TELLABS 9191
2WIRE AUTOMATIC RINGDOWN
CONFERENCE TERMINATE LINE CIRCUIT

1. GENERAL

1.01 This Section describes the 9191 2W ARD Conference Terminate Line Circuit manufactured by TELLABS Inc. and approved for installation by Southwestern Bell Telephone Co.

1.02 This Section is issued to provide guidelines for the installation and maintenance of the TELLABS 9191 2W ARD Conference Terminate Line Circuit.

2. DESCRIPTION/APPLICATION

2.01 The TELLABS 9191 2Wire ARD (Automatic Ringdown) Conference Terminate Line Circuit module is designed specifically for use in the TELLABS 291 Conference/Alerting System, where it provides the means to transfer one conference station from its normal residential (or PBX) service to the conference circuit when a conference is originated. The 291 System is a 2Wire multistation ringdown conference system designed for emergency reporting and business conference applications. The System provides simultaneous conference access of up to 30 local stations from either a dedicated master telephone or any local telephone via a listed directory number. In the 291 System, each 9191 transfers one station from its normal service to the conference circuit, controls the application of ringing and talk battery, and marks the local line appearance busy to incoming traffic during a conference call.

2.02 In the 291 System, a conference is originated when either a TELLABS 9193 Conference Originate Line Circuit, a 9192 2Wire ARD Conference Access Trunk Circuit, or a 9196 2Wire ARD Loop Start Access Trunk outputs a start pulse to all 9191 modules. With manual conference origination, this start pulse occurs in response to the master station's going off-hook. With automatic conference origination, the start pulse occurs in response either to incoming ringing from an emergency-reporting connector number, to incoming ringing from a ground-start line circuit in an electronic office, or to a grounded C or sleeve lead in an electro-mechanical office. The start pulse causes the 9191 to disconnect the associated telephone (if not busy with a normal call) from the central office (or PBX) line circuit and connect it to ringing voltage and either battery or ground (as determined by switch option).

2.03 As each station goes off-hook to join the conference, its associated 9191 cuts off the ringing voltage and connects the station to the talk-battery supply for the duration of the conference, or until the station user disconnects from the conference via hookswitch flash.

2.04 In applications where the 291 System interfaces a central office, the local line appearance of each conference station is marked busy by its associated 9191 upon connection to the conference circuit. The 9191 immediately applies interrupted alerting tone, provided by the 9121 Tone Supply module, as a busy indication to any outside caller. In applications where the 291 System interfaces a PBX, if the PBX has provision for marking individual line appearances busy (i.e., sleeve-lead or C-lead control), or if the PBX will accept a simultaneous tip-ring resistive seizure on all conference lines, the 9191 will mark the

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station lines busy to normal traffic during a conference.

2.05 If, however, this is not possible due to the type of PBX in use, the 9191 can be optioned either to ignore the incoming call, or to automatically trip the incoming ringing voltage and return interrupted alerting tone as a busy indication. In the latter case, the incoming call is dropped after a preset interval of approximately 10 seconds.

NOTE: Also in the latter case, because the 9191 essentially "answers" the call, the caller will be billed for any toll charges incurred.

2.06 If a conference station is engaged in a normal call when a conference is originated, the 9191 either disconnects the call in progress and connects the station to the conference circuit or applies an alerting tone to notify the station user that a conference has been originated. The station user may then enter the conference via either hookswitch flash, or, if complete disconnect occurs, the System will ring the station and the station user will be able to enter the conference by simply answering the telephone.

2.07 Circuitry integral to the 9191 allows each station to be equipped (optional) with a pushbutton to control the operation of a community siren or other alerting device.

2.08 The front-panel of the 9191 contains a busy light-emitting diode (LED) that lights whenever the associated station is engaged in a conference call. The front-panel tip and ring test points are also included to facilitate transmission level measurements.

2.09 The 9191 is designed to operate on -42.75 to -56Vdc input with positive ground. Maximum current requirement is 60mA plus loop current.

2.10 The 9191 module, when installed in the 291 System, is located in positions 1 through 10 of one of the System's (up to three) station line equipment shelves. Each station line equipment shelf is factory-wired and equipped with a connectorized backplane.

3. INSTALLATION

A INSPECTION

3.01 The 9191 2W ARD Conference Terminate Line 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.

B MOUNTING

3.02 The 9191 module mounts in positions 1 through 10 of the System's one to three station line equipment shelves. The module plugs physically and electrically into a 56-pin connector at the rear of the shelf.

C 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 When the 9191 module is supplied as part of the 291 System, all intermodule wiring is factory-wired and external wiring is simplified through the use of connectorized cable. Table A lists external connections to the 9191 module for reference purposes only.

NOTE: When the 9191 module is used in applications other than the 291 System (e.g., 2Wire multistation ARD conference arrangement), the SG1 and SG2 leads can be externally strapped to ground.

D OPTION SELECTION

3.05 The 9191 module contains five option switches. Locations of these option switches are shown in Figure 1.

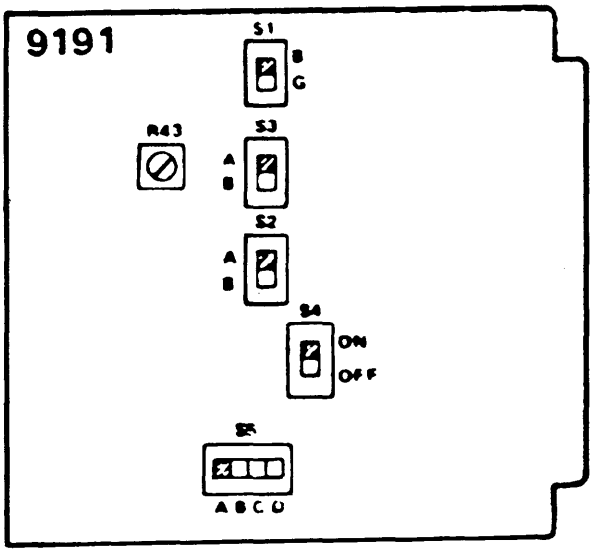

FIGURE 1

3.06 The funtions of the five option switches are summarized in Table B. After these options are selected, no further optioning or alignment of the module is required.

3.07 Set switch S1 to the G position if the associated switching equipment uses battery-biased ring generator or to the B position if the switching equipment uses ground-connected ring generator.

NOTE: This instruction may seem incorrect. It is not incorrect. On this module, B = ground-connected and G = battery-biased ring generator.

3.08 Switch S2 is used in PBX and CO applications where no provision is made for marking individual line appearances busy while a conference call is in progress. Set switch S2 to the A position to condition the 9191 to automatically trip incoming ringing and to return interrupted alerting tone as a busy indication. Set switch S2 to the B position to condition the 9191 to ignore an incoming call. (With S2 set to B, the 9191 does not trip ringing; thus, the caller will not be billed for any toll charges incurred.)

3.09 Switch S3 determines the manner in which the station, if busy with a normal call at the time a conference is originated, will enter the conference. Set S3 to the B position to condition the 9191 to apply alerting tone to the call in progress (after which the station user may enter the conference via a hookswitch flash), or to the A position to condition the 9191 to cut off the call in progress and force the busy station into the conference.

3.10 Switch S4 conditions the manner in which the station disconnects from a conference. In 291 System applications, set S4 to the OFF position to allow the station to disconnect from a conference in progress via hookswitch flash. The ON position of S4, which is not normally used in the 291 System, restricts the station from leaving a conference in progress by causing the station to be rerung by the System after hanging up.

3.11 Switch S5 conditions the module (through appropriate control-lead functions) so that the station is marked busy to the switching equipment while a conference is in progress. Set S5 to the A position for use with SxS, to the B position for use with Crossbar, to the C position for use with ESS (i.e., systems that require only a closure between the make-busy leads to make a line circuit busy), or to the D position for use with electronic PBX's that will accept a 700-ohm tip-ring short as a make-busy indication (e.g., Dimension 2000). If the switching equipment is not one of the types listed above, provision is made within the module to automatically trip incoming ringing voltage (regardless of the optioning of S5) on an incoming call made to the station while a conference is in progress and return interrupted alerting tone as a busy indication (see paragraph 2.04).

4. CIRCUIT DESCRIPTION

4.01 This circuit description is intended to familiarize you with the 9191 2W ARD Conference Terminate Line Circuit module for engineering and application purposes only. Attempts to trouble-shoot the 9191 internally are not recommended.

4.02 Procedures for recommended trouble-shooting in the field are limited to those prescribed in Part 6 of this Section. Reference to the 9191 Block Diagram, (Exhibit 1), will aid in following this circuit description.

4.03 The central office (or PBX) line circuit assigned to each conference station for normal telephone service is connected to the 9191's T and R (facility tip and ring) leads (pins 47 and 49). The telephone set is connected to the T1 and R1 (station tip and ring) leads (pins 51 and 53). Alerting tone, supplied by the 9121 Tone Supply module, is connected to the AT and ATR (alerting tone and alerting tone return) leads (pins 38 and 40).

A IDLE CONDITION

4.04 While the conference circuit is idle, the telephone set is connected to the central office tip and ring leads via un-operated contacts of relay B on the 9191. In this way, the station can originate and answer normal telephone calls.

B CONFERENCE ORIGINATION

4.05 A conference is originated when either a 9192, 9193, or 9196 supplies a ground to the 9191's SF (start) lead (pin 33) and LG (locking ground) lead (pin 15). Relay ST operates and latches via the LG lead ground. Relay ST remains operated until either relay A operates (when the station enters the conference) or the LG ground is removed (when the conference terminates).

C CALL SEQUENCE

4.06 If the station is idle when a conference is originated, relay ST applies a ground to the timer/driver circuit, causing relay B to operate. When relay B operates, the tel set is disconnected from the central office (or PBX) line circuit and connected to either battery-biased or ground-biased ringing voltage (as determined by option switch S1) via two contacts of relay RC.

4.07 When the ringing station is answered, the ring trip detector circuit recognizes the off-hook condition and relay RC operates to cut off ringing voltage and supply talk battery to the tel set. The resultant loop current is detected by the loop current sensing circuitry, thus operating relay A, which completes the speech path into the conference circuit and supplies a

closure between the G1 (gain control) lead (pin 21) and the G2 (gain control common) lead (pin 19) to control the gain of the 9194 2Wire Conference Amplifier. Relay A also provides a holding path to keep relay B operated after relay ST releases in response to the operation of relay A.

4.08 While the station is connected to an established conference, the central office (or PBX) line circuit is marked busy to incoming traffic by the condition of the C and CN leads, as determined by option switch S5 and a set of B relay contacts. If the 291 System interfaces a central office (or PBX) whose line circuits cannot be marked busy, the 9191 can be optioned (via switch S2) to recognize the incoming ringing voltage and cause relay BT to operate via the busy tone timer.

4.09 Relay BT applies a loop closure toward the incoming line circuit to trip ringing, and supplies interrupted alerting tone as a busy indication to the originating caller through normally open contacts of relay ST. At the conclusion of the busy tone timer's timing interval, the timer's output goes to ground, relay BT releases, the incoming loop closure releases, and alerting tone is disconnected. The timing interval of the busy tone timer is factory set at approximately 10 seconds.

D STATION BUSY WHEN CONFERENCE ORIGINATED

4.10 If the station is busy when a conference is originated, the subscriber may (depending upon System optioning) either be disconnected from the call in progress and immediately transferred into the conference, or be informed of the conference by an alerting tone imposed on the call in progress, after which the subscriber may enter the conference via hookswitch flash.

4.11 As indicated in paragraph 4.10, transfer of a busy station into a conference may be forced immediately or may be dependent on subscriber disconnect (hookswitch flash), depending on module optioning. When busy-station transfer inhibiting is employed and a conference is originated, relay ST operates as outlined in paragraph 4.05, thereby applying alerting tone to the call in progress through contacts of the ST relay to inform both parties of the impending call. Operation of relay B, however, is inhibited by the busy station indication to the B-relay timer/driver circuit. Upon a hookswitch flash (momentary disconnect), the System will remove the busy station transfer inhibition and will ring the station as outlined in paragraphs 4.06 and 4.07.

E SIREN CONTROL

4.12 Optional siren control may be provided at the conference station by means of a pushbutton that applies a ground to the tip lead to operate relay SDI via the tip ground sensing circuit (as long as relay A is operated). When relay SDI operates, a ground is placed on the P (siren control) lead used in the 9133 Long Interval Timer for siren control. The siren control pushbutton is enabled only when the station is engaged in a conference.

5. SPECIFICATIONS

- 2WIRE LOOP LIMIT
  2000 ohms or central office loop limit, whichever is less

- RING GENERATOR BIAS
  module may be optioned for operation with either grounded or battery-biased ring generator

- RINGING CAPABILITY
  up to 5 ringers may be run simultaneously

- TRANSFORMER IMPEDANCE RATIO
  1:1

- INSERTION LOSS
  0.5dB at 1000Hz

- FREQUENCY RESPONSE
  ±0.5dB, 300 to 3500Hz, re 1000Hz

- LONGITUDINAL BALANCE
  60dB minimum, 200 to 4000Hz

- POWER REQUIREMENTS
  input voltage: -42.75 to -56Vdc with positive ground
  input current: 60mA plus loop current

- MOUNTING
  one position of station line equipment shelves of TELLABS 291 Conference/ Alerting System

- OPERATION 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
  19 ounces (590 grams)

6. TESTING AND TROUBLESHOOTING

6.01 The Testing Guide Checklist (Exhibit 2) may be used to assist in the installation, testing or troubleshooting of the 9191 2W ARD Conference Terminate Line Circuit 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 9191 module. Unauthorized testing or repairs may void the 9191's warranty.

6.02 If a 9191 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.).

A REPLACEMENT

6.03 If a defective module is encountered on central office installed equipment, Network Maintenance will arrange for a replacement by notifying TELLABS via telephone on 312-969-8800, letter (See Below), or TWX on 910-695-3530. Notification should include all relevant information, including the 8X9191 part number (from which TELLABS can determine the issue of the module in question). Upon notification, TELLABS will ship a replacement module to the site or other designated address. 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 preaddressed label provided with the replacement module to the carton being returned; and ship the equipment prepaid to TELLABS.

6.04 For defective customer premise installed units, Business I/M will return the defective module to their Supplies Attendent or Material Management coordinate for repair and return handling as covered in paragraph 6.05.

B REPAIR AND RETURN

6.05 Return the defective module, shipment prepaid to:
TELLABS Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532
Attn: Repair and Return Dept.

6.06 Enclose an explanation of the module's malfunction. TELLABS will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.

TABLE A

9191 EXTERNAL CONNECTIONS

CONNECT:	TO PIN:
T (switching equipment tip lead)	47
R (switching equipment ring lead)	49
T1 (station tip lead)	51
R1 (station ring lead)	53
T2 (station tip lead - reserved for future use)	52
R2 (station ring lead - reserved for future use)	54
AT (alerting tone lead to 9121)	38
ATR (alerting tone return lead to 9121)	40
ST (start lead to 9192, 9193, or 9196)	33
ANS (answer lead to 9192, 9193, or 9196)	23
LG (locking ground lead to 9192, 9193, or 9196)	15
P (siren control lead to 9133)	31
CN (control and make busy lead to switching equipment except SxS)	11
C (control and make busy lead to switching equipment)	9
L (lamp lead for external busy indication)	45
L1 (common audio bus 1)	37
L2 (common audio bus 2)	39
RG (ring generator input)	44
G1 (gain control lead to 9194)	21
G2 (gain control common bus to 9194)	19
ADI (normally open contact of relay SDI - not used)	32
SDI (common contract of relay SDI - not used)	34
SDI (normally closed, contact of relay SDI - not used)	36
-BATT (-42.75 to -56Vdc input)	35
GND (ground)	17
*SG1 (feature enable)	46
*SG2 (feature enable)	13

*Not required with 291 System - possible future application.

TABLE B

9191 OPTION SWITCHES

FUNCTION	SWITCH	SELECTION
Biasing of loop for compatibility with CO ring generator	S1	G (Battery-biased generator: ground on tip side of line during ringing) or B (ground-connected generator: battery on tip side of line during ringing)
Automatic ring trip disable	S2	A (calls to the station involved in a conference are automatically answered and busy tone applied) or B (the call is not answered)
Conference entry supervision control (call cutoff or alerting tone)	S3	A (call cutoff) or B (alerting tone)
Selection of manner in which station can disconnect from conference	S4	ON (conference station remains connected to conference until entire conference is terminated), or OFF (conference station can disconnect from conference in progress via hookswitch flash)
Conditions module so that associated station is marked busy to switching equipment while a conference is in progress	S5	A (for use with SxS or EAX offices), B (for use with Crossbar-type offices), C (for use with ESS-type offices), or D (for use with certain electronic PBX's (see text))

EXHIBIT 1

9191 BLOCK DIAGRAM

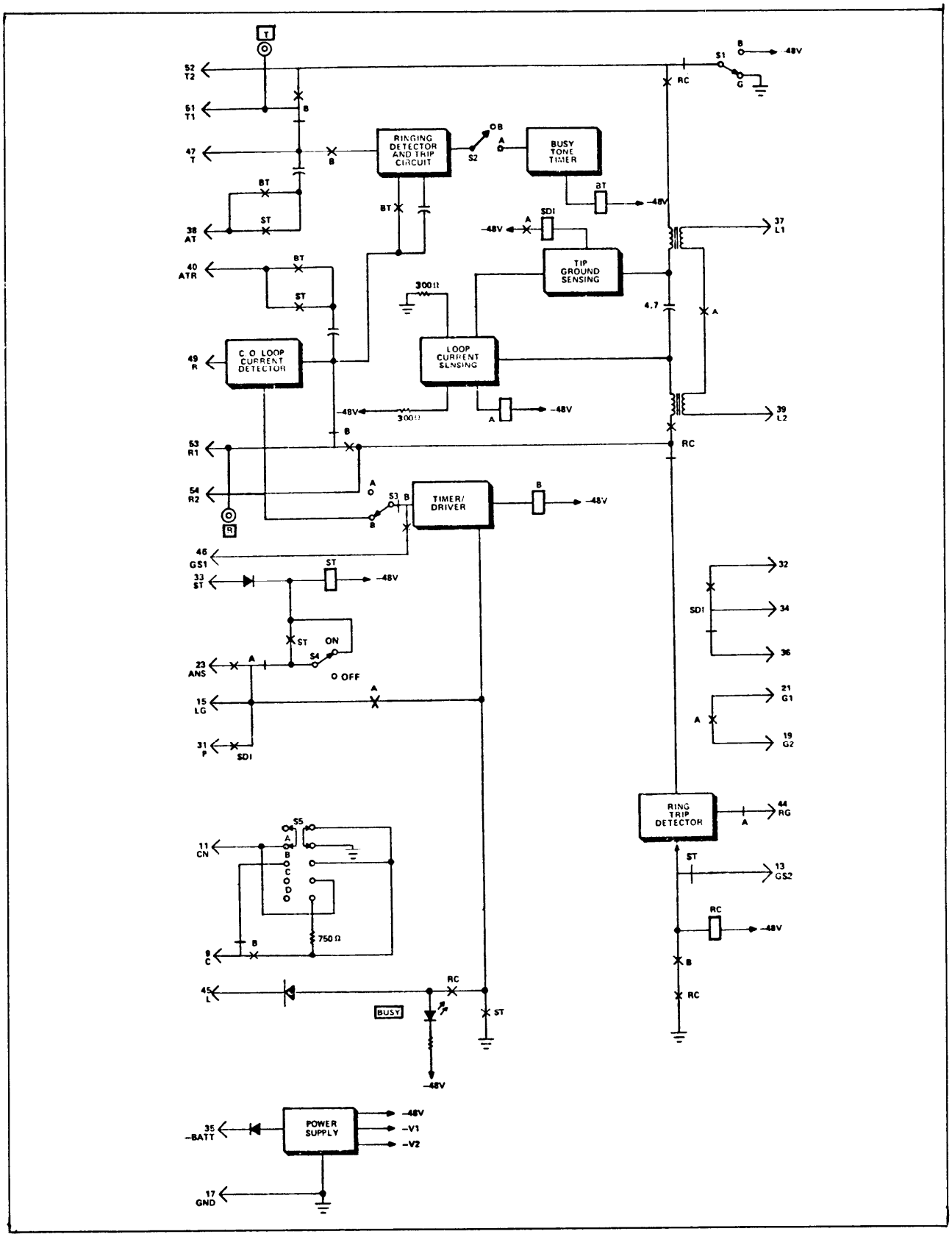

EXHIBIT 2

9191 TESTING GUIDE CHECKLIST

TROUBLE CONDITION	POSSIBLE CAUSE (IN ORDER OF LIKELIHOOD)
Station does not ring when conference is originated	1) Incorrect strapping from ring generators to 291's common equipment shelf. 2) Fuse associated with specific 9191 blown. 3) 9191 incorrectly optioned (check switches S1, S3, or S5). 4) Defective 9191, replace and retest.
Station does not trip ringing on conference call	1) 9191 incorrectly optioned (check switch S1) for type of ring generator. 2) Defective 9191, replace and retest.
Conference calls override normal service; no alerting tone applied to busy stations	1) 9191 incorrectly optioned (check switch S3). 2) Defective 9191, replace and retest.
Station inoperative, both normal and conference service	1) 9191 not fully inserted in mounting shelf position. 2) Corroded or dirty connector contacts on 9191. 3) Defective 9191, replace and retest.
Station unable to operate optional siren via tip-grounding pushbutton	1) Tip-ring reversal in station wiring. 2) Poor ground at station. 3) Defective 9191, replace and retest.

Note: Because the connectorized backplane of each 291 System equipment shelf prevents access to the connector pins at the rear of most module positions, use of a TELLABS 9801 Card Extender is necessary for testing of this module in that System.