S1-3* to *OFF*. In addition, the settings of switches *S1-4* and *S1-5* are based on the disconnect sequence

used by the electronic office. When disconnect is initiated by momentary interruption of loop current (ground-start operation) set switch *S1-4* to *ON* and set switch *S1-5* to *OFF*. When disconnect is initiated upon return of dial tone when the distant end goes on-hook (loop-start operation), set switch *S1-4* to *OFF* and set switch *S1-5* to *ON*.

2.08 Set switch *S2* to the *A* position when the 9296 is used in common equipment shelf position 1 or 2. Set switch *S2* to the *B* position when the 9296 is used in shelf position 3, 4, or 5.

2.09 When the 9296 is used in common equipment shelf position 1 or 2, set switches *S3* and *S4* in accordance with table 2. When the module is used in shelf position 3, 4, or 5, the settings of switches *S3* and *S4* do not matter ("don't care condition").

2.10 Set switches *S5* and *S6* according to tables 2 and 3, as applicable. When the 9296 is used in common equipment shelf position 3, 4, or 5, the setting of switch *S7* does not matter ("don't care condition"). When the module is used in shelf position 1 or 2, set switch *S7* as follows: to the *ON* position to keep the conference active as long as any of the conference stations remain off-hook (regardless of whether the originating caller remains off-hook), or to the *OFF* position to terminate the conference when the originating caller goes on-hook.

type of switching equipment	S1-1	S1-2	S1-3	S1-4	S1-5	S2	S3	S4	S5	S6	S7
SxS	ON	OFF	ON	OFF	OFF	A	A or B**	B	ON	ON	see paragraph 2.10
No. 1 EAX	ON	OFF	ON	OFF	OFF	A	C	G	OFF	ON	
No. 2 EAX	ON	OFF	ON	OFF	OFF	A	C	G	ON	ON	
X-Bar or similar	ON	OFF	ON	OFF	OFF	A	C	G	OFF	ON	
DMS-10	ON	OFF	ON	OFF	OFF	A	A	G	OFF	ON	
DMS-100	ON	OFF	ON	OFF	OFF	A	X*	X*	OFF	ON	
ESS or similar (ground start)	OFF	ON	OFF	ON	OFF	A	X*	X*	OFF	ON	
ESS or similar (loop start)	OFF	ON	OFF	OFF†	ON†	A	X*	X*	OFF	ON	

\*The letter X indicates a "DON'T CARE CONDITION."

\*\*Note 1: Set switch S3 to the B position for normal use and to the A position in AECo offices with 600 + 230Ω in the line-equipment tie lead.

†Note 2: In this case, the disconnect must be indicated by return of dial tone.

table 2. Option switch positions (9296 in shelf position 1 or 2)

type of switching equipment	S1-1	S1-2	S1-3	S1-4	S1-5	S2	S3	S4	S5	S6	S7
SxS	ON	OFF	ON	OFF	OFF	B	X*	X*	ON	OFF**	X*
No. 1 EAX, No. 2 EAX, X-Bar, DMS-10, DMS-100 or similar	ON	OFF	ON	OFF	OFF	B	X*	X*	ON	OFF	X*
ESS or similar (ground start)	OFF	ON	OFF	ON†	OFF†	B	X*	X*	OFF	OFF	X*
ESS or similar (loop start)	OFF	ON	OFF	OFF†	ON†	B	X*	X*	OFF	OFF	X*
*The letter X indicates a "DON'T CARE CONDITION."											
**Note 1: Set switch <i>S6</i> to the <i>ON</i> position only when the CO requires resistance battery of less than 1200Ω (provides 850Ω when <i>S6</i> in <i>ON</i> ).											
†Note 2: Set switch <i>S1-4</i> to <i>ON</i> and set switch <i>S1-5</i> to <i>OFF</i> when the electronic office is a ground-start office that indicates disconnect via momentary interruption of loop current. Set switch <i>S1-4</i> to <i>OFF</i> and set switch <i>S1-5</i> to <i>ON</i> when the electronic office is a loop-start office that indicates disconnect by returning a dial tone.											

table 3. Option switch positions (9296 in shelf position 3, 4, or 5)

### 3. circuit description

3.01 This circuit description is intended to familiarize you with the 9296 2Wire ARD Trunk Access Module for application and engineering purposes only. Attempts to troubleshoot the 9296 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 9296 block diagram, section 4 of this Practice, as an aid in following this circuit description.

3.02 The 9296 module is designed to perform two separate functions in the 292R System. When mounted in shelf position 1 or 2, the 9296 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 9296 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.

#### **conference-access-trunk-circuit mode**

3.03 When the 9296 is used as a conference-access trunk circuit, the associated line circuit is accessed by dialing an emergency number. When this number is dialed, either the *SL* or *RD* relay energizes, depending upon the type of office the module interfaces. The energized relay contacts then provide a start pulse to signal conference origination and also to provide a locking ground to hold up the conference.

3.04 The start pulse signals the 292R System to apply ringing to all associated stations. When any station answers, it provides a ground to the 9296's ANS lead (pin 23), which energizes the *A* relay. The *A* relay's closed contacts allow loop current to flow, which trips ringing (the switching equipment senses a closed loop and removes ringing). Also, loop current flow is sensed by the *loop-current detector* on the 9296, which energizes the *ID* relay. The *ID* relay's contacts provide a locking ground on the LG lead (pin 15). This establishes the conference, and any station that subsequently goes off-hook is connected to conference. All unanswered stations continue to ring until a ringing timeout interval expires (adjustable from 2 to 5 minutes via a potentiometer on the 9132 module).

3.05 When the 9296 is optioned to hold the conference when the originator hangs up, one of the following actions occurs (depending on the type of office the module interfaces): either the *SL* relay or *ID* relay de-energizes or the *dial-tone detector* turns on. Either of these actions energizes the *CD* relay if the conference is still in progress. The closed *CD* relay contacts enable the module to allow access to any additional emergency calls while the conference is still in progress.

3.06 When the 9296 is optioned to terminate the conference when the originator hangs up, all relays de-energize and the conference terminates. This returns the module to the idle state, readying it for another conference origination when accessed.

#### **remote-answer trunk-circuit mode**

3.07 When the 9296 is used as a remote-answer trunk circuit, the associated line circuit is marked busy via the RAC relay on the 9133 module when

the siren is not active and a conference is not in progress. When the siren is active and a conference is in progress, the associated line circuit is no longer marked busy and the 9296 can be accessed by dialing an unlisted telephone number.

3.08 The *RD* relay energizes upon incoming ringing, and its contacts de-energize the *CD* relay. The *CD* relay's contacts close the loop to trip ringing. The *loop-current detector* senses loop-current flow and energizes the *ID* relay. The 9296 is then connected to conference.

#### **disconnect sequence**

3.09 Disconnect starts either upon momentary opening of the loop, upon return of dial tone, or upon removal of sleeve-lead ground. When any of the above actions occur, either the *SL* relay or the *ID* relay de-energizes or the *dial-tone detector* turns on, depending upon how the System is optioned. In all of the above cases, the *CD* relay energizes, which opens the loop and provides disconnect.

## **5. specifications**

#### *dial tone frequency*

350 ±10Hz at levels greater than -24dBm

#### *C-lead resistance*

0, 830, or 1200 ohms, switchable, battery or ground connected

#### *longitudinal balance*

60dB minimum, 200 to 4000Hz

#### *REN (ringer equivalence number)*

0.2A

#### *power requirements*

input voltage: -42 to -56Vdc, positive-ground-referenced  
input current: 30mA maximum at idle, 125mA maximum when busy

#### *operating environment*

32° to 122°F (0° to 50°C), humidity to 95%  
(no condensation)

#### *dimensions*

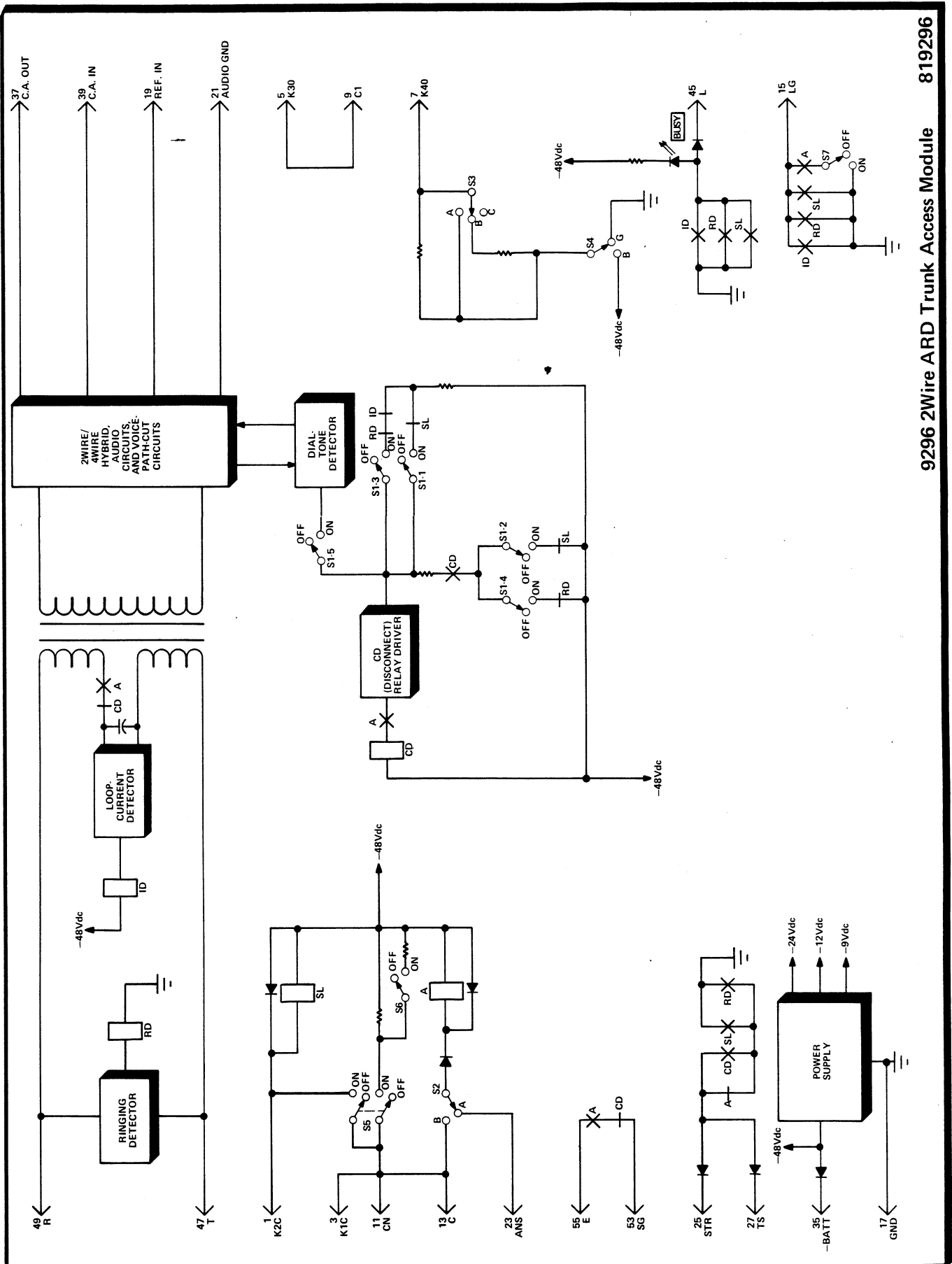
5.58 inches (14.17cm) high  
1.42 inches (3.61cm) wide  
5.96 inches (15.14cm) deep

#### *weight*

16 ounces (454 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 292R System's common equipment shelf. Relay-rack or apparatus-case mounting is also possible 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 9296 2Wire ARD Trunk Access 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 9296 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 9296 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 9296 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 8X9296 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 9296 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 9296 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 292R 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 <input type="checkbox"/> 2) Fuse associated with 9296 blown <input type="checkbox"/> 3) 9296 not correctly optioned <input type="checkbox"/> 4) Defective 9296; replace and retest <input type="checkbox"/>
ringing does not trip upon answer of incoming call when conference stations are answered	1) Option switch S2 set incorrectly <input type="checkbox"/> 2) Defective 9296; replace and retest <input type="checkbox"/>
incoming call does not drop when distant end goes on-hook	1) Dial tone not returned to 9296 at termination of call <input type="checkbox"/> 2) Dial tone is not precise dial tone ( $350 \pm 10\text{Hz}$ ) <input type="checkbox"/> 3) 9296 not correctly optioned <input type="checkbox"/> 4) Connector sleeve lead from switching equipment remains at ground <input type="checkbox"/> 5) Defective 9296; replace and retest <input type="checkbox"/>