tellabs
technical manual
76-829961BR
rev A

practice section 829961BR

9961BR FXO Signaling Converter Subassembly

contents

section 1	*general description*	*page 1*
section 2	*application*	*page 1*
section 3	*installation*	*page 2*
section 4	*circuit description*	*page 2*
section 5	*block diagram*	*page 4*
section 6	*specifications*	*page 3*
section 7	*testing and troubleshooting*	*page 4*

1. general description

1.01 The 9961BR FXO (foreign-exchange, office-end) Signaling Converter subassembly (figure 1) provides conversion between E&M-lead signaling and the type of loop signaling normally used at the switching-equipment end of a foreign exchange (FX) or off-premises station (OPS) circuit. Specifically, the 9961BR converts E-lead signals to loop signaling for operation of the switching equipment and converts loop supervisory and ringing signals from the switching equipment to M-lead signals. The 9961BR is intended for use on Tellabs 6461R Common Signaling Modules mounted in a Tellabs 266XR Registered Network Interface System, where each module and subassembly together provide an FCC-registered FXO interface.

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

1.03 The 9961BR makes electrical and physical connection to the host 6461R by means of male connectors on the 9961BR and receptacles on the 6461R module's printed circuit board. A standoff mounting near the center of the subassembly adds rigidity.

1.04 Functions, options, and features of the 9961BR include the following: switch-selectable loop-start or ground-start operation, with accommodation of office-side signaling via either A and B or local transmission leads; switch-selectable normal or inverted M-lead operation; M-lead current limiting; active loop-current limiting; transient suppression during dialing and idle; and idle circuit termination.

1.05 Input power is supplied to the 9961BR subassembly via the host 6461R module. A voltage regulator integral to the subassembly permits operation from −22 to −56Vdc filtered, ground-referenced input. Maximum current draw is 60mA. Both M-lead and tip-ground (ground-start) sensing circuitry access the subassembly's input power prior to regulation; this permits conventional external M-lead potentials and loop supervisory ranges to be used.

1.06 As stated above, the 9961BR plugs into a receptacle on the printed circuit board of the host 6461R module. The 6461R, in turn, plugs into one position of the Tellabs 266XR Registered Network Interface System. For a detailed description of the 266XR System, refer to Practice section 8X266XR. For complete information on the 6461R module and the other 9961X subassemblies, please refer to their respective Tellabs Practices.

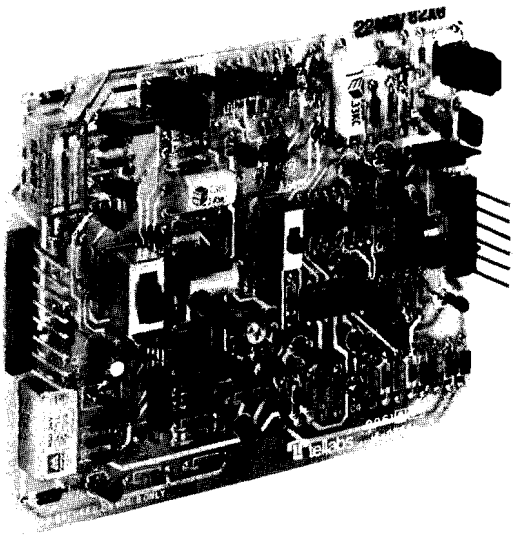


figure 1. 9961BR FXO Signaling Converter subassembly

2. application

2.01 The 9961BR FXO Signaling Converter subassembly, when mounted on a host 6461R Common Signaling Module, interfaces a 4wire E&M transmission facility (typically, a carrier channel) with a termination employing the type of loop signaling normally used at the office end of an FX or OPS circuit. Typically, this termination is a central office switching system or a PBX (both are 2wire terminations), although it may in some cases be a 4wire facility to a remote PBX. (The host 6461R module accommodates either 2wire or 4wire loop operation via a switch option on the module.)

2.02 Signaling interface between the 9961BR and the host 6461R module is accomplished via local A and B leads.

2.03 A loop-current regulator on the 9961BR limits dc loop current to approximately 55mA, thereby eliminating the need for line build-out resistors. Also, because the impedance of the loop-current regulator is approximately 4000 ohms throughout the voice frequency range, A&B-lead inductors are not required in the 2wire-to-4wire hybrid terminating set of the host 6461R.

2.04 The 9961BR can be switch-optioned for loop-start or ground-start operation and for normal or inverted M-lead operation. In normal M-lead operation, local ringing will produce M-lead ground in the loop-start mode and tip ground will produce M-lead battery in the ground-start mode. In inverted M-lead operation, local seizure will produce M-lead battery in the loop-start mode and M-lead ground in the ground-start mode.

2.05 Depending upon the type of facility signaling used, it may be desirable in certain loop-start applications to use idle-state signaling (M-lead at ground during the idle state). With such an arrangement, a failure of the facility results in seizure at the distant end, where the resultant continuous ringing provides an immediate audible indication of facility failure. In applications where this arrangement is desired, the inverted mode of M-lead operation should be selected. In most applications, however, it is not desirable to seize the distant end when the facility fails. In these applications, the normal M-lead operating mode should be selected.

Note: *Part 68 of the FCC Rules and Regulations requires that the network interface not be seized during carrier failure.*

2.06 In all modes of operation, normal E-lead signaling states (open during idle and ground during busy) are used.

2.07 All internal circuitry of the 9961BR receives power from an integral regulator that permits operation on −22 to −56Vdc input. Please note that, to ensure proper tip-lead sensing in ground-start applications, the power supplied to the 9961BR must be of the same dc voltage as that of the serving switching equipment. M-lead power is derived directly from the external power source. Thus, if the associated carrier channel (or other facility-side switching equipment) requires a −48Vdc M-lead potential, the 9961BR must be powered from a nominal −48Vdc source.

3. installation

inspection

3.01 The 9961BR FXO Signaling Converter subassembly should be visually inspected upon arrival to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the subassembly should be visually inspected again prior to installation.

mounting and connections

3.02 The 9961BR subassembly makes physical and electrical connection to the host 6461R module via seven-pin connector *P1* and eight-pin connector *P2* located on the component side of the subassembly. Connector *P1* on the 9961BR plugs into receptacle *J1* on the 6461R, and connector *P2* plugs into receptacle *J2*. The subassembly is further secured to the 6461R's printed circuit board via a standoff mounting. Connections to the subassembly and their corresponding pinouts on the host 6461R module are listed in table 1.

9961BR connector pin*	designation/function	externally accessible via 6461R pin
P1-1	GND (ground input)	1
P1-6	−BATT (−22 to −56Vdc input)	39
P2-4	TIP	41
P2-3	RING	43
P2-8	A(A lead)	7
P2-7	B (B lead)	9
P2-6	A1 (internal A lead)	none
P2-5	B1 (internal B lead)	none
P1-5	E1 (E1 lead)	25
P1-4	M1 (M1 lead)	21
P1-7	CT (cut and terminate)	none
P1-2	none	none
P1-3	none	none
P2-1	none	none
P2-2	none	none

*Corresponding receptacles on 6461R module are designated J1-1, J1-6, J2-4, etc.

table 1. Connections to 9961BR subassembly via host 6461R module

options and alignment

3.03 No alignment of the 9961BR subassembly is required. Before the subassembly is placed into service, however, two option switches must be set. Locations of these switches on the subassembly are shown in figure 2.

3.04 Option switch *S1* conditions the subassembly for loop-start or ground-start operation. Set *S1* to the *LS* position for loop-start operation or to the *GS* position for ground-start operation.

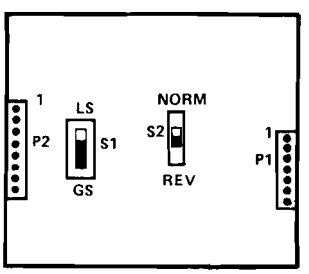


figure 2. Option switch locations

3.05 Option switch *S2* conditions the subassembly for normal or inverted M-lead operation. Set *S2* to the *NORM* position if it is desired that local seizure produce M-lead ground in the loop-start mode or M-lead battery in the ground-start mode. Set *S2* to the *REV* position if it is desired that local seizure produce M-lead battery in the loop-start mode or M-lead ground in the ground-start mode.

4. circuit description

4.01 This circuit description is intended to familiarize you with the 9961BR FXO Signaling Converter subassembly for engineering and application purposes only. Attempts to troubleshoot the 9961BR internally are prohibited by FCC regulations. Troubleshooting procedures should be limited to those prescribed in section 7 of this Practice. Refer to the block diagram, section 5 of this Practice, as an aid in understanding the circuit description.

4.02 The 9961BR provides seizure and loop dial pulsing toward a central office or PBX line circuit in response to an external E-lead input. In the loop-start mode (switch *S1* set to *LS*), an E-lead ground operates the *A relay*. This closes the local loop through an active *loop current limiter* that limits loop current to approximately 40mA. Loop dial pulses are generated via the *A-relay* contacts in response to incoming E-lead pulses. An idle-line-termination relay, the *CC relay*, is also activated from the input E lead and provides fast-operate, slow-release operation. This relay provides resistive termination of the host 6461R's 2wire-to-4wire hybrid during idle conditions and while dial pulses are being received. A CT (cut-and-terminate) relay control circuit is operated in parallel with the CC relay. This circuit energizes the CT relay on the host 6461R module via connector pin *P1-7*. The 6461R's CT relay cuts (opens) the 4wire receive path and terminates it in both directions.

4.03 In the ground-start mode (switch *S1* set to *GS*), the input E lead controls the *seizure/release logic* as well as the *A* and *CC relays*. The *seizure/release logic* circuit provides input to the *GS seizure-control* circuit, which places ground on the CO or PBX ring lead in response to an input E-lead transition from open to ground. When the CO or PBX responds to incoming seizure by placing ground on the tip conductor, a tip-ground sensing circuit indicates outgoing seizure via the M lead and provides input to the *seizure/release logic*, enabling operation of the *A relay*. Detection of CO or PBX tip-lead ground also causes removal of the ring-lead-seizure ground via the *seizure/release logic* circuit. After this conversion from the ground-start to the loop supervisory mode is completed, incoming dial pulses are repeated by the *A relay*, while supervisory continuity is maintained via the *seizure/release logic* circuit. The local loop is released in response to either a long E-lead open interval or removal of the CO or PBX tip-lead ground.

4.04 Outgoing signaling in the loop-start mode is controlled by an optocoupler *ringing detector* bridged across the local A and B leads. When ringing is detected in the loop-start mode, input is provided to the M-lead control circuit through switch *S2*, which conditions the M lead for normal or reversed operation. When *S2* is set to *NORM*, the outgoing M lead is at input battery potential during both busy and idle and at ground potential during ringing. When *S2* is set to *REV*, these states are reversed.

4.05 In the ground-start mode of operation, outgoing signaling is controlled by the *tip/ring ground sense* circuit. Detection of ground on either the tip or ring lead will cause the M lead to change state. When *S2* is set to *NORM*, the M lead is at ground potential in the absence of tip-lead ground (idle state) and at input battery potential when ground is detected on either the local tip or ring lead (busy condition). M-lead control is not obtained from the ringing detector circuit in the ground-start mode.

4.06 Idle circuit termination in the 9961BR is controlled by fast-operate, slow-release circuitry, including the *CC relay*. This relay is operated when the circuit is idle and released when the E lead is at ground. The control circuit is arranged for fast-operate, slow-release operation so that the *CC relay* remains operated during dial pulsing. When operated, the *CC relay* places resistive terminations between the tip and A leads and between the ring and B leads of the host 6461R's hybrid. The 9961BR also provides an output (connector pin *P1-7*) that energizes the 6461R's CT relay during idle and dialing. The 6461R's CT relay cuts the 4wire receive path and terminates it in both directions.

4.07 An active series *voltage regulator* integral to the 9961BR supplies −11 and −22Vdc power to the subassembly's internal circuitry from −22 to −56Vdc input. The regulator uses a zener diode for establishing the reference potential and a series pass transistor for voltage limiting. The external M-lead potential is derived from the input power potential and thus provides either −24 or −48Vdc potential, depending upon input powering.

6. specifications

outgoing signaling

ring detector
detection sensitivity: 50 volts rms
ringing frequency rnage: 16 to 67Hz

M-lead signaling states
- **loop start, normal M-lead operation: ground during ringing, input battery potential during busy and idle**
- **loop start, inverted M-lead operation: input battery potential during ringing, ground during busy and idle**
- **ground start, normal M-lead operation: ground during idle, input battery potential during busy (tip ground)**
- **ground start, inverted M-lead operation: input battery potential during idle, ground during busy (tip ground)**

M-lead current capacity
ground state: 100mA maximum sourcing capability
input battery state: 130mA maximum sinking capability

M-lead seizure delay
loop start: 200ms nominal
ground start: 150ms nominal

incoming signaling

E-lead signaling states
open during idle, ground during busy

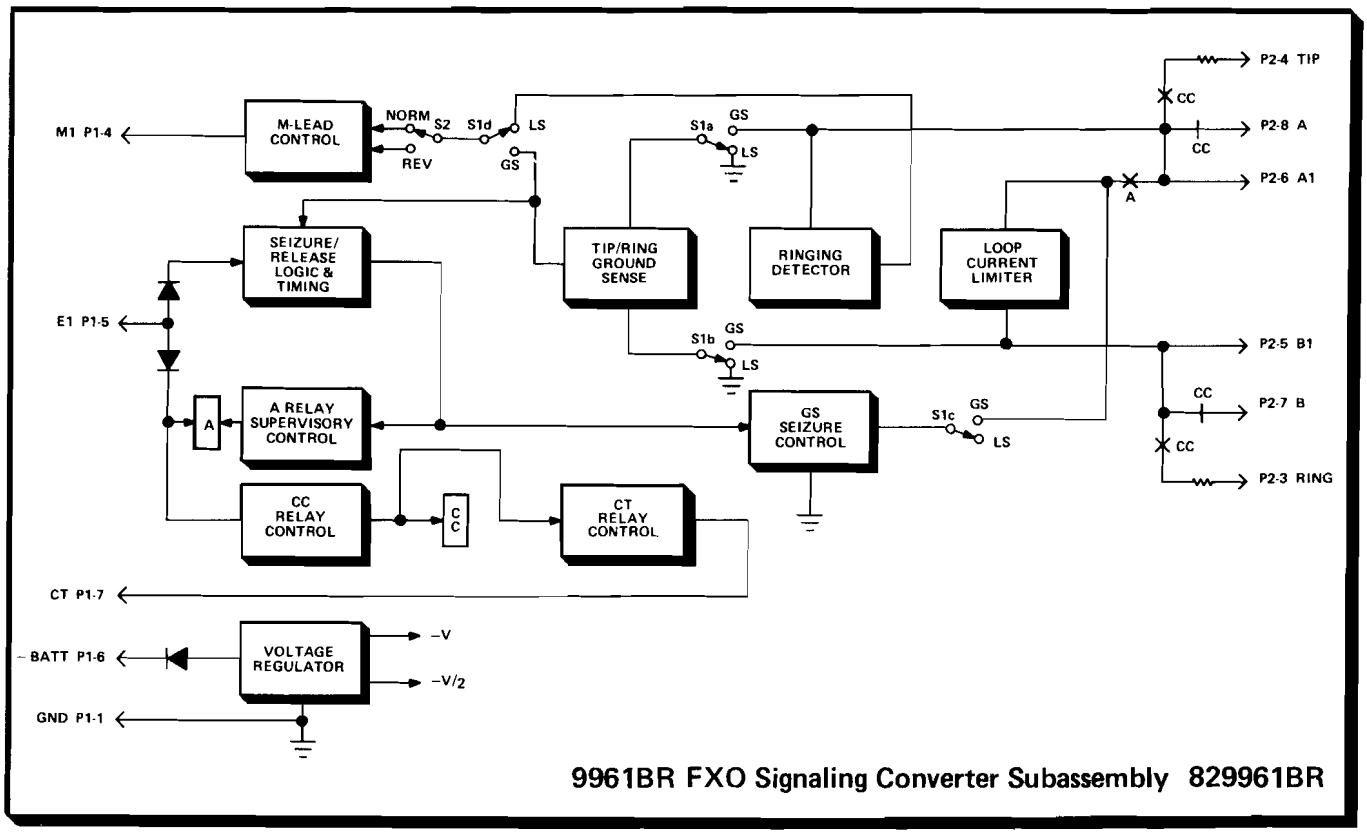
idle termination removal delay
100ms nominal

dial pulse distortion
5% maximum, 8 to 14pps

ring-ground seizure delay (ground-start operation only)
40ms nominal

common specifications

input power requirements
voltage: −22 to −56Vdc, filtered, ground referenced
current: 60mA maximum



5. block diagram

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

dimensions
4.1 inches (10.4cm) high
1.2 inches (3.0cm) wide
5.1 inches (13.0cm) deep

weight
4 ounces (113 grams)

mounting
mounts on printed circuit board of 6461R Common Signaling Module via two male connectors on 9961BR and two receptacles on 6461R

7. testing and troubleshooting

7.01 The Testing Guide Checklist in this section may be used to assist in the installation, testing, or troubleshooting of the 9961BR FXO Signaling Converter subassembly. The Checklist is intended as an aid in the localization of trouble to a specific module or subassembly. If a subassembly is suspected of being defective, a new subassembly should be substituted and the test conducted again. If the substitute subassembly operates correctly, the original subassembly should be considered defective and returned to Tellabs for repair or replacement. Internal (component-level) testing and repairs are prohibited by FCC regulations and may void the 9961BR's warranty.

Note: *Warranty service does not include removal of permanent customer markings, although an attempt will be made to do so. If a subassembly must be marked* **defective**, *we recommend that it be done on a piece of tape or on a removable stick-on label.*

7.02 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

7.03 If a 9961BR 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

7.04 To obtain a replacement 9961BR subassembly, 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 8X9961BR part number that indicates the issue of the subassembly in question. Upon notification, we shall ship a replacement subassembly to you. If the subassembly in question is in warranty, the replacement will be shipped at no charge. Pack the defective 9961BR in the replacement subassembly's carton, sign the packing slip included with the replacement, and enclose it with the defective subassembly (this is your return authorization). Affix the preaddressed label provided with the replacement subassembly to the carton being returned, and ship the module prepaid to Tellabs.

repair and return

7.05 Return the defective 9961BR subassembl shipment prepaid, to Tellabs (attn: repair a return).

in the USA: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532

in Canada: Tellabs Communications Canada, Lt
1200 Aerowood Drive, Unit 39
Mississauga, Ontario, Canada L4W 2

Enclose an explanation of the subassembly's m function. Follow your company's standard pr cedure with regard to administrative paperwor Tellabs will repair the subassembly and ship it ba to you. If the subassembly is in warranty, invoice will be issued.

testing guide checklist

Note: *The 9961BR must be tested in place (i.e., while mounted on the host 6461R module).*

test	test procedure	normal result	if normal conditions are not met, verify:
circuit idle supervision loop start, normal or inverted M-lead operation	With circuit idle, determine M-lead condition via M-lead LED on host 6461R.	M-lead LED lit (M lead at battery) in normal mode ☐. M-lead LED unlit (M lead at ground) in inverted mode ☐.	Option switches correct ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐. Local office wiring ☐.
circuit idle supervision, ground start, normal or inverted M-lead operation	With circuit idle, determine M-lead condition via M-lead LED on host 6461R.	M-lead LED unlit (M lead at ground) in normal mode ☐. M-lead LED lit (M lead at battery) in inverted mode ☐.	Option switches correct ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐. Local office wiring ☐.
outgoing seizure, loop start, normal or inverted M-lead operation	Apply ringing to terminal-side loop. Observe M-lead LED on host 6461R.	M-lead LED unlit (M lead at ground) when ringing applied in normal mode ☐. M-lead LED lit (M lead at battery) when ringing applied in inverted mode ☐.	Option switches correct ☐. Circuit not seized from distant end ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.
outgoing seizure, ground start, normal or inverted M-lead operation	Apply tip ground toward 9961B from office-side loop and observe M-lead LED on host 6461R.	M-lead LED lit (M lead at battery when tip ground applied) in normal mode ☐. M-lead LED unlit (M lead at ground when tip ground applied) in inverted mode ☐.	Option switches correct ☐. Circuit not seized from distant end ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.
circuit idle, incoming signaling	With distant station on-hook, observe E-lead LED on host 6461R and loop status.	E-lead LED unlit (E lead open) ☐. Loop open ☐.	Option switches correct ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.
incoming seizure, loop start	Seize circuit from distant end. Observe E-lead LED on host 6461R and loop status.	E-lead lit (E lead at ground) ☐. Loop seized ☐. Continuity between tip and ring leads (pins 41 and 43 on host 6461) ☐.	Option switches correct ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.

test	test procedure	normal result	if normal conditions are not met, verify:
incoming seizure, ground start	Seize circuit from distant end. Observe E-lead LED on host 6461R. Also observe loop status when ground applied to tip lead (6461R pin 41) after detection of ring-lead (6461R pin 43) ground.	E-lead LED lit (E lead at ground) ☐. Ground applied to local ring lead ☐. When local office places ground on tip lead, ring ground removed ☐. Continuity between tip and ring leads (pins 41 and 43 on host 6461R) ☐.	Option switches correct ☐. Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.
dialing	Request distant end to send dial pulses at 50% break and 10pps. Observe local loop pulsing.	Loop dial pulses between 45% and 70% break, depending upon facility characteristics ☐.	Replace 9961BR and retest ☐. Replace host 6461R and retest ☐.
idle circuit termination and busy-condition transmission	Determine that CC relay operates. This can be done as follows: Insert 1000Hz tone at 0dBm at 2wire port or 4wire xmt input port of host 6461 (pins 41 and 43). Using 600 ohm terminated transmission measuring set, measure level at 4wire transmit output port of host 6461R (pins 8 and 10).	With circuit seized, levels consistent with circuit alignment levels ☐. With circuit idle, levels 3 to 9dB below circuit alignment levels ☐.	Option switches correct ☐. Power to host 6461R ☐. Replace 9961BR and retest ☐.

Tellabs Incorporated
4951 Indiana Avenue, Lisle, Illinois 60532
telephone (312) 969-8800 twx 910-695-3530