tellabs
technical manual
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rev B

practice section 816971

6971 Common Interface Module (2W/4W)

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1. general description

1.01 The 6971 Common Interface Module (figure 1) provides transmission interface between 4wire transmission equipment and a 2wire or 4wire telephone station loop or a PBX trunk. Both adjustable transmission attenuation and switch-selectable 4wire-to-2wire conversion are provided. As an alternative to 4wire-to-2wire conversion, the 6971 may be switch-optioned to provide a 4wire-to-4wire pad/transformer interface. In addition, the 6971 accepts several types of optional signaling converter plug-on subassemblies that provide various modes of loop-to-E-and-M and E-and-M-to-DX signaling conversion.

1.02 Levels in both the transmit and receive channels may be prescription-set via front-panel switches that introduce from 0 to 26.5dB of attenuation, in 0.1dB increments, into the transmit and receive 4wire paths.

1.03 An integral two-coil hybrid provides 4wire-to-2wire transmission path conversion. A switch option, however, conditions the 6971 to provide 4wire transmission between the transmission equipment side and the facility side. The 4wire option provides adjustable transmission attenuation with transformer isolation and balance.

1.04 Switchable 600 or 900-ohm terminating impedance is provided on the facility side of the 6971 when the module is optioned for 2wire loop operation. The facility-side terminating impedance is fixed at 600 ohms when the module is optioned for 4wire loop operation. The 600 or 900-ohm resistive component at the 2wire port is in series with a 2.15μF capacitive component. On the equipment side of the 6971, terminating impedances are fixed at 600 ohms.

1.05 The 6971 module is designed to accept Tellabs' series of 9961X loop-to-E-and-M and E-and-M-to-DX Signaling Converter plug-on subassemblies. The 9961A subassembly, when used on the 6971, provides conversion between local E-and-M signaling leads and foreign-exchange station-end (FXS) loop signaling. The 9961B subassembly provides conversion between E-and-M signaling and foreign-exchange office-end (FXO) loop signaling.

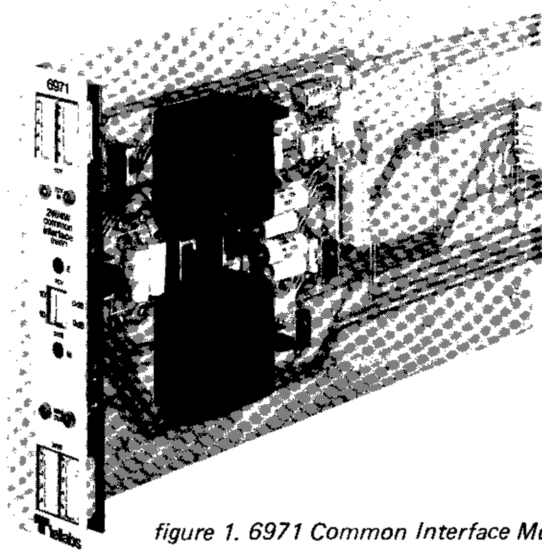


figure 1. 6971 Common Interface Module

The 9961C subassembly provides conversion between E-and-M signaling and switchboard (ac) or manual (dc) ringdown loop signaling. The 9961D subassembly provides E-and-M-to-duplex (DX) signaling conversion. Signaling conversion is provided when the 6971 is optioned for either 2wire or 4wire operation.

Note: *When DX signaling is used (9961D), the DX signaling path derived via the 6971 includes only the transmit loop, as access to the receive-loop simplex lead is not available.*

1.06 The 6971 is equipped with a compromise balance network that provides 600 or 900-ohm impedance in series with 2.15μF capacitance when the module is optioned for 2wire loop operation. Network build-out (NBO) capacitors associated with this balance network provide from 0 to 0.126μF of NBO capacitance in 0.002μF increments. If precision balancing of the hybrid is desired, a Tellabs 993X Precision Balance Network (PBN) subassembly may be plugged into a receptacle on the 6971's printed circuit board and the compromise network switch-optioned out of the circuit. Refer to the 993X Tellabs Practice for detailed information on these PBN subassemblies.

1.07 The front panel of the 6971 contains, in addition to the aforementioned attenuation switches, two light-emitting diodes (LED's) that light to indicate seizure in either direction (i.e., to indicate E-lead and M-lead status) and two sets of test points to access the equipment-side receive input and transmit output ports.

1.08 When used without an associated 9961X Signaling Converter subassembly, the 6971 module is completely passive except for its front-panel LED's and thus requires no external power connections unless it is desired that these LED's be functional. Because the 9961X subassemblies are active devices, however, the 6971, when equipped with a 9961X, must be powered from a filtered −42 to −56Vdc input.

1.09 The 6971 module mounts in one position of the Tellabs Type 16 Mounting Shelf, versions of which are available for 19-inch and 23-inch relay rack installation. Both versions accommodate 12 modules and occupy 4 rack mounting spaces (7 inches of vertical rack space).

2. application

2.01 The 6971 Common Interface Module is designed to interface 4wire transmission equipment (typically, a carrier channel) with a 2wire or 4wire telephone station loop or a PBX trunk. In the majority of its applications, the 6971 will be equipped with a Tellabs 9961X plug-on signaling converter subassembly to provide conversion between E-and-M signaling and either foreign-exchange or ringdown loop signaling, or DX signaling. In this configuration (i.e., when equipped with a 9961X subassembly), the 6971 is a compact, single-module unit that performs the functions of both a signaling converter module and an associated 4wire-to-2wire terminating set module, with the added advantage of switch-selectable 4wire loop operation.

2.02 The 6971 may also be used without a 9961X subassembly as an ordinary 4wire-to-2wire terminating set or 4wire-to-4wire pad/transformer module. Use of the 6971 in these capacities, however, will normally be limited to prewired bay applications because other applications requiring a term set or pad/transformer module without a companion signaling converter may often be accommodated more economically through use of other Tellabs modules (e.g., Tellabs' 420X Term Sets and 440X Pad/Transformer modules).

2.03 When a 9961X subassembly is used on a 6971 module optioned for 2wire loop operation, the 6971's A and B leads are used internally for loop access. In the 4wire loop operation mode, regardless of whether or not a 9961X subassembly is used, the 6971's transmit-path transmission repeat coil provides A and B leads that are, again, used internally for loop signaling access. Only when the 6971 is used without a 9961X subassembly and optioned for 2wire loop operation are A and B leads available for use with external equipment.

2.04 The 6971's facility-side port impedance may be switch-optioned for 600 or 900 ohms (in series with 2.15μF) only when the module is optioned for 2wire loop operation. (The 6971's facility-side port impedance is fixed at 600 ohms when the module is optioned for 4wire operation, regardless of the settings of the impedance option switches.) The choice of 2wire port impedance permits interface with a variety of facilities and equipment. The 600-ohm option is selected when the 6971 interfaces nonloaded cable or station equipment, while the 900-ohm option is selected when the 6971 interfaces loaded cable or switched networks accessing loaded and nonloaded cable.

2.05 Optioning the 6971 for 2wire loop operation introduces the module's 4wire-to-2wire hybrid into the circuit and configures the facility-side leads for 2wire operation. Some 2wire applications of the 6971 may require hybrid balance (transhybrid loss) greater than that achievable via the module's internal compromise balance network. For these applications, the compromise network may be switch-optioned out of the circuit and a Tellabs 993X Precision Balance Network (PBN) subassembly plugged into a receptacle on the 6971's printed circuit board. The 993X subassemblies are available in several versions to approximate the impedances of specific transmission facilities and equipment. Refer to the Tellabs 993X PBN Practice for details.

2.06 The 6971 provides integral network build-out (NBO) capacitors to compensate for capacitance of office cables or associated gain devices. Network build-out capacitance should be added to optimize transhybrid loss (or 4wire return loss). From 0 to 0.126μF of NBO capacitance, in 0.002μF increments, may be switch-optioned into the circuit.

2.07 When the 6971 is optioned for 4wire loop operation, the module's transformers (which function as hybrid transformers in 2wire loop operation) function instead as repeat coils, and the facility-side leads are configured for 4wire operation.

use with 9961A subassembly

2.08 The 9961A Signaling Converter FXS (foreign-exchange, station) subassembly, when mounted on the 6971 module, provides conversion between E-and-M signaling and loop signaling conventionally used at the station end of a foreign-exchange circuit. Specifically, the 9961A converts E-lead signals to ringing and tip-ground supervision toward the station, and also converts loop supervisory and dialing signals from the station to M-lead outputs.

2.09 The 9961A accommodates local ring trip during either ringing or silent intervals and includes an integral ringing interrupter that provides 2-second-on, 4-second-off ringing.

2.10 Use of the 9961A subassembly and associated 6971 module is not restricted to foreign-exchange applications. The 9961A and 6971 may be used, for example, to provide loop-to-E and M conversion at the station end of an off-premise extension circuit. Also, automatic ringdown operation may be accommodated by equipping both ends of an E-and-M channel with a 6971 and a 9961A. In any of its intended applications, the 9961A may be switch-optioned for loop-start or ground-start operation and for normal or inverted E-lead operation.

use with 9961B subassembly

2.11 The 9961B Signaling Converter FXO (foreign exchange, office) subassembly, when mounted on the 6971 module, provides conversion between E-and-M signaling and loop signaling conventionally used at the office (i.e., switching equipment) end of a foreign exchange circuit. Specifically, the 9961B converts E-lead signals to loop signaling for operation of the switching equipment, and also converts loop supervisory and ringing signals from the switching equipment to M-lead outputs.

2.12 Like the 9961A, the 9961B subassembly is not restricted to foreign-exchange applications. With its companion 6971 module, the 9961B may be used to provide loop-to-E-and-M conversion at the PBX end of an off-premise extension circuit. Also like the 9961A, the 9961B may be switch-optioned for loop-start or ground-start operation and for normal or inverted E-lead operation.

use with 9961C subassembly

2.13 The 9961C Signaling Converter Ringdown subassembly, when mounted on the 6971 module, provides conversion between E-and-M signaling and ac switchboard or dc manual ringdown signaling. Specifically, the 9961C converts E-lead signals to ringing signals toward the local termination, and also converts ringing signals from the local termination to M-lead outputs.

2.14 In either the ac switchboard or dc manual ringdown mode, M-lead ground is transmitted from the local termination to initiate ringing at the distant end. In the ac switchboard ringdown mode, this is effected via local application of ringing voltage across the A and B leads. In the dc manual ringdown mode, this is effected via local application of ground to the dc manual ringdown lead. Ringing at the distant end persists throughout the duration of the transmitted M-lead ground.

2.15 The 9961C may be switch-optioned for normal or inverted E-lead operation. During **normal** E-lead operation in either ringdown mode, receipt of incoming E-lead **open** is interpreted as incoming seizure and activates local ringing. During **inverted** E-lead operation in either ringdown mode, receipt of incoming E-lead **ground** is interpreted as incoming seizure and activates local ringing. Local ringing persists throughout the duration of the incoming seizure condition.

use with 9961D subassembly

2.16 The 9961D Signaling Converter DX subassembly, when mounted on the 6971 module, provides extended-range E-and-M-lead (DX) signaling over the associated metallic facility. Maximum range of the 9961D is 5000 ohms of loop resistance. The 9961D may be conditioned, via slide switch, for either DX1 or DX2 operation. In the DX1 mode of operation, M-lead signals are input to the module, and E-lead signals are output. In the DX2 mode, M-lead signals are output and E-lead signals are input.

Note: *The 9961D subassembly uses either the 2wire loop or the transmit loop for its DX path, with access via the 6971's A and B leads. When using the 9961D with the 6971 module, be sure that the A-and-B-lead capacitor (switch* S4 *on the 9961D subassembly) is set to the* OFF *position in 2wire applications and set to the* 2μF *position in 4wire applications.*

2.17 For complete application, installation, optioning, and alignment information on the 9961A, 9961B, 9961C, and 9961D subassemblies, refer to the separate Tellabs Practice on each subassembly.

3. installation

inspection

3.01 The 6971 Common Interface Module should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the module should be visually inspected again prior to installation.

mounting

3.02 Each 6971 module mounts in one position of the Tellabs Type 16 Mounting Shelf, which is available in configurations for both 19-inch and 23-inch relay rack installation. The module plugs physically and electrically into a 56-pin connector at the rear of the Type 16 Shelf.

installer connections

3.03 In most cases, the 6971 module will be installed in Type 16 Mounting Shelves with connectorized backplanes. External connections are made via plug-ended cables that are mated to connectors on the backplane of the Shelf. Before plugging modules into place, proper external connections and proper input fusing should be verified, and each module should be properly optioned.

3.04 If Type 16 Shelves without connectorized backplanes are used, external connections are made via wire-wrap to the 56-pin connector at the rear of each module's mounting shelf position. Pin numbers are found on the body of the 56-pin connector. Again, modules should be put into place only after verifying wiring, fusing, and option selection. Table 1 lists external connections required when non-connectorized Type 16 Shelves are used.

options

3.05 All options in the 6971 are selected via slide or DIP switches located as shown in figure 2. Table 2 lists these options and indicates the option choices, which are described below.

3.06 Switches *S1, S4,* and *S6* condition the 6971 for either 2wire or 4wire loop operation. Set *S1, S4,* and *S6* to their *2W* positions to introduce the module's integral 4wire-to-2wire hybrid into the circuit and configure the facility-side leads for 2wire loop operation. Set *S1, S4,* and *S6* to their *4W* positions to arrange the module's transformers and facility-side leads for 4wire operation.

connect:	to pin:
4W XMT OUT T (4wire transmit out tip)*	3
4W XMT OUT R (4wire transmit out ring)*	1
4W RCV IN T1 (4wire receive in tip)*	55
4W RCV IN R1 (4wire receive in ring)*	53
2W/4W XMT IN T1 (2wire tip or 4wire transmit in tip)**	7
2W/4W XMT IN R1 (2wire ring or 4wire transmit in ring)**	5
2W A/4W RCV OUT T (2wire A lead or 4wire receive out tip)**	51
2W B/4W RCV OUT R (2wire B lead or 4wire receive out ring)**	49
MB/SG LEAD (or manual ringdown when 9961C subassembly is used)	33
EG/SG LEAD	35
RG (ring generator)	23
RGB (ring generator dc ringing bias)	17
E LEAD	21
M LEAD	19
−BATT (−48Vdc)	15
GND (ground)	25
*transmission equipment side **facility side	

table 1. External connections to 6971

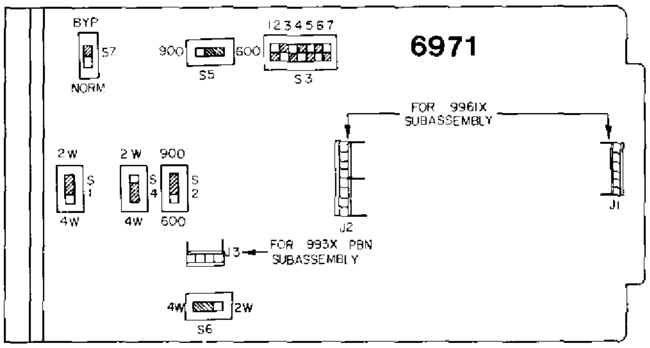


figure 2. Switch locations

switch	option	function
S1, S4, and S6	2w or 4w	condition module for 2wire or 4wire loop operation
S2 and S5	600 or 900	condition module for 600 or 900 ohm 2wire port impedance
S3-7*	on (closed) or off (open)	includes (on) or excludes (off) internal compromise balance network from circuit
S3-1* S3-2* S3-3* S3-4* S3-5* S3-6*	on (closed) or off (open)	0.002μF 0.004μF 0.008μF 0.016μF 0.032μF 0.064μF when on, introduce indicated amounts of NBO capacitance
S7	NORM or BYP	conditions module's A and B leads for use with (NORM position) or without (BYP position) 9961A, B, or C Signaling Converter subassembly. When used with 9961D (DX) subassembly, selects 2wire DX operation (BYP position) or 4wire DX operation (NORM position).
*functional only when 6971 is optioned for 2wire loop operation.		

table 2. 6971 switch options

3.07 Switches *S2* and *S5* condition the 6971 for 600 or 900-ohm facility-side port impedance **only** when the module is optioned for 2wire loop operation. Both switches must be set to their *600* or *900* positions to derive proper terminating impedances at the terminal-side (2wire) ports. Switch *S5* also automatically selects the proper internal compromise balance network impedance when set to the *600* or *900* position. When the 6971 is optioned for 4wire operation, *S2* and *S5* need not be set to a particular position, as fixed 600-ohm terminating impedance is provided at the facility-side (4wire) ports regardless of the settings of *S2* and *S5*.

3.08 Switch *S7* conditions the module's A and B leads for use with or without a 9961A, B, or C subassembly, or for 2wire or 4wire DX operation when the 9961D subassembly is used. When a 9961A, B, or C subassembly **is not** used, set *S7* to the *BYP* position to provide A-and-B-lead continuity through the module. When a 9961A, B, or C is used, set *S7* to the *NORM* position to connect the A-and-B-lead path through the subassembly. When a 9961D (DX) subassembly is used, set *S7* to the *BYP* position for 2wire DX operation or set *S7* to the *NORM* position for 4wire DX operation, and plug the subassembly into receptacles *J1* and *J2*.

Note: *Switch* S4 *on the 9961D subassembly must be set to the* 0μF *position in 2wire applications, and set to the* 2μF *position in 4wire applications.*

3.09 Seven-position DIP switch *S3* is associated with the 6971's internal compromise balance network and is functional only when the module is optioned for 2wire loop operation. (Optioning the 6971 for 4wire operation automatically excludes the 4wire-to-2wire hybrid and internal compromise network from the circuit and disables switch *S3*.) Six positions of *S3* are used to introduce network build-out (NBO) capacitance (see paragraph 3.10). The seventh position is provided to permit an external precision balance network (in the form of a Tellabs 993X plug-on PBN subassembly) to be used in lieu of the internal compromise network. When the module's internal compromise network is to be used, set position *7* of switch *S3* to the *on* (closed) position to include the compromise network in the circuit. When a 993X PBN subassembly is to be used, set *S3-7* to the *off* (open) position to exclude the compromise network and plug the subassembly into receptacle *J3*.

Note: *At this point, all option switches except the NBO capacitance switches should be set, and the required subassemblies should be plugged into their receptacles.*

3.10 Network build-out capacitance is introduced via positions *1* through *6* of switch *S3*. Values of these switch positions are listed in table 2. These values are additive; thus, the amount of NBO capacitance introduced is the sum of those positions set to the *on* (closed) position. These switches are to be set during the alignment procedure. Do **not** set these switches without first reading paragraph 3.15.

alignment – 2wire option

3.11 When the 6971 is optioned for 2wire loop operation, the alignment procedure consists of adjusting the variable attenuators at the 4wire equipment-side ports in accordance with circuit requirements and introducing NBO capacitance as required to maximize transhybrid loss. Align the 6971 as directed below.

Note 1: *If the 6971 is equipped with a 9961X Signaling Converter subassembly, the circuit must be seized locally to remove the idle-line termination inserted by the subassembly.*

Note 2: *The following alignment procedure will be expedited if a Tellabs 9807 Card Extender or an external jackfield is used to access the module's 2wire and 4wire ports. If a Card Extender or jackfield is not used, these ports may be accessed via the module's connector pins.* **Because external connections must be temporarily removed from these pins, this last method of access is not recommended.** *Pin numbers as well as 9807 jack designations are provided in the instructions that follow.*

3.12 **Transmit Attenuator.** Using a transmission measuring set (TMS) set for 1000Hz at the impedance and level specified for the circuit, insert a signal at the 2wire port (*4W XMT DROP or 2W IN* jack on 9807 or pins 5 and 7). With the TMS terminated into 600 ohms and connected to the 4wire transmit output port (*XMT SF OUT* jack or *xmt out* test points), measure the transmit level. Set the front-panel *xmt* attenuation switches to derive the equipment-side level specified for the circuit under test.

3.13 **Receive Attenuator.** Request the facility-side to send 1000Hz tone toward the equipment-side (carrier) location. If you are using a 9807 Card Extender, insert an opening plug into the *RCV SF IN* jack. Then, using a terminated 600 ohms TMS (receive), measure the received level at the 4wire receive input port (*RCV LINE MON* jack or *rcv in* test points). When this level is consistent with circuit specifications, remove the opening plug (if used), disconnect the TMS from the 4wire receive input port, and connect it (with 600 or 900-ohm termination, as required) to the 2wire port (*4W XMT DROP or 2W IN* jack or pins 5 and 7). Set the front-panel *rcv* attenuation switches to derive the receive level specified for the circuit at the 2wire port.

3.14 **Balance Network.** Before introducing NBO capacitance, the type of balance network to be used must be determined. If the module's internal compromise balance network is to be used, set position *7* of switch *S3* to the *on* (closed) position and proceed to paragraph 3.15. If a Tellabs 993X Precision Balance Network subassembly is to be used, set *S3-7* to the *off* (open) position to exclude the compromise network from the circuit, and refer to the 993X Practice for alignment information.

3.15 **Network Build-Out Capacitance.** Request the equipment-side (carrier) location to send 2000Hz test tone at the level specified for the circuit. Verify that the received level is within limits for the circuit as follows: If you are using a 9807 Card Extender, insert an opening plug into the *RCV SF IN* jack. Then, using a terminated (600 ohms) TMS (receive), measure the received level at the 4wire receive input port (*RCV LINE MON* jack or *rcv in* test points). When this level is verified, remove the opening plug (if used), disconnect the TMS from the 4wire receive port, and, if the 6971 was removed from its shelf position, reinsert it. Connect the TMS to the 4wire transmit output port (*XMT SF OUT* jack or *xmt out* test points). Seize the circuit (the 2wire facility must be connected to pins 5 and 7 for this measurement) and set DIP switches *S3-1* through *S3-6* to **minimize** the signal level measured at the 4wire transmit output port. A more precise adjustment may be achieved if the test frequency is varied over the voice band as the NBO adjustment is made.

alignment – 4wire option

3.16 When the 6971 is optioned for 4wire loop operation, the alignment procedure consists of adjusting the variable attenuators at the equipment-side 4wire ports in accordance with circuit requirements. Align the 6971 as directed below.

Note: *The following alignment procedure will be expedited if a Tellabs 9807 Card Extender or an external jackfield is used to access the module's 4wire equipment-side and facility-side ports. If a Card Extender or jackfield is not used, these ports may be accessed via the module's connector pins.* **Because external connections must be temporarily removed from these pins, this last method of access is not recommended.** *Pin numbers as well as 9807 jack designations are provided in the instructions that follow.*

3.17 **Transmit Attenuator.** Using a TMS (transmit) set for 1000Hz at the impedance and level specified for the circuit, insert a signal at the 4wire transmit input port (*4W XMT DROP or 2W IN* jack on 9807 or pins 5 and 7). With the terminated (600 ohms) TMS (receive) connected to the 4wire transmit output port (*XMT SF OUT* jack or *xmt out* test points), measure the transmit level. Set the front-panel *xmt* attenuation switches to derive the level specified for the circuit under test.

3.18 **Recieve Attenuator.** Request the facility-side location to send 1000Hz tone at the specified level toward the transmission equipment. If you are using a 9807 Card Extender, insert an opening plug into the *RCV SF IN* jack. Then, using a terminated (600 ohms) TMS (receive), measure the received level at the 4wire receive input port (*RCV LINE MON* jack or *rcv in* test points). When this level is consistent with circuit specifications, remove the opening plug (if used) and disconnect the TMS from the 4wire receive input port. Connect the TMS (with 600-ohm termination) to the 4wire receive output port (*4W RCV DROP or BAL NET OUT* jack or pins 49 and 51). Set the front-panel *rcv* attenuation switches to derive the receive level specified for the circuit at the 4wire receive output port.

4. circuit description

Note: *The following circuit description covers only the 6971 module itself; the 9961X subassemblies are covered in the separate Tellabs Practices on these units. Please refer to the associated functional schematic diagram (section 5) as an aid in understanding the circuit description.*

4.01 The 6971 Common Interface Module, when switch-optioned for 2wire loop operation, is a conventional two-transformer hybrid that uses capacitive tuning of the 2wire port. Trimming capacitors are used across both 4wire ports and the balance port to mitigate the effects of interwinding capacitances. Trimming resistors are used across the 4wire ports to compensate for dc resistance of both primary and secondary windings. Selection of 2wire port impedance is accomplished via switch-selection of taps on the 4wire ports of both transformers. Adjustable T-pad attenuators in the transmit and receive 4wire paths provide a means of level coordination in each direction of transmission.

4.02 When the 6971 is switch-optioned for 4wire loop operation, its two transformers are arranged to function as repeat coils and the integral compromise balance network is excluded from the circuit. In this configuration, the 6971 provides adjustable transmission attenuation and transformer isolation and balance on the terminal side.

6. specifications

facility-side port impedance
2wire option: 600 or 900 ohms, switch-selectable, in series with 2.15μF
4wire option: 600 ohms, resistive

equipment-side port impedance
600 ohms, resistive

attenuation range
transmit and receive: 0 to 26.5dB in 0.1dB increments, switchable

transhybrid loss
58dB minimum, 200 to 4000Hz (including insertion loss correction of approximately 8dB, measured with matched terminations on 2wire and balance network ports)

echo return loss
2wire option: 30dB minimum vs. 600 or 900 ohms
4wire option: 20dB minimum vs. 600 ohms

insertion loss
2wire option: 4.2dB nominal at 1000Hz
4wire option: 1dB nominal at 1000Hz

frequency response
2wire option: +0.5, −1.5dB re 1000Hz level, 300 to 4000Hz
4wire option: ±1.0dB re 1000Hz level, 300 to 4000Hz

longitudinal balance
60dB minimum, 200 to 4000Hz, any port

balance network
internal comrpomise network, 604 or 905 ohms in series with 2.15μF

NBO capacitance
0 to 0.126μF in 0.002μF increments, switchable

dc current capability
no performance degradation for A-and-B-lead current up to 100mA

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

dimensions
6.71 inches (17.04cm) high
1.42 inches (3.61cm) wide
12.94 inches (32.87cm) deep

weight
22 ounces (0.624kg)

mounting
relay rack via one position of Tellabs Type 16 Mounting Shelf

7. testing and troubleshooting

7.01 The Testing Guide Checklist may be used to assist in the installation, testing or troubleshooting of the 6971 Common Interface Module. The Testing Guide Checklist is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new module should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. It is strongly recommended that no internal (component level) testing or repairs be attempted on the 6971 module. Unauthorized testing or repairs may void the 6971's warranty.

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

7.03 If a 6971 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return.* Because it is the more expedient method, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

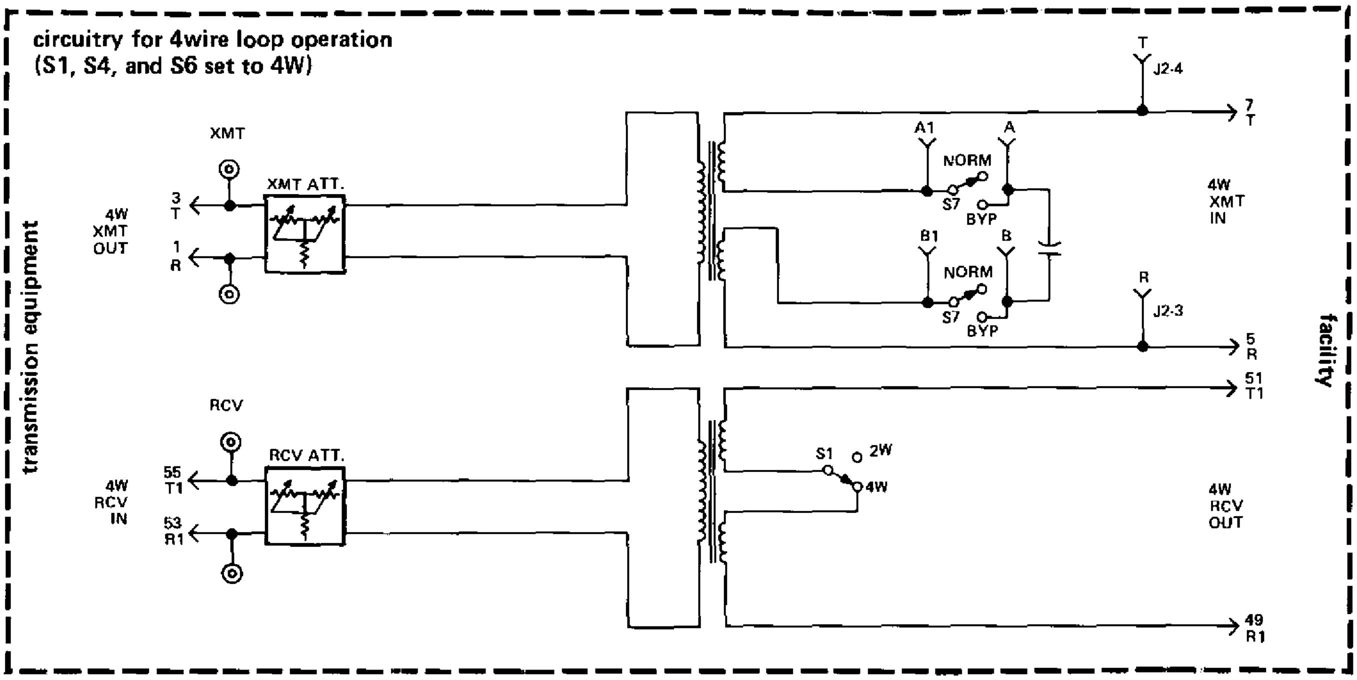
replacement

7.04 If a defective 6971 is encountered, notify Tellabs via telephone [(312) 969-8800], letter [see below], or twx [910-695-3530]. Notification should include all relevant information, including the 8X6971 part number (from which we can determine the issue of the module in question). Upon notification, we shall ship a replacement 6971 to you. If the warranty period of the defective module has not elapsed, the replacement module will be shipped at no charge. Package the defective 6971 in the replacement module's carton; sign the packing list included with the replacement 6971 and enclose it with the defective module (this is your return authorization); affix the preaddressed label provided with the replacement module to the carton being returned; and ship the equipment prepaid to Tellabs.

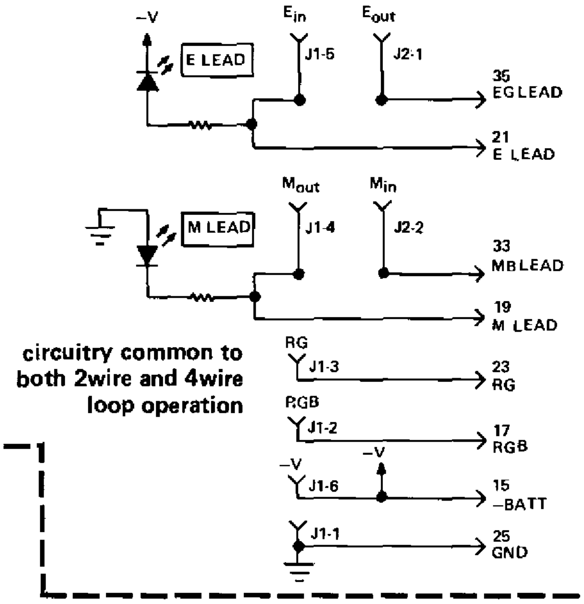
repair and return

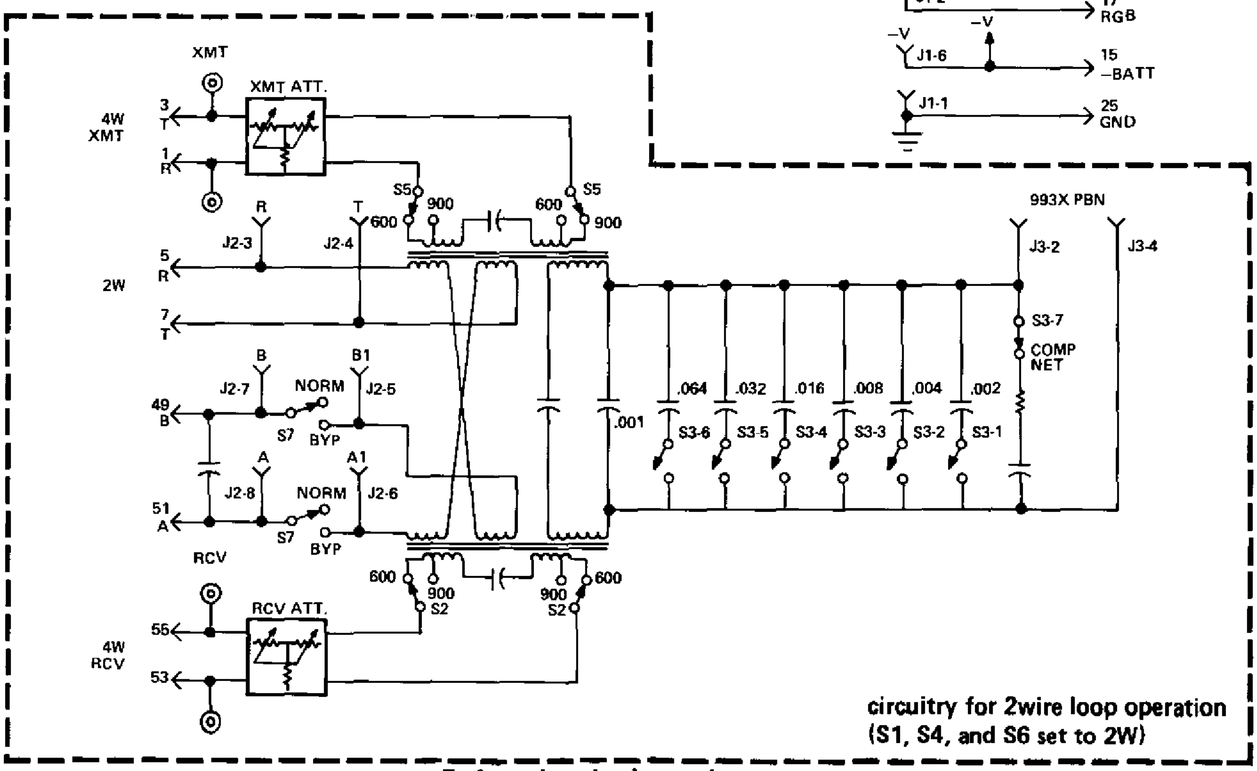
7.05 Return the defective 6971 module, shipment prepaid, to: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532
Attn: repair and return dept.

Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.



Note: *Switches S4 and S6 are not shown in 4wire mode diagram, and switches S4 and S6 are not shown in 2wire mode diagram. These two switches condition the 6971 for either 2wire or 4wire loop operation and cannot be shown without making the functional schematic inordinately complex.*





5. functional schematic

testing guide checklist

Note 1: *The following test procedure will be expedited if a Tellabs 9807 Card Extender or an external jackfield is used to access the module's 2wire and 4wire ports. If a Card Extender or jackfield is not used, these ports may be accessed via the module's connector pins.* **Because external connections must be temporarily removed from these pins, this last method of access is not recommended.** *Pin numbers as well as 9807 jack designations are provided in the checklist.*
Note 2: *For testing and troubleshooting information on the 9961X Signaling Converter subassemblies, refer to the separate Tellabs Practices on these units.*

test	test procedure	normal result	if normal conditions are not met, verify:
2wire option: 2wire receive level	Arrange for 1000Hz tone to be transmitted from equipment-side location over 4wire facility. Verify, if necessary, that level at 4wire receive port is proper as directed in paragraph 3.13. (Be sure to remove opening plug used during level verification before performing 2wire receive level measurement.) Using properly terminated TMS, measure 2wire recieve level at 2wire port (*4W XMT DROP or 2W IN* jack or pins 5 and 7).	Level within ±0.2dB of specified level, and variable as *rcv* attenuator is adjusted □.	Switches *S1, S4,* and *S6* set to *2W* □. Impedance switches properly set □. Opening plug not removed before 2wire receive level measured □. Level at 4wire receive port proper (see 3.13) □. If not, check 4wire facility alignment □. If level too high, cause may be circuit instability. To test, remove external connections at 4wire transmit port (*xmt out* test points) or insert opening plug into *XMT SF OUT* jack; then remeasure 2wire receive level at 2wire port (*4W XMT DROP or 2W IN* jack or pins 5 and 7). If levels now normal, check levels and terminations throughout circuit □. If not normal, replace 6971 and retest □. Remove opening plug (if used) □.
2wire option: 4wire transmit level	At 2wire port (*4W XMT DROP or 2W IN* jack or pins 5 and 7), insert 1000Hz test tone at level and impedance specified for circuit. Using properly terminated TMS, measure level at 4wire transmit port (*XMT SF OUT* jack or *xmt out* test points).	Level within ±0.2dB of specified level, and variable as *xmt* attenuator is adjusted □.	Circuit not "singing" by removing external connections at 4wire receive port (pins 53 and 55) or by inserting opening plug into *RCV SF IN* jack □. Replace 6971 and retest □. Remove opening plug (if used) □.
2wire option: 4wire return loss	Seize circuit locally. Request equipment-side location to send 1000Hz test tone at proper test level. Using terminated (600 ohms) TMS, measure levels at 4wire transmit port (*XMT SF OUT* jack or *xmt out* test points).	Signal level at 4wire transmit port below alignment level by required amount (a minimum 10dB singing point margin is suggested) □.	Option switch *S3-7* set to *off* (open) if plug-on precision balance network (993X) used □. Switch *S3-7* set to *on* (closed) if plug-on PBN not used □. Switches *S2* and *S5* set properly □. 2wire connection to pins 5 and 7 intact □. Front-panel *xmt* and *rcv* attenuators properly adjusted □. NBO capacitor selection □. Remove external connections to A and B leads (pins 51 and 49) and measure 4wire return loss. If condition improves when external connections removed, install external A and B-lead isolation inductor □. Replace 6971 and retest □.
4wire option: transmission continuity	Using the TMS, measure transmission continuity at 1000Hz from 4wire receive input port (*RCV SF IN* jack or *rcv in* test points) to 4wire receive output port (*4W RCV DROP or BAL NET OUT* jack or pins 49 and 51), and from 4wire transmit input port (*4W XMT DROP or 2W IN* jack or pins 5 and 7) to 4wire transmit output port (*XMT SF OUT* jack or *xmt out* test points).	Signal appears at output port at specified level □.	Switches *S1, S4,* and *S6* set to *4W* □. Wiring □. Attenuator settings □. Facility on either side of module □. Replace 6971 and retest □.