

# 281A and 281B Teleconferencing System Description

FCC Registration No. BPX826-64443-KF-E

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## 1. general description

1.01 The 281A (figure 1) and 281B Teleconferencing Systems provide teleconferencing capability for up to 10 and 15 conference stations, respectively. Both systems interface PBX or central office (CO) lines directly to provide conference access for both local and long distance conference participants. Consistently high audio quality is maintained by the 281A and 281B Systems regardless of the number of lines in use and of the various distances of the conferees from the system. Each system is controlled from a 30-key attendant console, which is used to configure the system for single or multiple conferences in either automatic or manual modes. In the manual mode, a conference attendant intercepts incoming calls and transfers them into the conference, while in the automatic mode, incoming calls are transferred directly into the conference. Both systems are housed in attractive cabinets suitable for location in an office or conference room. System installation is simplified

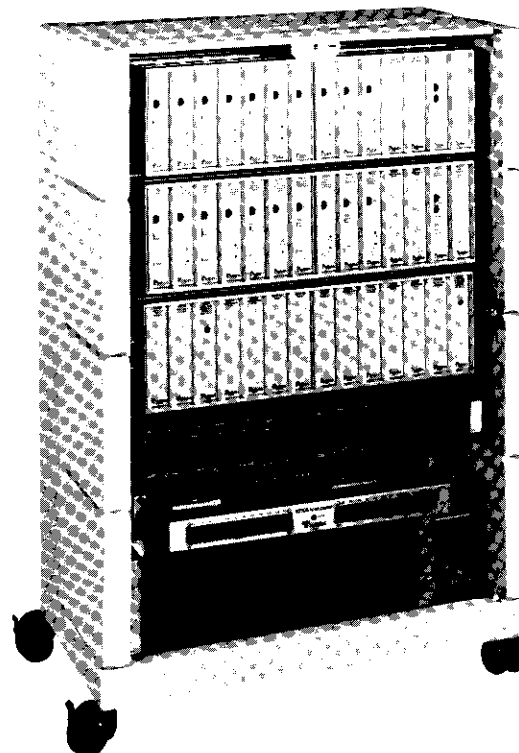


figure 1. 281A 10-Line Teleconferencing System

through the use of standard cable connectors for all required connections. Both systems are FCC-registered and are equipped with UL-listed power supplies.

**Note:** In those parts of this practice that apply equally to the 281A and 281B, both systems are, for convenience, referred to collectively as the 281A/B.

1.02 In the event that this practice section is re-issued, the reason for reissue will be stated in this paragraph.

1.03 Features provided by the 281A/B include the following:

- Split-conference capability.
- Simultaneous use of automatic and manual conference modes in split-conference operation.
- Attendant conference access, line pickup, and call screening.
- Attendant recall from conference stations.
- Status indication for all conference lines and system features by means of lighted console keys.
- Optional remote attendant console.
- Auxiliary conference port that allows for use of a speaker/microphone system (boardroom interface equipment).
- Tape-recorder port with station-controlled recorder start/stop.
- Station control of a slide projector or other device.

1.04 The 281A/B is controlled by a conference attendant via the 30-key attendant console (figure 2) provided with the system. The attendant console is equipped with one line key for each conference line in the system (i.e., 10 for the 281A console and 15 for the 281B console). The line keys provide attendant access to the individual conference lines to answer incoming calls, to call conference participants, or to remove a line from a conference for private consultation. A *HOLD* key and an *XFER* key are provided to place individual lines on hold or to transfer them into a conference.

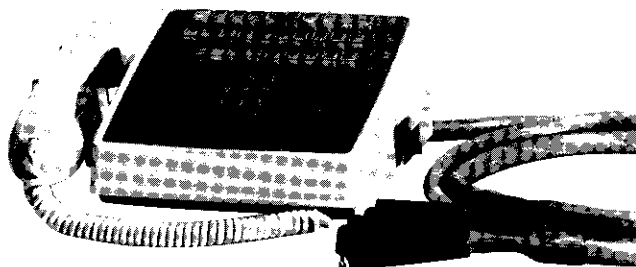


figure 2. 281A/B Attendant Console

1.05 The remaining console keys are designated as feature keys and are used to activate the system's attendant-controlled features. These features include attendant conference access, automatic or manual operation, split-conference operation, control of the system's auxiliary port, and control of the optional remote attendant console. Attendant conference access allows the attendant to enter a conference in response to an attendant recall from a conference station (see paragraph 1.09) or to make an announcement. Automatic operation allows meet-me conferences to be held without the attendant's intervention, while manual operation provides attendant controlled meet-me or dial-up conferences. Manual operation also provides the 281A/B's attendant call-screening feature by allowing the attendant to intercept incoming calls. Split conference operation provides for up to two independent conferences in the 281A System and for two or three independent conferences in the 281B System. All feature keys are duplicated to provide full conference features for each individual conference in split-conference operation.

1.06 The system's auxiliary port provides access to the conference bridge for a speaker/microphone system or "boardroom interface". The boardroom interface allows a number of conferees convened in a conference room to participate in a teleconference over a single telephone line. The boardroom interface equipment can also be used independently of the 281A/B to allow the boardroom interface equipment at one location to communicate directly with similar equipment at another location over a separate telephone line. This is accomplished by bypass circuitry in the auxiliary port's path and a separate modular telephone jack that connects directly to a CO line. Upon request, Tellabs will supply boardroom interface equipment for use with the 281A/B. Contact your Tellabs sales representative for details.

1.07 The 281A/B's recorder port allows a tape recorder to be connected to the system to record conferences or to play back prerecorded material. On the 281A System, the record port is connected in parallel with the system's auxiliary port and is therefore controlled by the same console keys. On the 281B System, the record port can be used independently of the auxiliary port.

1.08 An optional remote attendant console is available with the 281A/B to provide system control from a second location. For example, the remote console can be installed in a dedicated teleconference room to provide attendant control to a conference moderator, or it can be installed next to the master console to allow two conference attendants to more easily handle heavy conference traffic. The remote console is activated from the master console and provides the same features and functions. When the remote console is activated, system control is shared by both consoles, i.e., a feature activated on one console can be deactivated on the other, and vice versa.

1.09 In addition to the attendant-controlled features provided by the 281A/B, several station-controlled features are also provided. These features can be activated by any conference participant by dialing the appropriate codes on a DTMF telephone. The attendant recall feature allows a conferee to summon the attendant for conference consultation. The slide advance feature provides a dry relay-contact closure that can be used to advance a slide projector or to activate other switch-controlled devices. The recorder start/stop feature allows a conferee to start or stop a tape recorder connected to the system's recorder port.

1.10 The 281A System consists of a single Tellabs 1925 Apparatus Cabinet that contains three specially prewired Tellabs 1014 Mounting Shelves, a 319A Key Panel to interface the attendant console to the incoming conference lines, a fuse panel, and power and ringing supplies. The 281B is identical to the 281A with the addition of a second 1925 Cabinet, designated A-1, which contains two more prewired 1014 shelves, a second 319A Key Panel, and a fuse panel. The A-1 cabinet can be purchased separately to expand a 10-line 281A System to a 15-line 281B System. The modules required to interface the 281A/B with the incoming conference lines are also purchased separately, allowing either system to be configured for a conference line capacity smaller than its maximum, and later expanded to its full capacity.

1.11 The 281A/B can be installed in an office, conference room, or PBX equipment room. The only required installer connections are between the 281A/B and its associated attendant console, and between the 281A/B and the CO or PBX conference lines. The connections to the CO or PBX are made via a single connectorized Universal Service Order Code (USOC) RJ21X cable. A separate connectorized cable is provided for connection to the attendant console. Two RJ11C modular jacks are also provided for connection to the boardroom interface equipment, and from there to an outside line. A record out and a remote jack are provided for connection to a tape recorder.

**Note:** The only restriction on the location of the 281A/B is the distance between the system and the associated attendant console. Due to limitations of the system's ac power supply, the loop length between the console and the system must not exceed 25 ohms (approximately 500 feet of 24AWG cable). This is also true for the optional remote attendant console.

1.12 Power for the 281A/B is supplied from a commercial 120Vac, 60Hz outlet. The system's integral power supply rectifies the ac input and provides filtered, regulated dc operating voltage to its modules. The ac input is also used to power the 281A/B's integral ringing generator. Fusing is provided for each individual line circuit and for other strategic modules in the system.

## 2. system components

2.01 A basic 281A (10-line) Teleconferencing System consists of a 1925 cabinet and a 30-key attendant console. A basic 281B (15-line) Teleconferencing System consists of two 1925 cabinets and a 30-key attendant console. Optional equipment supplied by Tellabs for use with both systems includes a remote attendant console (also with 30 keys) and boardroom interface equipment. The 281A/B System can also accommodate tape recorders, slide projectors, and other media equipment.

### 1925 cabinet

2.02 The 1925 cabinet(s) that houses the 281A/B is designed to discreetly fit into an office or conference room environment. The cabinet is off-white in color with a smoked plexiglas front cover. Both the front and the rear covers are hinged for easy access and can be locked for security. The cabinet is also equipped with locking casters to facilitate movement and provide secure positioning.

2.03 The main cabinets of both systems are identical. Designated cabinet A, each contains three pre-wired Tellabs Type 1014 Mounting Shelves, a 319A Key Panel, an 8210A Fuse Panel, an 8051 Ringing Generator, and a 24Vdc, 2A power supply. The two top 1014 shelves are designated as line shelves (1 and 2) and are specifically wired to provide mounting for a conference amplifier, the modules required to interface the amplifier with up to five incoming CO or PBX lines, and various relay/switching modules to interface the line shelves with each other and with the third 1014 shelf. The third 1014 shelf is designated as a control shelf (1) and is specifically wired to provide mounting for various timing and relay/switching modules and two VF interface modules for the system's auxiliary port and the attendant console. The auxiliary cabinet, which is designated cabinet A-1, and used with the 281B only, contains two prewired 1014 shelves, a 319A Key Panel, and an 8210A Fuse Panel. The top shelf is designated as a line shelf (3) and is identical to the line shelves in cabinet A. The bottom shelf is designated as a control shelf (2) and contains a single timing module and four relay/switching modules. Table 1 lists the modules contained in each shelf, and the following paragraphs briefly describe each module.

### 2801 2wire ARD Loop-Start Access Trunk module

2.04 The 2801 2Wire ARD (Automatic Ringdown) Loop-Start Access Trunk module performs the signaling and switching functions required to interface a single CO or PBX line with the 281A/B System. The 2801's signaling circuitry is capable of operation with either loop-start or ground-start circuits and provides both ringing and loop-current detection. This signaling circuitry also provides forward disconnect when

Shelf	Modules Accommodated	
	type	number
line shelves	2801 2Wire ARD Loop-Start Access Trunk module	up to 5 (one for each conference line)
	2802 2Wire Switched-Gain Amplifier module	up to 5 (one for each conference line)
	6073 DTMF Decoder module	1
	9001 Relay Module	2
	9194 Conference Amplifier module	1
control shelf 1	2803 Universal Matrix Module	1
	2804 2Wire Conference Originate Line Circuit module	2
	2805 Relay Latch Module	2
	2806 Tone Supply module	1
	9001 Relay Module	5
	9005 Loop Current Detector module	1
	9131A Universal Timer module	2
control shelf 2 (281B only)	2805 Relay Latch Module	1
	9001 Relay Module	3
	9131A Universal Timer module	1

table 1. Component modules for 281A/B System

an incoming line drops. The 2801's switching circuitry switches the incoming line between the conference bridge and the attendant console and selects either automatic or manual operation. The 2801 also contains circuitry that controls the *LINE*-key lamp on the attendant console and switches the security tone into the conference when the line is accessed.

#### **2802 2Wire Switched-Gain Amplifier module**

2.05 The 2802 2Wire Switched-Gain Amplifier module provides the AGC and level compression functions required to maintain proper signal levels within the conference bridge. The switched-gain circuitry on the 2802 simultaneously provides gain in the direction of the dominant signal and attenuation in the direction of the weaker signal. The 2802's compression circuitry provides switch-selectable gain of up to 9 or 15db for signal levels below the compression threshold of -9dBm. The 2802 also contains signal direction-detection circuitry that, in conjunction with the lamp control circuitry on the 2801, provides the talking party indication on the attendant console.

#### **2803 Universal Matrix Module**

2.06 The 2803 Universal Matrix Module provides miscellaneous resistors and diode circuits for use in control shelf 1 for the auxiliary port and attendant-access functions of the 281A/B.

#### **2804 2Wire Conference Originate Line Circuit Module**

2.07 The 2804 2Wire Conference Originate Line Circuit Module interfaces the attendant console and the auxiliary port with the conference bridge. The 2804 provides loop current to its input device (console or boardroom interface equipment) and contains sensing circuitry to detect an off-hook condition and connect itself to the conference bridge.

#### **2805 Relay Latch Module**

2.08 The 2805 Relay Latch Module provides five independent relay latch circuits that are used in conjunction with the attendant console's nonlocking keys (*OA-X*, *AUX-X*, *MX-X*, *SPLIT-X*, and *REMOTE*). Each latch is designed to provide a toggle function (i.e., one input signal sets the relay; the next one resets it). Three out of the five latch circuits are also equipped with a separate reset lead that is used in the 281A/B System to prevent an accidental lockup in the event that two keys are inadvertently depressed at the same time.

#### **2806 Tone Supply Module**

2.09 The 2806 Tone Supply Module provides the 281A/B's security tone whenever a station or the attendant enters the conference. The 2806 consists of a 620Hz oscillator, a level control circuit, and a low-pass filter. The oscillator's output is continuous and is switched into the conference bridge as needed by signals from the 2801 or the attendant console.

#### **6073 DTMF Decoder Module**

2.10 The 6073 DTMF Decoder Module is designed to decode DTMF signals and provide an individual ground output for each key on a DTMF pad. In the 281A/B, the 6073 is used to decode the DTMF signals

that activate the station features, including attendant recall, recorder start/stop, and slide advance.

#### **9001 Relay Module**

2.11 The 9001 Relay Module contains four separate relay circuits. Each relay is equipped with four sets of normally-open and normally-closed contacts. The 9001 is used in both the line shelves and control shelves to provide a variety of switching functions.

#### **9005 Loop Current Detector module**

2.12 The 9005 Loop Current Detector module is a 2wire loop current detector that provides a ground output via relay contacts when loop current is flowing. In the 281A/B, the 9005 is used to disable the auxiliary port when the boardroom interface equipment is in independent use.

#### **9131A Universal Timer Module**

2.13 The 9131A Universal Timer Module provides two independent timer circuits: one 1-second timer and one 30-second timer. The output of each timer is via normally-open relay contacts that close for the duration of the timing cycle. The timing functions performed by the 9131As used in the 281A/B include timing out the attendant recall cycle, and timing the security tone for the attendant access function.

#### **9194 Conference Amplifier module**

2.14 The 9194 Conference Amplifier module acts as the conference bridge for the 281A/B. The 9194 maintains satisfactory voice levels in the conference by automatically increasing gain as successive stations enter the conference. In split-conference operation, the line circuits in each line shelf are connected via separate 9194s. In single conference operation, all conference lines in the system are connected via the 9194 in line shelf 1.

#### **319A Key Panel**

2.15 The 319A Key Panel contains the key-system line interface cards required to interface the attendant console with the incoming CO or PBX conference lines and an interrupter card to provide interrupted ringing (nominally 1-second on and 3-seconds off), lamp battery, and lamp flash to the console. In manual operation, each line interface card is connected to an incoming conference line via relay contacts on the 2801. For incoming calls, the line interface card detects ringing from the CO or PBX and repeats it to the attendant console until the attendant answers the call. The line interface card then closes the loop toward the CO or PBX to trip ringing. For outgoing calls, the line interface card closes the loop toward the CO or PBX as a request for service. In automatic operation, the ring-detect and ring-trip functions are performed by the 2801, which then switches the incoming call directly into the conference; the line interface card is not used unless the attendant chooses to access the line for private consultation with the conferee. The line interface card also controls the *LINE*-key lamps on the console when the line is not transferred into the conference.

2.16 The interrupter card receives ringing voltage and lamp battery from the 281A/B's integral ringing generator and outputs interrupted ringing, lamp flash,

and lamp wink to the console. The lamp-flash and interrupted-ringing outputs are also routed to control shelf 1 and switched through relay contacts to provide ringing and lamp flash for the attendant recall function.

#### **power equipment**

2.17 Power equipment used in the 281A/B includes a 24Vdc, 2A power supply, a Tellabs 8051 Power and Ringing Supply, and a Tellabs 8210A Fuse Panel. Input power for both the 24Vdc power supply and ringing generator is supplied from a commercial 120Vac, 60Hz, grounded outlet. The output of the ringing generator, which also supplies lamp battery for the system, is routed to the interrupter card in the 319A Key Panel (see paragraph 2.16). The output of the 24Vdc power supply is routed to the fuse panel and then distributed to the rest of the system. The 8210A Fuse Panel, in addition to providing fused input power to the modules in the 281A/B, also provides an alarm relay output that lights the attendant console's *HOLD* key whenever a fuse blows.

#### **attendant console**

2.18 The 30-key attendant console provides attendant control of the 281A/B. The 281A (10-line) console has 10 line keys and 10 feature keys (10 keys are inactive), while the 281B (15-line) console has 15 line keys and 15 feature keys. The line keys on each console allow the attendant to answer incoming calls, to make outgoing calls, and to consult privately with individual conferees. The feature keys allow the attendant to select automatic and split-conference operation and attendant conference access, and to activate the system's auxiliary port and optional remote console. A detailed description of the functions performed by each feature key is provided in paragraphs 3.09 through 3.17.

#### **boardroom interface equipment**

2.19 The board room interface equipment available from Tellabs provides a means by which several conferees convened in a single conference room can participate in a teleconference via the 281A/B. The boardroom interface equipment is basically a conference-room speaker/microphone system that interfaces the 281A/B via a telephone coupler connected to the 281A/B's auxiliary port. A second port is provided by the 281A/B to connect the boardroom interface equipment to the public switched network. This allows the boardroom interface equipment to be used in teleconferences not connected through the 281A/B. (It should be noted that this second port is not FCC registered and therefore must interface the public switched network through an FCC-registered coupling device.) When not being used in a teleconference, the boardroom interface equipment can be used as a conventional audio conference system. Please contact Tellabs for a complete list of available boardroom interface equipment.

### **3. system operation**

3.01 The 281A (10-line) and the 281B (15-line) Teleconferencing Systems are intended for use with 2wire CO or PBX lines in voice conferencing applications. The 281A/B uses automatic gain control (AGC)

and level compression to maintain constant voice levels within the conference bridge regardless of the number of conference lines in use and of the distances of the conference participants from the system's location. The 281A/B can be used for both meet-me and dial-up conferences in the manual mode, or for meet-me conferences in the automatic mode. The following paragraphs contain a detailed discussion of the 281A/B's features, functions, and operation.

#### **system features**

3.02 **Automatic and Manual Conferences.** The automatic conference mode of the 281A/B allows meet-me conferences to be held without the intervention of the conference attendant, while the manual conference mode provides attendant controlled meet-me and dial-up conferences. In an automatic meet-me conference, conferees calling into the system are connected directly to the conference bridge. In a manual meet-me conference, conferees calling into the system are intercepted by the attendant, who has the option of placing them on hold, transferring them into the conference, or dropping them. This provides conference security by allowing the attendant to screen incoming calls. In a manual dial-up conference, the attendant calls the individual conferees and transfers them into the conference one at a time. In all conferences, the 281A/B supplies a security tone to the conference whenever a new party or the attendant enters the conference.

3.03 **Split-Conference Operation.** Split-conference operation allows the 281A/B to be configured for more than one conference at a time. The 281A System can be configured for one 10-line conference or for two 5-line conferences. The 281B System can be configured for one 15-line conference, for one 10-line and one 5-line conference, or for three 5-line conferences. All other feature keys (auto/manual, attendant conference access, and auxiliary port) are duplicated to provide full conference features for each conference group in split-conference operation. This feature allows both automatic and manual modes to be used simultaneously.

3.04 **Auxiliary And Record Ports.** The system's auxiliary port is a 2wire port that provides access to the conference bridge for the boardroom interface equipment (see paragraph 2.19). The boardroom interface equipment allows a number of conferees at a common location to participate in a teleconference via a single conference port. The boardroom interface equipment can also be connected to the public switched network through a separate 2wire port of the 281A/B for independent use. The 281A/B's record port allows a tape recorder to be connected to the system to record a conference or to playback pre-recorded material. The 281A's record port is connected in parallel with the auxiliary port and is therefore connected to the same conference as the auxiliary port and controlled by the same console keys. While the same is true of the 281B, it also has the capability of connecting the record port to a conference other than the one to which the auxiliary port is connected.

## station features

**3.05 Attendant Recall.** The attendant recall feature allows a conferee to summon the attendant for conference consultation. To activate this feature, any conference participant dials #. This causes the attendant console to ring and the OA key to flash. The attendant responds by going off-hook and depressing the flashing OA key. A security tone is transmitted into the conference when the attendant enters. (The 281A/B can be optioned to defeat the attendant security tone. See paragraph 3.24.)

**3.06 Recorder Start/Stop.** This feature allows a conference participant to remotely start or stop a tape recorder connected to the conference. To start the recorder, the conference participant dials 2 (on a DTMF telephone); to stop the recorder, the conference participant dials 3.

**3.07 Slide Advance.** This feature provides a momentary dry-relay-contact closure that can be used to remotely advance a slide projector or to control some other device. To activate this feature, a conference participant dials \*. This is repeated each time a contact closure is required.

## attendant-console key functions

**3.08** Other than the station features listed above, all functions of the 281A/B are controlled from the attendant console via the lighted console keys. The following paragraphs describe the functions of each key on the console.

**3.09 LINE Keys.** The *LINE* keys are locking keys labeled *LINE 1* through *LINE 10* on the 281A console and *LINE 1* through *LINE 15* on the 281B console. Each key provides attendant access to an incoming CO or PBX line. A line is accessed by pressing the appropriate *LINE* key and going off-hook (not necessarily in that order). The *HOLD* key and *XFER* key are used in conjunction with the *LINE* keys to place a line on hold or to transfer it into a conference (see paragraphs 3.10 and 3.11). A line is dropped by going on-hook or depressing another *LINE* key without either placing the first line on hold or transferring it into a conference. The *LINE* keys flash to indicate an incoming call, wink to indicate line on hold, light at half intensity when the line is transferred into a conference, and go to full intensity when the party on a particular line is addressing the conference (talking-party indication).

**3.10 HOLD Key.** The *HOLD* key is a nonlocking key that, when depressed, places the accessed line on hold. A line is released from hold by depressing the *LINE* key again. The *HOLD* key provides an alarm function by lighting whenever a system fuse blows. (Depending upon which fuse blows, the system may not be totally incapacitated. However, repairs should be made as soon as possible.)

**3.11 XFER Key.** The *XFER* key is a nonlocking key that, when depressed, transfers the accessed line into a conference (see paragraph 3.12). A line can be removed from a conference by depressing the appropriate *LINE* key.

**3.12 SPLIT Keys.** The *SPLIT* keys are nonlocking keys labeled *SPLIT 5/5* on the 281A console and *SPLIT 5/5/5* and *SPLIT 10/5* on the 281B console. These keys configure the system for split-conference operation. In the 281A System, the *SPLIT 5/5* key connects lines 1 through 5 to one conference bridge, and lines 6 through 10 to a second conference bridge. In the 281B System, the *SPLIT 10/5* key connects lines 1 through 10 to one conference bridge, and lines 11 through 15 to a second conference bridge. The *SPLIT 5/5/5* key establishes three five-line conferences. The conference into which a line is transferred is determined by the line number as outlined above (i.e., line 1 is always transferred into conference 1, line 6 is always transferred into conference 2, etc.). The appropriate *SPLIT* key lights to indicate the present conference-bridge configuration (if no *SPLIT* keys are lighted, all lines are connected to a single conference bridge). The system is returned to the single-conference mode by depressing the lighted *SPLIT* key. The remaining feature keys are duplicated to provide conference features for each individual conference when the system is in the split-conference mode. Each feature key is numbered to indicate with which conference it is associated, e.g., key *MX-5 1* selects the automatic or manual conference mode for conference 1.

**3.13 MX Keys.** The *MX* keys are nonlocking keys labeled *MX-5 1* and *MX-5 2* on the 281A console, and *MX-5 1*, *MX-5 2*, and *MX-5 3* on the 281B console. These keys select automatic or manual conference operation. In automatic operation, incoming calls are automatically switched into the conference bridge. In manual operation, incoming calls are intercepted by the attendant and manually switched into the conference via the *XFER* key (this provides the attendant call-screening feature of the 281A/B). Each key affects only five lines, thereby allowing simultaneous use of automatic and manual modes in split-conference operation. Use of the automatic mode and the lines affected are indicated by the lighted *MX* key. The system is returned to the manual mode by depressing the appropriate *MX* key again.

**Note:** *In single conference operation, all MX keys must be depressed to provide full-auto operation.*

**3.14 OA Keys.** The *OA* keys are locking keys labeled *OA-1* and *OA-2* on the 281A console, and *OA-1*, *OA-2*, and *OA-3* on the 281B console. These keys provide attendant access to the conference bridge. In single conference operation, only the *OA-1* key need be depressed to access the conference. In split-conference operation, the appropriate *OA* key must be depressed to enter the desired conference (i.e., *OA-1* accesses the conference containing lines 1 through 5; *OA-2* accesses lines 6 through 10; and *OA-3* accesses lines 11 through 15). The *OA* key lights when the attendant enters a conference.

**3.15 AUX Keys.** The *AUX* keys are nonlocking keys labeled *AUX-1* and *AUX-2* on the 281A console, and *AUX-1*, *AUX-2*, and *AUX-3* on the 281B console. These keys transfer the system's auxiliary port into a conference to allow use of the boardroom interface

equipment. The *AUX* keys also control the system's record port. In single-conference operation, depressing any *AUX* key transfers the auxiliary port into the system (the *AUX* key goes to half intensity illumination). In split-conference operation, the appropriate *AUX* key must be depressed to transfer the auxiliary port into the desired conference. The record port is in parallel with the auxiliary port and is therefore connected to the same conference as the auxiliary port (see paragraphs 3.06 and 3.16). The *AUX* keys are unlighted when the auxiliary port is idle, they light at half intensity when the auxiliary port is transferred into a conference, and go to full intensity when the recorder-start function is activated. In the 281A/B System the boardroom interface equipment is connected through the system to a separate outside line. It is therefore possible for the auxiliary port to be busy when it is not being used in a conference. In this event, all *AUX* keys light at full intensity and are disabled. To remove the auxiliary port from a conference, depress the *AUX* key again.

**Note:** *If two AUX keys are depressed at the same time the auxiliary port may lock up. To alleviate this condition, simultaneously depress the XFER and AUX-1 keys.*

**3.16 AUX-REC Key (281B System Only).** The *AUX REC* key is a nonlocking key which is provided on the 281B console only. Depressing the *AUX-REC* key conditions the record port on the 281B for connection to a conference other than the one to which the boardroom interface equipment is connected. To use this feature, first depress the *AUX-REC* key; then depress the *AUX* key of the desired conference. This operation is possible even when the auxiliary port is busy. When the auxiliary record feature is active, the *AUX-REC* key is lighted at full intensity and the *AUX* key is lighted at half intensity. The *AUX* key then goes to full intensity when the record start function is activated.

**3.17 REMOTE Key.** The *REMOTE* key is a nonlocking key that, when depressed, activates the optional remote attendant console available with the 281A/B System. When the remote console is activated, it shares system control with the master console (i.e., a feature activated from one console can be deactivated from the other console). The *REMOTE* key is lighted when the remote console is activated.

#### operation

**3.18** The following paragraphs provide a circuit description for the 281A/B Teleconferencing System. This circuit description is intended to familiarize you with the 281A/B for engineering and application purposes only. Attempts to troubleshoot the 281A/B should be limited to those outlined in practice section 81281A/B-2, the 281A/B's installation and alignment practice. Please refer to the system block diagram, section 4 of this practice, while reading the following circuit description.

**Note:** *All statements in the following circuit description refer to both the 281A and 281B unless specifically noted otherwise.*

**3.19** In the manual conference mode, incoming conference lines are connected to the attendant console via the transfer relay on the 2801 and the 9990 Line Interface card in the 319A Key Panel. For incoming calls, the 9990 detects ringing from the CO or PBX and repeats it to the attendant console. It also extends lamp-flash to the appropriate *LINE* key on the console. When the attendant answers the call by depressing the flashing *LINE* key, the 9990 trips ringing and connects the call to the attendant console. When the attendant transfers the call into the conference by depressing the console's *XFER* key, the transfer relay on the 2801 energizes, thus switching the call from the attendant console to the conference bus through the 2801 and the 2802. (A single 2801 and 2802 comprise the line circuits referred to later.) In the automatic conference mode (*MX* key depressed), the transfer relay on the 2801 is held energized by a signal from the 2805 (1) module in the control shelf and the 2801 performs the signaling interface functions performed by the 9990 in the manual mode. Incoming calls are now transferred directly to the conference bus.

**3.20** In either conference mode, the attendant can access a conference line to make an outgoing call (for a dial-up progressive conference, for instance) or hold a private conversation with a conference participant by depressing the appropriate *LINE* key. If the attendant is using an idle line to make an outgoing call, the 9990 forwards a request for service to the CO or PBX. If the attendant is accessing a busy line to speak with a conference participant, the transfer relay on the 2801 is de-energized, thus connecting the conference line back to the attendant console.

**3.21** The conference bus on each line shelf is connected to the 9194 Conference Amplifier module via the 9001 (1) Relay Module. The relay on the 9001 provides the conference-bus switching required for the various split-conference configurations of the 281A/B. The conference bus relay on line shelf 1 is held permanently closed by a hard-wired ground at the input to the relay coil. The conference bus relays on line shelves 2 and 3 are controlled by the *SPLIT* keys on the attendant console via the 2805 (1) module on control shelf 1. In the single conference mode, the conference bus relay on line shelf 2 — and on line shelf 3 in a 281B System — is de-energized, and the outputs of all line circuits are routed to the 9194 module on line shelf 1. The *SPLIT 5/5* key on a 281A console and the *SPLIT 5/5/5* key on a 281B console energizes the conference bus relays on both line shelf 2 and line shelf 3 to route the outputs of line circuits 6 through 10 to the 9194 module on line shelf 2, and the outputs of line circuits 11 through 15 to the 9194 module on line shelf 3. The *SPLIT 10/5* key on a 281B console energizes the conference bus relay on line shelf 3 to route the outputs of line circuits 11 through 15 to the 9194 module on line shelf 3 and the outputs of line circuits 1 through 10 on line shelves 1 and 2 to the 9194 module on line shelf 1.



3.22 Whenever a line circuit is transferred into a conference (regardless of the conference configuration and mode of operation), the 2801 module associated with that line circuit outputs a 1-second pulse to the 9001 (2) on its line shelf. This closes a relay contact that switches the security tone generated by the 2806 module on control shelf 1 into the conference for the duration of the pulse.

3.23 Each line shelf is equipped with a 6073 DTMF Decoder module. The input to the 6073 is connected to the conference bus. When a conference participant activates one of the station features, the 6073 decodes the DTMF signal and provides a ground output on the appropriate lead (*REC-X* for a record start/stop signal, *SLIDE-X* for a slide advance signal, or *AR-X* for an attendant recall signal). These signals are routed to control shelf 1. The *REC-X* and *SLIDE-X* leads energize relays on control shelf 1's 9001 (3) module which provide contact closures at the *RECORD START* and *SLIDE CONTROL* jacks, respectively. The *AR-X* lead is connected to the 30-second timer start input of control shelf 1's 9131A module. The output of this circuit causes the attendant console to ring and the appropriate OA key to flash for 30 seconds. The 30-second timer is turned off when the attendant enters the conference.

3.24 The attendant responds to the attendant-recall signal by depressing the flashing OA key. As mentioned above, this stops the 30-second timer on the 9131A. It also sends a signal to the 1-second timer on the 9131A, which outputs a 1-second pulse to the 9001 (2) module on the appropriate line shelf (depending upon the OA key depressed). This 9001 (2) module then applies the security tone to the conference bus (the attendant security tone can be disabled by removing an option strap located at the rear of control shelf 1). Depressing one of the OA keys also sends a signal to control shelf 1's 9001 (1) module. This connects the output of the 2804 (1) module, which provides the VF interface between the attendant console and the conference, to the control shelf 1 conference bus, which in turn is connected to the appropriate line shelf-conference bus.

3.25 The 2805 (1) and 2805 (2) modules on control shelf 1 provide a latching function for the attendant console's *MX*, *SPLIT*, *REMOTE*, and *AUX* keys. The 2805 (1) module supplies the *SPLIT* signals to line shelf 2 and, in a 281B, line shelf 3. The 2805 (1) also supplies the *MX* signals to each line shelf for automatic operation, and the remote signal that activates the optional remote attendant console. The 2805 (2) module supplies the required signals to connect the auxiliary port to a particular line shelf.

3.26 As mentioned above, the boardroom interface equipment can be used independently of the 281A/B. In this application, the 281A/B's *AUX CONF LINE* jack, which provides the connection to the boardroom interface equipment, is connected through the normally closed relay contact on the 9001 (3) module to the 9005 Loop Current Detector module. Whenever the boardroom interface equipment is being used independently of the 281A/B and is therefore

drawing loop current, the 9005 signals the 2805 (2), which in turn lights the *AUX* key lamps on the attendant console and disables the *AUX* keys. When the boardroom interface equipment is being used in conjunction with the 281A/B, a signal from the 2805 (2) energizes the relay on the 9001 (3), thus connecting the boardroom interface equipment to the 2804 (2) module, which performs the same interface functions for the auxiliary port as the 2804 (1) performs for the attendant console. The same signal from the 2805 (2) energizes the appropriate relay on the 9001 (5) to connect the auxiliary port to the desired line shelf. When the attendant depresses the *AUX* key a second time to remove the auxiliary port from the conference, the 2805 (2) releases all previously energized relays. The *RECORD OUT* jack is connected to the desired conference in essentially the same manner as the auxiliary port.

3.27 The 2805 (1) module in control shelf 2 of the 281B, in conjunction with the 9001 (1) and 9001 (2) modules on control shelf 2, provides the switching functions required for the *AUX-REC* feature of the 281B. When the *AUX-REC* key on a 281B attendant console is depressed, a signal is sent to the 2805 (1) in control shelf 2. The 2805 (1) outputs a signal to the 9001 (1) and 9001 (2) to energize their relays. The relay contacts on the 9001 (1) switch the attendant console's *AUX* key A leads from the 2805 (2) on control shelf 1 to the 2805 (1) on control shelf 2. The relay contacts on the 9001 (2)-A switch the *RECORD OUT* jack on control shelf 1 from the auxiliary port relay circuits to the relay contacts of the 9001 (2)-B. When the attendant then depresses one of the *AUX* keys, the 2805 (1) on control shelf 2 outputs a signal to the 9001 (2), which then connects the record port to the desired attendant-access bus on control shelf 1. When the attendant depresses the *AUX-REC* key again to disable the *AUX-REC* feature, the 2805 (1) on control shelf 2 resets the relays on the 9001 (1) and 9001 (2), and the record port is connected to any auxiliary port bus that is activated. Use of this feature does not alter the station-controlled recorder start/stop feature.

## 5. specifications

### system transmission specifications

*port-to-port gain*

**both ports set for high gain: +27±3dB**

**one port set for low gain: +15±3dB**

*port-to-port frequency response*

**maximum -3.5dB at 400Hz re 1000Hz**

**maximum -7.5dB at 2800Hz re 1000Hz**

*maximum compression level*

**unity gain at -9dBm, average measurement at network interface**

*port impedance*

**600 ohms nominal (with all other ports terminated in 600 ohms)**

*direction-detector threshold*

**-47dBm or lower at 100Hz**

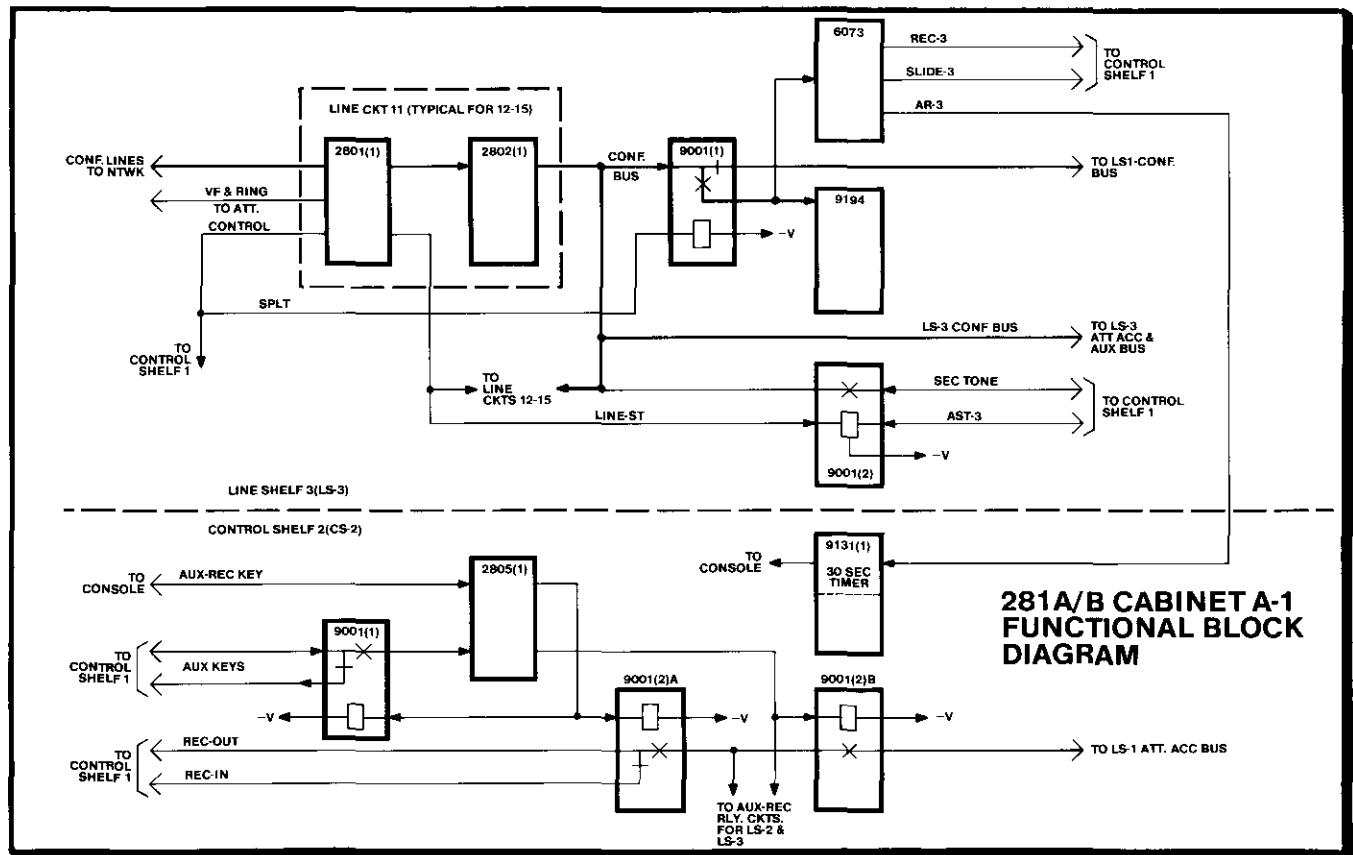
*port noise*

**+7dBmC maximum (with 15 ports at maximum gain)**





**4. block diagram**  
*page 9*



4. block diagram

*longitudinal balance*  
**60dB minimum, 200 to 4000Hz**  
*total harmonic distortion*  
**less than 1% at 1000Hz at -9dBm**

#### system signaling and supervision specifications

*ringing sensitivity*  
**40vrms minimum**  
*required loop current*  
**12mA minimum**  
*dial tone detection*  
**frequency: 350Hz  $\pm$  7Hz**  
**threshold: -21dBm**  
*input power requirements*  
**nominal 120Vac at 60Hz, 3 amperes maximum**  
*dc power output to modules*  
**24V at 3.5 amperes maximum**  
*ac power output to attendant console*  
**ringing: 100 to 118Vac at 30Hz nominal, 5 watts maximum**  
**lamp: 10  $\pm$  1Vac, at 1.5 amperes maximum, 57 to 63Hz (Note: The maximum dc resistance between the 281A/B and the attendant console should not exceed 25 ohms.)**  
*operating environment*  
**20° to 122°F (-7° to 50°C), 95% humidity (no condensation)**  
*mounting*  
**281A: Tellabs 1925 cabinet**  
**281B: two Tellabs 1925 cabinets**

#### 2801 module specifications

*dial-tone-detect frequency*  
**350 $\pm$ 5Hz**  
*dial-tone threshold level*  
**-21dBm**  
*transformer impedance ratio*  
**1:1**  
*insertion loss*  
**1.0  $\pm$  0.5dB at 1000Hz**  
*frequency response*  
**+0.5dB, -1.5dB, 300 to 3500Hz, re 1000Hz**  
*longitudinal balance*  
**60dB minimum, 200 to 4000Hz**

#### 2802 module specifications

*gain*  
**9  $\pm$  1dB or 15  $\pm$  1dB, switch selectable**  
*maximum output level*  
**10dBm**  
*gain compression level into 600-ohm load*  
**-9dBm  $\pm$  0.5dB**  
*harmonic distortion*  
**less than 1% (for any gain setting)**  
*noise*  
**16dBmC maximum**  
*frequency response (full gain)*  
**-3.5  $\pm$  0.5dB at 300Hz re 1000Hz**  
**-1.5  $\pm$  0.5dB at 3000Hz re 1000Hz**  
*direction-detector sensitivity*  
**-50  $\pm$  3dB at 1004Hz, approximately 20dB less than 300Hz**

*delay distortion*  
less than 175 $\mu$ s, 500 to 2804Hz, re 1004Hz

### 2803 module specifications

*Not applicable; the 2803 contains only passive components.*

### 2804 module specifications

*maximum station loop length*  
1400 ohms maximum

*transformer impedance ratio*  
1:1

*insertion loss*  
0.75dB maximum at 1000Hz

*frequency response*  
-0.75dB maximum, 300 to 3500Hz, re 1000Hz

*longitudinal balance*  
60dB minimum, 200 to 4000Hz

### 2805 module specifications

*switching rate*  
1pps maximum with 50  $\pm$  5% break

*output contact rating*  

- 125Va maximum switching power
- 220Vdc or 250Vac maximum switching voltage
- 2A maximum switching current

*UL/CSA rating*  

- 0.6A, 125Vac
- 0.6A 110Vdc
- 2A 30Vdc

### 2806 module specifications

*security tone frequency*  
620  $\pm$  20Hz

*level adjustment*  
-30 to 0dBm, factory set for -20 $\pm$ 2dBm

*output impedance*  
25 ohms, balanced

### 6073 module specifications

*input impedance*  
100,000 ohms

*input signal level range*  
-24 to +6dBm

*signal duration*                      *pause time*  
40ms minimum                      40ms minimum

*tone detect bandwidth*  
 $\pm$ 1.5%

*tone reject bandwidth*  
 $\pm$ 3.0%

*60Hz tolerance*  
2Vrms

*dial tone tolerance*  
0dB (re lower-amplitude tone)

*noise tolerance*  
-12dB (re lower-amplitude tone)

*output interface*  
open-collector transistor

*maximum output load*  
100mA at -24Vdc

*output pulse width (momentary mode)*  
125, 250, 500, or 1000ms  $\pm$  10%, switch selectable

*interdigital timeout*  
6  $\pm$  0.6 seconds

*maximum input current (any input)*  
3mA

*power-on reset*  
all outputs go idle within 500ms after power is applied

### 9001 module specifications

*relay coil resistance*  
1150 ohms  $\pm$  10%

*must-operate voltage*  
19Vdc

*must-release voltage*  
2Vdc

*relay contact ratings*  
 maximum current: 1A  
 maximum apparent power: 10VA  
 maximum voltage: 100Vdc  
 typical operate time: 20ms  
 typical release time: 60ms

### 9005 module specifications

*operating current*  
20 to 100mA

*output contact rating*  
500mA maximum

### 9131A module specifications

*timers*  
 circuit 1: 30 seconds  $\pm$  15%  
 circuit 2: 1 second  $\pm$  15%  
 lamp flash: 60ipm nominal  
 lamp wink: 120ipm nominal

*output contact rating*  
1A maximum (resistive load at 48V)

### 9194 module specifications

*maximum level*  
+5dBm for 36 lines

*typical bridging loss*  
4dB, 2 to 36 lines, 800 to 1000Hz

## 6. warranty information

6.01 Tellabs warrants the 281A and 281B Teleconferencing Systems to be free of defective components, workmanship, and design for a period of two years from the date of manufacture, when applied as outlined in our practices, subject to handling and installation commensurate with industry standards for solid-state electronic equipment. If the 281A/B System does not prove to be free of defective components, workmanship, and design under these criteria, Tellabs will replace or repair it free of charge.

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

6.02 For additional information on the 281A/B System, please contact Tellabs Customer Service at your Tellabs Regional Office or at our Lisle, Illinois, or Mississauga, Ontario, Headquarters. Telephone numbers are as follows:

US central region: (312) 969-8800

US northeast region: (412) 787-7860

US southeast region: (305) 645-5888

US western region: (702) 827-3400

Lisle Headquarters: (312) 969-8800

Mississauga Headquarters: (416) 624-0052

## **7. FCC information**

### **introduction**

7.01 The Federal Communications Commission (FCC) has established through Part 68 of its Rules and Regulations that FCC-registered terminal equipment may be connected to the telephone network through standard plugs and jacks. This section documents the customer's responsibility to the serving telephone company when Tellabs' 281A and 281B Teleconferencing Systems are connected to the public switched network or to the PBX station lines.

### **connection arrangements**

7.02 Registered terminal equipment may not be connected to coin lines or party lines.

7.03 Customers directly connecting this equipment to the telephone network shall, before connection is made, give notice to the telephone company of the particular CO lines to which such connection is to be made, and shall provide to the telephone company the FCC Registration Number of this equipment. The customer shall also give notice to the telephone company upon final disconnection of this equipment from a particular line.

7.04 Customers directly connecting systems consisting of combinations of individually registered terminal equipment (e.g., a PBX and telephone sets) shall, before such connection is made, provide to the telephone company the following information:

a) For each line, the FCC Registration Numbers for all equipment dedicated to that line, the largest ringer equivalence to be presented to that line, and any information required for the compatible operation of this equipment with telephone company communications facilities (e.g., type of service required).

b) The quantities and USOC numbers of the required jacks for connection to the network.

c) For each jack, the sequence in which the lines are to be connected.

7.05 The following information is provided for the 281A and 281B Teleconferencing Systems:

Required Network Interface Jack: USOC RJ21X

Ringer Equivalence: 2.8A

## **installation requirements**

7.06 Registered Tellabs 281A and 281B Systems are connected to the serving telephone company interface by means of a cable less than 25 feet in length and terminated in a USOC RJ21X plug. Cables do not require registration and may be purchased from Tellabs or another manufacturer. The only requirement for cables is that they meet the industry standard 1000Vac dielectric rating and that those cables used to derive the network interface be terminated in USOC RJ21X plugs.

7.07 Connection to the equipment is to a 25-pair male connector located in the rear of the shelf. If connections are to be made to station lines behind a PBX and the PBX is not a fully protected system, the installation of the 281A and 281B systems must be made under the unprotected premise wiring provision (section 68.215) of FCC Part 68. A wiring mixture of PBX lines and CO lines to the 281A and 281B systems would have to be installed under the same section 68.215 noted above.

7.08 The power supply used to energize the 281A and 281B Systems should be typically FCC approved or UL listed.

### **incidence of harm**

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

7.10 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 registered equipment is malfunctioning, the use of such equipment shall be discontinued until the problem has been corrected. No repair work is authorized to be performed by the user. Part 68 of the FCC Rules prescribes that all repairs of registered equipment be made by the manufacturer or his authorized agent.

7.11 The telephone company may make changes to its communications facilities, equipment, operations, or procedures, where such action is reasonably required in the operation of its business and is 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, or require modification or alteration of such terminal equipment, or otherwise materially affect its use or performance, the customer shall be given adequate notice in writing, to allow the customer an opportunity to maintain uninterrupted service.