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practice section 816131

6131 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module

contents

1. general description

1.01 The 6131 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module (figure 1) provides transmission interface between a 2wire or 4wire metallic facility and a carrier channel or PBX. Both adjustable prescription-set loss and switch-selectable 2wire-to-4wire or 4wire-to-4wire operation are available. For non-FCC-registered applications, straps on the 6131 may be removed to independently allow each transmission path to be optioned to provide either loss or gain. In addition, the 6131 accepts any plug-on Tellabs 6008X Signaling Converter subassembly to provide optional signaling conversion between a variety of facility-side signaling formats and terminal-side E&M signaling.

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

1.03 The 6131 module offers the following features:

- Printed-circuit-board connectors for optional use of any Tellabs 6008X plug-on Signaling Converter subassembly, in which case the module-subassembly combination, known as the 6131X, functions as both a transmission-interface device and a signaling converter (see paragraph 1.04).
- From 0 to 24dB of prescription-set loss in 0.1dB increments in both the receive and transmit channels. (From 0 to 24dB of prescription-set gain in switch-selectable 0.1dB increments is also available in both channels, but **only** in non-FCC-registered applications.)
- Maximum terminal-side input and output levels of +8dBm.
- Maximum facility-side input and output levels of +8dBm (at 600 ohms).
- Maximum transmit and receive noise levels of +5dBrnC at zero loss or gain.
- Switch-selectable 2wire or 4wire facility-side interface, with an integral magnetic hybrid providing the 2wire-to-4wire conversion when 2wire facility interface is selected.
- Transformer isolation at all ports in either the 2wire-to-4wire or 4wire-to-4wire mode.

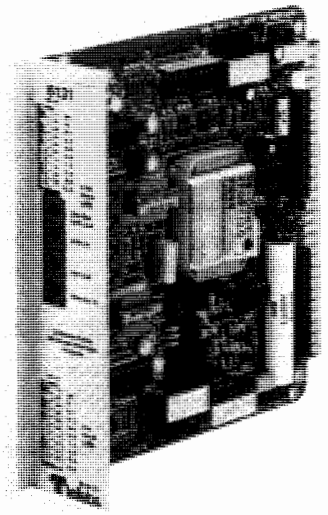


figure 1. 6131 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module

- Balanced, switch-selectable 900 or 600-ohm terminating impedance in series with 2.15μF of capacitance at the facility-side 2wire port in the 2wire-to-4wire mode.
- Fixed, balanced 600-ohm terminating impedances at the module's terminal-side 4wire ports and also at both facility-side 4wire ports in the 4wire-to-4wire mode.
- An integral compromise balance network (CBN) that provides either 900 or 600 ohms (switch-selectable) or 0 to 2000 ohms (continuously adjustable) in series with 2.15μF at the hybrid's balance port.
- Leads available at the module's card-edge connector for optional use of an external Tellabs 423X PBN module (or equivalent) instead of the module's integral CBN.
- From 0 to 0.062μF of network build-out (NBO) capacitance in switch-selectable 0.002μF increments, for use with either the module's integral CBN or an external PBN module.
- Lightning surge protection at all transmission ports.
- Reverse-battery protection, transient-limiting circuitry, and RC (resistance-capacitance) filtering and decoupling networks to minimize crosstalk coupling and the effects of noise on the input power leads.
- Four front-panel bantam-type test jacks (one opening jack facing the module at each port) to facilitate alignment and maintenance.
- Operation on filtered, ground-referenced −22 to −56Vdc input power with current requirements of 45mA at idle (typical) and 75mA maximum.

- Type 10 module for mounting in a variety of Tellabs Type 10 Mounting Shelves, which are available in versions for relay-rack (occupying 6 inches of vertical rack space) and apparatus-case installation.

1.04 As described above, when a Tellabs 6008X Signaling Converter subassembly is installed on the 6131 module, the resulting module-subassembly combination is referred to as a *Tellabs 6131X module,* where X indicates the alphabetic suffix of the 6008A, B, C, or D subassembly used on the module. Please note that while the 6131 module and 6008X subassemblies are available separately, module-subassembly combinations can be ordered from Tellabs with the desired subassembly factory-installed on the module. These modules are designated the 6131A, 6131B, 6131C, and 6131D, depending upon the particular subassembly installed. Table 1 summarizes the module-subassembly combinations currently available.

function	subassembly	module-subassembly designation
2/4wire-to-4wire (facility-to-terminal) interface with no signaling conversion	none	6131 (no subassembly)
2/4wire-to-4wire FXS-to-E&M (facility-to-terminal) interface	6008A FXS-to-E&M Signaling Converter subassembly	6131A
2/4wire-to-4wire FXO-to-E&M (facility-to-terminal) interface	6008B FXO-to-E&M Signaling Converter subassembly	6131B
2/4wire-to-4wire DX-to-E&M (facility-to-terminal) interface	6008C DX-to-E&M Signaling Converter subassembly	6131C
2/4wire-to-4wire E&M-to-E&M (facility-to-terminal) interface	6008D E&M-to-E&M Signaling Converter subassembly	6131D

table 1. Functions of 6131 module and associated 6008X subassemblies

2. application

2.01 The 6131 2Wire/4Wire-to-4Wire Terminal Interface Module provides a switch-selectable 2wire or 4wire interface on the facility side and a 4wire interface on the terminal side. In FCC-registered applications, the transmit and receive paths can be individually prescription-set to introduce from 0 to 24dB of loss in switch-selectable 0.1dB increments. With the factory-installed straps removed, which is permissible in non-FCC-registered applications only, the module's transmit and receive paths may be individually optioned to provide from 0 to 24dB of prescription-set **loss or gain** in switch-selectable 0.1dB increments.

2.02 The 6131 can be used by itself as a 2wire-to-4wire or 4wire-to-4wire transmission-interface module or with a plug-on Tellabs 6008X Signaling Converter subassembly to provide conversion between various facility-side signaling formats and terminal-side E&M signaling as required by an associated carrier channel or PBX.

2.03 When equipped with a 6008A, 6008B, or 6008C subassembly, the A&B leads on the 6131 are used internally for loop access in both the 2wire and 4wire facility-side modes. When the 6131 is used alone or with the 6008D subassembly, the 6131's A&B leads (2wire facility side) or simplex leads (4wire facility side) remain available for use with external equipment.

2.04 When optioned for 2wire-to-4wire operation, the 6131's facility-side 2wire port can be switch-optioned for 600 or 900-ohm terminating impedance in series with 2.15μF. In 4wire-to-4wire operation, the facility-side port impedances are restricted to 600 ohms only. The choice of two 2wire-port impedances permits interface with a variety of 2wire facilities and equipment. The 600-ohm option is selected when the 6131 interfaces nonloaded cable or station equipment, while the 900-ohm option is selected when the 6131 interfaces loaded cable, switched networks involving both loaded and nonloaded cable, or 900-ohm equipment. On the terminal side, the impedance at both 4wire ports (transmit output and receive input) is fixed at 600 ohms, as required for carrier and many nonloaded-cable applications. Both terminal-side transformers are center-tapped to derive balanced simplex (SX) leads.

2.05 Optioning the 6131 for 2wire loop interface on the facility side introduces the module's 2wire-to-4wire hybrid into the circuit and conditions the module's facility-side leads for 2wire operation. With 2wire facility interface selected, A&B leads are derived on the 6131's facility side, and external access to these leads is available at the card-edge connector for signaling interface to the hybrid. The 6131's A&B leads can accommodate up to 40mA of direct current without significant degradation of performance. With 4wire facility interface selected, both facility-side transformers are center-tapped to derive balanced SX leads, which, like the A&B leads with a 2wire interface, are externally available at the card-edge connector for signaling interface. (With either 2wire or 4wire facility-side interface selected, external access to the terminal-side SX leads is available as well.)

2.06 To ensure that adequate hybrid balance (i.e., enough transhybrid loss) is provided in any application, the 6131's hybrid can be switch-optioned to function with the module's internal compromise balance network (CBN) or with an external precision balance network (PBN). The CBN can be optioned for the same impedances as the 2wire port: 900 ohms (in series with 2.15μF) when the 2wire port interfaces loaded cable, switched networks, or 900-

ohm equipment, or 600 ohms (in series with 2.15μF) when the 2wire port interfaces nonloaded cable or 600-ohm station-end equipment. A third CBN option allows the module user to manually introduce from 0 to 2000 ohms of balancing impedance (in series with 2.15μF) via a continuously adjustable control on the 6131's printed circuit board. This CBN option can be used as an economical alternative to a PBN in many applications. If, however, none of the three CBN options provides adequate hybrid balance, an external PBN can be used. An external PBN may also be necessary in applications where the module's 2wire port interfaces a long section of nonloaded cable.

2.07 The external PBN used with the 6131 can be provided as a Tellabs 423X PBN module, which, like the 6131, is a Type 10 module. The 423X PBN's are available in several versions to approximate the impedances of specific transmission facilities and station equipment. For complete information on these PBN's, please refer to the Tellabs 423X practice.

2.08 To further improve hybrid balance, especially in applications where a **PBN for loaded cable** is used with the 6131, from 0 to 0.062μF of network build-out (NBO) capacitance can be introduced across the module's balance port. This NBO capacitance can also be used to compensate for the capacitance of station cables or other equipment or to compensate for drop build-out (DBO) capacitors on the 2wire loop. Please note that while NBO capacitance **can be used** with a CBN or with a PBN for nonloaded cable or a tel set, the NBO capacitance introduced in these cases may or may not result in significantly improved hybrid balance. The amount of additional transhybrid loss obtained in such applications depends upon individual circuit characteristics.

3. installation

inspection

3.01 The 6131 2Wire/4Wire-to-4Wire Terminal Interface Module 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 module should be visually inspected again prior to installation.

mounting

3.02 The 6131 module mounts in one position of a Tellabs Type 10 Mounting Shelf and plugs physically and electrically into a 56-pin connector at the rear of the 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** they are properly optioned and **after** wiring is completed.

3.04 Table 2 lists external connections to the 6131 module. All connections are made via wire-wrapping to the 56-pin connector at the rear of the module's mounting-shelf position. Pin numbers are found on the body of the connector.

connect:	to pin:
4WIRE TRANSMIT IN TIP*	7
4WIRE TRANSMIT IN RING*	13
B LEAD/4WIRE TRANSMIT IN SIMPLEX*	9
TRANSMIT OUT TIP**	5
TRANSMIT OUT RING**	15
TRANSMIT OUT SIMPLEX**	3
RECEIVE IN TIP**	55
RECEIVE IN RING**	49
RECEIVE IN SIMPLEX**	51
2WIRE TIP/4WIRE RECEIVE OUT TIP*	41
2WIRE RING/4WIRE RECEIVE OUT RING*	47
A LEAD/4WIRE RECEIVE OUT SIMPLEX*	43
−BATT (−22 to −56Vdc filtered input)	35
GND (ground)	17
E1 LEAD**†	23
M1 LEAD**†	21
SG1 (signal ground 1) LEAD**†	19
SB1 (signal battery 1) LEAD**†	1
E2 LEAD*†	14
M2 LEAD*†	10
SG2 (signal ground 2) LEAD*†	6
SB2 (signal battery 2) LEAD*†	8
RINGING GENERATOR†	46
EXT BAL NET (external PBN)	2 and 4

* Facility side.
** Terminal side.
† Applies only when a Tellabs 6008X Signaling Converter plug-on subassembly is present on 6131.

table 2. External connections to 6131

option selection

Note: *If your 6131 module is equipped with a Tellabs 6008X Signaling Converter subassembly, be certain to properly option the subassembly as directed in its separate Tellabs practice.*

3.05 With the exception of two factory-installed straps that allow for loss only or a choice of gain or loss in each channel and that are covered under **alignment** later in this practice, all 6131 options are selected via slide or DIP switches. Locations of these switches and straps on the module's printed circuit board are shown in figure 2. Table 3 gives a brief explanation of the function and settings of each option switch and strap, along with a convenient optioning and alignment checklist. The checklist can be filled out (by checking the appropriate box for each switch and strap) either prior to installation to allow for prescription optioning and alignment of the module, or as the module is being optioned and aligned to provide a record for future reference. Detailed instructions for optioning the 6131 are provided in paragraphs 3.06 through 3.09.

Note: *Introduction of NBO capacitance is covered under* **alignment** *in paragraphs 3.20 and 3.21 of this practice.*

3.06 **2Wire or 4Wire Facility-Side Transmission Interface.** Two-position slide switch *S5* selects either a 2wire or 4wire transmission interface on the 6131's facility side. Set *S5* as follows:

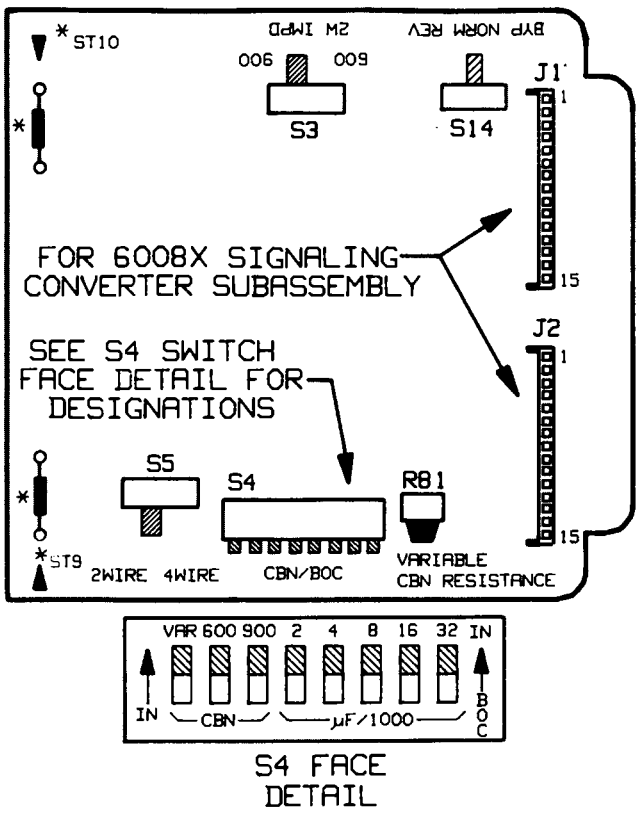


figure 2. 6131 option switch and strap locations

- To the *2WIRE* position for a 2wire facility interface.
- To the *4WIRE* position for a 4wire facility interface.

3.07 **2Wire-Port Terminating Impedance.** Two-position slide switch *S3 (2W IMPD)* selects either 900-ohm or 600-ohm terminating impedance (in series with 2.15μF) at the 6131's 2wire port when the module is optioned for 2wire facility interface (*S5* set to *2WIRE*). Switch *S3* also conditions the 6131 to provide 600-ohm terminating impedance at both facility-side ports when the module is optioned for 4wire facility interface (*S5* set to *4WIRE*). Set *S3 (2W IMPD)* as follows:

- To the *900* position for 900 ohms in series with 2.15μF, as is normally required for interface with loaded cable, switched networks, or 900-ohm equipment.
- To the *600* position for 600 ohms in series with 2.15μF, as is normally required for interface with nonloaded cable or 600-ohm equipment.
- To the *600* position for 600-ohm impedance at both facility side ports in **all** applications where **4wire facility interface** is selected (*S5* set to *4WIRE*).

3.08 **Facility-Side Signaling-Lead Arrangement.** Three-position slide switch *S14* selects either a bypass, normal, or reverse signaling-lead arrangement on the 6131's facility side. Set *S14* as follows:

- To the *BYP* (bypass) position when card-edge connector-pin access to the 6131's A&B leads (2wire mode) or to the receive output SX and transmit input SX leads (4wire mode) is desired. **The *BYP* setting is required in all applications where the 6131 is used alone, i.e., without a Tellabs 6008X Signaling Converter subassembly.**
- To the *NORM* (normal) position when it is desired that the 6131's signaling leads be derived as follows:
  - ★ In the 2wire mode, A lead derived from 2wire tip lead and B lead derived from 2wire ring lead.
  - ★ In the 4wire mode, RCV OUT SX lead derived from receive output pair and XMT IN SX lead derived from transmit input pair.
- To the *REV* (reverse) position when it is desired that the 6131's signaling leads be derived as follows:
  - ★ In the 2wire mode, A lead derived from 2wire ring lead and B lead derived from 2wire tip lead.
  - ★ In the 4wire mode, RCV OUT SX lead derived from transmit input pair and XMT IN SX lead derived from receive output pair.

3.09 **Internal CBN Options.** The first three positions of eight-position DIP switch *S4 (CBN/BOC)* select the 6131's internal compromise-balance-network (CBN) options. These are the *CBN* positions labeled *VAR, 600,* and *900.* Set the *CBN* positions of DIP switch *S4* as follows:

- To select 900-ohm impedance in series with 2.15μF, set *VAR* to *OUT, 600* to *OUT,* and *900* to *IN.*
- To select 600-ohm impedance in series with 2.15μF, set *VAR* to *OUT, 600* to *IN,* and *900* to *OUT.*
- To select user-adjustable 0 to 2000-ohm impedance (via *VARIABLE CBN RESISTANCE* potentiometer *R81*) in series with 2.15μF, set *VAR* to *IN, 600* to *OUT,* and *900* to *OUT.*
- To exclude the 6131's internal CBN from the circuit for use of an external PBN module (e.g., a Tellabs 423X PBN), set *VAR* to *OUT, 600* to *OUT,* and *900* to *OUT.*

installing optional 6008X subassembly

3.10 In applications where an optional Tellabs 6008X Signaling Converter subassembly is to be used on the 6131, refer to figure 2 for the appropriate connector locations and install the subassembly 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 6008X subassembly so that male connector *P1* on the 6008X lines up with female connector *J1* on the 6131, male connector *P2* on the 6008X lines up with female connector *J2* on the 6131, and the small rectangular plastic panel on the 6008X lines up with the opening at the upper righthand corner of the 6131's front panel adjacent to the 6131 model number.

switch/strap option	switch/strap	selection	setting	checklist
2wire or 4wire facility-side transmission interface	S5	2wire interface	2WIRE	
		4wire interface	4WIRE	
2wire-port terminating impedance (with *S5* set for *2WIRE* facility interface) **Note:** *With* S5 *set to* 4WIRE, *switch* S3 (2W IMPD) *must* **always** *be set to* 600.	S3 (2W IMPD)	600 ohms plus 2.15μF in 2wire mode, 600 ohms resistive in 4wire mode (**required** with **4wire** facility interface)	600	
		900 ohms plus 2.15μF (**not available** with **4wire** facility interface)	900	
facility-side signaling-lead arrangement	S14	bypass: A&B-lead (2wire mode) or SX-lead (4wire mode) interface available at card-edge connector pins; required when 6131 is used alone (without 6008X subassembly)	BYP	
		normal: A&B leads derived via 2wire T&R leads, respectively, in 2wire mode; RCV OUT SX and XMT IN SX leads derived via RCV OUT and XMT IN pairs, respectively, in 4wire mode	NORM	
		reverse: A&B leads derived via 2wire R&T leads, respectively, in 2wire mode; RCV OUT SX and XMT IN SX leads derived via XMT IN and RCV OUT pairs, respectively, in 4wire mode	REV	
internal compromise balance network (CBN) options	S4 (CBN/BOC), CBN positions only (VAR, 600, 900)	900 ohms with 2.15μF	VAR to OUT 600 to OUT 900 to IN	
		600 ohms with 2.15μF	VAR to OUT 600 to IN 900 to OUT	
		user-adjustable 0 to 2000 ohms (via *VARIABLE CBN RESISTANCE* potentiometer *R81*) with 2.15μF	VAR to IN 600 to OUT 900 to OUT	
		internal CBN excluded (for use of external PBN)	VAR to OUT 600 to OUT 900 to OUT	
conditioning of transmit channel for loss only (FCC-registered applications) or for gain or loss in non-registered applications **Note:** *In FCC-registered applications,* **both channels** *of the 6131 must be conditioned for* **loss only.**	strap ST9 and front-panel *xmt level* DIP switch, *gn* and *ls* positions	loss only, as **required** in FCC-registered applications	ST9 present gn to out ls to in	
		loss (with gain available as an alternative; non-registered applications)	ST9 cut or removed gn to out ls to in	
		gain (with loss available as an alternative; non-registered applications)	ST9 cut or removed gn to in ls to out	
transmit-channel level (either gain or loss, as selected above)*	front-panel *xmt level* DIP switch, dB-value positions*	0.1dB	0.1 in	
		0.2dB	0.2 in	
		0.4dB	0.4 in	
		0.8dB	0.8 in	
		1.5dB	1.5 in	
		3dB	3.0 in	
		6dB	6.0 in	
		12dB	12.0 in	
conditioning of receive channel for loss only (FCC-registered applications) or for gain or loss in non-registered applications **Note:** *In FCC-registered applications,* **both channels** *of the 6131 must be conditioned for* **loss only.**	strap ST10 and front-panel *rcv level* DIP switch, *gn* and *ls* positions	loss only, as **required** in FCC-registered applications	ST10 present gn to out ls to in	
		loss (with gain available as an alternative in non-registered applications)	ST10 cut or removed gn to out ls to in	
		gain (with loss available as an alternative in non-registered applications)	ST10 cut or removed gn to in ls to out	

table continued on page 6

C. Carefully plug the 6008X onto the host 6131, ensuring that all connector pins on the 6008X fit properly into their receptacles on the 6131's female connectors and also ensuring that the small plastic panel on the 6008X fits properly into the opening in the 6131's front panel.

switch/strap option	switch/strap	selection	setting	checklist
receive-channel level (either gain or loss as selected above)*	front-panel *rcv level* DIP switch, dB-value positions*	0.1dB	0.1 in	
		0.2dB	0.2 in	
		0.4dB	0.4 in	
		0.8dB	0.8 in	
		1.5dB	1.5 in	
		3dB	3.0 in	
		6dB	6.0 in	
		12dB	12.0 in	
network build-out (NBO) capacitance**	S4 (CBN/BOC), μF/1000 positions only (2, 4, 8, 16, and 32)**	0.002μF	2 to IN	
		0.004μF	4 to IN	
		0.008μF	8 to IN	
		0.016μF	16 to IN	
		0.032μF	32 to IN	

* The dB-value positions of the 6131's front-panel *rcv level* and *xmt level* DIP switches are cumulative. Total gain or loss introduced into a channel is the sum of that channel's dB-value DIP-switch positions set to *in*. For zero gain or loss in a channel, set all dB-value positions of that channel's front-panel *level* DIP switch to *out*.

** The 6131's network build-out capacitance (NBOC) switch positions on DIP switch *S4* are cumulative. Total NBO capacitance introduced is the sum of those NBOC DIP-switch positions set to *IN*. For zero NBO capacitance, set all five NBOC DIP-switch positions on *S4* to *OUT*.

table 3. Summary and checklist of 6131 switch and strap options

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

alignment

3.11 Alignment of the 6131 consists of setting the receive and transmit transmission levels and, where required in 2wire facility-interface applications, introducing user-adjustable CBN resistance and/or NBO capacitance to achieve optimum hybrid balance. After all options on the 6131 are selected, two methods of alignment are available: *prescription* and *direct measurement* (non-prescription). With the prescription method, the 6131's front-panel *rcv level* and *xmt level* switches and the printed-circuit-board *BOC* DIP switches are set in accordance with the specifications on the circuit layout record (CLR). Procedures for prescription alignment of the 6131 are given in paragraphs 3.12 and 3.13. In applications where the information provided by the CLR is inadequate, it is necessary to perform the direct-measurement (non-prescription) alignment procedure. The non-prescription procedure consists of making measurements at the 6131's ports to determine the required settings of the alignment switches. The non-prescription alignment procedures are given in paragraphs 3.14 through 3.21.

prescription level adjustment, transmit and receive

3.12 To adjust the transmit and receive levels on the 6131, proceed as follows: From table 3 or the CLR, determine whether loss or gain is required in each channel. If loss is required in a channel (as is mandatory in FCC-registered applications), set the *ls* position of that channel's front-panel *level* DIP switch to *in* and the adjacent *gn* position of the same DIP switch to *out*. If gain is required in a channel (non-registered applications only), ensure that the appropriate option strap on the 6131's printed circuit board (see figure 2) is cut or removed; then set the *gn* position of that channel's *level* DIP switch to *in* and the adjacent *ls* position of the same switch to *out*. Next, determine (from the CLR) the amount of loss or gain required in each channel. Then, to achieve the required levels, set the appropriate combinations of *rcv level* and *xmt level* dB-value DIP switches to the *in* position. The specific amount of loss or gain introduced by each dB-value DIP-switch position is indicated on the front panel adjacent to the switch position. These switch positions are cumulative; the total amount of loss or gain introduced into a channel is the sum of that channel's *level* DIP-switch positions set to *in*.

post-alignment testing

3.13 After the transmission levels are set and, where applicable, NBO capacitance is introduced, it may be desirable to confirm the results via end-to-end tests. Where computer-controlled test equipment is used, a printout will verify the alignment results. Any deviation from the required levels can then be adjusted via the front-panel *level* switches and printed-circuit-board *BOC* switches. If computer-controlled test equipment is not available, the alignment results can be confirmed by performing the measurements in the non-prescription alignment procedure below.

prealignment switch settings for non-prescription alignment

3.14 Before beginning actual non-prescription alignment of the 6131, do the following:

A. Ensure that all option switches (see table 3), especially those that select the module's facility-side terminating impedance(s), are properly set.
B. Ensure that the user-adjustable *VARIABLE CBN RESISTANCE* potentiometer (*R81*) is adjusted fully counterclockwise for zero CBN resistance.
C. Ensure that no NBO capacitance is introduced (all five *BOC* positions of the *CBN/BOC* DIP switch set to *OUT*).
D. Set all dB-value positions of the front-panel *rcv level* and *xmt level* DIP switches to the *out* position for zero gain or loss in each channel.

non-prescription transmit-level adjustment

3.15 To adjust the transmit level of the 6131 when prescription level settings are not given in the CLR or when the given settings do not provide adequate results, proceed as follows:

A. In the 2wire mode only, insert an opening plug into the 6131's *rcv in* jack. Then, in either the 2wire or 4wire mode, arrange the receive portion of a transmission measuring set (TMS) for 600-ohm terminated measurement and connect it to the 6131's *xmt out* jack.

B. Request the distant facility-side location to send 1004Hz test tone at that location's CLR-specified output level.

C. If the measured transmit output level is the same as the local CLR-specified transmit output level, proceed to **non-prescription receive level adjustment,** paragraph 3.16. If the measured transmit output level is different from the specified transmit output level, proceed to step D or E, as appropriate.

D. If the specified transmit output level is **lower than** the measured transmit output level, loss is required. Set the *ls* position of the front-panel *xmt level* DIP switch to *in* and the *gn* position to *out.* Then set to *in* that combination of *xmt level* dB-value DIP switches which equals the required amount of loss (see note below). This amount is the difference between the transmit output level measured in step C and the CLR-specified transmit output level. Proceed to paragraph 3.16.

E. If the specified transmit output level is **higher than** the measured transmit output level, gain is required. Ensure that option strap *ST9* on the 6131's printed circuit board (see figure 2) is cut or removed (please note that this is permissible in **non-FCC-registered** applications only). Then set the *ls* position of the front-panel *xmt level* DIP switch to *out* and the *gn* position to *in.* Finally, set to *in* that combination of *xmt level* dB-value DIP switches which equals the required amount of gain (see note below). This amount is the difference between the transmit output level measured in step C and the CLR-specified transmit output level.

F. Remove the opening plug (if present) from the *rcv in* jack, and disconnect the TMS. Proceed to paragraph 3.16.

Note: *The dB-value positions of the front-panel* xmt level *DIP switch are cumulative. Total loss or gain introduced into the 6131's transmit channel is the sum of those* xmt level *dB-value switches set to* in.

non-prescription receive-level adjustment

3.16 To adjust the receive level of the 6131 when prescription level settings are not given in the CLR or when the given settings do not provide adequate results, proceed as follows:

A. Arrange the receive portion of the TMS for 900 or 600-ohm terminated measurement, as appropriate, and connect it to the 6131's *2w/4w rcv out* jack.

B. Request the distant terminal-side location to send 1004Hz test tone at that location's CLR-specified output level.

C. If the measured receive output level (4wire mode) or 2wire output level is the same as the local CLR-specified receive/2wire output level, level adjustment is complete, so disconnect the TMS. If the 6131 is optioned for 2wire facility-side interface, proceed to paragraph 3.17. If the 6131 is optioned for 4wire facility interface, alignment is complete. If, however, the measured receive/2wire level is different from the specified receive/2wire output level, proceed to step D or E, as appropriate.

D. If the specified receive/2wire output level is **lower than** the measured receive/2wire output level, loss is required. Set the *ls* position of the front-panel *rcv level* DIP switch to *in* and the *gn* position to *out.* Then set to *in* that combination of *rcv level* dB-value DIP switches which equals the required amount of loss (see note below). This amount is the difference between the receive/2wire output level measured in step C and the CLR-specified receive/2wire output level. If the 6131 is optioned for 2wire facility-side interface, proceed to paragraph 3.17. If not, alignment is complete.

E. If the specified receive/2wire output level is **higher than** the measured receive/2wire output level, gain is required. Ensure that option strap *ST10* on the 6131's printed circuit board (see figure 2) is cut or removed (please note that this is permissible in **non-FCC-registered** applications only). Then set the *ls* position of the front-panel *rcv level* DIP switch to *out* and the *gn* position to *in.* Finally, set to *in* that combination of *rcv level* dB-value DIP switches which equals the required amount of gain (see note below). This amount is the difference between the receive/2wire output level measured in step C and the CLR-specified receive/2wire output level. If the 6131 is optioned for 2wire facility-side interface, proceed to paragraph 3.17. If not, alignment is complete.

Note: *The dB-value positions of the front-panel* rcv level *DIP switch are cumulative. Total loss or gain introduced into the 6131's receive channel is the sum of those* rcv level *dB-value switches set to* in.

non-prescription balance-network alignment and introduction of NBO capacitance (2wire mode only)

3.17 **Determining Transhybrid Loss and Adjusting Internal CBN When User-Adjustable Option Is Selected.** If it is not known whether the module's internal CBN will provide adequate hybrid balance (transhybrid loss) in a particular application, make this determination as follows (use of a Tellabs 9801 or 9802 Card Extender, or equivalent, is recommended for this procedure):

A. Ensure that the CBN is inserted and properly optioned (via the *VAR, 600,* and *900* positions of

the *CBN/BOC* DIP switch, *S4*) for either 600 ohms in series with 2.15μF, 900 ohms in series with 2.15μF, or a user-adjustable (via potentiometer *R81*) range of 0 to 2000 ohms in series with 2.15μF. See table 3 or paragraph 3.09 for CBN optioning information.

B. Arrange the transmit portion of the TMS for 1004Hz tone output at the CLR-specified receive input level. (If the transmit portion of the TMS has a separate impedance setting, select 600 ohms.) Connect this signal to the *rcv in* jack.

C. Arrange the receive portion of the TMS for 600-ohm terminated measurement, and connect it to the *xmt out* jack.

D. If the user-adjustable CBN option is selected, adjust potentiometer *R81* on the 6131's printed circuit board (see figure 2) until the output-level reading on the TMS reaches its **lowest** point. If either the 600-ohm or 900-ohm CBN option is selected, simply observe the output-level reading on the TMS. Regardless of which CBN option is in effect, if the measured output level is too high (i.e., if transhybrid loss is insufficient) to meet the circuit requirements of the application, a PBN may be required or, occasionally, introduction of NBO capacitance in conjunction with the CBN may be necessary to compensate for terminal cable capacitance or for drop build-out (DBO) capacitors on the 2wire loop. These situations are covered in paragraphs 3.18 through 3.21.

3.18 **Using a PBN.** If the module's internal CBN does not provide sufficient hybrid balance (transhybrid loss), which is most likely to occur when the module's 2wire port interfaces a long section of nonloaded cable, a PBN can be used to improve hybrid balance. When an external PBN is used, exclude the module's internal CBN from the circuit by setting the *VAR, 600,* and *900* positions of DIP switch *S4* (*CBN/BOC*) to *OUT.* If an external PBN (e.g., a Tellabs 423X PBN module) is to be used, ensure that it is connected to the 6131's EXT BAL NET leads (pins 2 and 4). Then align the external PBN as directed in its separate practice.

3.19 To further improve hybrid balance, when a **PBN for loaded cable** is used, proceed as follows:

A. Doublecheck that the module's internal CBN is excluded from the circuit (*VAR, 600,* and *900* positions of the *CBN/BOC* DIP switch, *S4,* set to *OUT*).

B. Refer to table 3 and set to *IN* that combination of the *μF/1000* positions of DIP switch *S4* (*CBN/BOC*) that introduces the appropriate amount of NBO capacitance. This amount should be determined from information in the PBN practice or on the CLR. If this amount is not known, proceed to paragraph 3.20 or 3.21, as applicable. Otherwise, disconnect the TMS from the module. At this point, if NBO capacitance is already introduced, alignment of the 6131 is complete. If a card extender was used, unplug both it and the 6131 module; then plug the module back into its shelf position.

3.20 **Introducing NBO Capacitance by TMS Measurement When Required Amount Is Unknown (CBN and PBN Applications).** To introduce NBO capacitance to compensate for office cable capacitance or for DBO capacitors on the 2wire loop when the module's internal CBN is used, or to achieve optimum hybrid balance with a PBN (especially with one for loaded cable) when the required amount of NBO capacitance is unspecified, proceed as follows (use of a Tellabs 9801 or 9802 Card Extender is recommended for this procedure):

A. Ensure that the CBN is included in the circuit and properly optioned if it is being used or that it is excluded from the circuit if a PBN is being used (*VAR, 600,* and *900* positions of the *CBN/BOC* DIP switch, *S4*).

B. Arrange the transmit portion of the TMS for 2000Hz tone output at the CLR-specified receive input level. (If the transmit portion of the TMS has a separate impedance setting, select 600 ohms.) Connect this signal to the *rcv in* jack.

C. Arrange the receive portion of the TMS for 600-ohm terminated measurement and connect it to the *xmt out* jack.

D. Using the five *μF/1000* positions of DIP switch *S4* (*CBN/BOC*), add NBO capacitance until the TMS level reading is at its **lowest** point (i.e., add NBO capacitance until the TMS reading reaches a minimum and then starts to rise; then return to the setting of the *μF/1000* positions of *S4* that produced the minimum reading). Disconnect the TMS from the module. At this point, alignment of the 6131 is complete. If a card extender was used, unplug both it and the 6131 module; then plug the module back into the shelf or assembly position.

3.21 **Introducing NBO Capacitance by Formula When Required Amount Is Unknown (Some CBN Applications).** If the module's internal CBN is being used and an easier method of introducing NBO capacitance (generally, to compensate for office cable capacitance) is desired than the procedure in paragraph 3.20, proceed as follows:

Note: *The amount of NBO capacitance introduced by this method should provide adequate results in most applications. If it does not, the procedure in paragraph 3.20 must be performed.*

A. From table 4, calculate the required amount of NBO capacitance for the type and length of cable interfacing the module's 2wire port. (For example, if 1.2 kilofeet of high-capacitance cable interfaces the module's 2wire port, multiply 1.2 kilofeet by 0.016μF per kilofoot to obtain 0.0192μF.)

B. Set to *IN* that combination of the *μF/1000* positions of DIP switch *S4* (*CBN/BOC*) that most closely approximates the calculated amount of NBO capacitance. (For the example in step A, you would set positions *4* and *16* to *IN* to introduce 0.020μF, the closest possible amount to 0.0192μF.) At this point, alignment of the 6131

is complete. If a card extender was used, unplug both it and the 6131 module; then plug the module back into the shelf or assembly position.

type of cable interfacing 2wire port:	amount of NBO capacitance to be introduced for each kilofoot of cable between module and local facility-side equipment:
high capacitance (0.083μF per mile)	0.016μF per kilofoot
low capacitance (0.066μF per mile)	0.012μF per kilofoot

table 4. Guidelines for introducing NBO capacitance (in conjunction with CBN) by formula to compensate for facility-side cable capacitance

4. circuit description

4.01 This circuit description is intended to familiarize you with the 6131 2Wire/4Wire-to-4Wire Terminal Interface Module for engineering and application purposes only. Attempts to test or troubleshoot the 6131 internally are not recommended. Procedures for recommended testing and troubleshooting in the field are limited to those prescribed in section 7 of this practice. Refer to the 6131 block diagram, section 5 of this practice, as an aid in following the circuit description.

power supply

4.02 The *power supply* in the 6131 is a series-regulated bipolar supply. A series diode in the negative input lead protects the circuit against reversed input power connections.

lightning protection

4.03 Lightning protection is provided at all three ports (2wire mode) or all four ports (4wire mode) of the 6131 module.

2wire facility interface

4.04 When the 6131 is switch-optioned for 2wire-to-4wire (facility-to-terminal) operation, a magnetic 2wire-to-4wire (facility-to-terminal) *hybrid* with switch-selectable 900 or 600-ohm terminating impedance in series with 2.15μF provides the 2wire-side interface. A&B leads derived via the 2wire T&R leads are available at the 6131's card-edge connector for signaling interface to the hybrid.

4.05 An internal *compromise balance network (CBN)* associated with the hybrid offers a switch-selectable choice of 900 or 600-ohm impedance in series with 2.15μF or user-adjustable 0 to 2000-ohm impedance (via potentiometer *R81*) in series with 2.15μF. This CBN can be excluded via switch option if use of an external precision balance network (PBN), e.g., a Tellabs 423X PBN module, is preferred. Provision for connecting an external PBN is made at the 6131's card-edge connector. From 0 to 0.062μF of *network build-out (NBO) capacitance,* in switch-selectable 0.002μF increments, is available for use either with the 6131's internal CBN or with an external PBN.

receive channel

4.06 The receive-channel input uses a transformer to interface the transmission facility and to derive the receive input tip, ring, and simplex (SX) leads. The secondary winding of the transformer is coupled to the *receive attenuator/amplifier.* The output of this *attenuator/amplifier* is coupled to the magnetic *hybrid* in the 2wire mode or to the 4wire receive output transformer in the 4wire mode. The receive output transformer derives the receive output tip, ring, and SX leads in the 4wire mode.

transmit channel

4.07 In the 4wire mode, the transmit-channel input uses a transformer to derive the transmit input tip, ring, and SX leads. The secondary winding of the transmit input transformer is coupled to the *transmit attenuator/amplifier.* The transmit-channel input in the 2wire mode is from the magnetic 2wire-to-4wire *hybrid,* which is coupled to the *transmit attenuator/amplifier.* The output of this *attenuator/amplifier* is coupled to the transmit output transformer, which derives the transmit output tip, ring, and SX leads.

signaling interface

4.08 When the 6131 is used alone, i.e., without a Tellabs 6008X Signaling Converter plug-on subassembly, the 6131's signaling interface in the 4wire mode is available via the terminal-side and facility-side SX leads and in the 2wire mode, via the A&B leads. When the 6131 is used with a 6008X subassembly, the signaling interface is available via various interface combinations of the following leads, depending upon the subassembly used: facility-side E&M leads, terminal-side E&M leads, facility-side SX or A&B leads, and/or terminal-side SX leads. Signaling information is passed between the 6131 and the 6008X via 15-pin female connectors *J1* and *J2* on the 6131.

6. specifications

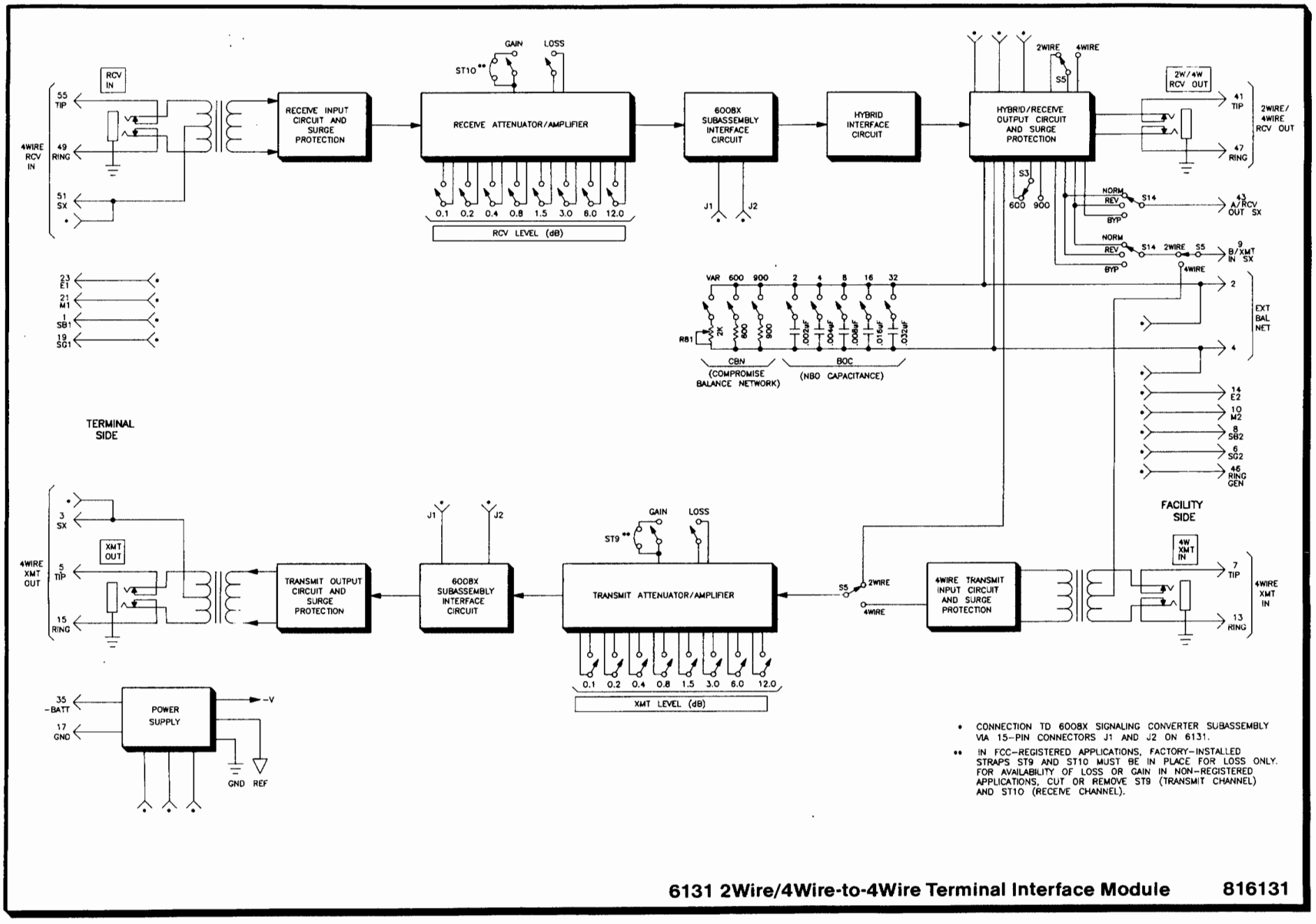
Note: *Some specifications may change when a Tellabs 6008X Signaling Converter subassembly is used on the 6131 module; see the applicable Tellabs 6008X practice for specifications affected by the presence of a particular subassembly.*

attenuation range (transmit and receive)
0 to 24dB of loss in switch-selectable 0.1dB increments (0 to 24dB of gain in switch-selectable 0.1dB increments also available via strap removal in non-FCC-registered applications only)

maximum 2wire input and output levels (2wire mode)
+8dBm at 600 ohms
+4dBm at 900 ohms

maximum 4wire input and output levels (any 4wire port)
+8dBm

frequency response (at 600 ohms)
2wire receive path (2wire mode): −1.0, +0.2dB re 1004Hz level, 300 to 1004Hz; −1.0, +0.5dB re 1004Hz level, 1004 to 4000Hz
4wire receive path (4wire mode): −0.9, +0.2dB re 1004Hz level, 300 to 1004Hz; −0.9, +0.5dB re 1004Hz level, 1004 to 4000Hz
2wire transmit path (2wire mode): −1.0, +0.4dB re 1004Hz level, 300 to 1004Hz; −1.0, +0.5dB re 1004Hz level, 1004 to 4000Hz



6131 2Wire/4Wire-to-4Wire Terminal Interface Module 816131

5. block diagram

4wire transmit path (4wire mode): −0.9, +0.2dB re 1004Hz level, 300 to 1004Hz; −0.6, +0.5dB re 1004Hz level, 1004 to 4000Hz

4wire-port terminating impedances (any 4wire port)
600 ohms, balanced

2wire-port terminating impedance
switch-selectable 900 or 600 ohms in series with 2.15μF, balanced

2wire dc current capability
40mA maximum with no significant performance degradation

2wire dc resistance (with A&B leads shorted)
50 ohms nominal

insertion loss (with 0dB gain or loss)
±0.2dB maximum at 600 ohms

total harmonic distortion
less than 1% at maximum output level, 500 to 4000Hz

crosstalk loss between units in adjacent shelf slots
80dB minimum, 200 to 3000Hz

channel-to-channel crosstalk loss (4wire mode)
75dB minimum, 200 to 3000Hz

4wire-port echo return loss (any 4wire port)
20dB minimum vs. 600 ohms

2wire echo return loss (2wire mode)
25dB minimum vs. 600 or 900 ohms in series with 2.15μF

noise
5dBrnC maximum at 0dB loss or gain

peak-to-average ratio (P/AR)
greater than 98

transhybrid loss
33dB ERL minimum with precision port terminations
30dB ERL minimum with internal CBN inserted and with precision termination on 2wire port

compromise balance network
switch-selectable for 600 ohms, 900 ohms, or a user-adjustable range of 0 to 2000 ohms, all in series with 2.15μF; excludable via switch option for external PBN use

network build-out (NBO) capacitance
0 to 0.062μF in switch-selectable 0.002μF increments

longitudinal balance
4wire: 60dB minimum, 200 to 1000Hz; 50dB minimum, 4000Hz
2wire: 60dB minimum, 200 to 1000Hz; 50dB minimum, 4000Hz

input power requirements (without 6008X subassembly)
voltage: −22 to −56Vdc, filtered, ground-referenced
current: 45mA idle (typical), 75mA maximum

dimensions
5.58 inches (14.17cm) high
1.42 inches (3.16cm) wide
5.96 inches (15.14cm) deep

weight
9 ounces (255 grams) without 6008X subassembly

mounting
relay rack or apparatus case via one position of a Tellabs Type 10 Mounting Shelf

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 6131 2Wire-to-4Wire or 4Wire-to-4Wire Terminal Interface Module. The checklist 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 **testing guide checklist**, 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.

testing guide checklist

Note: *Do not use an unbalanced measuring device or signal source for 2wire level measurements, or erroneous readings will occur.*

test	procedure	normal result	if normal conditions are not met, verify:
receive-path loss or gain, 2wire or 4wire mode	Connect properly terminated TMS (rcv) to *2w/4w rcv out* jack. Use TMS (xmt) to insert 1004Hz test tone at −18dBm into *rcv in* jack. Vary *rcv level* switches over their entire loss and/or gain range.	Signal level corresponds to loss or gain settings, with maximum loss or gain of 24dB ☐.	Power ☐. Wiring ☐. Impedance terminations (check for double terminations) ☐. Option switch settings ☐. Level settings ☐. Replace 6131 and retest ☐.
transmit-path loss or gain, 2wire mode	Insert opening plug into *rcv in* jack. Connect properly terminated TMS (rcv) to *xmt out* jack. Use TMS (xmt) to insert 1004Hz test tone at −18dBm into *2w/4w rcv out* jack. Vary *xmt level* switches over their entire loss and/or gain range.	Signal level corresponds to loss or gain settings, with maximum loss or gain of 24dB ☐.	Same as above ☐.
transmit-path loss or gain, 4wire mode	Connect properly terminated TMS (rcv) to *xmt out* jack. Use TMS (xmt) to insert 1004Hz test tone at 0dBm into *4w xmt in* jack. Vary *xmt level* switches over their entire loss and/or gain range.	Signal level corresponds to loss or gain settings, with maximum loss or gain of 24dB ☐.	Same as above ☐.

8. FCC registration information

8.01 The Federal Communications Commission (FCC) has established through Part 68 of its Rules and Regulations that FCC-registered terminal equipment may be directly connected to the telephone network through standard plugs and jacks. This section documents the customer's responsibility to the telephone company when the Tellabs 6131X module is connected to central office (CO) and off-premises-station (OPS) lines.

connection arrangement

8.02 FCC-registered terminal equipment may not be connected to coin lines or party lines.

8.03 Customers directly connecting this equipment to the telephone network shall, before connection, give notice to the telephone company of the particular CO/OPS lines to which such connection is to be made. In off-premises applications, the OPS class for which the equipment is registered shall be observed. The customer shall give notice upon final disconnection. In addition, the telephone company shall be provided the following information:

A. For each line, the FCC registration numbers for all equipment dedicated to that line, the largest ringer equivalence number (REN) to be presented to that line, and any information required for the compatible operation of this equipment with telephone company communications facilities.
B. The quantities and universal service order code (USOC) numbers of the required standard jacks.
C. For each jack, the sequence in which lines are to be connected, the technical description codes by position, and the service codes by position.

sample information table

8.04 Table 5 is representative of the information that the customer must supply to the serving telephone company in regard to installation of the registered 6131X module. At the time USOC's are ordered, it is the customer's responsibility to specify the sequence in which lines are to be connected. The serving telephone company will consecutively wire these lines without skipping any jack positions.

module	telephone company facilities	service code	facility code	REN
6131B	CO 2wire loop	N/A	N/A	1.0B
6131B	CO 4wire loop	N/A	N/A	1.0B
6131B	CO 2wire ground	N/A	N/A	1.0B
6131B	CO 4wire ground	N/A	N/A	1.0B
6131A	2wire DID	N/A	N/A	0.0B
6131A	4wire DID	N/A	N/A	0.0B
6131A	OPS	9.0F or 7.0Z*	0L13A	N/A
6131A	OPS	9.0F or 7.0Z*	0L13B	N/A
6131A	OPS	9.0F or 7.0Z*	0L13C	N/A
* Service code 7.0Z is for CPCS registration.				

table 5. Telephone company information for 6131X

FCC requirement on CPCS

8.05 Customer-provided communications systems (CPCS's), such as private microwave systems and analog/digital cable facilities, may be connected to the telephone network to provide Wide Area Telephone Service (WATS), Long Distance Message Telecommunications Service (LDMTS), and private-line services by regulations established under Tariffs 259, 263, and 260, respectively. An alternative within these tariffs has been established to allow CPCS's to be connected to the network through registered protective circuitry that provides hardware protection for all requirements of Part 68 of the FCC Rules and Regulations except signal-power limitation. With this alternative, signal-power limitation is accomplished from a CPCS at the network interface by means of new institutional procedures. These procedures include supplying to the telephone company all of the information in paragraphs 8.03 through 8.04 and, in addition, filing an affidavit that attests to the customer's willingness and ability to comply with the signal-power levels set forth in the appropriate tariffs.

Note: *The affidavit requirement noted in paragraph 8.05 applies only to CPCS's. Exhibit 1 is a sample affidavit. See paragraph 8.06 for this affidavit procedure.*

affidavit procedure

8.06 Part 68 of the FCC Rules and Regulations requires that a CPCS's overall gain be unity gain for live transmission. Signals other than live voice transmission and network control signaling must be less than −9dBm entering the switched network interface and less than −13dBm entering an OPS interface. The customer assures compliance with these restrictions with an affidavit.

8.07 A customer who wishes to connect a CPCS to the telecommunications network and who chooses to use the institutional procedures for control of signal power may do so by submitting an affidavit to the telephone company where the network connection is to be made. The customer attests in the affidavit, in accordance with the appropriate tariff, that the communications system will be operated only by trained individuals and that the signal power at the interface with telephone company services will not exceed signal-power limitations set forth in Part 68.

8.08 The affidavit is to be notarized and filed at least 10 days before the initial connection of the communications system to the telecommunications network. After the telephone company receives the affidavit and is satisfied that it meets all the tariff requirements, the affiant is assigned an affidavit identification number (AIN) valid for one year. The AIN covers all connections at the network access points for a period of one year. After an AIN is provided, additional affidavits are not required for additional network connections of communications system(s) at the location(s) covered by the original AIN. When requesting additions, the customer may provide the existing, valid AIN to the telephone

company to comply with the tariffs. Reference to the existing AIN may be oral. If the customer requires a network connection of a communications system at a location not covered by the previous affidavit, the new information must be filed in the form of an amended affidavit that updates the information in the initial affidavit.

8.09 A copy of the affidavit is to be maintained at the customer's premises where the network connections are made. This requirement may be satisfied by posting a label on the premises within sight of the network interface rather than by posting a copy of the affidavit. Under either of these options, the telephone company can verify affidavit accuracy, if necessary.

8.10 The tariffs specifying the institutional procedures for signal-power control require the following specific information in filing the affidavit: full name, business address, business telephone number, and signature of customer or authorized representative.

8.11 The affidavit must be filed either by the customer who wishes to connect a CPCS to the telecommunications network or by the customer's authorized representative who has responsibility for the operation and maintenance of the CPCS.

8.12 A separate affidavit must be submitted to each telephone company in whose territory the CPCS will be connected to the telecommunications network. If telephone companies operate in more than one state, a complete affidavit must be filed with the company in each state where CPCS's will be connected to the telecommunications network. It is important to emphasize that the affidavit must be submitted only in those territories where CPCS's will be connected to the telecommunications network. A customer, therefore, with a communications system from New York City to Chicago who will connect to the telecommunications network only in New York City and Chicago will file only two affidavits, even though the system passes through several states.

installation requirements

8.13 The Tellabs 6131X module is considered a fully protected system. As such, all premises wiring is considered fully protected and requires no documentation of procedures or personnel. A 6131X module is typically connected to the LDMTS/WATS or OPS interface by a cable less than 25 feet in length and terminated in a USOC RJ2DX or RJ21X plug. Cables do not require registration and may be purchased from Tellabs or another manufacturer. The only requirements for cables are that they meet the industry standard 1000Vac dielectric rating and that those cables deriving the network interface be terminated in USOC RJ2DX or RJ21X plugs.

incidence of harm

8.14 If the registered equipment causes harm to the telephone network, the telephone company shall, where practicable, notify the customer that a temporary discontinuance of service may be required. Where prior notice is not practicable, however, the telephone company may temporarily discontinue service if such action is reasonable under the circumstances. If the telephone company temporarily discontinues service, the customer must be promptly notified. The customer must also be provided with an opportunity to correct the problem that caused the discontinuance and be informed of the right to bring a complaint to the FCC.

8.15 When trouble is experienced, the customer shall disconnect the registered equipment from the telephone line to determine if the registered equipment is malfunctioning. If the equipment is malfunctioning, its use shall be discontinued until the problem is corrected. No repair work (other than those routine troubleshooting procedures prescribed in this practice) is authorized to be performed by the user. Part 68 of the FCC Rules and Regulations prescribes all repairs of registered equipment to be made by the manufacturer or his authorized agent.

8.16 The telephone company may make changes to its communications facilities, equipment, operations, or procedures when reasonably required in the operation of its business and not inconsistent with the rules and regulations of Part 68. If such changes can be reasonably expected to render any customer's terminal equipment incompatible with telephone company communications facilities, to require modification or alteration of such terminal equipment, or to otherwise materially affect its use or performance, the customer shall be given adequate notice, in writing, so that the customer has an opportunity to maintain uninterrupted service.

AFFIDAVIT FOR THE CONNECTION OF CUSTOMER-PROVIDED COMMUNICATIONS SYSTEMS NOT SUBJECT TO PART 68 OF THE FCC RULES AND REGULATIONS

For work to be performed in the certified territory of _____
(Telco's Name and State)

State of _____ County of _____

I, _____, _____
(Name) (Business Address) (Telephone Number)

representing _____, a customer located at _____,
(Name of Customer) (Address)

_____ being duly sworn, state:
(Telephone Number)

1. I have responsibility for the operation and maintenance of the customer-provided communications system(s) not subject to Part 68 of the FCC Rules and Regulations which is (are) to be connected to the telecommunications network as indicated in paragraph (3.) below.

2. The said communications system(s) will be connected through FCC registered or grandfathered terminal equipment, systems, or protective circuitry which assures that all of the requirements of Part 68 of the FCC Rules and Regulations, with the sole exception of excessive signal power, are met at the telecommunications network interface.

3. The telephone line(s) to which the equipment in (2.) above will be connected to, or arranged for connection to, is (are):

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

4. I attest that all operations associated with the establishment, maintenance and adjustment of the said communications system(s) will be made so that the signal power (within the frequency range of 200-4000 Hertz) at the telecommunications network interface continuously complies with Part 68 of the FCC Rules and Regulations.

5. I attest that the operator(s)/maintainer(s) of the said communications system(s) responsible for the establishment, maintenance, and adjustment of the voice frequency signal power present at the telecommunications network interface has (have) been trained to perform these functions by successfully completing one of the following: (Check appropriate one(s))

a. A training course provided by the manufacturer of the equipment used to control voice frequency signal power; or
b. A training course provided by the customer or authorized representative, who has responsibility for the entire communications system, using training materials and instructions provided by the manufacturer of the equipment used to control the voice frequency signal power; or
c. An independent training course (e.g., trade school or technical institution) recognized by the manufacturer of the equipment used to control the voice frequency signal power; or
d. In lieu of the preceding training requirements, the operator(s)/maintainer(s) is (are) under the control of a supervisor trained in accordance with a b c above.
(circle one)

6. I agree to provide _____ with proper documentation to demonstrate compliance with the information as provided in paragraph (5.) preceding, if so requested.

Subscribed and Sworn to before me
this _____ day of _____, 19__.

_____
NOTARY PUBLIC

My commission expires: _____

_____
(Signature)

_____
(Title)

_____
(Date)