

9101 Automatic Exclusion Module

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1. general description

1.01 The 9101 Automatic Exclusion module (figure 1) provides three switch-selectable modes of automatic exclusion (cutoff) service for two 2wire customer loops sharing a common CO or PBX line appearance. A circuit of this type is also known as a *relay-type bridge lifter* or an *automatic cutoff circuit*.

1.02 In mode one, *privacy*, the first of the two stations (which are designated *station A* and *station B*) to go off-hook automatically excludes the second station from the circuit. The excluded station is provided with sidetone and optionally with busy (or other) tone to signify that the circuit has been seized by the other station.

1.03 Mode two, *override*, provides for one of the two stations, station A, to be designated the *primary* station and the other station, station B, to be designated the *secondary* station. Both primary and secondary stations are signaled simultaneously on incoming calls. The primary station seizes control of the circuit whenever it goes off-hook, regardless of whether the secondary station is already off-hook. When off-hook, the primary station establishes privacy, excluding the secondary station from any use of the circuit.

1.04 Mode three, *monitor*, again involves the assignment of primary and secondary stations. In this mode, however, the primary station (station A) can bridge, i.e., monitor, a call in progress without cutting off the secondary station (station B). When the primary station seizes the circuit first, the secondary station is excluded.

1.05 In either the *privacy* or *monitor* mode, calls may be transferred from the primary station (first station to answer in the *privacy* mode; station A in the *monitor* mode) to the secondary station via a hookswitch flash. This transfer feature may be disabled in applications where it is not desired by means of an option switch on the 9101 module.

1.06 Spare contacts are provided on each of the two line relays of the 9101 module to accommodate auxiliary control functions, if desired.

1.07 The front panel of the 9101 contains a light-emitting diode (LED) labeled *busy* that lights to indicate line seizures by either station. Four

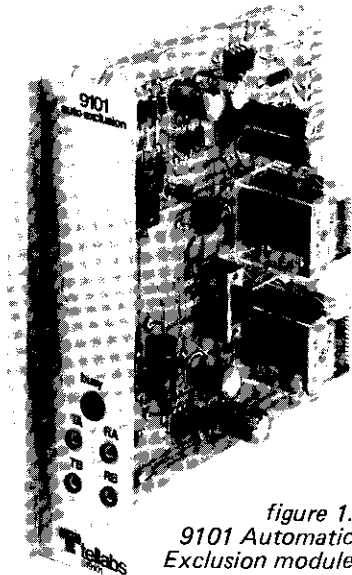


figure 1.
9101 Automatic
Exclusion module

front-panel test points permit access to the tip and ring leads of each station, A and B.

1.08 An internally regulated power supply permits the 9101 to operate on -22 to -56 Vdc input. Current requirement is 30mA, not including loop current for the excluded station.

1.09 A Type 10 module, the 9101 mounts in one position of a Tellabs Type 10 Mounting Shelf, versions of which are available for relay rack and KTU apparatus case installation. In relay rack applications, a maximum of 12 modules may be mounted across a 19 inch rack, and up to 14 modules may be mounted across a 23 inch rack. In either case, 6 inches of vertical rack space is used.

2. application

2.01 The most common application of the 9101 Automatic Exclusion module is on loop-start 2wire metallic facilities. The 9101 may be located either at the CO serving as the junction point for the two station (extension) loops or on a customer's premises, i.e., wherever the two station loops are most conveniently separated.

2.02 Where the two extensions are located on different premises, a separate metallic loop from the CO to each of the premises is usually mandatory, and the most convenient location for the 9101 is therefore the serving CO. In arrangements of this type (see figure 2), one extension is typically located at a place of business and the other extension at a residence. The exclusion functions provided by the 9101 allow calls after business hours to be answered at the residential extension, and

calls during business hours to be answered at the business location without intrusion by the residential extension. The 9101 may be used in conjunction with suitable customer extension equipment (e.g., Tellabs' 260, 261, or 269 Signaling and Terminating System) to provide foreign-exchange service on either or both station loops.

2.03 Where the two extensions are located close to one another (e.g., on the same premises), the most convenient location for the 9101 module is normally on the same premises as the extensions. Locating a 9101 on a customer's premises to serve two extensions close to one another is advantageous in that only one metallic loop from the CO to the customer location is needed to serve both extensions (see figure 3). Arrangements of this type are typically used in business applications where, for example, automatic exclusion is desired on a secretary's extension. The 9101's ability to operate on -22 to -56Vdc input power allows customer-location key telephone unit (KTU) power (typically -24Vdc) to be used for the module. The arrangement described in this paragraph may also be used to provide automatic exclusion for two PBX station extensions.

2.04 Because the 9101 senses line seizure by monitoring station ring-lead current, the module may be used on CO-to-PBX ground-start trunk circuits to provide automatic exclusion of a PBX in special applications where two PBX's are arranged so that both can access the same CO trunk (see figure 4).

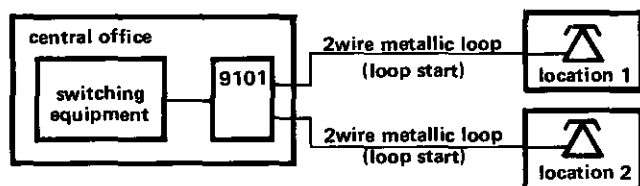


figure 2. Typical arrangement, 9101 located at CO and extensions on different premises

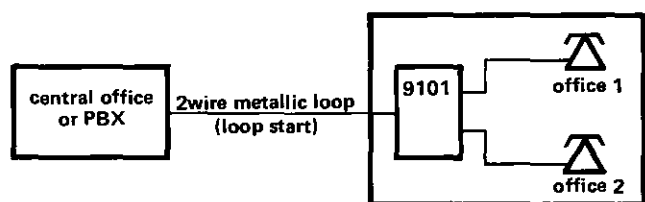
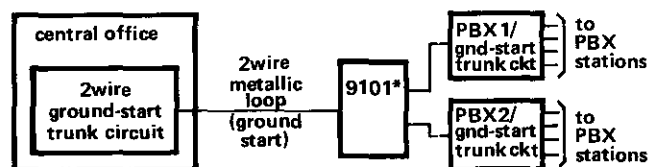


figure 3. Typical arrangement, 9101 located on same premises as both extensions



*May be located either at CO or at customer location, whichever is more convenient in a particular application.

figure 4. Special ground-start application, 9101 used to provide exclusion of PBX

2.05 In all applications, the 9101 provides a full choice of its three switch-selectable modes of automatic exclusion operation: privacy, override, and monitor (see paragraphs 1.02 through 1.04). In all applications except that described in paragraph 2.04, the hookswitch-flash transfer feature may be selected via switch option in the privacy or monitor mode only. When this feature is enabled, flashing the hookswitch at the primary station will transfer the call from the primary station to the secondary station, excluding the primary station. Note, however, that the secondary station must be off-hook when the hookswitch flash occurs and that the secondary station user **cannot** transfer the call back to the primary station.

2.06 Whenever a station is excluded, the 9101 supplies battery toward the excluded station to provide sidetone so that persons attempting to use the excluded station can tell that the telephone set is not dead. The 9101 also provides leads by which a source of busy or alerting tone may be connected to the module if it is desired that persons attempting to use the excluded station receive an audible indication of station exclusion.

2.07 Contacts are provided on each of the module's two line relays for auxiliary control functions (e.g., line lamp indications or A-lead control functions in KTU applications).

3. installation inspection

3.01 The 9101 Automatic Exclusion 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 9101 module mounts in one position of the Tellabs Type 10 Mounting Shelf, which is available in configurations for both relay rack and apparatus case installation. The module plugs physically and electrically into a 56-pin connector at the rear of the Type 10 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 9101 module. All connections are made via wire wrap at the 56-pin connector at the rear of the module's mounting shelf position. Pin numbers are found on the body of the connector.

options

3.05 Two option switches must be set before the 9101 is placed into service. Locations of these switches on the module are shown in figure 5. Switch S1 is used to select the mode of automatic exclusion

| connect: | to pin: |
|--|---------|
| TIP SW (tip from switching equipment) | 41 |
| RING SW (ring from switching equipment) | 47 |
| STA A TIP (station A [primary station] tip) | 55 |
| STA A RING (station A [primary station] ring) | 49 |
| STA B TIP (station B [secondary station] tip) | 5 |
| STA B RING (station B [secondary station] ring) | 15 |
| BUSY TONE TIP | 43 |
| BUSY TONE RING | 45 |
| LRA, N.C. (line relay A, normally closed [break contact]) | 12 |
| LRA, N.O. (line relay A, normally open [make contact]) | 8 |
| LRA, COM. (line relay A, common [swinger]) | 10 |
| LRB, N.C. (line relay B, normally closed [break contact]) | 6 |
| LRB, N.O. (line relay B, normally open [make contact]) | 2 |
| LRB, COM. (line relay B, common [swinger]) | 4 |
| -BATT (-22 to -56Vdc input) | 35 |
| GND (ground) | 17 |

table 1. External connections to 9101

(cutoff) service. Set *S1* to the *PRIV* position to select the privacy mode, to the *OVRD* position to select the override mode, or to the *MON* position to select the monitor mode. Switch *S2* is used to enable the hook-switch-flash transfer feature by which calls may be transferred from the primary station to the secondary station in either the privacy or monitor mode. If this transfer feature is desired, set *S2* to the *HSW* position. If not, set *S2* to *OFF*.

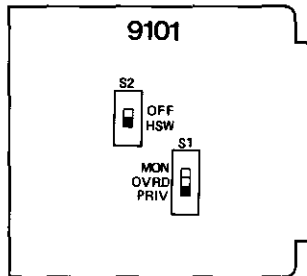


figure 5. Switch locations

4. circuit description

4.01 This circuit description is intended to familiarize you with the 9101 Automatic Exclusion module for engineering and application purposes only. Attempts to troubleshoot the 9101 internally are not recommended. Troubleshooting procedures should be limited to those prescribed in section 7 of this Practice. Please refer to the 9101 block diagram, section 5 of this Practice, as an aid in following the circuit description.

4.02 The 9101 performs all functions required to detect line seizure on either of two station loops and provide automatic exclusion (cutoff) of the appropriate station. When a loop is seized by either station (A or B), the associated *loop current detector and logic* are activated and the associated line relay operates. The *line A loop current detector and logic* and line relay A (LRA) are associated with station A, which is the primary station in the override and monitor modes. The *line B loop current detector and logic* and line relay B (LRB) are associated with station B, which is the secondary station in the override and monitor modes. Oper-

ation of either LRA or LRB causes the front-panel *busy* LED to light.

4.03 The slow-to-operate, slow-to-release characteristics of the *loop current detectors* provide sufficient time delay to prevent false operation of the line relays. The line relays will not operate during ringing, nor will they follow dial pulsing.

4.04 When a station seizes control of a call (this will be the first station off-hook in the privacy mode or the primary station [station A] in the other modes), subsequent loop seizure of the other line disables the time-delay circuitry of the controlling line. In the privacy and monitor modes only, this provides for detection of a hookswitch-flash transfer request (when switch *S2* is set to the *HSW* position) and allows the line relay of the non-controlling station to operate. Operation of this line relay causes the call to be transferred to the non-controlling station, excluding the original controlling station. (Note that no provision is made for transferring the call back to the original controlling station.)

4.05 Loop battery is provided to the excluded station via its operated line relay (LRA or LRB) and ballast lamps L1 and L2. Busy tone or alerting tone (if supplied) is coupled to the excluded station loop supply via capacitors C7 and C8.

4.06 The *power supply* integral to the 9101 consists of a simple series voltage regulator that uses a zener diode as a reference source. A series diode in the negative input lead provides protection against reversed input power leads.

6. specifications

loop current

20mA minimum, 60mA maximum

insertion voltage drop

module causes 4V drop between switching equipment and station equipment connections

transfer time

80ms nominal, line 1 to line 2

input power

-22 to -56Vdc, 30mA maximum (excluded-station loop current additional)

dial pulse rate

8 to 15pps, 75% break maximum (longer than 75% break may be interpreted as an on-hook condition)

relay contacts

1 ampere, maximum

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

8½ ounces (241 grams)

mounting

relay rack or apparatus case via one position of Tellabs Type 10 Mounting Shelf

7. testing and troubleshooting

7.01 The Testing Guide Checklist may be used to assist in the installation, testing or troubleshooting of the 9101 Automatic Exclusion module. The Testing Guide 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 module 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. It is strongly recommended that no internal (component level) testing or repairs be attempted on the 9101 module. Unauthorized testing or repairs may void the module's warranty.

7.02 If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at (312) 969-8800, or at your Tellabs Regional Office, for further assistance.

7.03 If a 9101 is diagnosed as defective, the situation may be remedied by either **replacement** or **repair and return**. Because it is the more expedient method, the **replacement** procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

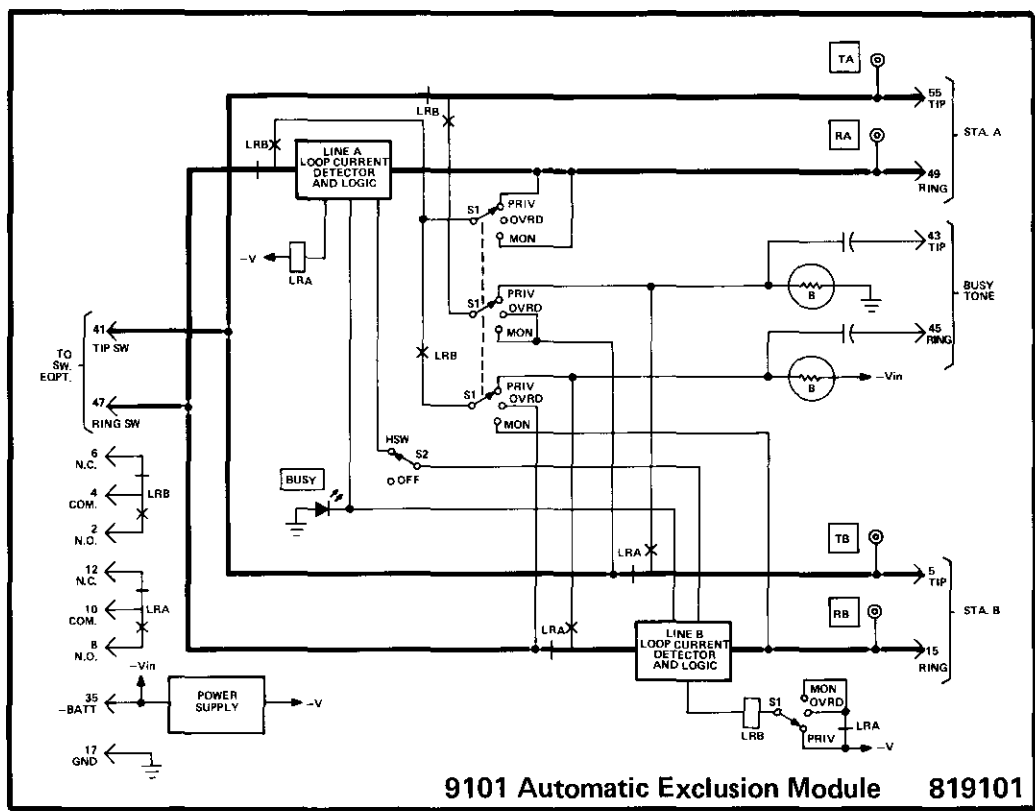
replacement

7.04 If a defective 9101 is encountered, notify Tellabs via telephone [(312) 969-8800], letter [see below], or twx [910-695-3530]. Notification should include all relevant information, including the 8X9101 part number (from which we can determine the issue of the module in question). Upon notification, we shall ship a replacement module to you. If the warranty period of the defective module has not elapsed, the replacement module will be shipped at no charge. Package the defective module in the replacement module's carton; sign the packing list included with the replacement module and enclose it with the defective module (this is your return authorization); affix the pre-addressed label provided with the replacement module to the carton being returned; and ship the equipment prepaid to Tellabs.

repair and return

7.05 Return the defective 9101 module, shipment prepaid, to:
Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532
Attn: repair and return

Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect 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.



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5. block diagram testing guide checklist

| test | test procedure | normal result | if normal conditions are not met, verify: |
|---|---|---|--|
| circuit idle | Using VOM set to 50Vdc or 250Vdc scale, measure voltage during idle condition across front-panel test points TA and RA and across TB and RB. | Busy LED is off <input type="checkbox"/> . Minimum of 48Vdc present across TA and RA and across TB and RB <input type="checkbox"/> . | Local power <input type="checkbox"/> . Wiring <input type="checkbox"/> . Cable (check for excessive leakage or ground on ring conductor) <input type="checkbox"/> . Switching cable pairs (check for open) <input type="checkbox"/> . Switching equipment <input type="checkbox"/> . |
| ringing | Using VOM set to 250Vac scale, measure voltage during ringing across test points TA and RA and across TB and RB. | Busy LED is off <input type="checkbox"/> . Minimum of 50Vac present across TA and RA and across TB and RB <input type="checkbox"/> . | Ringing load <input type="checkbox"/> . Local ringing source (see note below) <input type="checkbox"/> . |
| supervision | Using VOM set to 100mA scale, measure current across test points TA and RA and across TB and RB. | Busy LED is lighted <input type="checkbox"/> . Current is between 16 and 80mA <input type="checkbox"/> . | Local power <input type="checkbox"/> . Wiring <input type="checkbox"/> . |
| dialing | Using handtest tel set connected across either station-side tip and ring pair (or one of the associated station telephones), dial in normal manner. | Busy LED remains lighted steadily (i.e., does not follow dial pulsing) during dialing <input type="checkbox"/> . | Telephone set (check for proper operation) <input type="checkbox"/> . Cable (check for excessive leakage) <input type="checkbox"/> . |
| exclusion | Go off-hook at station A. Dial local milliwatt test line. Go off-hook at station B. | Busy LED lights when station A goes off-hook <input type="checkbox"/> . Milliwatt 1000Hz tone audible in station A tel set <input type="checkbox"/> . Station B is excluded and receives busy tone if supplied <input type="checkbox"/> . | Option switch S1 properly set for desired exclusion mode <input type="checkbox"/> . Wiring <input type="checkbox"/> . Replace module and retest <input type="checkbox"/> . |
| transfer (privacy or monitor mode only) | Establish call from primary station (A). Flash hookswitch. | Call transferred from primary station (A) to secondary station (B) <input type="checkbox"/> . | Option switch S2 set to HSW position <input type="checkbox"/> . Option switch S1 set to PRIV or MON position <input type="checkbox"/> . Wiring <input type="checkbox"/> . Replace module and retest <input type="checkbox"/> . |
| call release | Go on-hook at station being used (A or B). | Busy LED extinguishes <input type="checkbox"/> . | Cable (check for excessive leakage) <input type="checkbox"/> . |

Note: If excessive leakage resistance is present on the loops between the 9101 module and the stations, or if capacitance in excess of 5 μ F exists between tip and ring or from ring to ground, false cutoff may occur. This is evidenced by a short burst of ringing during each ringing cycle. If this condition occurs, the abnormal loop condition should be corrected.