

6008D E&M-to-E&M Signaling Converter Subassembly

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1. general description

1.01 The 6008D E&M-to-E&M Signaling Converter plug-on subassembly (figure 1) provides bidirectional conversion between facility-side E&M signaling and the E&M signaling required by an associated terminal-side carrier channel or PBX. The subassembly is designed 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 6008D include the following:

- Switch-selectable A-side or B-side E&M signaling on both the facility and terminal sides.
- Switch-selectable Type I, II, or III terminal-side E&M interface.
- Switch-selectable Type I, II, III, or V facility-side E&M interface.
- Bidirectional dial-pulse compensators to minimize pulse distortion.
- Front-panel LED's to indicate terminal-side E-lead and M-lead busy.
- Transmit and receive transmission-path-cut control.
- Lightning protection for the facility-side M lead with Type I interface and B-side signaling.

1.04 The 6131 module on which the 6008D is used provides transmission interface between a 2wire or 4wire 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 module. Thus, in the 2wire-to-4wire mode, the 6131 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 6008D is installed on the 6131, the resulting module-subassembly combination is referred to as a **6131D**. The 6008D subassembly makes physical and electrical connection to its host 6131 via two 15-pin male

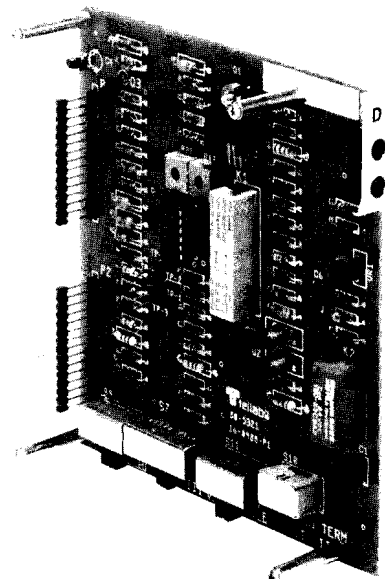


figure 1. 6008D E&M-to-E&M Signaling Converter subassembly

connectors on the 6008D and corresponding female connectors on the printed board of the 6131.

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

1.05 With the 6008D subassembly installed, the host 6131's signaling-lead-arrangement option switch is nonfunctional. Signaling conversion takes place regardless of whether the switch is set to the **NORMAL**, **REVERSE**, or **BYPASS** position.

1.06 The 6008D subassembly receives input power from its host 6131 module. The subassembly's integral voltage regulator permits operation on filtered, ground-referenced -22 to -56 Vdc input. Maximum current requirement for the 6131D module-subassembly combination is 140mA. M-lead circuitry accesses input power prior to regulation, thereby permitting the use of conventional external M-lead potentials.

1.07 As stated above, the 6008D plugs onto the printed circuit board of its host 6131, a Type 10 module. The resulting 6131D, in turn, plugs into one position of a Tellabs Type 10 Mounting Shelf, which is 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 6008D E&M-to-E&M Signaling Converter subassembly, when installed on its host 6131 2Wire/4Wire-to-4Wire Terminal Interface Module, interfaces a 2wire or 4wire facility that uses E&M signaling with a 4wire trunk (to an associated carrier channel or PBX) that also uses E&M signaling.

2.02 On its facility side, the 6008D can be switch-optional for either A-side or B-side E&M signaling (see note) and for Type I, II, III, or V E&M interface. The terminal side of the 6008D can be switch-optional for either A-side or B-side signaling (see note) and for Type I, II, or III E&M interface. Please be aware, however, that Type III terminal-side E&M interface requires that the subassembly be optional for A-side signaling. In other words, the 6008D can

function either as an E&M-to-E&M repeater when interfacing identical types of E&M signaling on both sides or as an E&M-to-E&M converter when one side uses a different type of E&M signaling than the other. Figures 2 through 5 show the various interfaces accommodated by the 6008D. Please observe that the only FCC-registered facility-side interfaces are Type I (A-side or B-side) and Type II (A-side or B-side). See the **appendix**, section 8 of this practice, for additional information.

Note: For each side (facility and terminal) of the 6008D, A-side signaling is selected when the associated equipment on that side provides M-lead outputs and receives E-lead inputs. B-side signaling is selected when the associated equipment provides E-lead outputs and receives M-lead inputs.

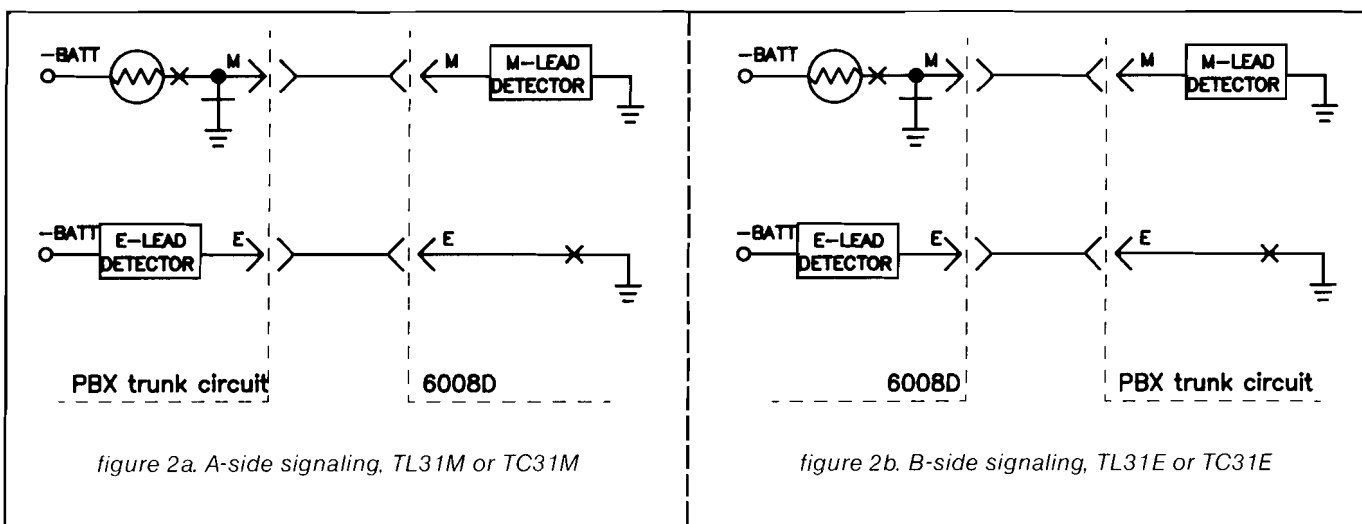


figure 2. Type I E&M interface arrangements

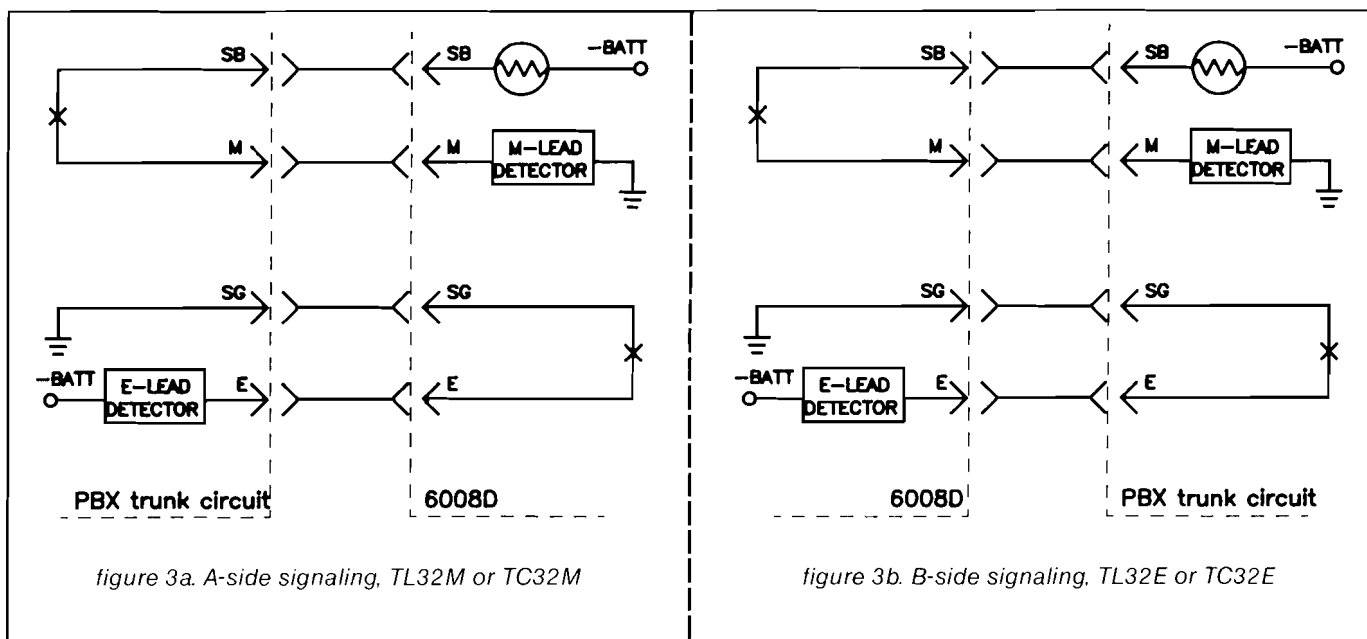


figure 3. Type II E&M interface arrangements

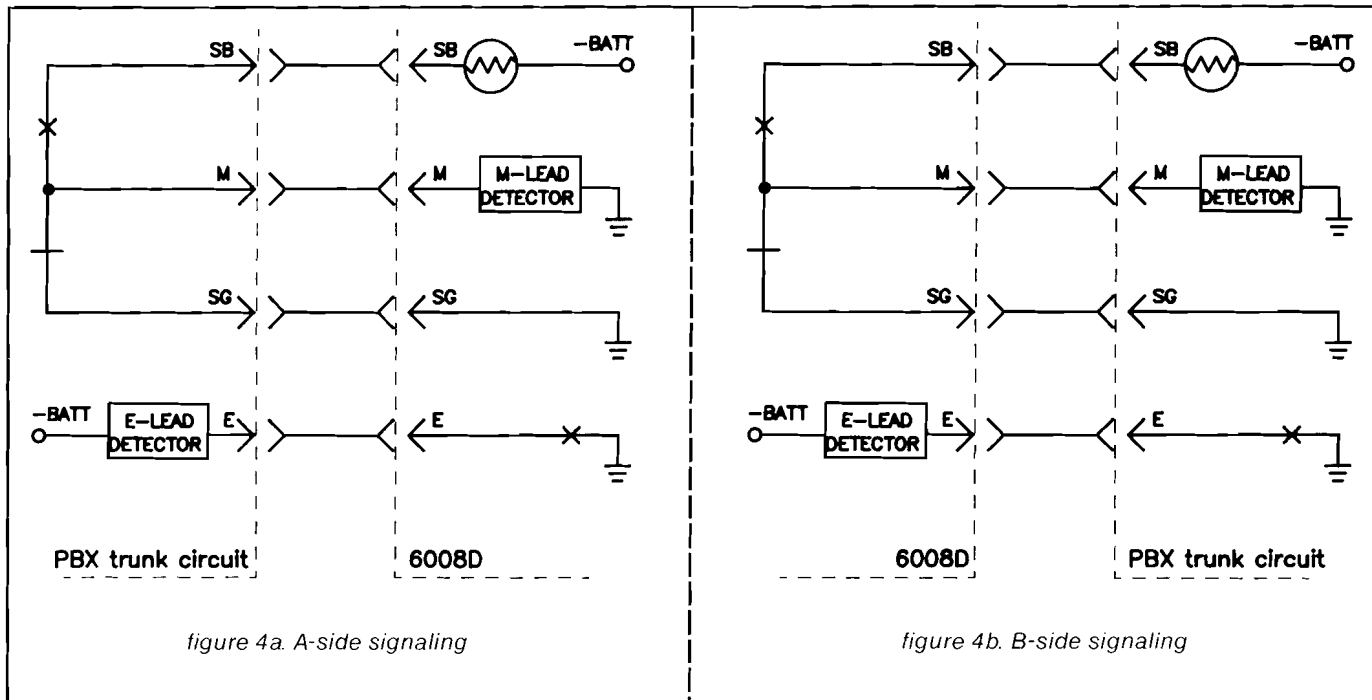


figure 4. Type III E&M interface arrangements

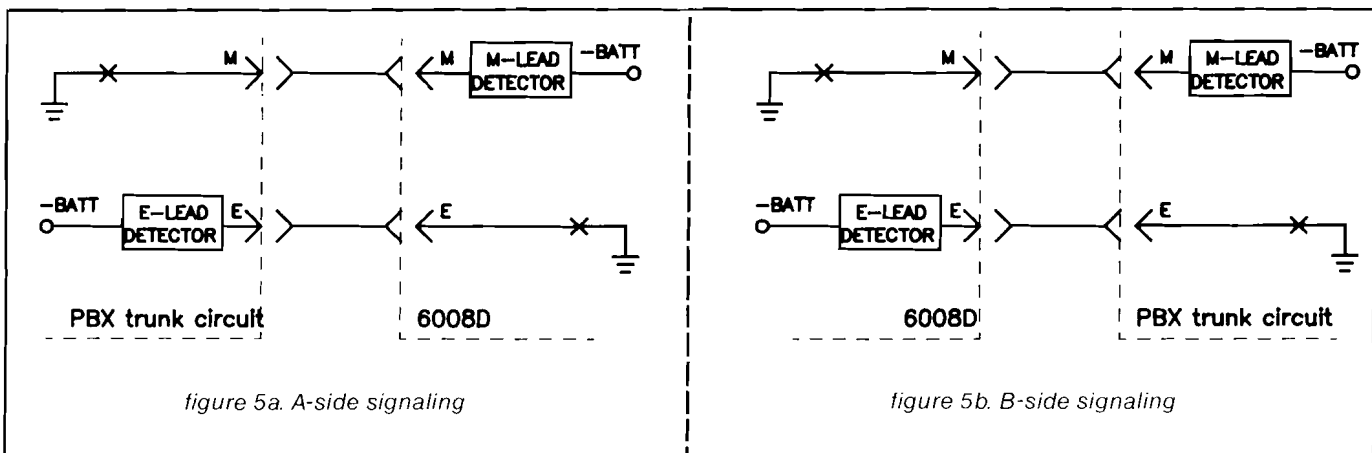


figure 5. Type V E&M interface arrangements

2.03 The 6008D's M-lead drivers are current-limited by thermistors. Under normal conditions, M-lead battery is supplied through a 23-ohm resistance. When a fault condition occurs, the thermistor folds back to reduce the M-lead current. Maximum E-lead or M-lead current drawn by the 6008D's detector is 6mA at -56Vdc.

2.04 For Type I E&M interface with B-side signaling, the M lead on the 6008D's facility side is protected against 1500V lightning surges as required by Part 68 of the FCC Rules and Regulations.

2.05 To prevent the transmission of noise, transients, speech, and other interfering signals during critical signaling intervals, the 6008D subassembly provides transmission-path-cut control for both the

transmit and receive paths of the host 6131 module. The 6131's transmit transmission path is cut (opened) when the facility-side equipment is on-hook or dialing. Similarly, the 6131's receive transmission path is cut when the terminal-side equipment is on-hook or dialing.

3. installation inspection

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

- A. 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.
- B. Orient the 6008D subassembly so that male connector *P1* on the 6008D lines up with female connector *J1* on the 6131, male connector *P2* on the 6008D lines up with female connector *J2* on the 6131, and the small rectangular plastic panel labeled *D* and containing the *E* and *M* LED's on the 6008D 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 6008D onto the host 6131, ensuring that all connector pins on the 6008D fit properly into their receptacles on the 6131's female connectors and also ensuring that the small plastic panel labeled *D* on the 6008D fits properly into the opening in the 6131's front panel.
- D. Finally, install and tighten the screws (supplied) that secure the 6008D's four standoff posts to the 6131's printed circuit board.

options and alignment

3.03 The 6008D subassembly itself requires no alignment. Before the 6008D is placed into service, however, four option switches on the subassembly itself must be set. One is a four-position slide switch, and the other three are two-position slide switches. Figure 6 shows the locations of these switches on the subassembly's printed circuit board. In addition to the 6008D's switches, several option switches on the host 6131 module must be

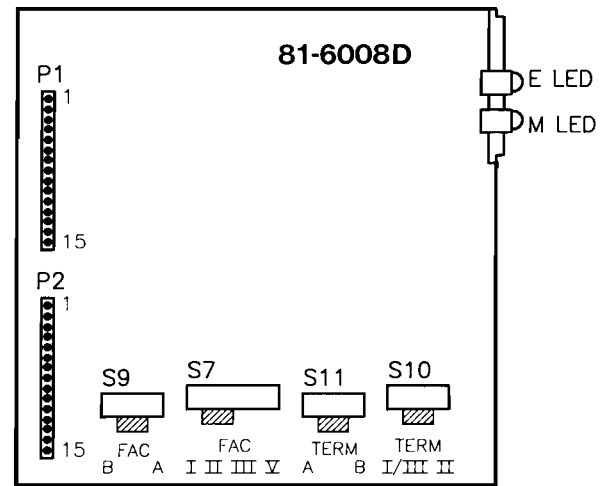


figure 6. 6008D option switch locations

set as well. Instructions for setting the 6131's option switches are provided in the Tellabs 6131 practice, while instructions for setting the 6008D's option switches are provided below.

prescription optioning

3.04 For prescription optioning of the 6008D, all required option-switch settings should be determined from circuit records prior to installation of the 6131D. These required options should then be noted in the **checklist** column of table 1 or on the circuit layout record (CLR). During installation, the 6008D can be quickly and easily optioned without referring to the detailed optioning instructions in the text. Simply refer to the **checklist** column of table 1 (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.

switch option	switch	selection	setting	checklist
A-side or B-side E&M signaling on 6008D's facility side*	S9	A-side signaling	A	
		B-side signaling	B	
Type I, II, III, or V E&M interface on 6008D's facility side	S7	Type I interface	I	
		Type II interface	II	
		Type III interface	III	
		Type V interface	V	
A-side or B-side E&M signaling on 6008D's terminal side*	S11	A-side signaling	A	
		B-side signaling	B	
Type I, II, or III E&M interface on 6008D's terminal side	S10	Type I interface	I/III	
		Type II interface	II	
		Type III interface	I/III	
		Type III interface (available only with S11 set to A)		

* For each side (facility and terminal) of the 6008D, select A-side signaling when the associated equipment on that side provides M-lead outputs and receives E-lead inputs. Select B-side signaling when the associated equipment provides E-lead outputs and receives M-lead inputs.

table 1. Summary and checklist of 6008D switch options

non-prescription optioning

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

3.06 **Facility-Side E&M Signaling.** Two-position slide switch S9 conditions the 6008D to accommodate either A-side or B-side E&M signaling on the facility side. Set S9 as follows:

- To *A* when the 6131D interfaces facility-side equipment that provides M-lead outputs and receives E-lead inputs.
- To *B* when the 6131D interfaces facility-side equipment that provides E-lead outputs and receives M-lead inputs.

3.07 **Facility-Side E&M Interface.** Four-position slide switch S7 selects Type I, II, III, or V E&M interface on the 6008D's facility side. Set S7 as follows:

- To *I* for Type I E&M interface.
- To *II* for Type II E&M interface.
- To *III* for Type III E&M interface.
- To *V* for Type V E&M interface.

3.08 **Terminal-Side E&M Signaling.** Two-position slide switch S11 conditions the 6008D to accommodate either A-side or B-side E&M signaling on the terminal side. Set S11 as follows:

- To *A* when the 6131D interfaces terminal-side equipment that provides M-lead outputs and receives E-lead inputs.
- To *B* when the 6131D interfaces terminal-side equipment that provides E-lead outputs and receives M-lead inputs.

3.09 **Terminal-Side E&M Interface.** Two-position slide switch S10 selects Type I, II, or III E&M interface on the 6008D's terminal side. Set S10 as follows:

- To *I/III* for Type I E&M interface.
- To *II* for Type II E&M interface.
- To *I/III* for Type III E&M interface (available only when S11 is set to A).

4. circuit description

4.01 This circuit description is intended to familiarize you with the 6008D E&M-to-E&M Signaling Converter subassembly for engineering and application purposes only. Attempts to troubleshoot the 6008D internally are not recommended (and are prohibited by FCC regulations in FCC-registered applications). 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.

terminal-to-facility signaling

4.02 On its terminal side, the 6008D can be switch-optioned to interface equipment that uses A-side or B-side E&M signaling with Type I or II E&M interface. The subassembly can also accommodate a Type III E&M interface on its terminal side, but

only when A-side signaling is used. Incoming off-hook states and dial pulsing from the associated terminal-side equipment pass through an integral *dial-pulse compensator* before being detected by the *terminal-side signaling relay* (K1). The *compensator* introduces a slight delay so that the 6008D ignores spurious signals. Also, to minimize dial-pulse distortion, the *compensator* adjusts for non-symmetrical switching of the *terminal-side signaling relay*. In addition, a *receive-path-cut control* circuit cuts (opens) the receive transmission path on the host 6131 module when the terminal-side equipment is on-hook or dialing. Front-panel E-lead and M-lead busy-indicating LED's provide a visible indication of the status of the 6008D's terminal-side interface.

facility-to-terminal signaling

4.03 On its facility side, the 6008D can be switch-optioned to interface equipment that uses A-side or B-side E&M signaling with Type I, II, III, or V E&M interface. Incoming off-hook states and dial pulsing from the distant facility-side equipment pass through an integral *dial-pulse compensator* before being detected by the *facility-side signaling relay* (K2). The *compensator*, like that on the 6008D's terminal side, introduces a slight delay so that spurious signals are ignored. To minimize dial-pulse distortion, the *compensator* also adjusts for nonsymmetrical switching of the *facility-side signaling relay*. A *transmit-path-cut control* circuit cuts (opens) the transmit transmission path on the host 6131 when the facility-side equipment is on-hook or dialing.

power regulation

4.04 An active *series regulator* integral to the 6008D supplies power to the subassembly's relays from the host 6131 module's -22 to -56Vdc input. The *regulator* uses a zener diode for establishing the relay supply and a series-pass transistor for voltage limiting.

6. specifications**A-side E&M signaling (facility or terminal side)**

E-lead current rating

500mA maximum (resistor-capacitor [RC] contact protection provided)

E-lead resistance

less than 0.5 ohm

M-lead sensitivity

-20Vdc minimum threshold; 500 ohms external

M-lead resistance from -48Vdc

B-side E&M signaling (facility or terminal side)

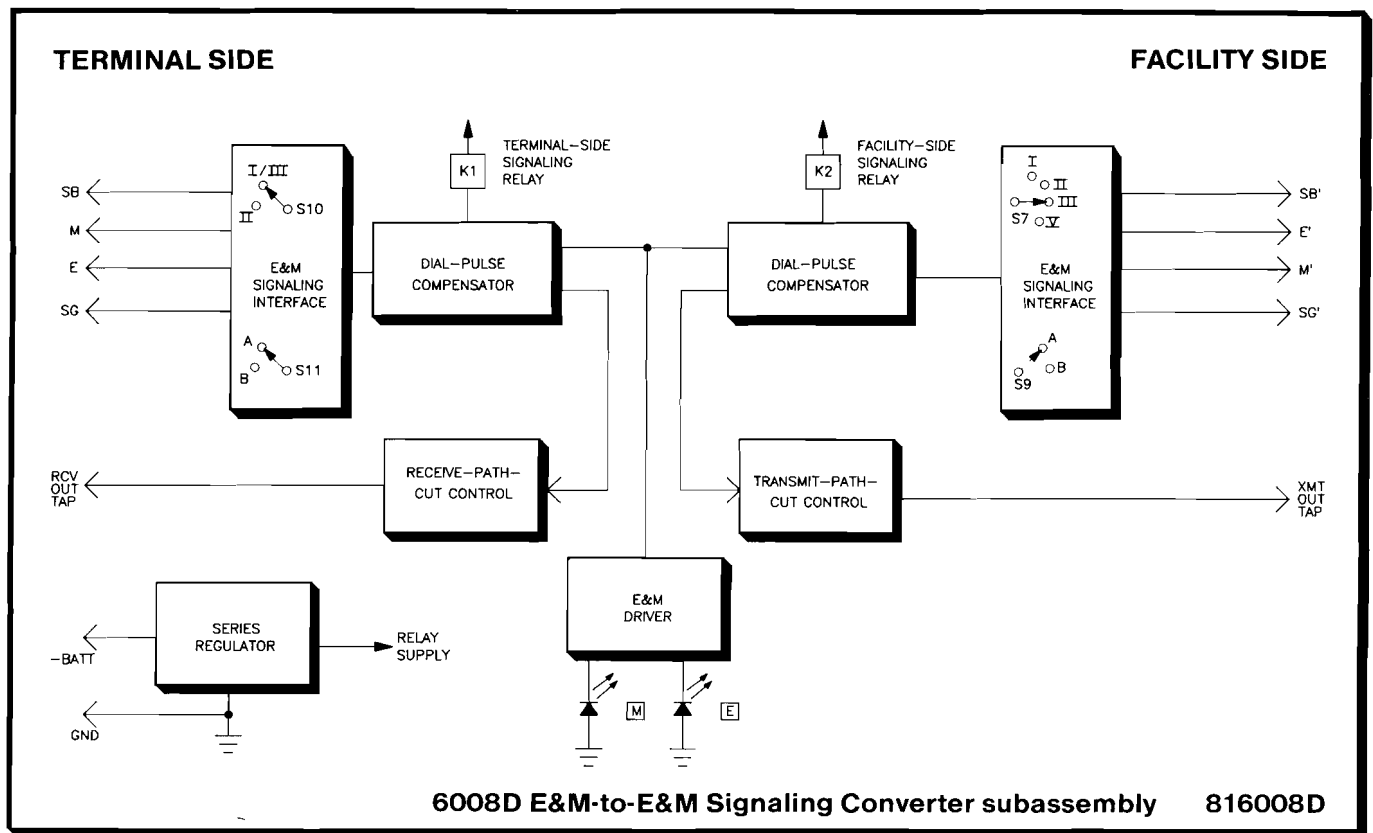
M-lead current rating

500mA maximum (resistor-capacitor [RC] contact protection provided)

M-lead current from battery (Type I interface only)

100mA with less than 5V drop; current foldback in fault conditions

specifications continued on page 6



5. block diagram

E-lead sensitivity

500 ohms maximum external E-lead resistance to ground

common specifications

dial-pulse distortion

3 percent maximum

transmit- and receive-path transmission cut timings:

attack: 25 to 45ms

release: 110 to 150ms

input power requirements

voltage: filtered, ground-referenced -22 to -56Vdc supplied via host 6131 module

current: 140mA maximum at -56Vdc, including host 6131 module

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

5 ounces (142 grams), not including host 6131 module

mounting

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

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 6008D E&M-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

Canadian customers: Contact our Canadian headquarters in Mississauga, Ontario. Telephone (416)624-0052.

International customers: Contact your Tellabs distributor.

selecting correct product service procedure

7.03 If equipment is diagnosed as defective or if in-service equipment needs repair, follow the **product return procedure** in paragraph 7.04 in all cases except those where a critical service outage exists (e.g., where a system or a critical circuit is down and no spares are available). In critical situations, or if you wish to return equipment for reasons other than repair, follow the **product replacement procedure** in paragraph 7.05.

product return procedure (for repair)

7.04 To return equipment for repair, first contact Tellabs Product Services (see addresses and numbers below) to obtain a Material Return Authorization (MRA). A service representative will request key data (your company's name and address, the equipment's model and issue numbers and warranty date code, and the purchase order number for the repair transaction). The service representative will then give you an MRA number that identifies your particular transaction. After you obtain the MRA number, send the equipment prepaid to Tellabs (attn: Product Services).

in the USA: Tellabs, Inc.

4951 Indiana Avenue
Lisle, Illinois 60532
telephone (312)969-8800

in Canada: Tellabs Communications Canada, Ltd.

1200 Aerowood Drive, Unit 39
Mississauga, Ontario, Canada L4W 2S7
telephone (416)624-0052

Enclose an explanation of the malfunction, your company's name and address, the name of a person to contact for further information, and the purchase order number for the transaction. Be sure to write the MRA number clearly on the outside of the carton being returned. Tellabs will inspect, repair, and retest the equipment so that it meets its original performance specifications and then ship the equipment back to you. If the equipment is in warranty, no invoice will be issued. Should you need to contact Tellabs regarding the status of a repair, call or write the Product Services department at our Lisle or Mississauga headquarters as directed above.

product replacement procedure

7.05 For critical service outages, Tellabs offers a choice of two replacement services (if the product is in replacement stock) in lieu of the 15-day repair and return service described above. These are **overnight express service** (at extra cost) anywhere in the USA and **five-day expedited delivery** (at no extra cost) anywhere in the USA and Canada. To obtain replacement equipment via either of these services, contact your Tellabs Regional Office in the USA or our Canadian headquarters in Mississauga, Ontario, for details, costs (if applicable), and instructions. Telephone numbers are given in paragraph 7.02. A service representative will request key data (your company's name and address, the equipment's model and issue numbers and warranty date code, and the purchase order number for the replacement transaction). Tellabs will then ship the replacement to you in accordance with the replacement service you request. An invoice in the amount of the replacement's current price plus any applicable service charges will be issued after the replacement is shipped. When you receive the replacement, pack the equipment to be returned in the replacement's carton, sign and enclose the packing list, affix to the carton the preaddressed label provided, and ship the carton prepaid to Tellabs at our USA or Canadian headquarters. When we receive the defective equipment (within 30 days of our issuing the replacement), the invoice will be adjusted to reflect only service charges (if applicable). Please note that OEM, modified, and manufacture-discontinued equipment is not available via overnight express service.

troubleshooting guide on next page

troubleshooting guide

Note 1: The 6008D must be tested while mounted on the host 6131 module.

Note 2: For additional troubleshooting information, see the Tellabs practice on the host 6131 module.

trouble condition	possible causes (check before assuming 6008D and/or host 6131 is defective)
subassembly completely inoperative	1) No input power. 2) Improper wiring. 3) Host 6131's card-edge connector not properly aligned. 4) Connectors between 6008D and host 6131 not properly aligned. 5) Option switches S14 and S5 on host 6131 improperly set.
improper signaling conversion	1) Option switches S7, S9, S10, and S11 on 6008D improperly set. 2) Improper supply voltage (should be between -22 and -56Vdc). 3) Option switches S14 and S5 on host 6131 improperly set.
improper dial pulsing	1) Option switches S7, S9, S10, and S11 on 6008D improperly set. 2) Improper supply voltage (should be between -22 and -56Vdc). 3) Option switches S14 and S5 on host 6131 improperly set.

8. appendix: FCC registration table

private-line registered facility interface code	type of service	service code	USOC number	required 6008D option-switch settings*		required 6131 option-switch settings*
				S7	S9	
TL11M	tie trunk	9.0F or 9.0Z	RJ2EX, RJ2GX, RJ2FX, or RJ2HX	I	A	2WIRE
TL12M	tie trunk	9.0F or 9.0Z	RJ2FX or RJ2HX	II	A	2WIRE
TL11E	tie trunk	9.0F or 9.0Z	RJ2EX, RJ2GX, RJ2FX, or RJ2HX	I	B	2WIRE
TL12E	tie trunk	9.0F or 9.0Z	RJ2FX or RJ2HX	II	B	2WIRE
TL31M	tie trunk	9.0F or 9.0Z	RJ2GX or RJ2HX	I	A	4WIRE
TL32M	tie trunk	9.0F or 9.0Z	RJ2HX	II	A	4WIRE
TL31E	tie trunk	9.0F or 9.0Z	RJ2GX or RJ2HX	I	B	4WIRE
TL32E	tie trunk	9.0F or 9.0Z	RJ2HX	II	B	4WIRE
TC31M	tie trunk	9.0F or 9.0Z	RJ2GX or RJ2HX	I	A	4WIRE
TC32M	tie trunk	9.0F or 9.0Z	RJ2HX	II	A	4WIRE
TC31E	tie trunk	9.0F or 9.0Z	RJ2GX or RJ2HX	I	B	4WIRE
TC32E	tie trunk	9.0F or 9.0Z	RJ2HX	II	B	4WIRE
* Switch options other than those listed are independent of FCC registration and should be set as required for the particular application.						