

Please Note: The 6008B subassembly can be optionally installed (by the customer or the factory) on the Tellabs 6132 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module as well as on the 6131 module. When installed on a 6132, the 6008B and its host module are referred to, and can be ordered as, the **6132B**.

6008B FXO-to-E&M Signaling Converter Subassembly

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1. general description

1.01 The 6008B FXO-to-E&M Signaling Converter plug-on subassembly (figure 1) provides bidirectional conversion between foreign-exchange office-end (FXO) signaling, which is the type of loop signaling normally used at the office (switching-equipment) end of a foreign-exchange (FX) or off-premises-station (OPS) circuit, and the type of E&M signaling used by a carrier channel (or a PBX). In such applications, the 6008B converts FXO signaling from the office end of the circuit to E-lead outputs (with A-side signaling) or M-lead outputs (with B-side signaling) toward the carrier channel or PBX, and converts M-lead inputs (with A-side signaling) or E-lead inputs (with B-side signaling) from the carrier channel (or PBX) to FXO signaling toward the office end. The 6008B subassembly is designed expressly for optional use on the Tellabs 6131 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module.

1.02 This practice section is revised to update the text portion of section 7.

1.03 Functions, features, and options of the 6008B include the following:

- Switch-selectable A-side or B-side E&M signaling.
- Independently switch-selectable normal or inverted input operation and output operation on the subassembly's E&M side.
- Switch-selectable loop-start, ground-start, or reverse-battery supervision.
- Active office-side loop-current limiting.
- Transmission-path-cut control
- A busy-indicating LED that is visible on the host module's front panel when the 6008B is installed on the 6131.

1.04 The 6131 module on which the 6008B subassembly is used provides transmission interface between a 2wire or 4wire loop-signaling facility and a 4wire E&M trunk. Along with switch-selectable 2wire or 4wire facility-side interface, transformer coupling is provided at all ports of the 6131, and prescription bidirectional level control (loss only in FCC-registered applications, gain or loss in non-registered applications) is also available on the

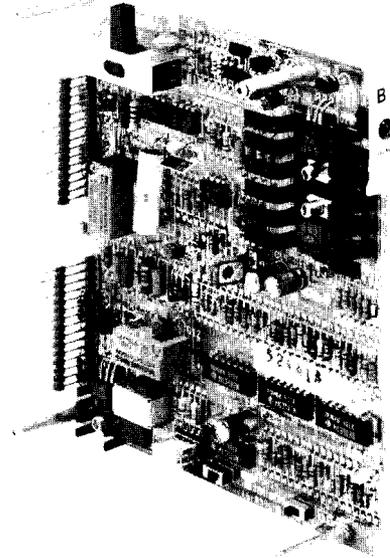


figure 1. 6008B FXO-to-E&M Signaling Converter subassembly

module. Thus, in the 2wire-to-4wire mode, the 6131 itself functions as a hybrid terminating set with pads (registered) or as a 2wire-to-4wire repeater (non-registered). In the 4wire-to-4wire mode, the 6131 functions as a pad/transformer module (registered) or as a 4wire-to-4wire repeater (non-registered). When the 6008B subassembly is installed on the 6131 module, the resulting module-subassembly combination is referred to as a **6131B**. The 6008B subassembly makes physical and electrical connection to its host 6131 via two 15-pin male connectors on the 6008B and corresponding female connectors on the printed circuit board of the 6131.

Note: While the 6008B subassembly and 6131 module can be ordered separately, the 6131 can also be ordered with the 6008B factory-installed on the module. To do this, simply specify the **6131B** module on the order.

1.05 With the 6008B subassembly installed, the host 6131 can be switch-optional for either of three facility-side signaling-lead arrangements:

- **Bypass:** In the *bypass* mode, the 6008B subassembly is electrically bypassed so that no signaling conversion takes place.
- **Normal:** In the *normal* mode with 2wire facility interface selected, the 6131's A lead is associated with the 2wire tip lead, and the B lead is associated with the 2wire ring lead. In the *normal* mode with 4wire facility interface selected, the 6131's receive output simplex (SX) lead (or A lead) is associated with the 4wire receive output pair, and the transmit input SX lead (or B lead) is associated with the 4wire transmit input pair.

- **Reverse:** In the *reverse* mode with 2wire facility interface selected, the 6131's A lead is associated with the 2wire ring lead, and the B lead is associated with the 2wire tip lead. In the *reverse* mode with 4wire facility interface selected, the 6131's receive output SX lead (or A lead) is associated with the 4wire transmit input pair, and the transmit input SX lead (or B lead) is associated with the 4wire receive output pair.

1.06 Input power is supplied to the 6008B sub-assembly via the host 6131 module. Integral voltage regulators on the 6008B and the 6131 allow the 6131B to operate on filtered, ground-referenced -22 to -56 Vdc input. Maximum current required by the 6008B and its host 6131 together is 140mA. Both M-lead and tip-ground (ring-ground in 6131's *reverse* signaling mode) circuitry are supplied with input power prior to regulation, which permits conventional M-lead potentials to be used and also provides normal loop supervisory ranges.

1.07 As stated above, the 6008B plugs onto the printed circuit board of its host 6131, a Type 10 module. The resulting 6131B, in turn, plugs into one position of a 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. application

2.01 The 6008B FXO-to-E&M Signaling Converter subassembly, when installed on its host 6131 2Wire/4Wire-to-4Wire Terminal Interface Module, interfaces a 2wire or 4wire FX or OPS facility that uses FXO-type loop signaling with a 4wire E&M trunk that normally interfaces a carrier channel. Typically, the FXO facility is terminated in a (2wire) CO switch or a PBX, although in some cases the termination may be a 4wire link to a remote PBX. When the host 6131 module is optioned for 2wire facility interface, signaling is derived via the module's 2wire tip and ring leads. When the 6131 is optioned for 4wire facility interface, signaling is derived via the module's receive output SX and transmit input SX leads. Signaling interface between the 6008B and its host 6131 is accomplished via local A&B leads.

2.02 The 6131B module-subassembly combination is typically used with a Tellabs 6131A combination at the station end of the FX or OPS circuit. This combination consists of a host 6131 module and a Tellabs 6008A FXS-to-E&M Signaling Converter subassembly, which together provide both 2wire-to-4wire or 4wire-to-4wire transmission interface and bidirectional signaling conversion between the foreign-exchange station-end (FXS) loop signaling used by the station equipment and the E&M signaling used by an associated carrier channel.

2.03 In any application, the 6008B can be switch-optioned for A-side or B-side E&M signaling; loop-

start, ground-start, or reverse-battery supervision; normal or inverted E&M-lead input states; and normal or inverted E&M-lead output states. Table 1 summarizes, for various combinations of signaling and supervisory options, the E&M-side outputs resulting from facility- (FXO-) side seizure. Please note that, in the ground-start supervisory mode, negatively biased ringing generator is received via the B lead and ground return is provided via the A lead. Table 2 summarizes, for the same combinations of signaling and supervisory options listed in table 1, the E&M-side inputs that cause loop closure on the facility (FXO) side.

2.04 In high-priority or high-security applications, it may be desirable to use a signaling arrangement that results in an outgoing loop seizure (forced busy) at the local (office) end if the E&M facility fails. Such an arrangement requires M-lead negative battery (A-side signaling) or E-lead ground (B-side signaling) at the local (office) end during idle. To implement this arrangement, the 6008B must be optioned for **inverted** E&M inputs in either loop-start, ground-start, or reverse-battery applications. Please be aware, however, that in most applications it is not desirable to permanently seize the office end when the facility fails. In such cases, the 6008B should be optioned for **normal** E&M inputs in all three supervisory modes.

Note: *If a Tellabs 6131A combination is being used at the distant (station) end of the circuit, the distant-end 6008A subassembly can be optioned so that failure of the E&M facility causes an incoming loop seizure at that end. The resultant continuous ringing then serves as an immediate audible indication of the facility failure. See the Tellabs 6008A practice for details.*

2.05 The 6131B module-subassembly combination can be physically located in the circuit at any distance from the serving switching equipment (CO or PBX) consistent with the loop supervisory limits of the switching equipment. The E&M-side range is determined by the limitations of the associated E&M signaling equipment. A loop-current regulator on the 6008B limits dc loop current to approximately 38mA, thereby eliminating the need for line build-out resistors.

2.06 All internal circuitry of the 6008B receives power via internal regulators (which permit operation on -22 to -56 Vdc filtered input) on both the host 6131 and the 6008B itself. To ensure proper tip-lead sensing in ground-start applications, the dc input power supplied to the 6008B must be of the same voltage as that used by the FXO-side switching equipment. M-lead power is derived directly from the external power source. Thus, if the associated carrier channel (or other E&M-side equipment) requires -48 Vdc M-lead potential, the 6131B must be powered from a nominal -48 Vdc source.

2.07 Table 3 lists a variety of possible operating modes of the 6131B, along with the switch options

A-side/B-side E&M signaling*	normal or inverted E&M outputs	supervisory mode	output when ringing	output when not ringing
A side*	normal	loop start	E-lead is floating	E-lead ground
		reverse battery	E-lead is floating	E-lead ground
		ground start	E-lead ground	E-lead is floating
A side*	inverted	loop start	E-lead ground	E-lead is floating
		reverse battery	E-lead ground	E-lead is floating
		ground start	E-lead is floating	E-lead ground
B side*	normal	loop start	M-lead ground	M-lead negative battery
		reverse battery	M-lead ground	M-lead negative battery
		ground start	M-lead negative battery	M-lead ground
B side*	inverted	loop start	M-lead negative battery	M-lead ground
		reverse battery	M-lead negative battery	M-lead ground
		ground start	M-lead ground	M-lead negative battery

* The 6008B subassembly is optioned for A-side signaling when it interfaces equipment that provides M-lead outputs and receives E-lead inputs. The 6008B subassembly is optioned for B-side signaling when it interfaces equipment that provides E-lead outputs and receives M-lead inputs. Thus, when the 6008B is optioned for A-side or B-side signaling, this means that it is properly conditioned **to interface** equipment that provides A-side or B-side signaling, respectively.

table 1. E&M outputs resulting from facility- (FXO-) side seizure

A-side/B-side E&M signaling*	normal or inverted E&M output states	supervisory mode	input from E&M side
A side*	normal	loop start	M-lead negative battery
		reverse battery	M-lead negative battery
		ground start**	M-lead negative battery
A side*	inverted	loop start	M-lead ground
		reverse battery	M-lead ground
		ground start**	M-lead ground
B side*	normal	loop start	E-lead ground
		reverse battery	E-lead ground
		ground start**	E-lead ground
B side*	inverted	loop start	E-lead open
		reverse battery	E-lead open
		ground start**	E-lead open

* See the footnote at the bottom of table 1 for information on A-side and B-side optioning.
 ** In ground-start operation, a tip ground (ring ground if the host 6131 is optioned for a **reverse** signaling arrangement) must be detected before loop closure can occur.

table 2. E&M inputs that cause facility- (FXO-) side loop closure

required to implement these modes and the E&M-side logic states that accomplish signaling. When referring to table 3, please note the following:

- The input and output switch settings (normal or inverted) apply to the 6008B's **E&M-side** inputs and outputs.
- The 6008B's A-side/B-side signaling optioning depends upon the E&M signaling equipment that interfaces the 6131B. The 6008B is optioned for A-side signaling when the 6131B interfaces equipment that provides M-lead outputs and receives E-lead inputs. B-side signaling is selected when the 6131B interfaces equipment that provides E-lead outputs and receives M-lead inputs.
- When the 6131 module is optioned for 2wire facility-side (loop-signaling) interface, its A&B leads are derived via the 2wire tip and ring leads. When the 6131 module is optioned for 4wire

facility-side interface, its A&B leads are derived via the facility-side SX leads.

3. installation inspection

3.01 The 6008B FXO-to-E&M 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 6008B subassembly makes physical and electrical connection to the host 6131 module via two 15-pin male connectors, P1 and P2, located on the subassembly's component side. To install the 6008B on the host 6131, proceed as follows:

- Remove the small plastic filler panel at the upper righthand corner of the 6131's front panel by pushing it outward from the rear of the panel.

facility interface	supervisory mode	required switch options*		E&M-side logic signals
		6008B	6131	
2wire	loop start	S12 = LS (loop start) S18 (input) = SIG S19 (output) = SIG	S14 (sig. mode) = NORM S5 = 2WIRE	incoming: on-hook = open loop off-hook = closed loop outgoing: not ringing = off-hook ringing = on-hook
4wire	loop start	S12 = LS (loop start) S18 (input) = SIG S19 (output) = SIG	S14 (sig. mode) = NORM S5 = 4WIRE	incoming: on-hook = open loop off-hook = closed loop outgoing: not ringing = off-hook ringing = on-hook
2wire	ground start	S12 = GS (ground start) S18 (input) = SIG S19 (output) = SIG	S14 (sig. mode) = NORM S5 = 2WIRE	incoming: on-hook = open loop off-hook = closed loop/ B-lead ground outgoing: A-lead open/not ringing = on-hook A-lead ground/ringing = off-hook
4wire	ground start	S12 = GS (ground start) S18 (input) = SIG S19 (output) = SIG	S14 (sig. mode) = NORM S5 = 4WIRE	incoming: on-hook = open loop off-hook = closed loop/ B-lead ground outgoing: A-lead open/not ringing = on-hook A-lead ground/ringing = off-hook
2wire	reverse battery	S12 = RB (reverse battery) S18 (input) = SIG S19 (output) = INV	S14 (sig. mode) = REV S5 = 2WIRE	incoming: on-hook = open loop off-hook = closed loop outgoing: normal battery/not ringing = on-hook reverse battery/ringing = off-hook
4wire	reverse battery	S12 = RB (reverse battery) S18 (input) = SIG S19 (output) = INV	S14 (sig. mode) = REV S5 = 4WIRE	incoming: on-hook = open loop off-hook = closed loop outgoing: normal battery/not ringing = on-hook reverse battery/ringing = off-hook

* See the 6131 practice and section 3 of this practice for switch options not listed in this table.

table 3. Typical 6131B operating modes

- B. Orient the 6008B subassembly so that male connector *P1* on the 6008B lines up with female connector *J1* on the 6131, male connector *P2* on the 6008B lines up with female connector *J2* on the 6131, and the small rectangular plastic panel labeled *B* and containing the *busy* LED on the 6008B lines up with the opening at the upper righthand corner of the 6131's front panel adjacent to the 6131 model number.
- C. Carefully plug the 6008B onto the host 6131, ensuring that all connector pins on the 6008B fit properly into their receptacles on the 6131's female connectors and also ensuring that the small plastic panel labeled *B* on the 6008B fits

properly into the opening in the 6131's front panel.

- D. Finally, install and tighten the screws (supplied) that secure the 6008B's four standoff posts to the 6131's printed circuit board.

options and alignment

3.03 The 6008B subassembly itself requires no alignment. Before the 6008B is placed into service, however, four option switches on the subassembly itself must be set. One is a three-position slide switch, and the other three are two-position slide switches. (Two of the three two-position switches are miniature; the other is standard size.) Figure 2

shows the locations of these switches on the sub-assembly's printed circuit board. In addition to the 6008B's switches, several option switches on the host 6131 module must be set as well. Instructions for setting the 6131's option switches are provided in the Tellabs 6131 practice, while instructions for setting the 6008B's option switches are provided below.

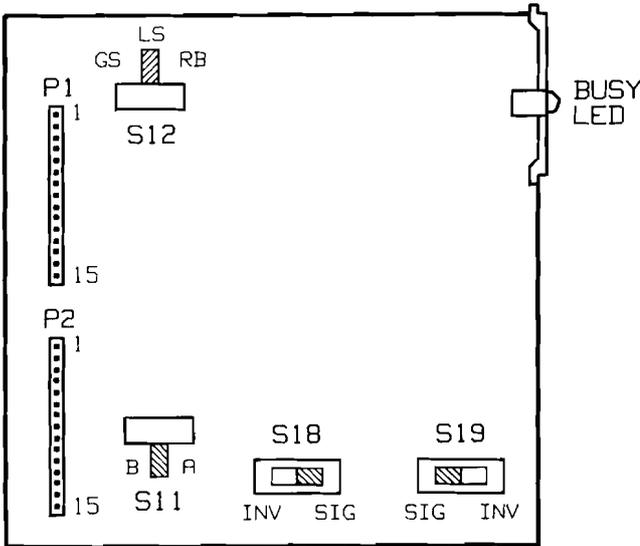


figure 2. 6008B option switch locations

prescription optioning

3.04 For prescription optioning of the 6008B, all required option-switch settings should be determined from circuit records prior to installation of the 6131B. These required options should then be noted in the checklist column of table 4 or on the circuit layout record (CLR). During installation, the 6008B can be quickly and easily optioned without referring to the detailed optioning instructions in the text. Simply refer to the checklist column of table 4 (or to the CLR) and set all option switches as indicated.

Note: A similar table and checklist are provided in the Tellabs 6131 practice for prescription optioning and alignment of the host 6131 module.

non-prescription optioning

3.05 If prescription option-switch settings are not available for the 6008B, set its four option switches as directed below.

3.06 **A-Side or B-Side E&M Signaling.** Two-position slide switch S11 conditions the 6008B to interface, on its E&M side, equipment that uses either A-side or B-side E&M signaling. Set S11 as follows:

- If the equipment interfaced on the 6008B's E&M side uses A-side signaling (i.e., provides M-lead outputs and receives E-lead inputs), set S11 to the A position.
- If the equipment interfaced on the 6008B's E&M side uses B-side signaling (i.e., provides E-lead outputs and receives M-lead inputs), set S11 to the B position.

3.07 **Supervisory Mode.** Three-position slide switch S12 selects either the loop-start, ground-start, or reverse-battery supervisory mode. Set S12 as follows:

- For loop-start supervision, set S12 to the LS position.
- For ground-start supervision, set S12 to the GS position.
- For reverse-battery supervision, set S12 to the RB position.

3.08 **Normal or Inverted E&M Inputs.** Miniature two-position slide switch S18 selects either normal or inverted E&M-side inputs. Set S18 as follows:

- For normal E&M-side inputs, set S18 to the SIG position.
- For inverted E&M-side inputs, set S18 to the INV position.

3.09 **Normal or Inverted E&M Outputs.** Miniature two-position slide switch S19 selects either normal or inverted E&M-side outputs. Set S19 as follows:

switch option	switch	selection	setting	checklist
A-side*/B-side** E&M signaling	S11	A-side signaling*	A	
		B-side signaling**	B	
supervisory mode	S12	loop start	LS	
		ground start	GS	
		reverse battery	RB	
normal or inverted E&M inputs	S18	normal inputs	SIG	
		inverted inputs	INV	
normal or inverted E&M outputs	S19	normal outputs	SIG	
		inverted outputs	INV	

* Option for A-side signaling if 6008B's E&M side interfaces equipment that provides M-lead outputs and receives E-lead inputs.

** Option for B-side signaling if 6008B's E&M side interfaces equipment that provides E-lead outputs and receives M-lead inputs.

table 4. Summary and checklist of 6008B switch options

- For normal E&M-side outputs, set *S19* to the *SIG* position.
- For inverted E&M-side outputs, set *S19* to the *INV* position.

4. circuit description

4.01 This circuit description is intended to familiarize you with 6008B FXO-to-E&M Signaling Converter subassembly for engineering and application purposes only. Attempts to troubleshoot the 6008B internally are not recommended. 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 6008B provides seizure and loop dial pulsing toward a central-office or PBX line circuit in response to external E&M inputs. In the loop-start or reverse-battery supervisory mode, an E-lead ground or M-lead negative battery operates the *A relay* (with switch *S18* set to *SIG*). This closes the local loop through an active *loop-current limiter* that limits loop current to approximately 38mA. Loop dial pulses are generated via the *A-relay* contacts in response to incoming E-lead or M-lead pulses. The *transmission-path-cut control* circuitry is also activated from the E&M inputs. It cuts the transmit and receive paths of the host 6131 during the on-hook and dial-pulsing states.

4.03 In the ground-start supervisory mode, E&M inputs control the 6008B's *seizure/release logic* as well as the *A relay* and the *transmission-path-cut control* circuitry. The *seizure/release logic* circuit provides input to the ground-start seizure-control circuit, which places ground on the CO or PBX ring lead in response to an E-lead ground or M-lead negative battery (with *S18* set to *SIG*). When the CO or PBX responds to incoming seizure by placing ground on the tip lead, the 6008B's tip-ground sensing circuit indicates outgoing seizure via the E lead or 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 ground via the *seizure/release*

logic circuit. After this conversion from the ground-start to the loop-start supervisory mode is completed, incoming dial pulses are repeated by the *A relay*, while supervisory continuity is maintained via the *seizure/release logic*. 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 supervisory mode is controlled by an opto-coupler *ringing detector* bridged across the local A&B leads. In the reverse-battery supervisory mode, the signaling output is controlled by the *ringing* and *reverse-battery detectors*. The function of this output due to battery reversal depends upon the settings of option switch *S14* (normal or reversed signaling) on the host 6131 and option switch *S19* (normal or inverted E&M outputs) on the 6008B. The E&M outputs resulting from ringing in the loop-start and reverse-battery supervisory modes for various signaling options are listed in table 1 in section 2 of this practice. The E&M outputs that result both from ringing and from the absence of ringing with various signaling options in effect are also listed in table 1. Table 5 below lists E&M outputs with a variety of signaling options in the reverse-battery supervisory mode.

4.05 In the ground-start supervisory mode, outgoing signaling is controlled by the *tip/ring-ground detector* circuit. Detection of ground on either the tip or ring lead causes the E&M output to change state. E&M-lead control is not obtained from the *ringing detector* circuit in the ground-start mode. The E&M output resulting from a tip or ring ground for various signaling-option combinations are listed in table 1. Please note that the tip and ring leads are interchanged if option switch *S14* on the host 6131 is set to the *REV* position for reversed signaling.

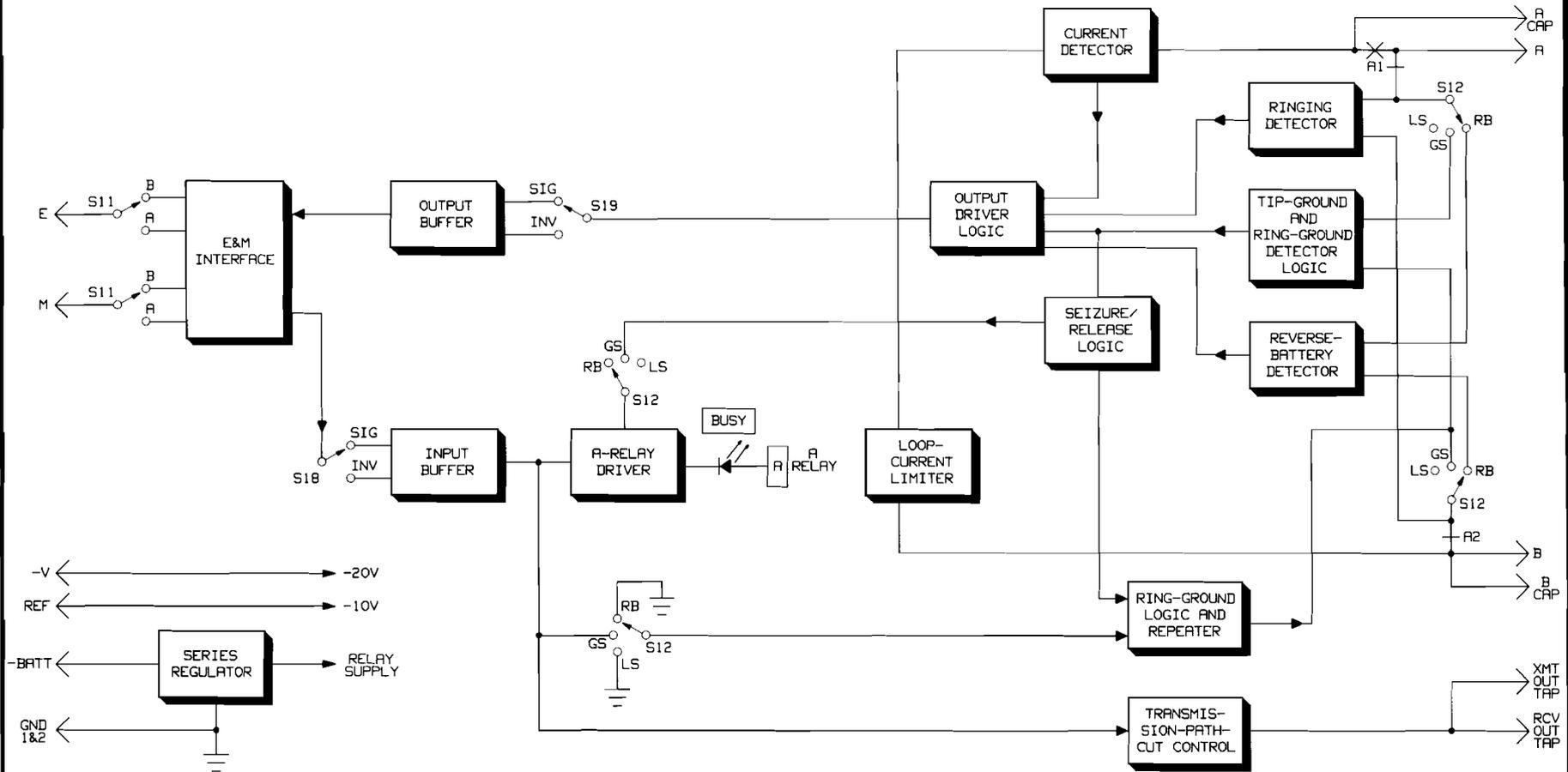
4.06 An active *series regulator* integral to the 6008B supplies power to the subassembly's relays from -22 to -56Vdc input. Other supplies and references (-20 and -10Vdc) are supplied by the host 6131 module. The 6008B's *series regulator* uses a zener diode for establishing the relay supply and series pass transistor for voltage limiting.

normal/reverse battery	normal/reverse signaling on 6131 (S14)	normal/inverted E&M outputs on 6008B (S19)	6008B E&M output states
normal battery	normal	normal	on-hook
normal battery	normal	inverted	off-hook
normal battery	reverse	normal	off-hook
normal battery	reverse	inverted	on-hook
reverse battery	normal	normal	off-hook
reverse battery	normal	inverted	on-hook
reverse battery	reverse	normal	on-hook
reverse battery	reverse	inverted	off-hook

table 5. E&M outputs with normal and reverse battery for various signaling options

E&M SIDE

FXO SIDE



page 7

6008B FXO-to-E&M Signaling Converter subassembly

816008B

5. block diagram

practice section 816008B

6. specifications

general

external E&M-lead resistance
500 ohms maximum

ringing frequency range
16 to 67Hz

ringing voltage
50Vrms minimum

ringing-detection delays
operate: 80±40ms
release: 80±40ms

ring-ground delays
operate: 15±10ms
release: 15±10ms

tip-ground delays
operate: 10±5ms
release: 200±100ms

reverse-battery delays (in busy state)
attack: 75±30ms
release: 75±30ms

transmission-path-cut control timing
insertion delay: 15±10ms
release delay: 15±10ms

maximum loop current
40mA

dial-pulse distortion
5 percent maximum

dial-pulse range
7.5 to 12.5pps

input power requirements
voltage: -22 to -56Vdc, filtered, earth-ground-referenced (supplied via host 6131 module)
current: 140mA maximum, including host 6131 but not including loop current

operating environment
32° to 130° F (0° to 54°C), humidity to 95% (no condensation)

dimensions
5.25 inches (13.35cm) high
1.14 inches (2.90cm) wide
5.20 inches (13.21cm) deep

weight
6 ounces (170 grams), not including host 6131 module

mounting
plugs onto printed circuit board of a Tellabs 6131 2W/4W-4W Terminal Interface Module, which, in turn, plugs into one position of a Tellabs Type 10 Mounting Shelf (relay-rack- or apparatus-case-configured)

transmission specifications affected by 6008B

2wire-port echo return loss
20dB ERL minimum vs. 600 or 900 ohms in series with 2.15µF, without current limiting
25dB ERL minimum vs. 600 or 900 ohms in series with 2.15µF, with current limiting active

transhybrid loss
25dB ERL minimum with precision termination of 600 ohms plus 2.15µF

insertion loss

0.3dB nominal at 1000Hz and 600 ohms

nominal frequency response (re 1000Hz)

receive path, 2wire facility interface:

300 to 1000Hz: -1.5, +1.0dB

1000 to 4000Hz: -1.5, +1.0dB

receive path, 4wire facility interface:

300 to 1000Hz: -0.8, +0.2dB

1000 to 4000Hz: -0.8, +0.5dB

transmit path, 2wire facility interface:

300 to 1000Hz: -1.5, +1.0dB

1000 to 4000Hz: -1.5, +1.0dB

transmit path, 4wire facility interface:

300 to 1000Hz: -0.8, +0.2dB

1000 to 4000Hz: -0.5, +0.5dB

longitudinal balance

60dB minimum, 200 to 1000Hz

50dB minimum at 4000Hz

7. testing and troubleshooting

7.01 The **troubleshooting guide** in this section may be used to assist in the installation, testing, or troubleshooting of the 6008B FXO-to-E&M Signaling Converter subassembly. The guide is intended as an aid in the localization of trouble to this specific equipment. If the equipment is suspected of being defective, substitute new equipment (if possible) and conduct the test again. If the substitute operates correctly, the original should be considered defective and returned to Tellabs for repair or replacement as directed below. We strongly recommend that no internal (component-level) testing or repairs be attempted on the equipment. Unauthorized testing or repairs may void its warranty. Also, if the equipment is part of a registered system, unauthorized repairs will result in noncompliance with Parts 15 and/or 68 of the FCC Rules and Regulations.

Note: *Although repair service always includes an attempt to remove any permanent markings made by customers on Tellabs equipment, the success of such attempts cannot be guaranteed. Therefore, if equipment must be marked **defective** or **bad**, we recommend that it be done on a piece of tape or on a removable stick-on label.*

technical assistance via telephone

7.02 If a situation arises that is not covered in the **troubleshooting guide**, contact Tellabs Customer Service as follows:

USA customers: Contact your Tellabs Regional Office listed below.

region	telephone	office location
US Atlantic	(203)798-0506	Danbury, CT
US Capital	(703)359-9166	Washington, DC
US Central	(312)357-7400	Chicago, IL
US Southeast	(305)834-8311	Orlando, FL
US Southwest	(214)869-4114	Dallas, TX
US Western	(714)850-1300	Orange County, CA