

## 6201 Two-Way Loop to E and M Converter Module

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### 1. general description

1.01 The Tellabs 6201 Two-way Loop to E and M Converter module (figure 1) provides signaling lead conversion between a loop-dial switching equipment trunk and an E and M-lead signaling facility. The module provides this conversion for one-way outgoing trunks (dial pulse originating), one-way incoming trunks (dial pulse terminating) and two-way loop dial trunks.

1.02 In the one-way incoming (dial pulse terminating) mode, the 6201 receives information from the facility on its E lead, and furnishes a loop closure to the switching equipment in response to an E-lead busy state. In this mode, the 6201 also detects battery reversals by the switching equipment and converts them to M-lead busy signals for transmission over the facility.

1.03 In the one-way outgoing (dial pulse originating) mode, the 6201 supplies the local switching equipment with loop current via the A and B leads and repeats loop current information to the facility via the M lead. Answer supervision received from the facility via the E lead causes the 6201 to reverse the battery/ground loop current polarity toward the switching equipment. In the one-way outgoing mode of operation, a ground is momentarily applied to the local switching equipment's outgoing sleeve lead to permit loop seizure. (When this sleeve lead is open, the module is arranged for the one-way incoming mode.)

1.04 In the two-way mode, the 6201 operates in each direction of transmission as in the respective one-way mode. When required by the local switch, the 6201 provides transfer between the incoming and outgoing ports of that switching equipment during two-way operation.

1.05 Dial pulse transient suppression and idle line termination for the local switching equipment may be provided via wiring option for outgoing calls in either one-way outgoing or two-way mode.

1.06 A momentary M-lead busy signal (start-dial wink) may, by switch option, be presented to the facility in response to an E-lead seizure on incoming or calls in either the one-way incoming or two-way mode.

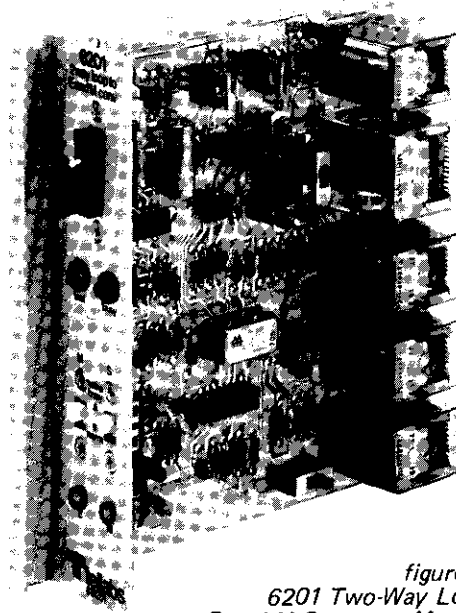


figure 1.  
6201 Two-Way Loop  
to E and M Converter Module

1.07 The 6201 may be equipped with an optional 9901 Pulse Corrector subassembly. The 9901 plugs into a connector on the 6201 printed circuit board. Input pulses at 8-12pps, 30-70% break are corrected to  $58 \pm 2\%$  break, and pulses at 14pps, 40-65% break are corrected to  $57 \pm 3\%$  break. The 9901 subassembly applies pulse correction to the 6201's E lead and is, therefore, used only on incoming calls.

1.08 The A and B leads furnished by the 6201 must be converted to transmission leads required by the local switching equipment by an associated Term Set or Repeat Coil.

1.09 Auxiliary relay contacts provide all-trunk-busy (ATB) and peg count (PC) meter leads. Two additional sets of relay contacts are provided for call status indication. One set provides a closure when answer supervision is received on an outgoing call, and a second set closes when an outgoing call is originated and remains closed for the duration of the call or as long as answer supervision is received, depending on which is longer (provided that the switching equipment provides called party control).

1.10 The 6201 incorporates an internally-regulated power supply that permits operation on -44 to -56Vdc input. Current requirements range from 30mA in the quiescent state to 70mA plus M-lead and talk-battery current when busy. The power supply is fused through a 1-1/3 ampere GMT type fuse mounted to the module's front panel.

1.11 To facilitate maintenance activities while the module is mounted in place, the front panel of the 6201 also incorporates two make-busy switches, two status-indicating LED's, and E and M-lead test points. One switch busies the outgoing sleeve lead from the local switch, resulting in the trunk appearing busy to the local switching equipment. The second switch busies the M lead, causing the trunk to extend a busy signal to the distant switching equipment. Whenever the trunk is seized (incoming or outgoing) the *busy* LED lights, and when either of the make-busy switches is operated, the *test* LED lights.

1.12 As a Tellabs Type 10 module, the 6201 Two-Way Loop to E and M Converter mounts in one position of a Tellabs Type 10 (or equivalent) Shelf, which is available in configurations for either relay rack or KTU apparatus case mounting.

## 2. application

2.01 The 6201 Two-Way Loop to E and M Converter module provides signaling interface between a loop signaling facility and an E and M signaling facility. Common usages of the 6201 are to interface a loop-dial PBX or central office switching equipment trunk with an E and M signaling facility, to provide signaling lead conversion for a toll-connecting trunk between two central offices, or to provide signaling lead conversion for a trunk between two PBX's. Any application may incorporate either dial pulse or multi-frequency address signaling. The 6201 must be physically located within 1200 ohms of the local (loop dial) switching equipment.

2.02 All applications of the 6201 employ one of three basic modes of operation: one-way outgoing (dial pulse originating), one-way incoming (dial pulse terminating) or two-way loop dial.

**Note:** *The terms outgoing and incoming as used in this Practice in relation to sleeve leads always refer to the direction of transmission over that lead as referenced to the local switching equipment; i.e., the outgoing sleeve lead is outgoing from the local switch to the 6201.*

### one-way outgoing operation

2.03 In the one-way outgoing loop-dial mode (dial pulse originating), seizure from the local switch causes the 6201 M lead to indicate seizure to the facility. Answer supervision, provided by the 6201 as a battery reversal on the 2wire loop toward the local switch, is initiated by an E-lead busy input to the 6201 from the facility. In order for the 6201 to operate in the one-way outgoing mode, the associated outgoing sleeve lead from the local switch to the module must be grounded momentarily prior to loop seizure. The 6201 then supplies loop current to the local switching equipment via its A and B leads.

### one-way incoming operation

2.04 In the one-way incoming loop-dial mode (dial pulse terminating), loop seizure is indicated to the local switch by a loop closure from the 6201 in response to an E-lead busy indication (ground) from

the facility. The 6201 also supplies grounded incoming sleeve lead on an incoming call. (Certain switching equipment may require this sleeve ground to maintain the switching path for the duration of the call.) A 2wire-loop battery reversal (answer supervision) from the local switch causes the 6201 to provide an M-lead busy indication (battery) toward the facility. In order for the 6201 to operate in the one-way incoming mode, the associated outgoing sleeve lead from the local switch to the module must be open.

### two-way dial operation

2.05 Two-way dial operation provides for both dial pulse originating and dial pulse terminating modes as explained above in 2.03 and 2.04. The 6201 provides one-way incoming operation when the outgoing sleeve lead from the switch is open, and one-way outgoing operation when that sleeve lead is momentarily grounded by the local switch to initiate outgoing seizure. If the local switching equipment has separate incoming and outgoing ports, transfer between those ports is handled by contacts on the 6201's TR relay. In the normal state, the transmission leads are connected to the incoming port; to seize the transmission path to the switch's outgoing port, momentary ground must be applied to the switch's outgoing sleeve lead and battery to the TR control lead, thus operating the TR relay.

2.06 The 6201, when arranged for either the one-way terminating or two-way dial mode of operation, may be optionally equipped with a 9901 Pulse Corrector subassembly. The Pulse Corrector ensures that dial pulse break intervals presented to the switching equipment are of sufficient duration for proper digit recognition. (See paragraph 1.07.)

2.07 The 6201 must be used in conjunction with an associated repeat coil (Tellabs 442X) or 4wire-to-2wire terminating set (Tellabs 4203). (The term set must incorporate A and B-lead inductors to ensure proper operation.) The term set or repeat coil derives the A and B signaling leads required by the 6201. The term set interfaces the 6201 with a 4wire E and M signaling facility and a repeat coil with a 2wire E and M signaling facility. (See figures 2 and 3.) Idle line termination is provided by the 6201 to prevent singing during idle circuit conditions.

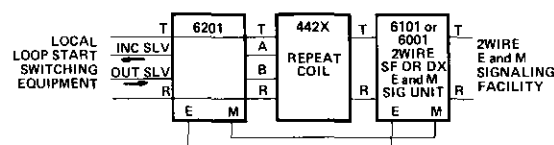


figure 2. Typical application, 2W-to-2W facility

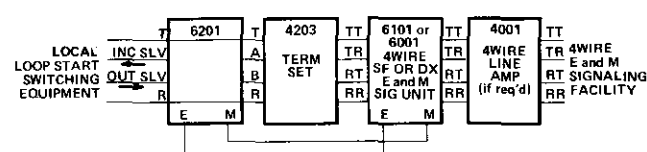


figure 3. Typical application, 4W-to-2W facility

2.08 Depending upon the length of the E and M facility to which the 6201 is applied, an associated E and M signaling device may or may not be employed to extend signaling over that facility. The associated signaling device may provide either SF (Tellabs 6101) or DX (Tellabs 600X) E and M signaling, as required. (See figures 2 and 3.) Normal E and M signaling states are used by the 6201: [E-lead: idle = open, busy = ground]; [M-lead: idle = ground, busy = battery].

**Note:** The 6201 may directly interface a Tellabs 6101 SF Transceiver module or a Tellabs 600X DX Signaling module. No 610X Signaling Converter module is required. However, the 6201 is not compatible with the 610X Converter module's pin arrangement and cannot be substituted for a 610X Converter in a 261 or other universally wired Tellabs Signaling and Terminating System assembly without rewiring the system specifically for the 6201.

2.09 The 6201 is normally physically located at or near the local switching equipment end of the circuit. The limiting factor in the distance between the 6201 and the local switching equipment is the supervisory range of the 2wire loop. In the one-way outgoing mode (dial pulse originating), the 6201 must be within 1200 ohms of the local switching equipment, while in the one-way incoming mode (dial pulse terminating), the 2wire loop must be short enough to supply a minimum of 20mA of loop current to the 6201 to ensure proper signaling.

2.10 Two front-panel switches, two front-panel LED's and two front-panel test points ease installation and testing. Switch *M* manually busies the M lead, which busies the distant switching equipment port. Switch *S* manually busies the outgoing sleeve lead, which busies the local switching equipment port. The *test* LED lights whenever either front-panel switch is set to the *make busy* position. The *busy* LED lights in response to a normal operational busy condition in either direction of transmission (indicating that the 6201 has been seized). The E and M test points further facilitate testing.

2.11 Mounting for the 6201 is provided by the Tellabs Type 10 Shelf, variations of which allow relay rack or apparatus case installation. In relay rack applications, up to 12 modules may be mounted across a 19-inch rack, while a 23-inch rack accommodates up to 14 modules. In either case, six inches of vertical rack space is utilized.

### 3. installation inspection

3.01 The 6201 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 Each 6201 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 properly optioned and after wiring has been completed.

3.04 Table 1 lists external connections to the 6201 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	from	to pin
A lead	switching eqpt (+)	48
B lead	switching eqpt (-)	54
tip	switching eqpt	55
ring	switching eqpt	47
M-lead	facility	45
E-lead	facility	11
CT-lead	facility (if required)	56
TR control	switching eqpt	3
INC sleeve	switching eqpt incoming sleeve	41
OUT sleeve	switching eqpt outgoing sleeve	39
ATB	switching eqpt (if required)	13
peg count	aux eqpt (if required)	15
sleeve (com)	switching eqpt (if required)	23
TR1	switching eqpt outgoing port tip (2Way operation only)	9
TR2	switching eqpt transmission eqpt tip (2way operation only)	8
TR3	switching eqpt incoming port tip (2way operation only)	7
TR4	switching eqpt outgoing port ring (2way operation only)	5
TR5	switching eqpt transmission eqpt ring (2way operation only)	6
TR6	switching eqpt incoming port ring (2way operation only)	4
B aux	aux eqpt (if required)	51
ring aux	aux eqpt (if required)	49
tip aux	aux eqpt (if required)	53
M busy	aux eqpt (if required)	25
ANS 1	aux eqpt (outgoing answer supervision)	21
ANS 2	aux eqpt (outgoing answer supervision)	19
ANS 3	aux eqpt (if required)	31
ANS 4	aux eqpt (if required)	29
fuse alarm	aux eqpt (if required)	37
fused BATT	aux eqpt (if required)	33
BATT	power supply -48V	35
GND	power supply	17

table 1. Installer connections

### option selection

3.05 Before plugging the 6201 Module into place, two options must be selected via slide switches located on the component side of the printed circuit

board (figure 4). Switches are labeled on the printed circuit board as they appear in figure 4.

#### start dial wink

3.06 If a start-dial wink signal is required by the distant switching equipment in the dial pulse terminating mode, switch S4 should be set to the WK position. This options the 6201 to send a start dial wink signal toward the E and M facility when the distant equipment seizes the 6201. When a start-dial wink signal is not required, switch S4 should be set to the OFF position.

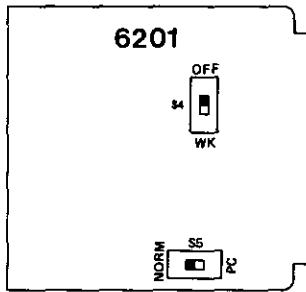


figure 4. Switch locations

#### dial pulse correction

3.07 If a Tellabs 9901 Pulse Corrector subassembly is provided, switch S5 should be set to the PC position. When the Pulse Corrector is not used, switch S5 should be set to the NORM position.

### 4. circuit description

4.01 This circuit description is intended to familiarize you with the 6201 Module for engineering and application purposes only. Attempts to troubleshoot the 6201 internally are not recommended. Procedures for recommended troubleshooting in the field are limited to those prescribed in Section 7 of this Practice.

4.02 The power supply in the 6201 Module is a simple series voltage regulator utilizing a zener diode as a reference source. A series diode in the negative input lead protects the circuit from reversed input power connections and a high voltage zener diode between input battery and ground limits high level supply transients to a safe level. Tantalum filter capacitors are used to provide filtering and decoupling.

4.03 A GMT-series 1-1/3 amp fuse (front-panel mounted) is used to fuse and provide fuse alarm for the 6201 and associated equipment connected to the fused battery lead.

4.04 The TR and B relays control the directional mode of the loop detection circuitry. The TR relay is controlled by sleeve and TR-lead states. The B relay transfers the loop detection circuitry between the two directions (incoming and outgoing) of loop signaling.

4.05 The CC relay and CT lead are controlled by signaling in either direction and operate during both the idle and dial pulsing modes. The S relay, controlled by the S-logic circuitry, also operates during either direction of signaling.

4.06 The A relay is used as a loop supervision and dial pulse relay when the 6201 is operating in the dial pulse terminating mode. The reverse battery detector is used to detect the reverse battery answer supervision from the switching equipment. When answer supervision is detected, the loop current de-

tector and M-lead driver will operate and place the M lead in the busy state (resistance battery).

### 6. specifications

#### 2wire loop supervisory limits

1200 ohms maximum, outgoing mode  
20mA loop current minimum, incoming mode (current limited to 80mA internally)

#### dial pulse distortion

5% maximum, 8 to 14pps, 1200 ohms and no leak or 0 ohms with leak A test

#### answer supervision (loop reversal)

10ms maximum recognition time

#### M-lead current limiting activate point

80mA to 120mA

#### cable leakage resistance

20 kilohms minimum

#### start dial wink

300ms nominal, 200ms minimum

#### sleeve lead release time

150ms minimum

#### input power

-48Vdc nominal (-44 to -56Vdc);  
30mA idle, 70mA busy (plus M-lead and talking battery current)

#### idle line termination

600 ohms, +2 microfarads

#### dial pulse correction

with 9901 Pulse Corrector subassembly: input 8-12pps, 30-70% break is corrected to 58±2% break; input 14pps, 40-65% break is corrected to 57±3% break

#### longitudinal balance

60dB minimum

#### fusing

1-1/3 Amp, GMT type, front-panel accessible

#### 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

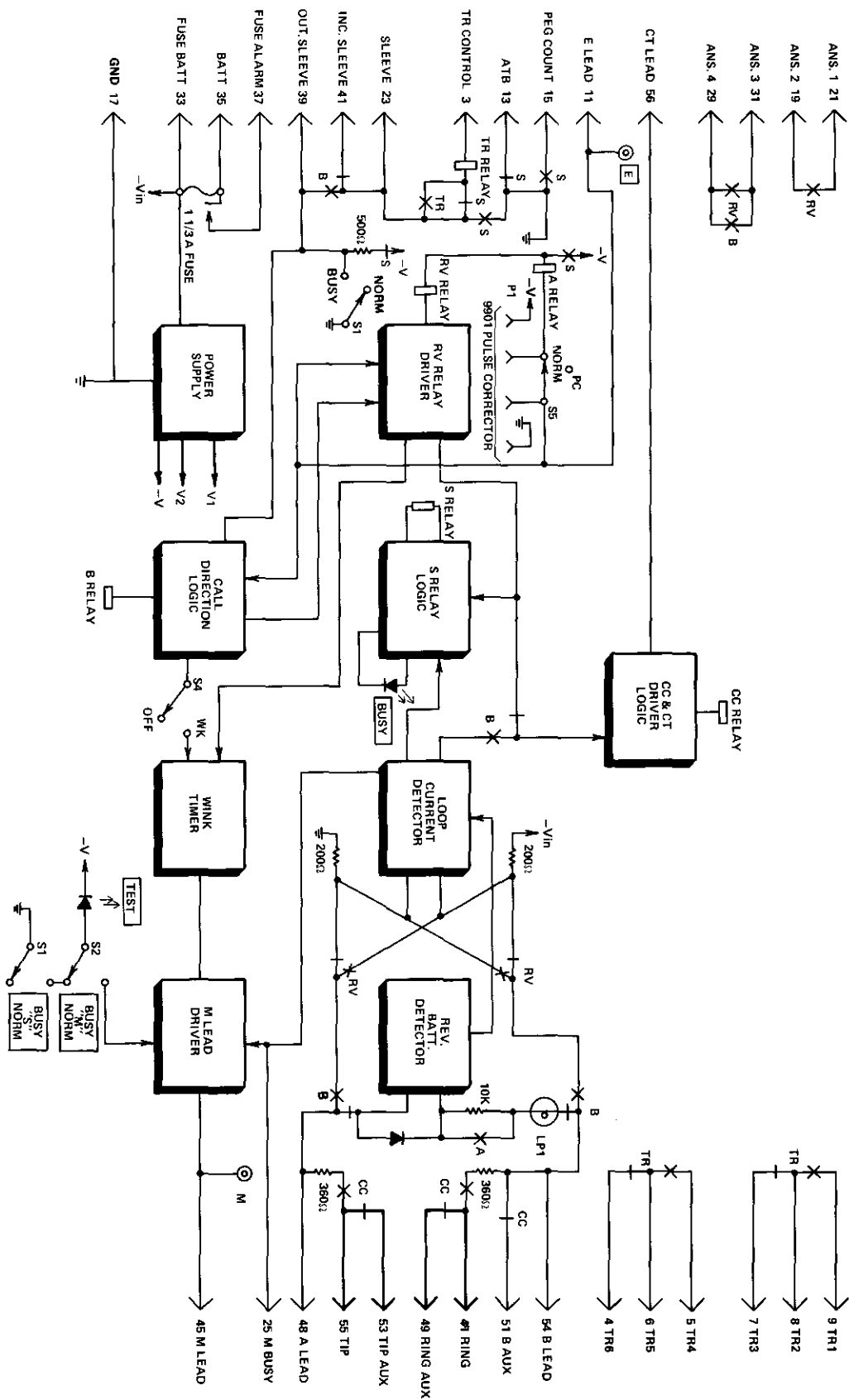
14 ounces (397 grams)

#### mounting

relay rack or apparatus case via one position of Tellabs Type 10 Shelf or one position Wescom Type 400 Shelf

### 7. testing and troubleshooting

7.01 The Testing Guide Checklist may be used to assist in the installation, testing or troubleshooting of the 6201 2Way Loop to E and M Converter 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



block diagram

6201 Two Way Loop to E and M Converter module

816201

attempted on the 6201 Module. Unauthorized testing or repairs may void the 6201 warranty.

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

7.03 If a 6201 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 6201 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 8X6201 part number (from which we can determine the issue of the 6201 Module in question). Upon notification, we shall ship a replacement 6201 to you. If the warranty period of the defec-

tive module has not elapsed, the replacement module will be shipped at no charge. Package the defective 6201 in the replacement module's carton; sign the packing list included with the replacement 6201 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.

#### repair and return

7.05 Return the defective 6201 Module, shipment prepaid, to: Tellabs Inc.

4951 Indiana Avenue  
Lisle, Illinois 60532

Attn: repair and return dept.

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.

testing guide checklist

test	test procedure	normal conditions	if normal conditions are not met, verify:
Incoming Seizure	Connect E-lead to ground (E-lead test point or connect pin 11 to pin 17.)	Busy light on <input type="checkbox"/> . Loop closure between pins 48 and 54 <input type="checkbox"/> . M-lead at ground <input type="checkbox"/> .	Wiring <input type="checkbox"/> . Option switches <input type="checkbox"/> . 6201 not seized outgoing <input type="checkbox"/> . Blown fuse <input type="checkbox"/> . A and B-lead loop current polarity (A+, B-) <input type="checkbox"/> . Replace 6201 and retest <input type="checkbox"/> .
Incoming Answer Supervision	Seize incoming mode; connect reverse resistance battery across pins 48 (-) and 54 (+).	Busy light on <input type="checkbox"/> . Loop closure between pins 48 and 54 <input type="checkbox"/> . M-lead at battery potential <input type="checkbox"/> .	Same as above, except battery reversal on A and B leads <input type="checkbox"/> .
Outgoing Seizure	Operate front-panel <i>make busy</i> S switch or connect sleeve lead to ground (pin 39 to pin 17) and hold while placing loop closure across pins 48 and 54. Remove sleeve lead (pin 39) from ground while holding loop closure across pins 48 and 54.	Busy light on <input type="checkbox"/> . M-lead at battery potential <input type="checkbox"/> .	Wiring <input type="checkbox"/> . Option switches correct <input type="checkbox"/> . 6201 not seized incoming <input type="checkbox"/> . Switching equipment operational <input type="checkbox"/> . Blown fuse <input type="checkbox"/> . Replace 6201 and retest <input type="checkbox"/> .
Outgoing Answer Supervision	Seize outgoing mode, and connect E-lead to ground (E-lead test point or pin 11 to pin 17). Connect VOM (50Vdc scale) across pins 48 and 54.	Busy light on <input type="checkbox"/> . M-lead at battery potential <input type="checkbox"/> . Sleeve lead (pin 39) at ground <input type="checkbox"/> .	Same as above <input type="checkbox"/> .
Start-Dial Wink	Connect E-lead to ground (E-lead test point or connect pin 11 to pin 17). Connect VOM (50Vdc scale) between M-lead (pin 45) and ground (pin 17).	A-lead (pin 48) positive (+), B-lead (pin 54) negative (-) prior to E-lead ground <input type="checkbox"/> . A-lead negative (-), B-lead positive (+) after E-lead is grounded <input type="checkbox"/> .	Same as above <input type="checkbox"/> .
incoming dial pulsing	Connect transmit side of pulsing test set to E lead (pin 11) and receive side to A and B leads (pins 48 and 54). Pulse E-lead at 58% break 10pps.	VOM indicates battery potential for approximately 300ms <input type="checkbox"/> .	Replace 6201 and retest <input type="checkbox"/> . Replace 9901 Pulse Corrector and retest <input type="checkbox"/> .