tellabs
technical manual
76-82291
rev B

291 Conference/Alerting System

contents

1.   general description

1.01   The Tellabs 291 Conference/Alerting System (figure 1) is a multistation ringdown telephone conference circuit designed primarily for use in local emergency reporting and alerting applications and in business conferencing applications. The 291 System provides simultaneous access to up to 30 local stations either from a dedicated telephone (i.e., a "master" station) or from any local telephone line via a listed directory number. Conferees are provided with emergency conference capability at their everyday home or business telephones with no disruption of normal telephone service except during an emergency call. All stations assigned to the conference network are signaled via a distinctive ringing format on conference calls. The 291 System may be used with any conventional Class 5 or PBX switching system. Services provided by the 291 System are typically used by volunteer fire departments, paramedic teams, airport emergency crews, banks, stores, and factories with multiple branch locations, and the like.

1.02   This practice section is reissued to incorporate all of the System improvements provided by the Issue 2 version of the 291 System.

1.03   The 291 System affords a choice of three methods of originating a conference: automatic origination, manual origination, or a combination of the two. The method chosen will, of course, depend upon local requirements.

1.04   With **automatic conference origination**, a call from any local line to a listed emergency-reporting number causes all stations assigned to the conference network to ring distinctively. These stations may be the home telephones of emergency crewmen (e.g., firemen or paramedics) or, in other applications, designated PBX stations (e.g., those of key executives and/or emergency personnel). Anyone in the conference network may answer the call and hold up the conference for the purpose of relaying information. The conference can either be maintained until the last conference station goes on-hook, or the conference can be forced idle after a predetermined timeout interval (adjustable between 1.5 and 5 minutes). This latter feature clears the conference in the event that a conference station is accidentally left off-hook.
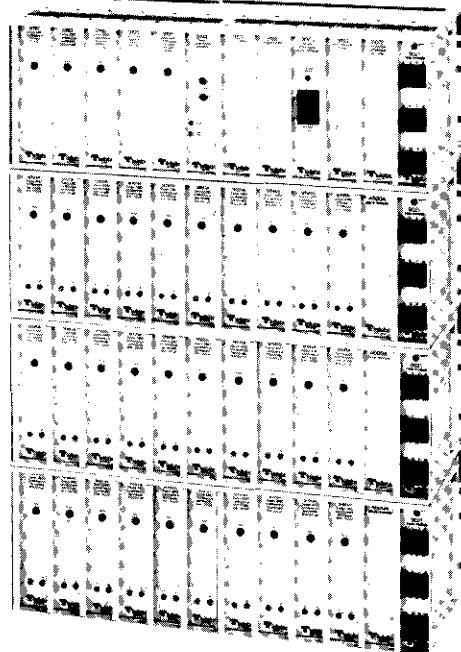

figure 1.   291 Conference/Alerting System

1.05   With **manual conference origination,** a master location manned 24 hours per day receives all emergency-reporting calls via a dedicated telephone. The person on duty at the master location (normally a dispatcher or a member of the emergency crew designated the "duty" crewman), upon receiving an emergency-reporting call, goes off-hook with a second dedicated telephone (the master station in the conference network), causing all stations in the conference network to ring distinctively. The dispatcher or duty crewman provides all answering personnel with the necessary information concerning the emergency. The conference is held up as long as the master station remains off-hook unless the System is optioned otherwise.

1.06   When the master location can be manned only part of the time, the 291 System may be arranged for **both automatic and manual conference origination.** While the master location is manned, manual conferencing is enabled. While the master location is unmanned, a call to the listed emergency-reporting number is transferred into the 291 System and automatic conferencing is enabled.

1.07   When an emergency conference is **not** in effect, all stations assigned to the conference network are provided with normal residential (or PBX) telephone service. When a conference is in effect, anyone involved in the conference need only depress his/her hookswitch momentarily to be disconnected from the conference and restored to normal service unless the system is optioned otherwise.

1.08 In addition to the operational capabilities previously mentioned (distinctive ringing on conference calls, automatic and/or manual conference origination, and compatibility with any conventional Class 5 or PBX switching system), the 291 System provides the following additional features related to its installation and operation:

★ a maximum of 4dB of bridging loss, regardless of the number of stations accessing the conference.

★ sleeve-lead, loop-start (Type II E&M interface), or ground-start control of conference access.

★ accommodation of up to five ringing frequencies for harmonic or decimonic ringing.

★ ringing timeout to terminate ringing at stations where conference calls are not answered.

★ timed siren control, either continuous or interrupted, under control of any number of stations.

★ remote access capability, whereby emergency crewmen away from home can call in via an unlisted number and be connected to a conference in progress.

★ an integral tone oscillator that eliminates the need to connect to office tone sources.

★ individual fusing for all modules in the System.

★ optional supervisory lamp panel available.

★ optional selective signaling for up to 11 groups of stations [dual tone multifrequency (DTMF) telephone set is required].

★ compact size: when arranged for the maximum number of lines (30), the complete System occupies only 24.5 inches of vertical space in a standard relay rack.

★ expandable beyond 30 lines in one-way conference applications (special application).

★ ease of optioning: most options are switch-selectable.

★ ease of installation, facilitated by a standardized wiring scheme and prewired, connectorized backplanes on the System's equipment shelves.

★ ease of alignment and testing, facilitated by a Tellabs 9802 Card Extender.

1.09 Designed primarily for central office installation, the 291 System mounts in either a 19 or 23 inch relay rack. All cabling between the System's equipment shelves, as well as cabling from the shelves to the office distributing frames, is simplified through the use of connectorized cables that plug into connectors on the backplanes of the System's equipment shelves (see figure 2). The System is powered from filtered −48Vdc central office battery.

2. system components

2.01 A 291 Conference/Alerting System equipped for the maximum number of lines (30) plus remote access and siren control normally consists of the following:

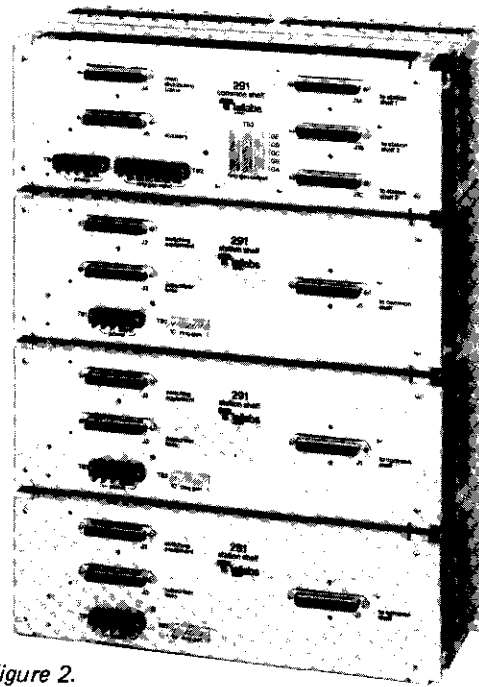★ one 291 Emergency Reporting System (mounting) Assembly configured for a maximum of 30

figure 2.
291 System, rear view

lines. In this configuration, the 291 Assembly consists of 4 prewired Type 10 Mounting Shelves with connectorized backplanes and three connectorized cables for interconnecting the Shelves. A 9802 Card Extender and auxiliary bypass connector are also provided with these Shelves.

★ four 9021 Fuse Modules.

★ one 9003 Ringing Interrupter Relay Module.

★ one 9132 Ringing Timer.

★ one 9121 Tone Supply.

★ one 9133 Long Interval Timer (see note 3).

★ thirty 9191 (or Issue 2 9191A) 2Wire Automatic Ringdown (ARD) Conference Terminate Line Circuits.

★ two 9192 2Wire ARD Conference Access Trunk Circuits (automatic conferencing and switching system with sleeve lead or Type II E and M access only; see notes 1 and 2).

★ one 9193 2Wire ARD Conference Originate Line Circuit (manual conferencing only).

★ one 9194 2Wire Conference Amplifier.

★ three 9195 2Wire ARD Conference Remote Answer Trunk Circuits (see note 2).

Note 1: *For combined automatic and manual conferencing, one 9192 Trunk Circuit and one 9193 Line Circuit are used in the System.*

Note 2: *The 9196 2Wire ARD Loop Start Access Trunk Circuit is substituted for the 9192 in loop- or ground-start applications. The 9196 can only be substituted for the 9195 in loop-start applications.*

Note 3: *For single digit DTMF activation of a siren, one 6072 Single Digit DTMF/Dial Decoder module (optional) is required with the 9133 module.*

2.02 Following is a brief description of each of the components of the 291 System. Detailed information on these items can be found in the Tellabs Practice or Catalog Sheet on each.

291 Emergency Reporting System Assembly

2.03 The 291 Emergency Reporting System Assembly provides the necessary hardware to mount and interconnect the modules in the System. The 291 Assembly is available in configurations for 19 and 23 inch rack installation and for maximums of 10, 20, and 30 emergency crewmen's lines. One Assembly consists of the following items:

★ two, three, or four Type 10 Mounting Shelves. One of these Shelves has a connectorized backplane wired for the System's common equipment, and each of the other Shelves has a connectorized backplane wired for 10 emergency crewmen's line circuits.

★ one, two, or three connectorized cables for interconnecting the Shelves.

★ one auxiliary bypass connector (equipped with a bypass plug for circuit continuity), which provides access to internal control leads required for special System applications.

★ one 9802 Card Extender. The 9802 provides a convenient means of testing and aligning a 291 System module while that module is functioning in its designated application. The 9802 plugs into the module's shelf position and the module then plugs into the 9802. The module now projects from the shelf to allow access to the connector pins, adjustment of potentiometers and switch-selection of options.

system modules

2.04 The modules in the 291 System may be functionally grouped into three classifications: internal control modules, central office interface modules, and station interface modules (the 9191 or Issue 2 9191A Line Circuit).

2.05 The internal control modules perform all necessary amplification, ringing, timing, tone supply, and fusing functions for the System. These modules include the 9194 Conference Amplifier, the 9121 Tone Supply module, the 9132 Ringing Timer, the 9003 Ringing Interrupter Relay module, the 9133 Long Interval Timer, and the 9021 Fuse Module.

2.06 The central office interface modules provide the necessary switching functions to originate a conference and to allow remote access to the conference. These modules include the 9192 Conference Access Trunk Circuit, the 9193 Conference Originate Line Circuit, the 9195 Remote Answer Trunk Circuit, and the 9196 Loop Start Trunk Circuit.

2.07 Each of the System modules is described individually in the following paragraphs.

9194 2Wire Conference Amplifier

2.08 The 9194 2Wire Conference Amplifier module provides controlled gain for 2wire conference applications of up to 30 participating stations. The 9194 maintains satisfactory transmission levels by automatically increasing gain as successive stations bridge the conference circuit. Maximum bridging loss is only 4dB, regardless of the number of stations (up to 30) accessing the conference.

9121 Tone Supply

2.09 The 9121 Tone Supply module, when used in the 291 System, supplies both ringback tone (440 + 480Hz interrupted at 30ipm) and alerting tone (440 + 620Hz interrupted at 120ipm). The System extends ringback tone to the originating station until the first conference station is answered. The alerting tone is applied to busy conference lines to provide notification that a conference call is waiting. By supplying these tones, the 9121 module eliminates the need for connection to the office tone supply.

9132 Ringing Timer

2.10 The 9132 Ringing Timer module provides control timing for the 9003 Ringing Interrupter Relay Module in the form of 1-second signals. The 9132 module also provides an adjustable timeout circuit to control the length of time the conference stations will ring if not answered. This timeout circuit can also be optioned to force the conference idle after a predetermined timeout interval has expired. This option clears the conference in the event that a conference station is accidentally left off-hook. The timeout circuit activates whenever the master station goes off-hook (manual mode), or in response to an incoming call (automatic mode). The timer is automatically reset after the first conference station answers or when a second incoming fire reporting call is made and one or more conference stations is still involved in the first conference call. An optional two-position level key may be installed at the headquarters of the emergency organization using the 291 System (e.g., a fire station) to allow a short or long ringing timeout interval to be selected.

9003 Ringing Interrupter Relay Module

2.11 The 9003 Ringing Interrupter Relay module divides the ringing load into two groups. When one group is connected to the ringing source, the other group is connected to either battery or ground. This configuration is reversed once every second in response to control signals supplied by the 9132 module. Five inputs per phase are provided to accommodate harmonic or decimonic ringing. Each of the five ring generator inputs is individually fused with a GMT-type fuse and provided with an alarm detection circuit. This alarm detection circuit provides an external alarm indication in the event that an overload condition (caused by a shorted cable) or loss of ring generator voltage is sensed by the 9003 module. The 9003 module can be optioned for either battery bias or ground during the silent interval and for either the normal 1-second-on, 1-second-off ringing, or continuous ringing to one group of stations.

9133 Long Interval Timer

2.12 The 9133 Long Interval Timer module provides the means to start a community siren and to control the duration of its operation. The 9133 may be optioned for three different modes of operation: manual, fixed time interval, and fixed time

interval with override capability. In the manual mode, the siren operates only while a pushbutton is depressed. In the fixed-time interval mode, the siren starts when the pushbutton is depressed and continues to operate until the predetermined time interval expires. In the third mode (fixed time interval with override), the siren starts when the pushbutton is depressed and continues to operate for the predetermined time unless the pushbutton is depressed again, at which time the siren stops. Operation of the siren in any mode is possible only while the conference circuit is activated. The 9133's timing interval may be adjusted from approximately 1 second to 26 minutes by means of two miniature 10-position rotary switches and a potentiometer on the module. When the 9133 module is optioned for either the fixed-time-interval or the fixed-time-interval-with-override mode, an additional siren interrupter-timing option can be implemented. This feature permits the siren to be continuously interrupted (on and off) during the entire time the siren is activated. Both the on-time and off-time intervals can be independently adjusted over a 1 to 10 second range.

9021 Fuse Module

2.13   The 9021 Fuse Module provides 12 distribution fuses functionally arranged in 2 groups of 6 fuses each. In the 291 System, the 9021 is used to separately fuse the circuits of each of the other modules in the same Type 10 Shelf, thus preventing a single module malfunction from affecting power to the rest of the System. An alarm lamp and relay provide both a local visible indication and leads for a remote indication of a blown fuse in any of the circuits served by the 9021 module. Fuses in the 9021 are Buss GMT-type fuses rated at 0.25 ampere. Located on the front panel of the module, these fuses may be replaced without removing the module from service.

9192 2W ARD Conference Access Trunk Circuit

2.14   The 9192 2Wire ARD Conference Access Trunk Circuit is used to initiate a conference call automatically (from a call placed by any DDD network telephone to a directory number) via a central office line circuit. The 9192 module provides the interface between the System and any SxS, No. 1 or No. 2 EAX, X-Bar or DMS-100 switching system equipped for sleeve lead or C-lead control or a DMS-10 System using Type II E&M-lead interfacing. The 9192 does this by generating a start pulse to signal all conference stations in response to a grounded sleeve or C lead in an electromechanical or EAX-type electronic office or a contact closure across the M and MB leads in a DMS-10 office. The DMS-100 System uses modified software to open a sleeve lead when either the 291 System or the call originator disconnects. The start pulse generated by the 9192 directs the 291 System to apply ringing to all idle conference lines and alerting tone (generated by the 9121 module) to all busy conference lines. The 9192 extends ringback tone to the originating station until the first party on the con-

ference answers (all unanswered conference lines continue to ring until answered or until time out by the 9132 module). The 9192 also provides holding ground to maintain the conference connection until the last conference station goes on-hook.

9193 2W ARD Conference Originate Line Circuit

2.15   The 9193 2Wire ARD Conference Originate Line Circuit is used to initiate a conference call manually from a dedicated conference-origination telephone (master station). The 9193 module supplies talk battery to the master station and supplies all necessary switching functions to originate a conference when the master station goes off-hook. These functions include outputting a start pulse to all 9191/9191A modules, providing system-locking ground to hold up the conference under control of the master station, and supplying ringback tone to the master station until the first party on the conference answers. The 9193 also contains circuitry to allow the master station to be equipped with a pushbutton to control a community siren or other external alerting device, if one is used.

9195 2W ARD Conference Remote Answer Trunk

2.16   When a siren is used in addition to regular telephones for notification (automatic or manual conferencing applications), up to three 9195 2Wire ARD Conference Remote Answer Trunk Circuits are used. These 9195 modules are connected to a line-hunting connector group reached by dialing an unpublished number. This arrangement permits emergency personnel away from their regular telephones, upon hearing the siren, to dial the unpublished number and be connected to the conference circuit. The line group (i.e., the one to three 9195's) may be accessed only when a conference is in progress and the siren is activated. At all other times, this group is marked busy to all incoming calls. The 9195 module can be used with any ground-start PBX or Class 5 central office switching system including SxS, No. 1 and No. 2 EAX, X-Bar, ESS, DMS-10, DMS-100, or systems equipped for sleeve- or C-lead control or Type II E and M lead interface.

9196 2W ARD Loop Start Access Trunk Circuit

2.17   The 9196 2Wire ARD Loop Start Access Trunk Circuit may be used to replace the 9192 Conference Access Trunk Circuit and/or the 9195 Remote Answer Trunk Circuit in applications where operation with loop-start lines or a mixture of loop-start and ground-start lines is required. The 9192 module is used with sleeve lead or Type II E and M lead interface. The 9195 module is arranged for ground-start, sleeve lead or Type II E and M lead interface. The 9196 is designed to seize the circuit in response to incoming ringing and to disconnect either upon a momentary opening of the loop in ground-start operation when the distant end goes on-hook, or upon return of dial tone (440Hz) in loop-start operation when the distant end goes on-hook. Option switches on the 9196 enable the module to function either as an originating trunk circuit (to replace the 9192) or as a remote-access trunk circuit (to replace the 9195).

9191 or Issue 2 9191A 2W ARD Conference Terminate Line Circuit

2.18   As stated previously, up to 30 conference stations may be signaled simultaneously upon activation of the 291 System. This is accomplished by routing each station's central office (or PBX) line circuit through a 9191 2Wire ARD Conference Terminate Line Circuit or Issue 2 9191A 2Wire ARD Conference Terminate Line Circuit. When the System is activated, the 9191/9191A module transfers each conference station from its standard residential (or PBX) service to the conference circuit. (Distinctive ringing is provided by the 9132 Ringing Timer module to distinguish a conference call from a normal call; see paragraph 2.10.) If a conference station is busy with a normal call at the time the conference is activated, the 9191/9191A, depending upon optioning, either disconnects the call in progress and connects the station to the conference or applies an alerting tone to notify the station user (emergency crewman) that a conference call is waiting. The crewman need only depress his hookswitch momentarily to be connected to the conference. In applications where the 291 System interfaces a CO, the local line appearance of each conference station is marked busy by the 9191/9191A upon connection to the conference network. In applications where the 291 System interfaces a PBX that provides for marking individual line appearances busy or that accepts a simultaneous tip-ring resistive seizure, the 9191/9191A mark the conference lines busy to normal traffic during a conference and applies interrupted alerting tone (supplied by the 9121 module) as a busy indication. If the PBX is not of the aforementioned types, the 9191/9191A can be optioned either to ignore the incoming call, or trip ringing voltage on incoming calls, then applies "busy" (interrupted alerting) tone, and finally, after a preset time interval, drops the call. **Note:** *In the latter case, because the 9191/9191A essentially "answers" the call, the caller will be billed for any toll charges incurred.*

6072 Single Digit DTMF/Dial Decoder (optional)

2.19   The 6072 Single Digit DTMF/Dial Decoder module when used in the 291 System, provides the means for any conference station, when equipped with a DTMF telephone, to start a community siren by simply pressing the * pushbutton. Operation of the siren is only possible when the conference circuit is activated. Once started, operation of the siren is then controlled by the 9133 Long Interval Timer module. The 6072 module (an optional auxiliary bypass connector is also required) can provide the dispatcher or other key personnel the means to selectively signal up to eleven separate groups of stations. This feature permits the dispatcher to call only the crewmen required for that particular emergency. For example, the paramedic teams can be assigned to one group, firemen to another group, other emergency crewmen to the third group, and so on. For additional information regarding this, and other selective signaling

features, please contact Tellabs Customer Service at (312) 969-8800 or your Tellabs Regional Office for further assistance.

3.   application

3.01   The 291 Conference/Alerting System is used primarily in local emergency reporting and alerting applications. In these applications, it provides volunteer fire departments, paramedic teams, and other emergency organizations with a means of receiving emergency calls, activating a community siren (if one is used), and informing emergency personnel of details concerning an emergency over their home (or business) telephones via a ringdown conference network. The 291 System may also be used by businesses for emergency reporting and alerting purposes and/or for multiparty conference calls involving key personnel within a company (i.e., "command" conferencing). Typical business users of the 291 System include downtown banks and stores with several suburban branches and manufacturing firms with their main offices at one location and their factories at several different locations. Additional, specialized business applications of the 291 System will be discussed later in this section.

3.02   Although emergency-reporting systems are used by a variety of emergency organizations, these systems have traditionally been associated with volunteer fire departments (and known as "fire bars.") For this reason, as well as for clarity and brevity, the application information in this section is written in terms of the 291 System's use in fire-reporting applications only. Because the requirements for emergency reporting systems are extremely varied, certain nonstandard features and nonconventional applications may not be covered in this practice. Therefore, please consult Tellabs' Application Engineering Department at (312) 969-8800 or your local Tellabs Regional Staff Engineer for additional application information.

background

3.03   In the past, before automatic exchanges and emergency conference systems came into use, all fire-reporting calls were typically received by an operator at the town's manual exchange. The operator connected the fire call to the fire station, took the necessary information concerning the fire (the fireman on the line at the fire station also received this information so that he could notify the firemen on duty), and immediately activated the community siren. Upon hearing the siren, the town's volunteer firemen who were away from the fire station called the operator, who acted as dispatcher and provided them with the necessary information.

3.04   The advent of automatic exchanges made the fire-reporting arrangement described in the preceding paragraph impractical, so emergency-reporting conference systems ("fire bars") were developed to work in conjunction with the automatic exchanges. A telephone conference system eliminates the necessity of relying solely upon a siren as a

means of notifying volunteer firemen of a fire. To notify firemen who are away from home, a siren can also be activated. If the conference system is arranged for remote access, firemen away from home, upon hearing the siren, can call in via an unpublished number and be connected to the conference. The fireman or dispatcher in charge of maintaining the conference can then direct them to the proper location.

types of conferencing
3.05   Depending upon local requirements, the 291 System may be arranged for automatic conference origination, manual conference origination, or both. In general, automatic conferencing is used in applications where a master location cannot be provided or is not desired; manual conferencing is used where a master location can be manned 24 hours per day; and both types of conferencing are used where a master location can be manned only part of the time.

automatic conferencing
3.06   In an automatic conferencing arrangement, the 291 System is activated directly from an incoming fire-reporting call and rings all idle firemen's lines with a distinctive 1-second-on, 1-second-off ringing interval. Any fireman may answer the call and hold up the conference for the purpose of relaying information. When a fireman wishes to disconnect from the conference, he need only go on-hook momentarily, as this restores normal residential service (unless optioned otherwise). The conference, however, is maintained until all firemen go on-hook. The System provides adjustable ringing timeout on conference lines to stop the ringing of unanswered firemen's telephones after a predetermined interval.

Note: *If the fire-reporting caller has returned to on-hook, but the conference is still maintained because one or more of the conference stations are still off-hook, a subsequent fire-reporting call will reset the 9132 Ringing Timer module and rering all conference stations that are on-hook.*

3.07   For firemen's lines that are busy at the time a fire-reporting call is made, the System either applies an alerting tone to indicate that a conference call is waiting or immediately cuts off the existing calls on the busy lines and transfers these lines into the conference. The choice of alerting tone or immediate cutoff for busy lines is an individual station option. If alerting tone is selected, a fireman need only depress his hookswitch momentarily to be connected into the conference.

3.08   Certain key firemen may be supplied with pushbuttons (not provided with the System) to start a siren if a siren is to be used to notify firemen away from home that a conference is in progress.

3.09   When a siren is used to notify firemen away from home of a conference in progress, the 291 System may be (and typically is) equipped for re-

mote access, whereby these firemen can call in via an unlisted number and be connected into the conference.

manual conferencing
3.10   In a manual conferencing arrangement, all fire-reporting calls are routed to a dedicated fire-report-answering telephone at a master location. Normally, the master location is a central dispatch facility if a single emergency number (e.g., 911) is used or the fire station if a separate fire-reporting number is used. The fire report-answering telephone is typically dialless (unless the System is optionally equipped for selective signaling, which requires a DTMF type telephone) which ensures that it is used for incoming fire-reporting calls only.

3.11   After receiving a fire-reporting call, the dispatcher or duty fireman manually activates the conference by lifting the receiver of a second dedicated telephone (the conference network master station) at the master location. This causes the 291 System to ring all firemen's home telephones that are not busy (using the distinctive ringing interval previously mentioned) and to either apply alerting tone to all busy conference lines or immediately cut off the existing calls on busy lines and automatically transfer these lines into the conference (see paragraph 3.07).

3.12   As in automatic conferencing, the System provides adjustable ringing timeout on firemen's lines to stop the ringing of unanswered telephones after a predetermined interval. If desired, a switch (not supplied with the System) that allows a shorter ringing timeout interval to be optionally selected may be installed at the master location. Such a switch might be used, for example, in instances where the duty fireman or dispatcher has determined that enough firemen have responded to make further ringing unnecessary.

3.13   After receiving a conference call, any fireman may disconnect from the conference by going on-hook, at which time normal residential service is restored (unless optioned otherwise). The conference circuit, however, does not release until the master station goes on-hook, unless the System is arranged so that the conference is held up until the last fireman in the conference goes on-hook.

3.14   When the 291 System is activated manually via telephone, an optional supervisory lamp panel may be installed at the master location to monitor the firemen's individual line circuits. Each supervisory lamp is connected to one line circuit and lights when the fireman on that circuit answers the conference call. This informs the duty fireman or dispatcher as to how many firemen have responded and thus provides an indication of whether or not, and when, to activate the community siren

3.15   The siren is activated by means of a pushbutton (not supplied with the System) at the master location. As in automatic conferencing, the pushbutton operates only while a conference is in progress, and the System may be equipped to provide

automatic timing of the siren's operating interval, with manual override available to stop the siren before the interval expires. Also as in automatic conferencing, when a siren is used for notification, the System is typically arranged for remote access (see paragraph 3.09).

3.16 Where it is not practical to man a master location 24 hours per day, a variation of the above may be used. In this alternate arrangement, two or more "key" locations (usually no more than three) are designated to answer all fire calls. These locations are chosen so that at least one will be manned at any given time. Each key location must have a dedicated telephone for receiving only fire-reporting calls. (These telephones are all bridged across the same connector terminal in the central office.) An incoming fire-reporting call causes all key-location telephones to ring, and these telephones stop ringing when any one of them is answered.

3.17 Each key location also requires another dedicated telephone to activate the fire conference equipment for notification of the volunteer firemen and a pushbutton to control the siren. (The two telephones required at each location may be replaced with one multiline telephone if desired.) One of the key locations must be manned at all times.

3.18 Multiple key locations for manual conferencing are, however, less desirable than a single master location because a certain amount of confusion, noise, and impairment of transmission results when more than one person answers a fire call. Multiple key locations also result in divided responsibility for siren operation and operation of the conference circuit. A more advantageous arrangement for installations where a master location cannot be manned around the clock is described immediately below.

combined manual and automatic conferencing
3.19 With combined manual and automatic conferencing, a single master location, equipped as usual with a dedicated fire-report-answering telephone and a master station (conference-origination) telephone, is manned only part-time. While the master station is manned, manual conferencing is enabled; while the master station is unmanned, automatic conferencing is enabled. This is done via a switch (not provided with the System) at the master location that transfers the fire-reporting number from the dedicated answering telephone to an automatic conferencing module. The duty fireman or dispatcher sets the switch for manual conferencing when he goes on duty and for automatic conferencing when he goes off duty.

supervision and ringing
3.20 The 291 System may be arranged to operate with sleeve or C-lead supervision (electromechanical switching systems), C and CN-lead supervision (EAX-type switching systems), and loop supervision (ESS-type switching systems). Arranging the System for these types of supervision requires both

switch-optioning of certain modules and specific methods of wiring (see part 4, *installation*).

3.21 The 9192 2Wire ARD Conference Access Trunk Circuit module is used in automatic conferencing applications where the access lines provide sleeve lead, C and CN-lead, or Type II E&M lead interfaces. The 9195 2Wire ARD Conference Remote Answer Trunk Circuit module is used in remote access applications where the access lines provide ground-start, sleeve lead, C and CN-lead, or Type II E&M lead interfaces. The 9196, as stated in paragraph 2.17, will accommodate either loop-start or ground-start access lines when substituted for a 9192 or 9195 in the 291 System. Refer to the 9196 Practice for further details.

3.22 The 291 System accommodates up to five different ringing frequencies for compatibility with harmonic and decimonic ringing. A machine-start lead is provided by the System to supply a switched ground to start a ringing machine when necessary, if required by the central office ringing supply.

basic requirements common to all conferencing arrangements
3.23 For any standard 291 System, be it arranged for automatic conferencing, manual conferencing, or both, the following items are **always** required:

★ one 291 System (mounting) Assembly for the desired rack size (19 or 23 inches) and maximum number of lines (10, 20, or 30).

★ one 9194 2Wire Conference Amplifier.

★ one 9121 Tone Supply.

★ one 9132 Ringing Timer.

★ one 9003 Ringing Interrupter Relay Module.

★ one to thirty 9191/9191A 2Wire ARD Conference Terminate Line Circuits. One 9191/9191A is required for each fireman's station in the conference network.

★ two to four 9021 Fuse Modules. One 9021 is required for each equipment shelf in the System.

specific requirements for automatic conferencing
3.24 In automatic conferencing applications, at least one 9192 2Wire ARD Conference Access Trunk Circuit or 9196 2Wire ARD Loop Start must be used to perform the necessary switching functions to initiate a conference. It is, however, **strongly** recommended (although not mandatory) that two 9192's or 9196's arranged as a hunting group always be used.

Note: *Refer to paragraph 3.36 for information on an option that is recommended when two 9192's or 9196's are provided.*

3.25 In manual conferencing applications, one 9193 2Wire ARD Conference Originate Line Circuit is required in the 291 System to perform the necessary switching functions to originate a conference.

3.26 Also in all manual conferencing applications, two dedicated telephones are required at the master location. One is a fire-report-answering telephone

that is often dialless and that is arranged for answeronly operation; this prevents it from being used for outgoing calls. All local fire-reporting calls are routed to this telephone. The other telephone is the conference master station (also dialless) from which a conference is initiated by going off-hook.

3.27 Where two or more key locations are used instead of a single master location, each location must have both a dedicated fire-report-answering telephone and a dedicated conference-origination telephone. Each of the fire-report-answering telephones are bridged across the same connector terminal appearance.

Note: At the master location or at the two or more key locations, if used, the two separate telephones may be replaced by one multiline telephone, if desired.

specific requirements for combined automatic and manual conferencing

3.28 In all combined automatic and manual conferencing arrangements, the 291 System must be equipped with one 9192 2Wire ARD Conference Access Trunk Circuit or 9196 2Wire ARD Loop Start Access Trunk Circuit for automatic conference origination and one 9193 2Wire ARD Conference Originate Line Circuit for manual conference origination.

3.29 The master location must be equipped as usual with a dedicated fire-report-answering telephone, a dedicated conference origination telephone (master station), and a siren-activation pushbutton. In addition, a two-position switch must be provided at the master location to transfer from manual conferencing (9193 module) to automatic conferencing (9192 or 9196 module). Refer to figure 13.

System options common to all conferencing arrangements

3.30 Remote Access. Remote access (see paragraph 3.09) is usually provided only where a community siren is used for notification of firemen away from home. To provide remote access call-in capability, at least one 9195 2Wire ARD Conference Remote Answer Trunk Circuit or 9196 2Wire ARD Loop Start Access Trunk Circuit is required. Two or three 9195's may be used if it is desired that the System be able to accommodate two or three remote-access conference calls simultaneously. When more than one 9195 or 9196 is used, these modules should be assigned to a hunting group.

3.31 Siren Control. Where a community siren is used for notification, the 291 System is ordinarily equipped with one 9133 Long Interval Timer module to control the duration of the siren. The 9133 may be set for any time interval between approximately 1 second and 26 minutes. In addition, the 9133 can be optioned to provide interrupted siren control, where both the on-time and off-time interval can be adjusted between a 1 and 10 second range. A pushbutton to activate the siren (not supplied with the System) is provided at the master

station (or at any desired conference station(s)) in manual conferencing arrangements, at selected firemen's stations in automatic conferencing arrangements, and at both the master station and selected firemen's stations in combined manual and automatic conferencing arrangements. (All conference stations are able, by virtue of their associated 9191/9191A Line Circuits, to accommodate a siren pushbutton.) Each pushbutton must be connected between the tip side of the line and ground, which unbalances the line. Although a separate metallic ground conductor is not electrically required if a good earth ground is available, National Board of Fire Underwriters Standard No. 73 (1962), section 1227, implies that it is desirable not to rely on earth connections. Where earth ground is not used, i.e., where a separate pair is connected to the pushbutton, the maximum loop resistance of the pair should not exceed 2000 ohms.

Note: In 291 System applications where grounded ringing generators are used, siren-activation ground must be applied through an unused hookswitch contact. This will prevent inadvertent grounding of the tip lead while the station is on-hook and receiving ringing, and will thereby prevent the fuses associated with that particular station from blowing.

3.32 A switch option on the 9133 allows manual override of the timer so that the siren can be stopped before the preset interval expires by redepressing the pushbutton. Another switch option allows manual control of the siren so that the siren operates only when the pushbutton is held depressed. Where a fire station has its own siren on the premises and a duty fireman is present around the clock, the fire department may elect to let the duty fireman manually control the siren at all times. In this application, the 9133 module provides the remote-access capability and marks the remote-access lines busy when the System is idle.

3.33 DTMF Siren Activation. When the 291 System is optionally equipped with the 6072 Single Digit DTMF/Dial Decoder module, each conference station that is equipped with a DTMF telephone can start the community siren by simply pressing the * pushbutton. Operation of the siren is only possible when the conference circuit is activated. Once started, operation of the siren is controlled by the 9133 module. The various operating modes of the 9133 module are explained in paragraph 3.32.

3.34 Supervisory Lamp Panel. In conjunction with the siren control option, an optional supervisory lamp panel may be installed at the master location in manual or combined conferencing arrangements. With one lamp connected to each fireman's line circuit (via a separate lead for each lamp), the duty fireman or dispatcher has a visible indication of how many firemen are involved in the conference and whether activating the siren is necessary. The loop resistance limit for the supervisory panel lamp pairs will depend on several factors (e.g., type of lamps or LED's used, current limiting provided, ect.). Note that the dc resistance of each pair must

be taken into consideration when calculating the loop limit for the supervisory lamps. The panel itself is wired with one lead per lamp and a common battery feed (or with a separate pair for each lamp with one side of each pair connected to office battery, although this is less practical).

Note: *Although not normally used in automatic conferencing applications or in manual conferencing applications where more than one station is provided with siren-activation capability, a supervisory lamp panel can be installed, if desired, wherever a fireman's telephone and siren-activation pushbutton are located.*

3.35   Selective Signaling. When the 291 System is optionally equipped with the 6072 Single Digit DTMF/Dial Decoder module (an optional auxiliary bypass connector is also required), the dispatcher or other key personnel can selectively signal up to eleven separate groups of stations. This feature permits the dispatcher to call only the crewmen required for that particular emergency. For example, the paramedic teams can be assigned to one group, firemen to another group, other emergency crewmen to the third group, and so on. A basic two group selective-signaling arrangement can also be provided by the 291 System. In this application, only an optional auxiliary bypass connector is required. For additional information regarding this, or other selective signaling features, please contact Tellabs Application Engineering at (312) 969-8800 or your Tellabs Regional Office for further assistance.

System options for automatic conferencing only
Note: *These options are not available for the automatic conferencing mode in combined automatic and manual conferencing arrangements.*

3.36   Transfer Switch. In automatic conferencing arrangements where two 9192 Conference Access Trunk Circuits or two 9196 Loop Start Trunk Circuits are used (as recommended), it is also strongly recommended that one conference telephone location (typically, the fire station) be supplied with a two-position switch (not provided with the System). This switch, depending on position, deactivates one 9192/9196 or the other and busies out the associated connector circuit in the central office. This arrangement ensures that one 9192/9196 will always be available to initiate a conference because, if a conference should be held up by a caller's failing to go on-hook (e.g., when abandoning a burning building), the responsible fireman need only set the switch to the other position to release the active 9192/9196 (which drops the conference in progress) and to activate the other 9192/9196 (which readies the System for future fire-reporting calls). If a means of transferring to the second 9192/9196 were not available, a conference held up as described would be activated indefinitely and subsequent fire-reporting calls would not be able to be completed. Also, with only one 9192/9196 active at a time, two simultaneous fire-reporting calls will result in one being cut through and the other receiving busy tone, which are necessary System func-

tions. If both 9192's/9196's were active at the same time, two simultaneous fire-reporting calls would result in both being connected to the conference, possibly creating confusion among both the callers and the firemen. If a transfer switch is not desirable, the 6072 module and an additional interface circuit can provide the same switching capabilities, remotely, from any conference station. For additional information on this feature, please contact Tellabs' Application Engineering at (312) 969-8800 or your Tellabs Regional Office for further assistance.

3.37   Trunk-Busy lamps. Where two 9192 or 9196 Trunk Circuits and a transfer switch are used, two trunk-busy lamps may be provided at the location of the transfer switch. These lamps provide a visible indication of which of the two 9192's/9196's is busy. Thus, a lamp lit for an abnormally long time would indicate a possible failure of an originator to go on-hook after placing a fire-reporting call and the need to activate the transfer switch. Each lamp requires one lead; a common ground is used for both.

System options for manual conferencing and for manual mode in combined automatic and manual conferencing
3.38   Maintenance of Conference. In the manual conferencing and the manual mode of combined automatic and manual conferencing, a switch on the 9193 2Wire ARD Conference Originate Line Circuit module determines how a conference call is to be terminated. With this switch in one position, a conference is held up as long as any conference station remains off-hook. With the switch in the other position, a conference is held up only as long as the master station (or conference-origination telephone at a key location if two or more key locations are used instead of a master location) remains off-hook.

other uses of 291 System
3.39   Although the 291 System is primarily designed for notification of emergency personnel by either automatic or manual conferencing (or both), it may be used, with certain necessary modification, for other purposes as well. One such use, for example, is as a one-way notification and data transmission system (with automatic conferencing) for a business with one main office and a number of branch offices. In this application, the System's 9194 Conference Amplifier module must be replaced by two Tellabs 4252 2Wire Distributive Data Bridge Splitter Amplifier modules and ten Tellabs 4255 2Wire Distributive Data Bridge Quad Termination modules from Tellabs' 242 2Wire Distributive Data Bridge System. (This particular System configuration is known as the 291A Command Conference Alerting System.)

3.40   Once again, if a 291 System is to be used for nonconventional applications where special modifications may be required, please consult Tellabs' Application Engineering Department at (312) 969-8800 or your local Tellabs' Regional Staff Engineer for information and assistance.

mounting and powering

3.41 The 291 System is designed for central office or PBX equipment room location and, by virtue of the prewired Type 10 Shelves that are supplied as part of its mounting Assembly, mounts in either a 19 inch or 23 inch relay rack. In its maximum configuration (i.e., 30 stations and 4 shelves), the System occupies only 24.5 inches of vertical rack space. The System is powered from −42.75 to −56Vdc office battery.

4. installation

inspection

4.01 The 291 Conference/Alerting System and its component modules should be inspected upon arrival to find possible damage incurred during ship-ment. If damage is noted, a claim should immedi-ately be filed with the carrier. If stored, the equip-ment should be inspected again prior to installation.

4.02 The 291 System mounts in a 19 inch or 23 inch relay rack. In the most common arrangement, the common equipment shelf is the uppermost shelf followed immediately below by one to three line equipment shelves, depending upon the num-ber of lines required (see figures 3a and 3b).

4.03 To begin the wiring procedure, install the wiring between the individual shelves, and from the office battery supply and ring generators as follows (refer to figure 4 and/or the System Wiring Diagrams [section 5] as necessary):

A. Interconnect the common equipment shelf
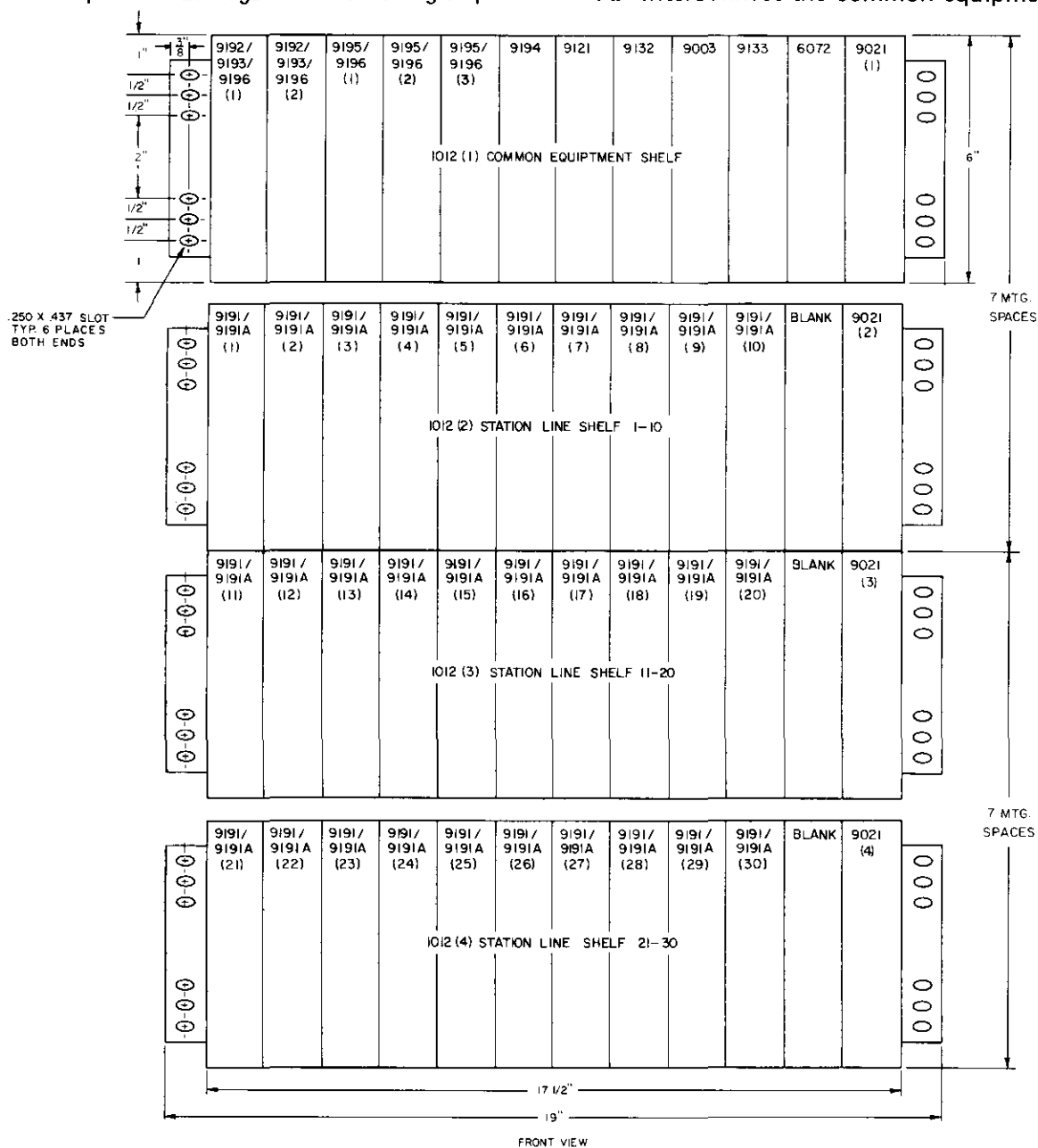
figure 3a. 291 System, front view, showing module configuration
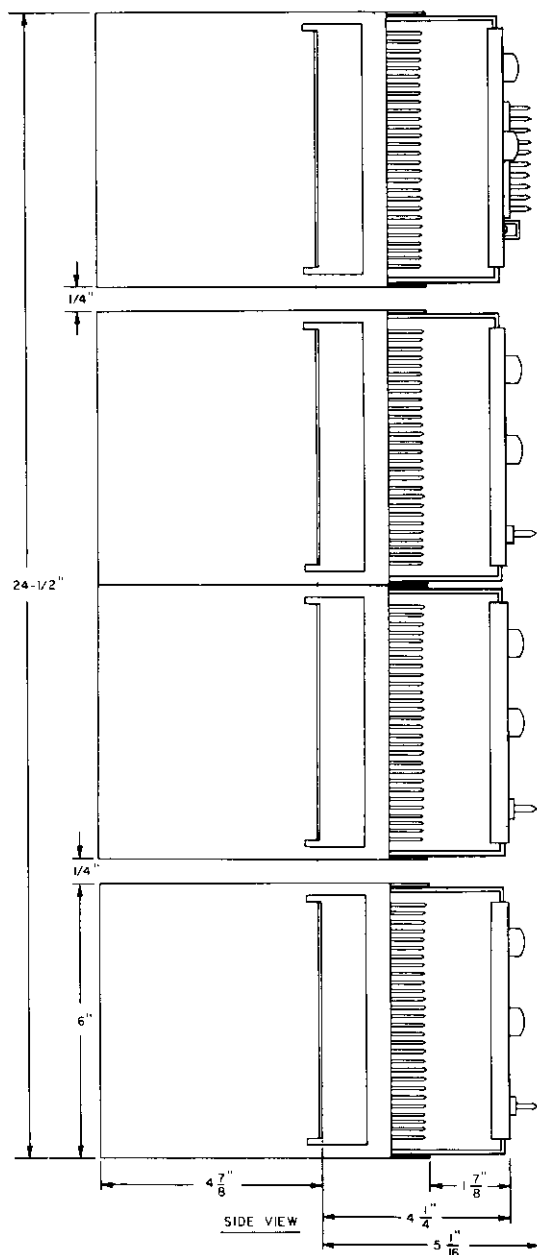
SIDE VIEW

figure 3b. 291 System, side view

with each line equipment shelf by means of the short, double-ended connectorized cables provided. These interconnections must be made between the following connectors on the backs of the shelves:

J1A on the common equipment shelf and *J1* on the first line equipment shelf.

J1B on the common equipment shelf and *J1* on the second line equipment shelf.

J1C on the common equipment shelf and *J1* on the third line equipment shelf.

Note: *Auxiliary bypass plug (part number 50-4001) must be installed into connector J5 on the common equipment shelf for proper System operation.*

B. Connect −48Vdc power and office fuse alarm leads to terminal block 1 (*TB1*) on each shelf. Battery must be connected to the negative (−) terminal and ground to the positive (+)

terminal. The battery lead should be fused (externally to the 291 System) with a fuse rated at no less than 10 amperes, and the wire gauge of the power leads should be no smaller than 14 gauge, since a fully equipped (30 station) 291 System requires 8.5 amperes (maximum) of current.

C. Connect continuous (biased or grounded) ring generator from the central office to the 291 System as follows: Connect the ring generator input leads to the 291 System directly to terminals *GA* through *GE* of terminal block 2 (*TB2*) on the common equipment shelf. A ringing machine start lead is provided and may be connected, if required, to terminal *M. ST.* of *TB2*. If less than five frequencies are used, more than one terminal may be used for the most common ringing frequency to divide the ringing load equally among the five input fuses on the 9003 modules' front panel.

Note: *If more than one ring generator is used, all the ring generators* **must** *be either biased or grounded to provide for proper ring trip.*

4.04   When all the ring generator input leads have been connected to TB2, the conference Line Circuits (9191A's) must be connected to the interrupted ring generator. This is accomplished by installing jumpers between terminal block 3 (*TB3*) of the common equipment shelf and terminal block 2 (*TB2*) on the station equipment shelf. Before installing these jumpers, however, note the following (reference to figure 4 and the System Wiring Diagrams [section 5] will be necessary for an understanding of the following):

TB3 consists of 10 horizontal rows of 3 terminals each. The terminals in each row are bussed together; three terminals are used per row simply to provide enough room for several jumpers to be installed. The 10 outputs from the 9003 Ringing Interrupter Relay Module are factory-wired to *TB3*. Specifically, each of the 9003's ten outputs terminates on one horizontal row of *TB3*. Two horizontal rows are used per ringing frequency; these rows (*G1A* and *G2A* through *G1E* and *G2E*) are numbered in accordance with the five terminals (*GA* through *GE*) on *TB2* that represent the 291 System's five possible ringing frequencies. The System provides alternate ringing between the pairs of rows on *TB3*, i.e., while the lines connected to rows *G1A* through *G1E* are ringing, the lines connected to rows *G2A* through *G2E* are silent (and vice versa).

Note: *Option switch S3 on the 9003 permits outputs G2A, G2B, G2C, G2D, and G2E to supply continuous ringing, while outputs G1A, G1B, G1C, G1D, and G1E to supply the normal interrupted ringing.*

4.05   Now install the jumpers to connect the conference Line Circuits to the interrupted ring generator as follows (continue to refer to figure 4 and/or the System Wiring Diagrams [section 5]):

figure 4. 291 System, rear view

A. Determine the ringing frequency for each line.

B. Connect a jumper from each line terminal on *TB2* of the station shelves to any pin on one of the two horizontal rows on *TB3* representing the ringing frequency of the line being connected. Take particular care to balance the number of lines of a given ringing frequency evenly between the two horizontal rows on *TB3* for that particular frequency. (More than one jumper may be connected to a single pin, if necessary.)

Note: *Three option switches, S1 and S3 on the 9003 Ringing Interrupter Relay Module and S1 on each 9191/9191A 2Wire ARD Conference Terminate Line Circuit module, are also related to the ringing function on the 291 System. See paragraphs 4.09 and 4.16 respectively, for details on these switch settings.*

4.06   Wiring between the shelves and the central office distributing frame(s) is installed as follows

(the specific terminals to be used on the office distributing frame(s) will vary, depending upon local wiring schemes):

A. Run a connectorized [on one end, two ends if a Tellabs' 8 x 25 switching terminal block (80-0066) is used] cable (not provided with the System) from connector *J2* on each line equipment shelf to the CDF or MDF and terminate these cables on the switching equipment terminal block as indicated in figure 5 or 6, as appropriate. See table 1 for lead assignments on connector *J2* on each line equipment shelf and paragraph 4.07 for wiring information.

B. Run a connectorized [on one end, two ends if a Tellabs' 8 x 25 switching terminal block (80-0066) is used] cable (not provided with the System) from connector *J4* on the common equipment shelf to the connector distributing frame (DCF) in a two-frame office or to the main distributing frame (MDF) in a single-frame office. Terminate this cable on the CDF or MDF in accordance with figure 5 or 6, as appropriate. See table 2 for lead assignments on connector *J4* on the common equipment shelf. In this Practice, the DCF or MDF 8 x 25 terminal block on which this cable is terminated will be called the switching equipment terminal block.

C. Run a connectorized [on one end, two ends if a Tellabs' 6x20 subscriber line block (80-0065) is used] cable (not provided with the System) from connector *J3* on each line equipment shelf to the line distributing frame (LDF) in a two-frame office or to the MDF in a single-frame office. Terminate this cable on the LDF or MDF in accordance with figure 5 or 6, as appropriate. See table 3 for lead assignments on connector *J3* on each line equipment shelf. In this Practice, the LDF or MDF 6 x 20 terminal block on which this cable is terminated will be called the subscriber line block.

4.07   Wiring between the distributing frame(s) and the central office switching system is installed as follows (the specific terminals to be used on the office distributing frame(s) will vary, depending upon local wiring schemes):

A. Remove the jumper between each emergency crewman's cable pair and the associated

line relay equipment (see figure 5 or 6, as appropriate).

B. Install a jumper between each emergency crewman's cable pair and the subscriber line block on the LDF or MDF (see figure 5 or 6, as appropriate).

common eqpt. shelf connector J2 pin no.	color	lead desig-nation	appearance on shelf at position no.	module with which lead is associated*
26	W-BL	T	1	9191/A in position 1
1	BL-W	R	1	of line equipment
27	W-OR	CN	1	shelf 1, 2, or 3
2	OR-W	C	1	
28	W-GRN	T	2	9191/A in position 2
3	GRN-W	R	2	of line equipment
29	W-BRN	CN	2	shelf 1, 2, or 3
4	BRN-W	C	2	
30	W-SL	T	3	9191/A in position 3
5	SL-W	R	3	of line equipment
31	R-BL	CN	3	shelf 1, 2, or 3
6	BL-R	C	3	
32	R-OR	T	4	9191/A in position 4
7	OR-R	R	4	of line equipment
33	R-GRN	CN	4	shelf 1, 2, or 3
8	GRN-R	C	4	
34	R-BRN	T	5	9191/A in position 5
9	BRN-R	R	5	of line equipment
35	R-SL	CN	5	shelf 1, 2, or 3
10	SL-R	C	5	
36	BLK-BL	T	6	9191/A in position 6
11	BL-BLK	R	6	of line equipment
37	BLK-OR	CN	6	shelf 1, 2, or 3
12	OR-BLK	C	6	
38	BLK-GRN	T	7	9191/A in position 7
13	GRN-BLK	R	7	of line equipment
39	BLK-BRN	CN	7	shelf 1, 2, or 3
14	BRN-BLK	C	7	
40	BLK-SL	T	8	9191/A in position 8
15	SL-BLK	R	8	of line equipment
41	Y-BL	CN	8	shelf 1, 2, or 3
16	BL-Y	C	8	
42	Y-OR	T	9	9191/A in position 9
17	OR-Y	R	9	of line equipment
43	Y-GRN	CN	9	shelf 1, 2, or 3
18	GRN-Y	C	9	
44	Y-BRN	T	10	9191/A in position
19	BRN-Y	R	10	10 of line equipment
45	Y-SL	CN	10	shelf 1, 2, or 3
20	SL-Y	C	10	

table 1. Typical connections from switching equipment to cable connector J2 on line equipment shelves

C. Install a jumper between each emergency crewman's line relay equipment and the switching equipment terminal block on the CDF or MDF (see figure 5 or 6, as appropriate).

D. If automatic conferencing is to be provided in offices that can supply sleeve or control leads, cross-connect a connector terminal, **with the line relay equipment removed,** to the appropriate terminals on the switching equipment terminal block (see figure 7).

E. If automatic conferencing is to be provided in offices that cannot supply sleeve or control leads, cross-connect the line circuit terminal block to the appropriate terminals on the switching equipment terminal block (see figure 8).

F. If automatic conferencing is to be provided in a Northern Telecom DMS-10 office or any type II Signaling interface, install jumpers in accordance with figure 9.

G. If remote access (i.e., conference access by calling in via an unlisted number) is desired, run similar jumpers from the connectors corresponding to the chosen unlisted numbers (those that the emergency crewmen call to enter the conference) to the switching equipment terminal block (see figure 10, 11 or 12 as appro-

priate). Provision is made for up to three unlisted numbers, and these should be arranged as a hunting group.

common eqpt. shelf connector J4 pin no.	color	lead desig-nation	appearance on shelf at position no.	module with which lead is associated*
26	W-BL	T	1	9192, 9193 or
1	BL-W	R	1	9196 module in
27	W-O	E	1	shelf, position 1.
2	O-W	SG	1	
28	W-G	K2C	1	
3	G-W	K1C	1	
29	W-BR	CN	1	
4	BR-W	C	1	
30	W-S	K30	1	
5	S-W	K40	1	
48	V-G	TDD_1	1	
31	R-BL	T	2	9192, 9193 or
6	BL-R	R	2	9196 module in
32	R-O	E	2	shelf, position 2.
7	O-R	SG	2	
33	R-G	K2C	2	
8	G-R	K1C	2	
34	R-BR	CN	2	
9	BR-R	C	2	
35	R-S	K30	2	
10	S-R	K40	2	
23	G-V	TDD_2	2	
36	BK-BL	T	3	9195 or 9196
11	BL-BK	R	3	module in shelf
37	BK-O	E	3	position 3.
12	O-BK	SG	3	
43	Y-G	CN	3	
21	BL-V	C_1	3	
45	Y-S	H_1	3	
49	V-BR	SB	3	
38	BK-G	T	4	9195 or 9196
13	G-BK	R	4	module in shelf
39	BK-BR	E	4	position 4.
14	BR-BK	SG	4	
18	G-Y	CN	4	
47	V-O	C_2	4	
20	S-Y	H_2	4	
24	BR-V	SB	4	
40	BK-S	T	5	9195 or 9196
15	S-BK	R	5	module in shelf
41	Y-BL	E	5	position 5.
16	BL-Y	SG	5	
44	Y-BR	CN	5	
22	O-V	C_3	5	
46	V-BL	H_3	5	
50	V-S	SB	5	

table 2. Connections from distributing frame to cable connector 4 on common equipment shelf

H. If manual conferencing (dedicated telephone access) is to be provided, or to provide for manual-mode operation in combined automatic and manual conferencing arrangements, jumper the master station cable pair (or multiple key station cable pairs, if used in manual conferencing) to the appropriate terminals on the subscriber line block of the LDF or MDF (see figure 13).

I. In automatic conferencing arrangements where two 9192 Conference Access Trunk Circuits or two 9196 Loop Start Trunk Circuits are used in loop start or sleeve lead access arrangements, cross-connect to the subscriber's line block in accordance with figure 14. With Type II E and M interfacing or ground-start access, please contact Tellabs' Customer Service at (312) 969-8800 or your Tellabs Regional Office for further assistance.

common eqpt. shelf connector J3 pin no.	color	lead desig- nation	appearance on shelf at position no.	module with which lead is associated*
26 1	W-BL BL-W	T1 R1	1 1	9191A in position 1 of line equipment shelf 1, 2, or 3
27 2	W-OR OR-W	T1 R1	2 2	9191A in position 2 of line equipment shelf 1, 2, or 3
28 3	W-GRN GRN-W	T1 R1	3 3	9191A in position 3 of line equipment shelf 1, 2, or 3
29 4	W-BRN BRN-W	T1 R1	4 4	9191A in position 4 of line equipment shelf 1, 2, or 3
30 5	W-SL SL-W	T1 R1	5 5	9191A in position 5 of line equipment shelf 1, 2, or 3
31 6	R-BL BL-R	T1 R1	6 6	9191A in position 6 of line equipment shelf 1, 2, or 3
32 7	R-OR OR-R	T1 R1	7 7	9191A in position 7 of line equipment shelf 1, 2, or 3
33 8	R-GRN GRN-R	T1 R1	8 8	9191A in position 8 of line equipment shelf 1, 2, or 3
34 9	R-BRN BRN-R	T1 R1	9 9	9191A in position 9 of line equipment shelf 1, 2, or 3
35 10	R-SL SL-R	T1 R1	10 10	9191A in position 10 of line equipment shelf 1, 2, or 3
36	BLK-BL	L1*	1	9191A in pos. 1 of l.e. shelf 1, 2, or 3
11	BL-BLK	L2*	2	9191A in pos. 2 of l.e. shelf 1, 2, or 3
37	BLK-OR	L3*	3	9191A in pos. 3 of l.e. shelf 1, 2, or 3
12	OR-BLK	L4*	4	9191A in pos. 4 of l.e. shelf 1, 2, or 3
38	BLK-GRN	L5*	5	9191A in pos. 5 of l.e. shelf 1, 2, or 3
13	GRN-BLK	L6*	6	9191A in pos 6 of l.e. shelf 1, 2, or 3
39	BLK-BRN	L7*	7	9191A in pos. 7 of l.e. shelf 1, 2, or 3
14	BRN-BLK	L8*	8	9191A in pos. 8 of l.e. shelf 1, 2, or 3
40	BLK-SL	L9*	9	9191A in pos. 9 of l.e. shelf 1, 2, or 3
15	SL-BLK	L10*	10	9191A in pos. 10 of l.e. shelf 1, 2, or 3
41	Y-BL	TL1*†	12	9192/9193/9196 in pos. 1 of common eqpt. shelf
16	BL-Y	TL2*†	12	9192/9193/9196 in pos. 2 of common eqpt. shelf
42	Y-OR	RL1*†	12	9192/9193/9196 in pos. 3 of common eqpt. shelf
17	OR-Y	RL2*†	12	9195/9196 in pos. 4 of common eqpt. shelf
43	Y-GRN	RL3*†	12	9195/9196 in pos. 5 of common eqpt. shelf
18 44	GRN-Y Y-BRN	TK† TKR†	12 12	short timeout key (optional)
19	BRN-Y	HVR†	12	ground output from 9133 in pos. 10 of common eqpt. shelf for siren control
45 20 46 21 47 22	Y-SL SL-Y V-BL BL-V V-OR OR-V	T† R† K1C† K2C† K3O† K4O†	12 12 12 12 12 12	9192/9193 in pos. 1 of common equip- ment shelf
48 23 49 24 50 25	V-GRN GRN-V V-BRN BRN-V V-SL SL-V	T† R† K1C† K2C† K3O† K4O†	12 12 12 12 12 12	9192/9193 in pos. 2 of common equip- ment shelf

*Optional busy indicator lamp leads.
†These leads appear on line equipment shelf 1 only and are spares on line equipment shelves 2 and 3 (if supplied).

table 3. Typical connections from station equipment to cable connector J3 on line equipment shelves

J. Connect indicator lamps, transfer switches, short timeout key, and supervisory lamp panel (if provided) to the appropriate terminals on the subscriber line block (see figure 13).

K. If a siren is required, strap the HVR (high-voltage relay) lead from the subscriber line block to one of the two siren control leads going to the siren location. The other siren control lead should be connected to −48Vdc. The HVR lead provides a ground signal to activate the siren when the siren pushbutton is depressed.

option switch selection

4.08 Nearly all optioning of the modules in the 291 System is accomplished via switches on the printed circuit board of each module. Once optioned and installed, no alignment or adjustment of the modules is necessary, with the possible exception of a level adjustment on the 9194 2Wire Conference Amplifier module and two tone level adjustments on the 9121 Tone Supply module. (These adjustments are described in paragraphs 4.30 and 4.31, respectively.) All option switches and their functions are listed in table 4. Locations of these switches on the modules' printed circuit boards are shown in figure 16. Paragraphs 4.09 through 4.28 provide instructions on optioning each of the modules in the System. This information also appears in greater detail in the separate Tellabs Practice on each module.

figure 16. Option switch locations

RECOMMENDED MAIN FRAME WIRING
(SUBSCRIBER LINE BLOCK)

6 x 20 TERMINAL BLOCK
(JUMPER WIRING SIDE)

PROTECTOR

CABLE PAIR

2W (NOTE 2)

SUBSCRIBER LINE BLOCK

FIG. B

3 CABLES

J3 SHELF 2
J3 SHELF 3
J3 SHELF 4

2W (NOTE 1)

SWITCHING EQUIP. TERMINAL BLOCK

FIG. A

T   R   C   CN

3 CABLES

J2 SHELF 2
J2 SHELF 3
J2 SHELF 4

291 SYSTEM

Installation
Notes:
1. Remove 2W jumper.
2. Install new 2W jumper.
3. Install new 3W jumper (4W (T, R, C, and CN) if EAX office].

(NOTE 3)

LINE RELAY EQUIPMENT

STRAPS SHOWN FOR REF. ONLY

CONNECTOR TERMINAL

T   R   C

figure 5. Typical station wiring for use in SxS, X-Bar, EAX, and other offices that can supply sleeve or control leads

8X25 TERMINAL BLOCK (JUMPER WIRING SIDE)
RECOMMENDED MAIN FRAME WIRING (SWITCHING FRAME)

MODULE POSITION

SHELF 2   SHELF 3   SHELF 4   SHELF 1

FIGURE A

PROTECTOR

CABLE PAIR

2W (NOTE 2)

SUBSCRIBER LINE BLOCK

FIG. B

3 CABLES

J3 SHELF 2
J3 SHELF 3
J3 SHELF 4

291 SYSTEM

SWITCHING EQUIPMENT TERMINAL BLOCK

FIG. A

T   R   C   CN

3 CABLES

J2 SHELF 2
J2 SHELF 3
J2 SHELF 4

2W (NOTE 1)

(NOTE 2)

T   R

SCANNER CONTROL LEADS

CO LINE EQUIP.

Installation
Notes:
1. Remove 2W jumper.
2. Install new 2W jumpers.
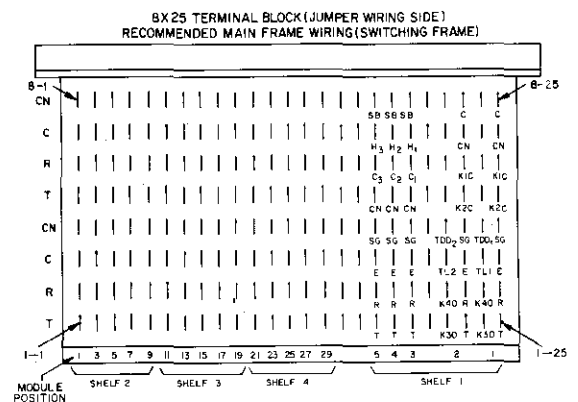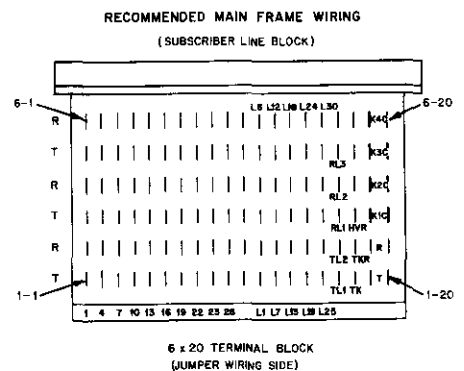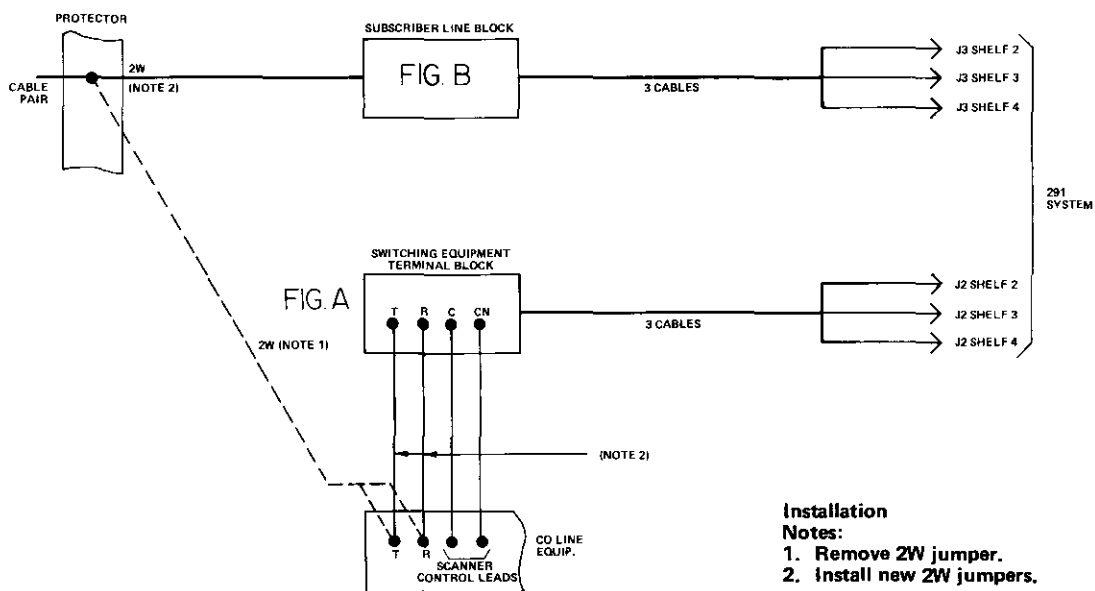
figure 6. Typical station wiring for use in ESS and other electronic offices that do not supply sleeve leads
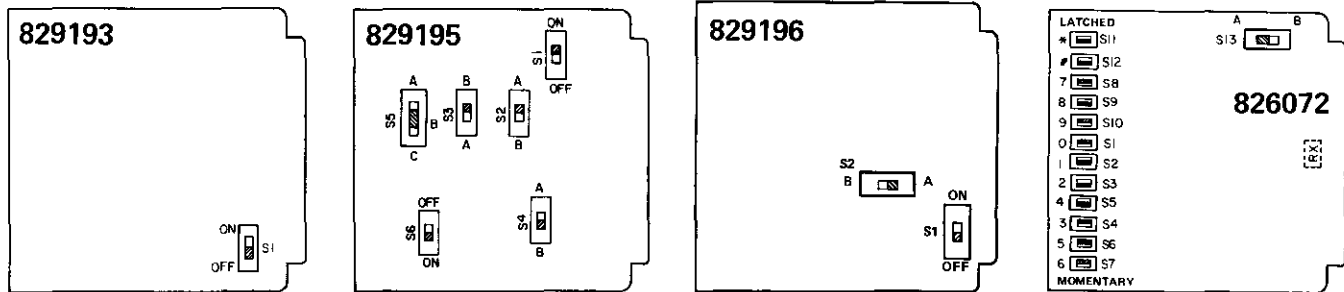
figure 16. Option switch locations

9003 options

4.09 On the 9003 Ringing Interrupter Relay module, set five-position DIP switch *S1* to the *OFF* position to enable the five (if all five ring generator inputs are used) ring-generator alarm detectors. Set switch *S2* to the *B* position if the CO or PBX uses battery-biased ring generator or to the *G* position if the CO or PBX uses ground-connected ring genera-tor. Finally, set switch *S3* to the *A* position for the normal 1-second-on, 1-second-off ringing to both groups of stations, or to the *B* position if ringing outputs G2A, G2B, G2C, G2D, and G2E are to supply continuous ringing, while ringing outputs G1A, G1B, G1C, G1D, and G1E are to supply the normal 1-second-on, 1-second-off ringing.
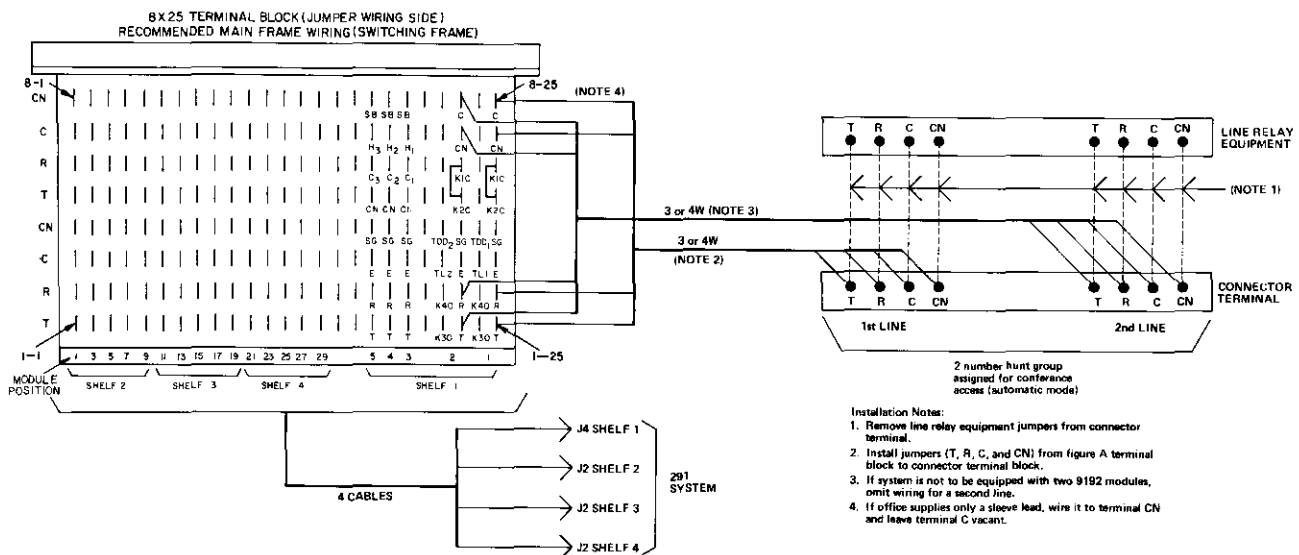
figure 7. Typical wiring for one- or two-line automatic conferencing System installed in SxS, X-Bar, EAS, or other office that can supply sleeve or control leads (9192 access port)
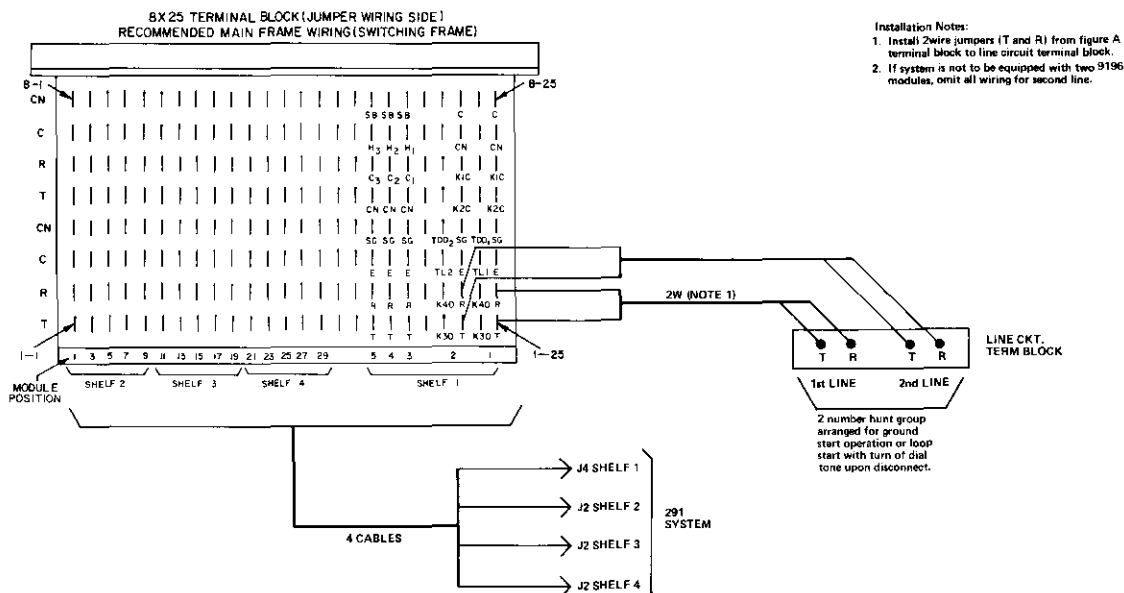
figure 8. Typical wiring for one- or two-line automatic conferencing System installed in ESS or other electronic office that does not supply sleeve leads (9196 access port)
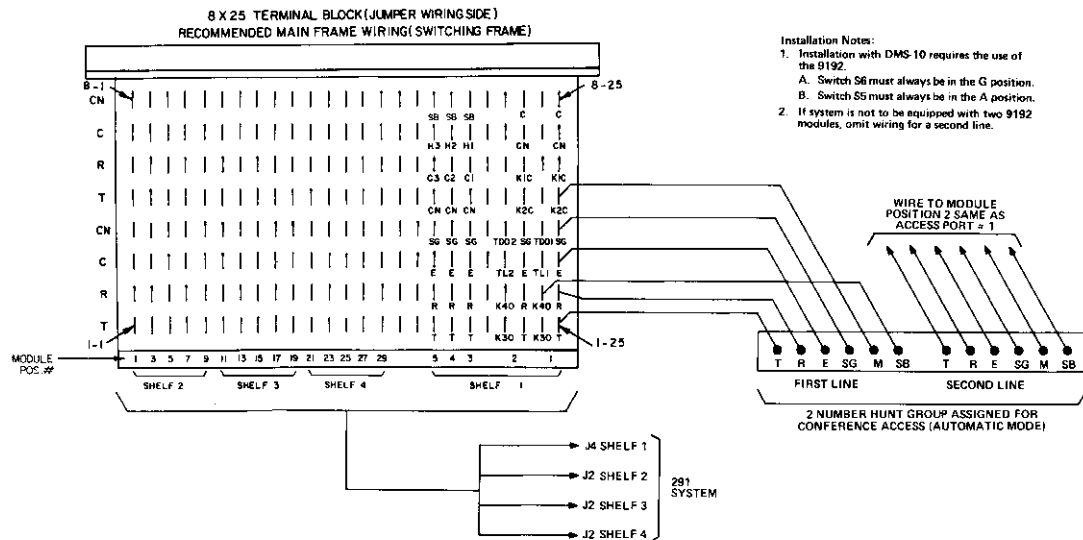
figure 9. Typical wiring for one- or two-line automatic conferencing System installed in a Northern Telecom DMS-10 office using Type II E and M Signaling (9192 access port)
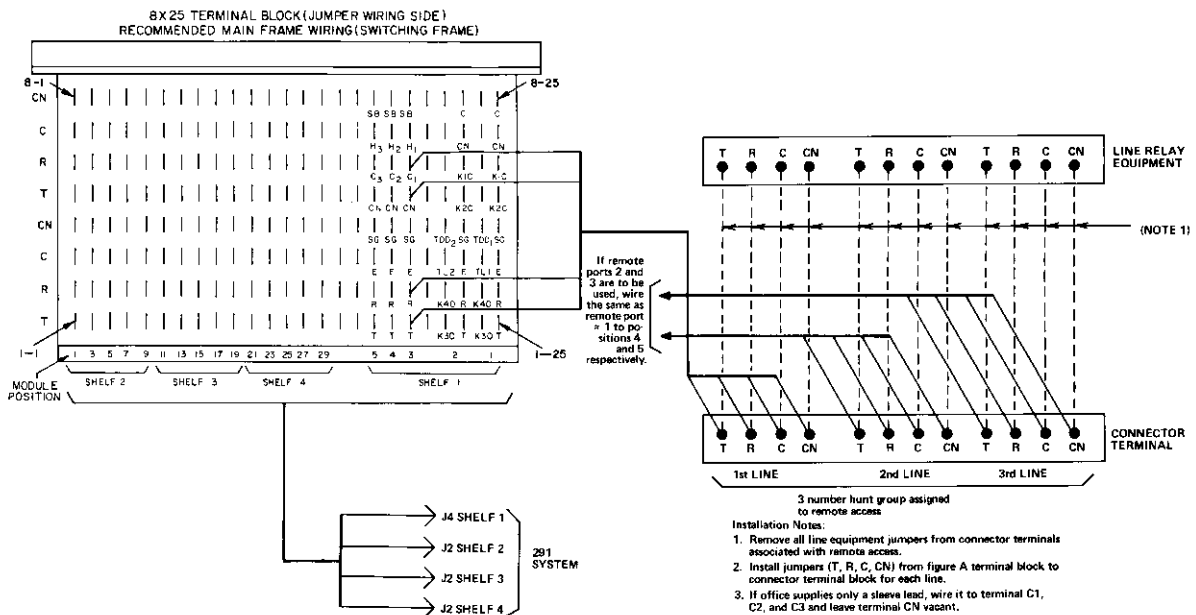
figure 10. Typical wiring for remote access capability in SxS, X-Bar, EAX, and other offices that can supply sleeve or control leads (9195 remote access port)
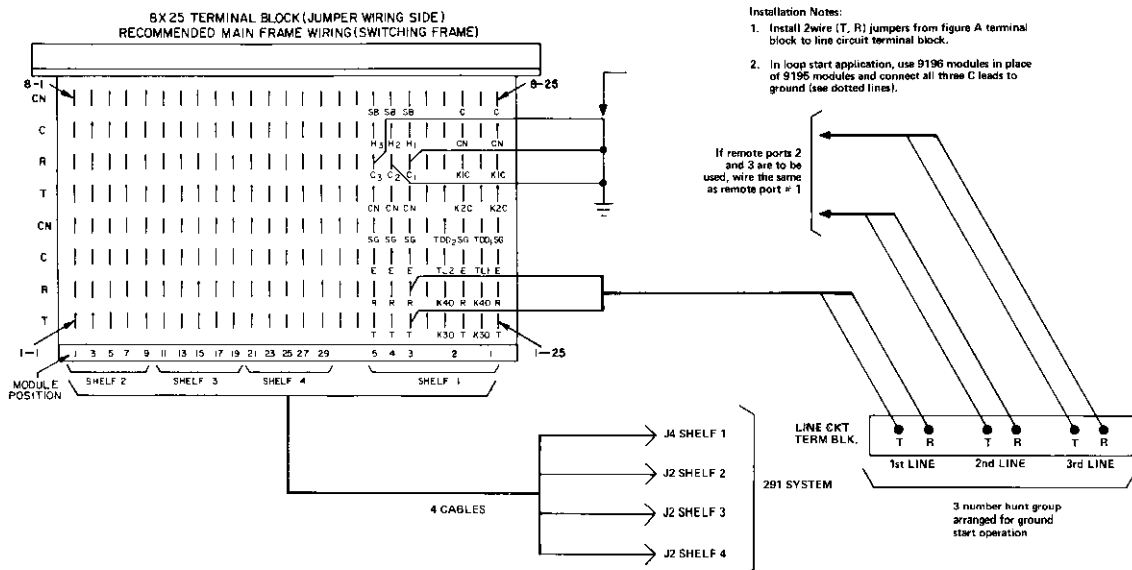
figure 11. Typical wiring for remote access capability in ESS and other electronic offices that do not supply sleeve leads (9196 remote access port)
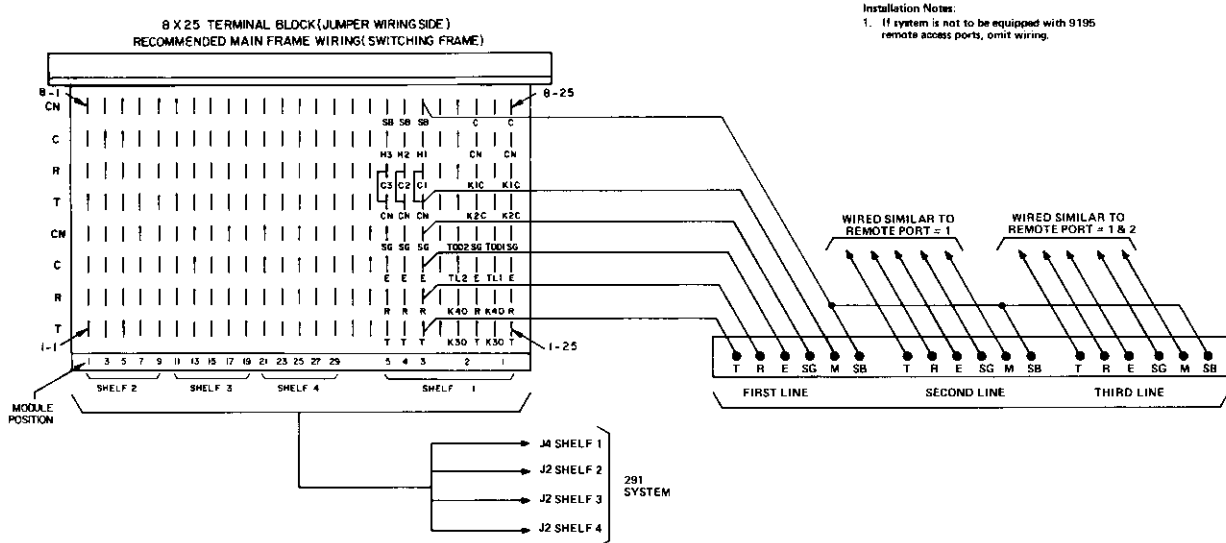
figure 12. Typical wiring for one- to three-automatic remote access ports when installed in a Northern Telecom DMS-10 office with Type II E and M Signaling (9195 remote access port)
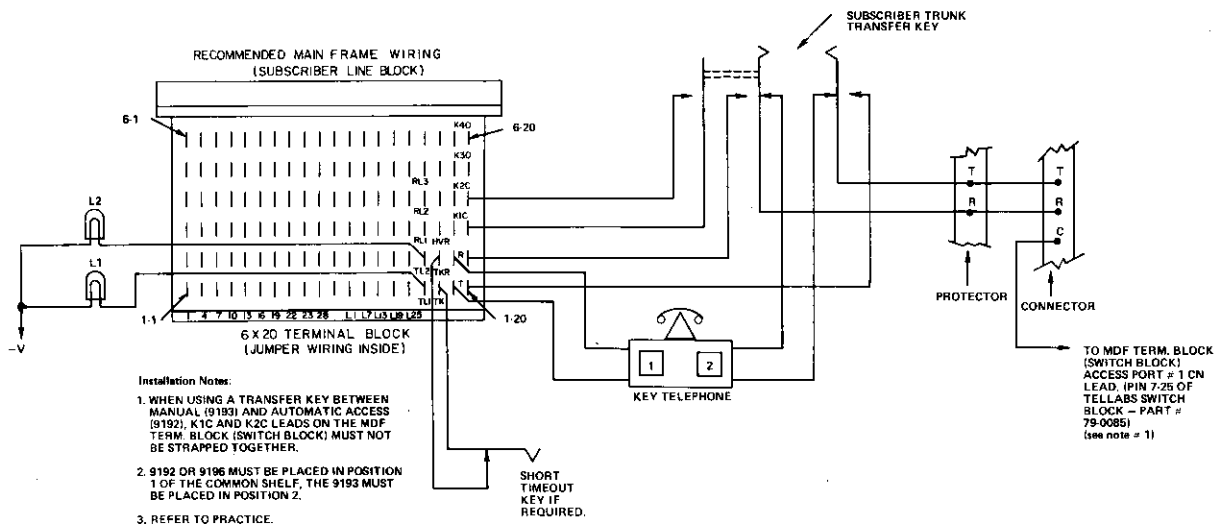
figure 13. Typical master station (or key station) wiring showing transfer switch (or key) and dedicated telephone connections (for applications arranged for both automatic and manual conference origination) (9192/9196 automatic access port and 9193 manual access port)
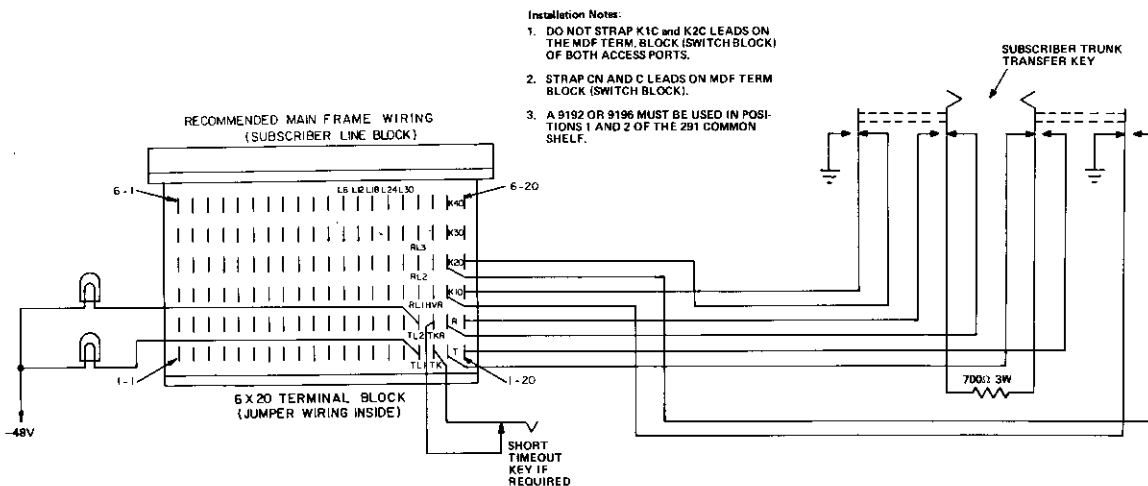
figure 14. Transfer switch between two automatic access lines (two 9196)

module	function	switch	selection
9003	ringing generator alarm detectors	S1A/S1E	OFF (activates ringing alarm detectors) or ON deactivates ringing alarm detectors)
	ringing generator bias	S2	B (battery) or G (ground)
	ringing mode	S3	A (continuous 1-sec-on/1-sec-off ringing) or B (continuous 1-sec-on/1-sec-off ringing on G2X ring generator outputs and interrupted ringing on G1X ring generator outputs
9021		none	
9121	tone choice	AT/BT	AT (alerting tone) or BT (busy tone)
	dial tone output level	pot. R10	−30 to 0dBm, continuously adjustable (not used with 291 System
	ringback tone output level	pot. R28	−30 to 0dBm, continuously adjustable
	alerting tone or busy tone output level	pot. R38	−30 to 0dBm, continuously adjustable
9132	long ringing timeout adjustment	pot. R2	1.5 to 5 minutes, infinitely variable
	short ringing timeout adjustment	pot. R1	0 to 2 minutes, infinitely variable
	method of conference termination	S1	B (conference forced idle, 1.5 to 5 minutes after first station answers) or A (conference held busy until last station returns to on-hook
9133	siren timing interval, selection of range in which desired timing interval falls	S1 and S2	Both switches set in combination to provide any of 100 timing interval ranges (minimum 1 to 1.5 seconds maximum; 17 to 26 minutes refer to table 5.
	siren timing interval selection of precise timing interval desired	pot. R2	continuously adjustable within range selected via S1 and S2
	siren control: timer override for early cutoff of siren (before timing interval expires)	S3	ON (early cutoff allowed) or OFF (no early cutoff allowed); enabled only when S4 is set to A position
	siren control: manual operation of siren	S4	A (siren under timer control with or without early cutoff, depending upon S3 setting), or B (siren under manual control, S3 and timer defeated)
	siren mode	S5	B (enables siren interrupter) or A (enables continuous siren)
	siren interrupter timing; controls on time	pot. R36	on time continuously adjustable between 1 second and 10 seconds
	siren interrupter timing: controls off time	pot. R37	off time continuously adjustable between 1 second and 10 seconds
9191 or 9191A (Issue 2)	biasing of loop for compatibility with CO ring generator	S1	G (ground connected to tip side of line during ringing) or B (battery connected to tip side of line during ringing)
	automatic ring trip disable	S2	A (calls to the station involved in a conference are automatically answered and busy tone applied) or B (the call is not answered)
	conference entry supervision control	S3	A (line transfer inhibited by C, CN, or sleeve lead) or B (line transfer inhibited by loop current
	disconnect control	S4	ON (conference station remains connected to conference until entire conference is terminated), or OFF (conference station can disconnect from conference in progress via hook-switch flash)

table 4. Switch and other user-adjustable options

module	function	switch	selection
	conditions module so that associated station is marked busy to switching equipment while a conference is in progress	S5	A (for use with SxS or EAX offices), B (for use with Crossbar-type offices), C (for use with ESS-type offices), or D (for use with certain electronic PBX's [see text])
	adjusts length of time 9191/9191A wil return busy tone (after tripping ringing voltage) when a non-conference call is made to a station involved in a conference call. Enabled only under certain circumstances, see paragraph 2.18, 4.20, and 4.21.	pot. R43	0 to approximately 30 seconds, continuously adjustable
9192	tip-to-ground and ring-to-ground resistance	S1	A (1200 ohms), B (1400 ohms), or C (2020 ohms)
	ring trip control	S2	A (immediate ring trip and conference initiation under control of C-lead or B (ring trip under control of sta. answer w/S3 in on pos.)
	loop seizure control	S3	ON (loop seizure enabled) or OFF (loop seizure disabled)
	CN lead resistance battery	S4	ON (850 ohms) or OFF (3000 ohms)
	sleeve lead resistance	S5	A (0 ohms), B (830 ohms), or C (1200 ohms)
	sleeve lead bias	S6	B (battery) or G (ground)
	enabling of tip and ring-to-ground resistance (see switch S1)	S7	ON (switch S1 enabled) or OFF (switch S1 disabled)
	loop sense control	*S8	A (special applications) or B (291 System)
9193	maintenance of conference by any station or by master station only	S1	ON (conference held up by any station's remaining off-hook) or OFF (conference held up by master station only)
9194		none	(see paragraph 4.30 for level adjustment)
9195	enabling of tip-to-ground and ring-to-ground resistance (see switch S5)	S1	ON (switch S5 enabled) or OFF (switch S5 disabled)
	loop sense control	S2	B (ground start) or A (conference must be initiated by sleeve or C-lead
	loop sense control	S3	A (ground start) or B (C-lead initiates conference)
	conference cut-through to 9194 Conference Amp (plus several other functions)	S4	A (ground start) or B (sleeve or control lead activation)
	tip-to-ground and ring-to-ground resistance	S5	A (1200 ohms), B (1400 ohms), or C (2020 ohms)
	sleeve lead resistance	S6	ON (830 ohms) or OFF (1200 ohms)
9196	maintenance of conference by any station or by master station only	S1	ON (conference held up by any station's remaining off-hook) or OFF (conference held up by master station only)
	conditioning of 9196 to function as either originating or remote-access trunk circuit	S2	A (9196 functions as originating trunk circuit when replacing 9192 in loop-start applications) or B (9196 functions as remote-access trunk circuit when replacing 9195 in loop-start applications)
6072 (optional)	selective signaling	S1 thru S10 and S12	Please consult Tellabs' Application Engineering Department at (312) 969-8800
	DTMF Siren activation	S11	Must be set to *momentary* position
	rotary or DTMF input	S13	Must be set to *B* (DTMF) position

*Early production models of the 829192 contain switch *S8*. If provided *S8* must be set to the *B* position.

table 4. Switch and other user-adjustable options

	switch 1 positions																			
	0		1		2		3		4		5		6		7		8		9	
	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
9	3.05	2.03	2.88	1.92	2.71	1.81	2.54	1.70	2.37	1.56	2.20	1.47	2.03	1.36	1.87	1.24	1.70	1.13	1.53	1.02
8	6.10	4.06	5.76	3.84	5.42	3.62	5.08	3.40	4.74	3.12	4.40	2.94	4.06	2.72	3.74	2.48	3.40	2.26	3.06	2.03
7	12.21	8.12	11.52	7.68	10.84	7.24	10.16	6.80	9.48	6.24	8.80	5.88	8.12	5.44	7.48	4.96	6.80	4.52	6.12	4.07
6	24.42	16.24	23.04	15.36	21.68	14.48	20.32	13.60	18.96	12.48	17.60	11.76	16.24	10.88	14.96	9.92	13.60	9.04	12.24	8.14
5	48.84	32.48	46.08	30.72	43.36	28.96	40.64	27.20	37.92	24.96	35.20	23.52	32.48	21.76	29.92	19.84	27.20	18.08	24.48	16.28
4	1:38	1:05	1:32	1:01	1:27	57.92	1:21	54.40	1:16	49.92	1:10	47.04	1:05	43.52	59.84	39.68	54.40	36.16	48.96	32.56
3	3:15	2:10	3:04	2:03	2:53	1:56	2:42	1:49	2:32	1:40	2:21	1:34	2:10	1:27	2:00	1:19	1:49	1:12	1:38	1:05
2	6:31	4:20	6:09	4:06	5:47	3:52	5:25	3:38	5:03	3:20	4:42	3:08	4:20	2:54	3:59	2:38	3:38	2:25	3:16	2:10
1	13:01	8:40	12:17	8:12	11:34	7:43	10:50	7:15	10:06	6:39	9:23	6:16	8:40	5:48	7:59	5:17	7:15	4:49	6:32	4:20
0	26:02	17:20	24:35	16:23	23:08	15:27	21:41	14:30	20:13	13:14	18:46	12:33	17:19	11:36	15:57	10:35	14:30	9:39	13:03	8:41

(Left vertical label: **switch 2 positions**)

Note 1: Adjustment of R2 allows selection of time interval within the ranges indicated for each switch combination.
Note 2: Timing intervals shorter than 1 minute are given in seconds and hundredths of a second (e.g., 14.96). Intervals longer than 1 minute are given in minutes and seconds (e.g., 23:08).

table 5. Switch settings for siren timing interval, 9133 Long Interval Timer module

9121 options

4.10 On the 9121 Tone Supply set switch S1 to the AT (alerting tone) position when used in a 291 System. (The BT (busy tone) position is used for applications other than the 291 System.) Refer to paragraph 4.29 for alerting-tone and ringback-tone level adjustment instructions.

9132 options

4.11 On the 9132 Ringing Timer module, adjust potentiometer R2 as required to provide a normal (1.5 to 5 minute) ringing timeout interval. If a lever key switch is provided at the master station for an optional short (0 to 2 minute) ringing time-out interval, adjust potentiometer R1 as required to provide the desired timeout. Set switch S1 to the B position if the conference is to be forced idle 1.5 to 5 minutes (preset) after the first conference station answers or to the A position if the conference is to be held busy until the last conference station goes on-hook.

Note: *The 291 System can only be forced idle after the timeout interval expires when a 9196 module is used as the access port.*

9133 options

4.12 On the 9133 Long Interval Timer module, the siren timing interval of 1 second to 26 minutes is set by means of switches S1 and S2 (which are both miniature 10-position rotary switches) and potentiometer R2. Set S1 and S2 as indicated in table 5 to obtain the timing interval range within which the specific desired timing interval falls. Then adjust potentiometer R2 (if necessary) to achieve the precise timing interval desired.

4.13 Switch S3 on the 9133 permits manual override of the timer for early siren cutoff. When S3 is set to the ON position, an emergency crew-man at any station equipped with a siren-activation pushbutton can start the siren (and activate the timer) by depressing the pushbutton, and can stop the siren, if desired, **before the preset timing interval expires** by depressing the pushbutton a second time. When S3 is set to the OFF position, however,

the siren, once activated, will operate until its preset timing interval expires, **even if the pushbutton is redepressed.**

4.14 Switch S4 on the 9133 permits totally manual control of the siren. When S4 is set to the B position, both the timer (switches S1 and S2 and potentiometer R2) and switch S3 are defeated, and the siren will operate only while the siren-activation pushbutton is held depressed. When S4 is set to the A position, the siren is under the control of the timer and will operate until manually stopped or until the timer times out, depending upon the setting of S3.

Note: *When using a non-locking pushbutton to activate the siren, the pushbutton must be depressed for 1 second and then released. When overriding the siren timer, the pushbutton must also be depressed for 1 second and released.*

4.15 Switch S5 on the 9133 is used to enable or disable the siren interrupter circuitry. Set switch S5 to the A position if the siren is to operate continuously during either the fixed-time-interval or fixed-time-interval-with-override mode. Set switch S5 to the B position if interrupted siren operation during the preset timing interval is desired. With switch S5 set to the B position, adjust potentiometer R36 for the desired on-time interval and potentiometer R37 for the desired off-time interval. Both timing intervals can be continuously adjusted between a 1 and 10 second range.

9191/9191A options

4.16 Set switch S1 to the G position if the associated switching equipment uses battery-biased ring generator or to the B position if the switching equipment uses ground-connected ring generator.

Note: *This instruction may seem incorrect. It is not incorrect. On this module, B = ground-connected and G = battery-biased ring generator.*

4.17 Switch S2 is used in PBX and CO applications where no provision is made for marking individual line appearances busy while a conference call is in progress. Set switch S2 to the A position

to condition the 9191/9191A to automatically trip incoming ringing and to return interrupted alerting tone as a busy indication. Set switch *S2* to the *B* position to condition the 9191/9191A to ignore an incoming call. (With *S2* set to *B*, the 9191/9191A does **not** trip ringing; thus, the caller will not be billed for any toll charges incurred.)

4.18   Switch *S3* determines the manner in which the station, if busy with a normal call at the time a conference is originated, will enter the conference. Set *S3* to the *B* position to condition the 9191/9191A to apply alerting tone to the call in progress (after which the station user may enter the conference via a hookswitch flash), or to the *A* position to condition the 9191/9191A to cut off the call in progress and force the busy station into the conference.

4.19   Switch *S4* conditions the manner in which the station disconnects from a conference. In 291 System applications, set *S4* to the *OFF* position to allow the station to disconnect from a conference in progress via hookswitch flash. The *ON* position of *S4*, which is not normally used in the 291 System, restricts the station from leaving a conference in progress by causing the station to be rerung by the System after hanging up.

4.20   Switch *S5* conditions the module (through appropriate control-lead functions) so that the station is marked busy to the switching equipment while a conference is in progress. Set *S5* to the *A* position for use with SxS or EAX systems, to the *B* position for use with Crossbar-type systems, to the *C* position for use with ESS-type systems (i.e., systems that require only a closure between the make-busy leads to make a line circuit busy), or to the *D* position for use with electronic PBX's that will accept a 700-ohm tip-ring short as a make-busy indication (e.g., Dimension 2000 PBX's). If the switching equipment is not one of the types listed above, provision is made within the module to automatically trip incoming ringing voltage (regardless of the optioning of *S5*) on an incoming call made to the station while a conference is in progress and return interrupted alerting tone as a busy indication.

4.21   In applications where the switching equipment is not one of the types mentioned above, adjust potentiometer *R43* to select the length of time (0 to approximately 30 seconds) the 9191/9191A will return busy tone after tripping ringing voltage when a normal call is made to the station while a conference is in progress (see paragraph 2.18).

9192 options

4.22   All option switches (*S1* through *S7*) on the 9192 2Wire ARD Conference Access Trunk module (which is used in automatic conferencing applications only) are set in various combinations, depending upon the type of switching equipment with which the 9192 and the 291 System as a whole must operate. Table 6 lists the required combinations of switch settings for all major types of switching systems.

type of switch-	switch positions						
ing equipment	S1	S2	S3	S4	S5	S6	S7
SxS	A or B (note 1)	A	OFF	ON	B or A (note 2)	B	ON
No. 1 EAX	X (note 3)	B	ON	OFF	C	G	OFF
No. 2 EAX	X	B	ON	ON	C	G	OFF
X-BAR (or similar)	C	A	OFF	OFF	C	G	ON
DMS-10	X	B	ON	OFF	A	G	OFF
DMS-100	X	B	ON	OFF	X	X	OFF

Notes:
1. Set *S1* to the *A* position for 1000Ω offices and to the *B* position for 1200Ω offices.
2. Set *S5* to the *B* position for normal use and to the *A* position in AECo offices with 600+230 ohms in line equipment tip lead.
3. "X" denotes that the switch is not utilized in that application (its setting, therefore, is immaterial).

table 6. Switch settings for 9192 2Wire ARD Conference Access Trunk module

9193 options

4.23   The 9193 2Wire ARD Conference Originate Line Circuit module (used in manual conferencing applications only) contains only one option switch, *S1*. Set *S1* to the *ON* position if it is desired that a conference be held up by **any** station's remaining off-hook (instead of the master station [or key station, if two or more key stations are used] only). Set *S1* to the *OFF* position if it is desired that the conference drop when the master station or a key station goes on-hook.

9195 options

4.24   All option switches (*S1* through *S6*) on the 9195 2Wire ARD Conference Remote Answer Trunk module are set in various combinations, depending upon the type of switching system with which the 9195 and the 291 System as a whole must operate. Table 7 lists the required combina-

type of	switch positions					
CO equipment	S1	S2	S3	S4	S5	S6
SxS	ON	A	B	B	A or B (note 1)	OFF (note 2)
No. 1 EAX, DMS-10, or DMS-100	OFF	A	A	B	X (note 3)	OFF
No. 2 EAX	OFF	A	A	A	X	OFF
X-Bar (or similar)	ON	A	A	B	C	OFF
ESS (or similar) (note 4)	OFF	B	B	A	X	OFF

table 7. Switch settings for 9195 module interfacing various switching systems

Notes:
1. Use position A with connectors for 1000Ω maximum loop. Use position B with connectors for 1200Ω maximum loop.

2. Set switch S6 to the ON position only when central office requires resistance battery on the C-lead of less than 1200Ω.

3. "X" denotes that the switch is not utilized in that application (its setting, therefore, is immaterial).

4. Use these switch settings for 2wire (no sleeve) ground-start control only.

tion of switch settings for all major types of switching equipment. If the 9196 module is used in place of (or in addition to) the 9195, proceed to paragraph 4.25. If the 9196 is not used in your 291 System, refer to paragraph 4.28.

9196 options
4.25 The 9196 2Wire ARD Loop Start Trunk Circuit module contains two option switches. Switch *S2* determines whether the 9196 is to be used in place of a 9192 to originate a conference (position *A*) or in place of a 9195 for remote access (position *B*). When the 9196 replaces a 9192, switch *S1* determines whether a conference will be held up by any station remaining off-hook (*ON* position) or will be terminated when the 9196 disconnects (*OFF* position). See paragraphs 4.25 and 4.26 for details.

4.26 When the 9196 is used in place of a 9192 for automatic conference origination in normal emergency-reporting applications, set *S2* to the *A* position and *S1* to *ON*. In other conference-origination applications where it is desired that the entire conference be terminated when the 9196 disconnects, set *S2* to *A* and *S1* to *OFF*.

4.27 When the 9196 is used in place of a 9195 for remote access, set *S2* to the *B* position and *S1* to *OFF*. In this application, setting *S1* to *OFF* does not mean that the entire conference will be terminated when the remote-access caller goes back on-hook; it merely ensures that the 9196 will disconnect to be ready for subsequent access.

6072 options
4.28 On the 6072 Single Digit DTMF/Dial Decoder module, switches *S1* through *S10* and switch *S12* program each of the eleven station groups to respond to one of the remaining eleven corresponding DTMF pushbuttons (the * pushbutton is used for siren activation). Because an additional interface circuit and external wiring is required, these switches cannot be optioned at this time. If this selective signaling feature is provided, contact Tellabs Customer Service at (312) 969-8800 or your Tellabs Regional Office for further assistance. Switches *S11* and *S13* provide the means for any conference station, that is equipped with a DTMF telephone, to start the community siren by pressing the * pushbutton. Switch *S11* must be set to the momentary position, and switch *S13* must be set to the *B* position (DTMF input) for proper siren operation.

module installation
4.29 The modules in a standard 291 System must be installed in their shelf positions exactly as shown in figure 3a. Once installed, these modules require no alignment, although the two potentiometers on the 9194 module may have to be balanced initially (see paragraph 4.29) and the alerting tone level adjusted on the 9121 module (see paragraph 4.31). If remote access, siren control, and/or (in automatic conferencing only) a second 9192 Trunk Circuit is not required in a given application, the appropriate module position(s) may simply be left blank.

Note 1: *For manual conferencing, insert the one 9193 Line Circuit in position 1 of common equipment shelf.*
Note 2: *For combined automatic and manual conferencing, insert the 9192 Trunk Circuit in position 1 and the 9193 Line Circuit in position 2 of the common equipment shelf.*

9194 Conference Amplifier Level Adjustment
4.30 The *level* and *gain ratio* potentiometers on the 9194 are factory-set and should not require any adjustment. However, if transmission levels are too high or too low the *level* and *gain ratio* controls may have to be balanced in order to provide the exact amount of gain necessary to overcome the bridging loss as stations enter the conference. To perform this level adjustment, proceed as follows:

A. Arrange the transmit portion of a transmission measuring set (TMS) terminated into 600 ohms, to output 1000Hz tone at −30dBm.

B. Initiate a conference. Request all conference subscribers to leave their station instrument off-hook for about 15 minutes while the circuit is being aligned. Inform subscribers that tone will be present during level measurements.

C. Disconnect the 25-pair J2 connectors (to the switching equipment) from the rear of all 291R System station equipment shelves. This will allow you to maintain control of the conference stations during alignment.

D. Place the TMS in the bridging mode and, using test cords equipped with type 310 plugs, connect the transmit and receive portions of the TMS to the parallel *monitor* jacks on the 9194.

E. Observe the receive level in TMS. If this level is a stady −34 ±4dBm, proceed to step G. Otherwise, adjust *level* control and *gain ratio* controls fully counterclockwise.

F. TMS should indicate −50dBm. Adjust *level* control until a −45dBm level is reached. Adjust *gain ratio* control until a −42dBm (3dB higher) level is reached.

G. Using the TMS's frequency-selection control, sweep the 300-to-3000Hz frequency range and observe the level-reading portion of the TMS for the highest level (peak amplitude) within this frequency range. Do not adjust the output level of the TMS. Leave the frequency-selection control of the TMS set for the frequency at which the peak amplitude was observed.

H. Observe the receive level on the TMS and adjust the *level* control until a −33 ±0.5dBm level is reached.

I. Momentarily depress the front-panel *test* pushbutton and observe receive level. If this level decreases when pushbutton is depressed, adjust *gain ratio* control ½ turn clockwise. If this level increases when the pushbutton is depressed, adjust *gain ratio* control ½ turn counterclockwise.

J. Repat steps H and I until the receive level remains at −33 ±0.5dBm before and while the *test* pushbutton is depressed.

9121 Tone Supply level adjustment

4.31   The alerting-tone and ringback-tone output levels of the 9121 Tone Supply module should be adjusted (if necessary) before the 291 System is placed into operation. This is done as follows:

Note: *To perform the following procedure, a Tellabs 9802 Card Extender (or equivalent) must be used. The reasons for this are twofold: first, the 9121's tone level controls are located on the module's printed circuit board and are therefore inaccessible with the module mounted in the shelf; and second, the alerting tone level adjustment must be made under actual 291-System load conditions.*

A. Connect a TMS to pins 1 and 5 of the Card Extender.

B. Adjust potentiometer *R38* on the module's printed circuit board for the desired alerting tone level (typically −15 to −20dBm).

C. Disconnect the TMS from pins 1 and 5 and connect it to pins 51 and 53 of the Card Extender.

D. Adjust potentiometer *R28* on the module's printed circuit board for the desired ringback tone level (typically −15 to −20dBm).

Note: *Because the 9121 does not supply dial tone when used in the 291 System, potentiometer R10 need not be adjusted.*

7.   testing and troubleshooting

7.01   This Testing Guide may be used in the installation, testing, or troubleshooting of the 291 Conference/Alerting System. The following *testing guide checklist* identifies the most common types of general trouble conditions with suggestions as to the probable cause. For specific difficulties associated with a particular module and not covered in the *checklist*, consult the separate Tellabs Practice on that module, where detailed testing information is provided. In general, the most expeditious method of isolating trouble is the substitution of a known good module for suspected defective modules while referencing that module's *testing guide checklist.*

7.02   It is strongly recommended that no internal (component level) testing or repairs be attempted on the modules or shelves in the 291 System. Unauthorized testing or repairs may void your Tellabs warranty.

Note: *Warranty service does not include removal of permanent customer markings on the front panels of Tellabs modules, 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.*

7.03   If a situation arises that is not covered in the Checklist, 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: (213) 595-7071
> Lisle Headquarters: (312) 969-8800
> Mississauga Headquarters: (416) 624-0052

7.04   If a 291 System mounting shelf, or module 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

7.05   If a defective shelf, or module 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 8XXXXX part number (from which we can determine the issue of the device in question). Upon notification, we shall ship a replacement to you. If the warranty period of the defective item has not elapsed, the replacement will be shipped at no charge. Package the defective device in the replacement carton; sign the packing list included with the replacement and enclose it with the defective device (this is your return authorization); affix the preaddressed label provided with the replacement to the carton being returned; and ship the equipment prepaid to Tellabs.

repair and return

7.06   Return the defective equipment, shipment prepaid, to: Tellabs Incorporated
> 4951 Indiana Avenue
> Lisle, Illinois 60532
> Attn: repair and return dept.

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

testing guide checklist

Note: *If a fault is isolated to a particular module in the 291 System but cannot be corrected with the information provided in this checklist, refer to the separate Tellabs Practice on that module for detailed testing information.*

trouble condition	possible cause (in order of likelihood)
In automatic mode, System cannot be accessed. Originating party continues to receive ringback tone.	1) 9192 module incorrectly optioned □. 2) Fuse blown in common equipment shelf □. 3) Originating line connected incorrectly to 291 System; line relay equipment not removed □. 4) 9192 module in wrong shelf position □. 5) Strap missing between K1C and K2C on subscriber line block □, or manual/automatic switch miswired □. 6) Power connections to 291 System open or improperly connected □. 7) 9192 module defective □.
In automatic mode, System access is incomplete. Ringback tone is removed from originating line, but conference telephones do not ring.	1) 9192 module incorrectly optioned □. 2) 9191/9191A modules incorrectly optioned □. 3) Ring generator(s) incorrectly connected to System □. 4) Ringing option straps on rear of common equipment shelf improperly installed □. 5) Power not connected to line equipment shelves □. 6) Strap missing between K1C and K2C on subscriber line block □, or manual/automatic switch miswired □. 7) Fuse associated with 9192 module blown □. 8) Line relay equipment not removed (SxS office only) □. 9) Defective 9192 module □. 10) Defective 9003 module □.
When accessed, not all conference telephones ring.	1) 9191/9191A associated with non-ringing phones incorrectly optioned □. 2) Ringing option straps on rear of common equipment shelf improperly installed □. 3) Required ringing frequency not wired to System □. 4) Non-ringing telephone lines incorrectly wired to System □. 5) Blown fuses in line equipment shelves □.

trouble condition	possible cause (in order of likelihood)
Alerting tone not received by conference telephones off-hook on routine call when conference is activated.	1) 9191/9191A optioned incorrectly □. 2) Fuse associated with 9121 module blown □. 3) If condition is limited to one specific telephone, defective 9191/9191A □. 4) If condition is always associated with same telephones (others work normally), check for incorrect wiring between switching equipment and 291 System on lines with problem □. 5) Defective 9121 module □.
Conference telephones can answer only during ringing cycle.	1) 9003 optioned incorrectly (check switch S1) □. 2) Switch S1 on 9191/9191A modules incorrectly set □. 3) Defective 9003 module □.
When a conference station with party-line service receives conference call, wrong party rings.	1) Ringing generator option straps installed incorrectly on rear of common equipment shelf □. 2) If party to be rung requires that ringing be applied to tip lead, reverse associated tip and ring leads at both switching equipment and line interface frame □. Note: *The 9191/9191A applies ringing to the lead designated* ring *only.*
Ringing period either too long or too short.	1) Timeout period of 9132 module requires adjustment □. 2) Defective 9132 module □. 3) If too short, possible short circuit across TK and TKR leads □.
Not all conference telephones ring. Those that do ring, ring without interruption.	1) Defective 9132 module □.
When System operated in manual mode, ringback tone not received by originating station.	1) Station off-hook □. 2) Ringback-tone level adjustment set too low on 9121 module □. 3) Defective 9121 module □. 4) Defective 9193 module □.
Remote-access lines inoperative.	1) 9195 module(s) incorrectly optioned □. 2) CN leads miswired □. 3) 9133 not operated or defective □. 4) Line relay equipment not removed (SxS office only) □. 5) Blown fuse associated with 9195 or 9133 □. 6) Defective 9195 module □.
Remote-access lines do not release from switching equipment at end of call.	1) Access lines are loop start rather than ground start □. 2) Defective 9195 module □.
One particular fuse blows repeatedly.	1) Module associated with blown fuse is defective □.
When System is accessed, howling is experienced on all conference telephones.	1) Level adjustment on 9194 Amplifier module incorrect (too high) □.
Voice level varies widely, depending on number of telephones on line at one time.	1) Adjustment of 9194 Amplifier module is incorrect; balance between *level* and *ratio* controls requires correction □. 2) Defective 9194 module □.
Voice level cannot be controlled by front-panel adjustment of 9194.	1) 9194 module in wrong position □. 2) Fuse associated with 9194 module blown □. 3) Defective 9194 module □.
Conference activation causes immediate termination of routine calls in progress at conference telephones.	1) C leads from switching equipment associated with conference lines either not connected or incorrectly connected □. 2) 9191/9191A modules incorrectly optioned □.
Siren control inoperative.	1) Inadequate ground on siren-activation pushbutton □. 2) Fuse associated with 9133 module blown □. 3) Defective 9191/9191A modules associated with siren control station □. 4) 9133 module defective □.
Siren timer output operates only when pushbutton is depressed.	1) 9133 module incorrectly optioned □.
Siren timing period too long or too short.	1) 9133 module requires timing adjustment per table 5 □.

LEAD GLOSSARY

ANS	ANSWER LEAD-INDICATION OF AN ANSWERED STATION (i.e. GROUND W/STA. OFF HOOK)
AT	ALERT TONE FROM 9121 TO ALL 9191's
ATR	ALERT TONE RETURN
C_1	C-LEAD FOR 1ST REMOTE ACCESS PORT (9195/9196)
C_2	C-LEAD FOR 2ND REMOTE ACCESS PORT (9195/9196)
C_3	C-LEAD FOR 3RD REMOTE ACCESS PORT (9195/9196)
C_{11}	C-LEAD FOR 1ST 9195/9196 MODULE TO 9133
C_{21}	C-LEAD FOR 2ND 9195/9196 MODULE TO 9133
C_{31}	C-LEAD FOR 3RD 9195/9196 MODULE TO 9133
C	C-LEAD BIAS WHEN REQUIRED
CN	C-LEAD INPUT (SLEEVE LEAD INPUT WHEN USING 9192)
E	NORMALLY OPEN CONTACT (PRIMARY USE -N.T. DMS-10)
SG	NORMALLY OPEN CONTACT (PRIMARY USE -N.T. DMS-10)
GA-GE	RING GENERATOR INPUTS (MAY USE 5 DIFFERENT RING FREQ)
GIA-GIE	RING GENERATOR OUTPUTS (OPPOSITE RING SCHEME OF G2A-G2E)
G2A-G2E	RING GENERATOR OUTPUTS (OPPOSITE RING SCHEME OF GIA-GIE)
GI-1 TO GI-35	GAIN CONTROL LEADS FOR 9194 CONFERENCE AMP
G2	GAIN CONTROL LEADS REFERENCE
H_1	CONTROL LEADS FOR NO. 2 EAX REMOTE ACCESS PORT #1 (9195)
H_2	CONTROL LEADS FOR NO. 2 EAX REMOTE ACCESS PORT #2 (9195)
H_3	CONTROL LEADS FOR NO. 2 EAX REMOTE ACCESS PORT #3 (9195)
HVR	GND OUTPUT TO CONTROL HIGH VOLTAGE SIREN RELAY
KIC	TRANSFER KEY (NORMALLY CLOSED)
K2C	TRANSFER KEY (NORMALLY CLOSED)
K30	TRANSFER KEY (NORMALLY OPEN)
K40	TRANSFER KEY (NORMALLY OPEN)
$L_1 - L_{30}$	LAMP LEADS FOR STATIONS 1-30
LG	LOCKING GROUND
LGI	LOCKING GROUND BETWEEN 9003 & 9132
LGC	LOCKING GROUND OFF NORMALLY CLOSED CONTACTS OF 9132
MRST	MASTER RESET
MST	MACHINE START
N.C.	NORMALLY CLOSED CONTACTS
N.O.	NORMALLY OPEN CONTACT
COM.	COMMON CONTACT
P	SIREN START LEAD
RBR	RING BACK TONE, RING
RBT	RING BACK TONE, TIP
RL1	REMOTE LINE (9195/6 #1 LAMP LEAD GND
RL2	REMOTE LINE (9195/6 #2 LAMP LEAD GND
RL3	REMOTE LINE (9195/6 #3 LAMP LEAD GND
RO	RING CONTROL FROM 9132 TO 9003 TO TIME-OUT RINGING.
RC	RING CONTROL FROM 9132 TO 9003 TO DISTINCTIVE RING RATE
R	RING LEAD TO CO
T	TIP LEAD TO CO
R_1	RING LEAD TO STATION
T_1	TIP LEAD TO STATION
RB	RING LEAD BUSS TIED TO CONFERENCE AMPLIFIER (9194)
TB	TIP LEAD BUSS TIED TO CONFERENCE AMPLIFIER (9194)
STR	START LEAD FROM 2 CONFERENCE ACCESS LINES
ST-A & ST-B	START LEAD DERIVED FROM N.O. CONTACT OF THE 9003
ST-1 TO ST-30	START LEADS TO STATIONS 1-30
TL_1	LAMP LEAD GND FOR CONFERENCE ACCESS LINE #1
TL_2	LAMP LEAD GND FOR CONFERENCE ACCESS LINE #2
#,*,0-9 OUT	GND OUTPUTS FROM 6072
TK	TIMER KEY (STRAP TK TO TKR FOR 0-2 MINUTE RING TIME - 9132)
TKR	TIMER KEY RETURN
TDD_1 & TDD_2	TIME DISCONNECT DISABLE FOR USE W/AE EAX SWITCHES

SYMBOLS:

1. ○   DENOTES WIRE WRAP TERMINAL ON 56 PIN CONNECTOR MOUNTED ON REAR OF ENCLOSURE.
2. - - -   DENOTES CUSTOMER WIRING.
3. —>x   DENOTES PIN NO. FOR 50 PIN MALE AMPHENOL CONNECTOR.
4. —<x   DENOTES PIN NO. FOR 50 PIN FEMALE AMPHENOL CONNECTOR.
5. ∩∪   DENOTES TWISTED PAIR.
6. x>—○   DENOTES FEMALE AMPHENOL CONNECTOR WITH WIRE WRAP TERMINALS AND THE ASSOCIATED PIN NUMBER.
- ⊘   DENOTES SCREW TERMINAL.

TABLE 1 — J3 ASSIGNMENT CHART FOR #1 STATION SHELF

POSITION	PIN	DESIG.	J3 PIN	COLOR
1	51	TI	26	W-BL
1	53	RI	1	BL-W
2	51	TI	27	W-O
2	53	RI	2	O-W
3	51	TI	28	W-G
3	53	RI	3	G-W
4	51	TI	29	W-BR
4	53	RI	4	BR-W
5	51	TI	30	W-S
5	53	RI	5	S-W
6	51	TI	31	R-BL
6	53	RI	6	BL-R
7	51	TI	32	R-O
7	53	RI	7	O-R
8	51	TI	33	R-G
8	53	RI	8	G-R
9	51	TI	34	R-BR
9	53	RI	9	BR-R
10	51	TI	35	R-S
10	53	RI	10	S-R
1	45	LI	36	BK-BL
2	45	L2	11	BL-BK
3	45	L3	37	BK-O
4	45	L4	12	O-BK
5	45	L5	38	BK-G
6	45	L6	13	G-BK
7	45	L7	39	BK-BR
8	45	L8	14	BR-BK
9	45	L9	40	BK-S
10	45	L10	15	S-BK
12	22	TLI	41	Y-BL
12	24	TL2	16	BL-Y
12	14	RLI	42	Y-O
12	16	RL2	17	O-Y
12	18	RL2	43	Y-G
12	52	TK	18	G-Y
12	54	TKR	44	Y-BR
12	20	HVR	19	BR-Y
12	50	T	45	Y-S
12	48	R	20	S-Y
12	46	KIC	46	V-BL
12	44	K2C	21	BL-V
12	42	K30	47	V-O
12	40	K40	22	O-V
12	38	T	48	V-G
12	36	R	23	G-V
12	34	KIC	49	V-BR
12	30	K2C	24	BR-V
12	28	K30	50	V-S
12	26	K40	25	S-V

TABLE 2 — J3 ASSIGNMENT CHART FOR #2 & #3 STATION SHELVES

POSITION	PIN	DESIG.	J3 PIN	COLOR
1	51	TI	26	W-BL
1	53	RI	1	BL-W
2	51	TI	27	W-O
2	53	RI	2	O-W
3	51	TI	28	W-G
3	53	RI	3	G-W
4	51	TI	29	W-BR
4	53	RI	4	BR-W
5	51	TI	30	W-S
5	53	RI	5	S-W
6	51	TI	31	R-BL
6	53	RI	6	BL-R
7	51	TI	32	R-O
7	53	RI	7	O-R
8	51	TI	33	R-G
8	53	RI	8	G-R
9	51	TI	34	R-BR
9	53	RI	9	BR-R
10	51	TI	35	R-S
10	53	RI	10	S-R
1	45	LI	36	BK-BL
2	45	L2	11	BL-BK
3	45	L3	37	BK-O
4	45	L4	12	O-BK
5	45	L5	38	BK-G
6	45	L6	13	G-BK
7	45	L7	39	BK-BR
8	45	L8	14	BR-BK
9	45	L9	40	BK-S
10	45	L10	15	S-BK

TABLE 3 — J2 ASSIGNMENT CHART FOR ALL STATION SHELVES

POSITION	PIN	DESIG	J2 PIN	COLOR
1	47	T	26	W-BL
1	49	R	1	BL-W
1	11	CN	27	W-O
1	9	C	2	O-W
2	47	T	28	W-G
2	49	R	3	G-W
2	11	CN	29	W-BR
2	9	C	4	BR-W
3	47	T	30	W-S
3	49	R	5	S-W
3	11	CN	31	R-BL
3	9	C	6	BL-R
4	47	T	32	R-O
4	49	R	7	O-R
4	11	CN	33	R-G
4	9	C	8	G-R
5	47	T	34	R-BR
5	49	R	9	BR-R
5	11	CN	35	R-S
5	9	C	10	S-R
6	47	T	36	BK-BL
6	49	R	11	BL-BK
6	11	CN	37	BK-O
6	9	C	12	O-BK
7	47	T	38	BK-G
7	49	R	13	G-BK
7	11	CN	39	BK-BR
7	9	C	14	BR-BK
8	47	T	40	BK-S
8	49	R	15	S-BK
8	11	CN	41	Y-BL
8	9	C	16	BL-Y
9	47	T	42	Y-O
9	49	R	17	O-Y
9	11	CN	43	Y-G
9	9	C	18	G-Y
10	47	T	44	Y-BR
10	49	R	19	BR-Y
10	11	CN	45	Y-S
10	9	C	20	S-Y

NOTES:

1. ALL BATT WIRING TO BE 22 Ga RED WIRE.
2. ALL GROUND WIRING TO BE 22 Ga BLACK WIRE.
3. ALL RING GEN WIRING TO BE 22 Ga WHITE WIRE.
4. ALL OTHER WIRING TO BE 24 Ga GREEN WIRE.
5. CUSTOMER WIRING OF RING GENERATOR WILL BE REQUIRED FROM TB-3 OF THE COMMON SHELF TO TB-2 OF EACH STATION SHELF. NUMBERS 1-10 OF TB-2 ON EACH STATION SHELF REPRESENTS ITS RESPECTIVE POSITION. CUSTOMER SHOULD USE 22 Ga WHITE WIRE.
6. IF A TRANSFER KEY BETWEEN THE TWO AUTOMATIC CONFERENCE ACCESS LINE (9192) IS NOT USED, STRAP LEADS KIC AND K2C OF EACH AUTOMATIC ACCESS LINE TOGETHER.
7. WHEN SLEEVE LEAD (C-LEAD) BIASING IS DESIRED AND TRANSFER KEYS ARE NOT USED, STRAP LEADS K30 AND K40, AND C & CN OF EACH ACCESS LINE (9192). ALSO REFER TO 9192 OPTION SETTINGS.
8. SPECIAL CONNECTOR PLUG (SUPPLIED BY TELLABS) SHOULD BE INSERTED IN AUXILIARY CONNECTOR J5 OF THE COMMON SHELF EXCEPT FOR SPECIAL APPLICATIONS. (CONSULT TELLABS REGIONAL STAFF ENGINEERS OR APPLICATIONS DEPT. FOR FURTHER DETAILS ON SPECIAL APPLICATIONS.)
9. WHEN USING TELLABS TERMINAL BLOCKS (79-0054 & 79-0085) FOR CONNECTIONS TO C.O. SWITCHING EQUIPMENT AND TO SUBSCRIBER LINES, THE CONNECTORIZED CABLE BEING USED MUST HAVE A FEMALE CONNECTOR ON ONE END AND A MALE CONNECTOR ON THE OPPOSITE END (TELLABS PART NO. 50-55XX).
10. MAXIMUM CURRENT DRAIN FOR THE COMMON SHELF IS 1.0 AMP. EACH STATION SHELF IS 2.5 AMPS. MAXIMUM CURRENT DRAIN FOR A 30 LINE FULLY EQUIPPED SYSTEM IS 8.5 AMPS.
11. P1, P2 & P3 ARE INTERSHELF CABLES PROVIDED BY TELLABS. ONE CABLE PER STATION SHELF WILL BE PROVIDED FOR CONNECTIONS BETWEEN THE STATION SHELVES (MAXIMUM OF 3) AND THE COMMON SHELF.

6. system flow chart

Automatic Conference Origination

CALLING PARTY DIALS THE CORRESPONDING CONNECTOR NUMBER (I.E. 911)

OFFICE (CO) APPLIES RING GENERATOR ON THE CONNECTOR NUMBER LINE AND GROUNDS THE SLEEVE (C) LEAD. (SEE NOTE 1)

USE OF 9196

USE OF 9192

USE OF 9196 branch

RING SENSE CIRCUIT DETECTS RING GENERATOR AND OPERATES THE SR RELAY ON THE 9196. (SLEEVE LEAD IS NOT USED)

SR-RELAY "MAKE" CONTACT APPLIES A GROUND TO THE STR LEAD (PIN 25) OF THE 9196.

SR-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH FOR THE RT RELAY ON THE 9196.

SR-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH FOR THE R RELAY ON THE 9196.

SR-RELAY "MAKE" CONTACT APPLIES A GROUND TO OPERATE THE SL RELAY ON THE 9196.

SL-RELAY "MAKE" CONTACT APPLIES A GROUND TO THE LAMP LEAD (PIN 45) AND LIGHTS THE BUSY LAMP ON THE 9196.

SL-RELAY "MAKE" CONTACT APPLIES A GROUND TO THE LG LEAD (PIN 15) OF THE 9196.

USE OF 9192 branch

SLEEVE-LEAD GROUND IS APPLIED TO AN UNOPERATED CONTACT OF THE RT RELAY AND OPERATES THE "C" RELAY ON THE 9192.

C-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH FOR THE RT RELAY ON THE 9192.

C-RELAY "MAKE" CONTACT OPERATES THE R RELAY ON THE 9192.

R-RELAY "MAKE" CONTACT APPLIES A GROUND TO THE LG LEAD (PIN 15) OF THE 9192.

C AND SR-RELAY "MAKE" CONTACTS PROVIDE A GROUND WHICH IS APPLIED TO THE STR LEAD (PIN 25) OF THE 9192.

C-RELAY "MAKE" CONTACT OPERATES THE ST RELAY ON THE 9192.

ST-RELAY "MAKE" CONTACT PROVIDES A RESISTIVE LOCKING PATH FOR THE R RELAY ON THE 9192.

ST-RELAY "MAKE" CONTACT APPLIES A GROUND TO THE LAMP LEAD (PIN 45) AND LIGHTS THE BUSY LED ON THE 9192.

ST-RELAY "MAKE" CONTACT PROVIDES AN OPERATE PATH FROM THE ANS LEAD (PIN 23) TO THE AN RELAY ON THE 9192.

Manual Conference Origination

MASTER TEL SET GOES OFF-HOOK

LOOP SENSE CIRCUITRY IN THE 9193 OPERATES A AND B RELAYS.

A-RELAY "MAKE" CONTACTS PROVIDE A PARTIAL CLOSURE BETWEEN TB AND RB LEADS AND G1 and G2 LEADS FOR PLACING THE MASTER TELSET INTO THE AUDIO BUS AND TO INCREASE THE GAIN OF THE 9194.

B-RELAY "MAKE" CONTACT PROVIDES RINGBACK TONE TO THE MASTER TELSET VIA THE 9121.

A-RELAY "MAKE" CONTACT APPLIES A GROUND ON THE R.M. ST. LEAD (PIN 28) TO START AN EXTERNAL RING GENERATOR.

B-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH ON THE 9193.

FRONT-PANEL BUSY LIGHTS.

A-RELAY "MAKE" CONTACT SUPPLIES A PARTIAL OPERATE PATH FOR THE SDI RELAY ON THE 9193.

A AND B RELAY "MAKE" CONTACTS GROUND BOTH THE LG LEAD (PIN 15) AND THE STR LEAD (PIN 25) OF THE 9193.

THE LG GROUND IS APPLIED TO THE 9132 TO THE LG1 LEAD (PIN 15) OF THE 9003 WHICH OPERATES THE IS RELAY.

IS-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH THROUGH THE 9003 TO APPLY RING GENERATOR TO THE STATIONS.

IS-RELAY "MAKE" CONTACT PROVIDES A GROUND TO OPERATE THE RT RELAY ON THE 9003.

THE LG GROUND IS APPLIED TO THE LG LEAD (PIN 13) OF THE 9132 AND ACTIVATES THE RING INTERRUPTER WHICH BEGINS PULSING THE RI RELAY AT A 1-SECOND-ON, 1-SECOND-OFF RATE.

THE RI RELAY PULSES THE RO RELAY ON THE 9003 BY PROVIDING A 1-SECOND-ON, 1-SECOND-OFF GROUND TO THE RO RELAY.

RO-RELAY "BREAK" CONTACT BREAKS THE OPERATING PATH OF THE RT RELAY WHEN SWITCH S3 IS IN THE A POSITION (SEE NOTE 2), WHEN RELAY RO OPERATES RELAY RT DOES NOT, AND VICE VERSA.

RELAY IS AND RO OR RT WHEN OPERATED PROVIDE A COMPLETE PATH FROM THE RING GENERATOR INPUT TO PIN 44 OF EACH 9191.

THE STR GROUND IS APPLIED TO THE STR LEAD (PIN 25) OF THE 9003 WHICH OPERATES THE STR RELAY.

STR RELAY "MAKE" CONTACTS PROVIDE A GROUND TO THE ST-A AND ST-B LEADS OF THE 9003 (PINS 49 AND 51). THESE GROUNDS OPERATE THE STR RELAYS ON ALL 9191s.

IS THE STATION BUSY WITH A NORMAL POTS CALL?

YES / NO

SWITCH S3 OF THE 9191 SET TO — POSITION B / POSITION A

GROUND IS PLACED ON THE LG LEAD (PIN 15) OF ALL 9191s.

ALERTING TONE IS APPLIED TO THE BUSY STATION VIA THE ST-RELAY "MAKE" CONTACTS.

APPLICATION OF A HOOK-SWITCH FLASH ENABLES THE A AND RC RELAYS TO ENERGIZE.

BUSY STATION IS AUTOMATICALLY CUT OFF FROM ITS CALL AND CONNECTED TO THE CONFERENCE.

ST-RELAY "MAKE" CONTACT PROVIDES A GROUND THAT OPERATES THE B RELAY VIA THE TIMER DRIVER CIRCUIT IN THE 9191.

OPERATED B RELAY DISCONNECTS THE STATION FROM ITS NORMAL CO LINE AND APPLIES RINGING FROM PIN 44, THROUGH THE RC RELAY "MAKE" CONTACT, OUT THE TIP AND RING TO THE STATION.

STATION ANSWERS

LOOP SENSE CIRCUIT DETECTS OFF-HOOK CONDITION AND OPERATES THE A RELAY ON THE 9191.

RING TRIP CIRCUIT DETECTS OFF-HOOK CONDITION AND OPERATES THE RC RELAY ON THE 9191.

RC-RELAY "BREAK" CONTACTS IN THE 9191 REMOVES RING GENERATOR FROM TIP AND RING (PINS 51 AND 53).

NOTES:

1. WHEN CENTRAL OFFICE OR SWITCHING EQUIPMENT USES A SLEEVE LEAD AS A CONTROL LEAD (GND DURING BUSY, OPEN DURING IDLE) USE THE 9192, WHEN A SLEEVE LEAD IS NOT AVAILABLE (IN THE CASE OF MOST ELECTRONIC OFFICES) USE THE 9196.

2. CAUTION — WHEN S3 OF THE 9003 IS IN THE A POSITION, ALL RING GENERATOR OUTPUTS ARE INTERRUPTED (ONE-SECOND-ON, ONE-SECOND-OFF). WHEN S3 IS IN THE B POSITION, ALL EVEN NUMBER RING GENERATOR OUTPUTS ARE CONTINUOUS WHILE ALL ODD NUMBER OUTPUTS ARE INTERRUPTED.

A-RELAY "MAKE" CONTACT PROVIDES A GROUND TO HOLD UP THE B RELAY AFTER THE ST RELAY RELEASES ON THE 9191.

A-RELAY "MAKE" CONTACT PROVIDES A PARTIAL OPERATE PATH FOR THE SDI RELAY ON THE 9191.

A-AND RC RELAY "MAKE" CONTACTS LIGHT THE FRONT PANEL BUSY LED ON THE 9191 AND PROVIDE A GROUND ON THE L LEAD FOR EXTERNAL LAMP INDICATION.

A-RELAY "MAKE" CONTACT PLACES A CLOSURE ACROSS THE ANS AND LG LEADS WHICH PLACES A GROUND BACK TO THE ANS LEAD OF THE 9192, 9193, or 9196.

A RELAY "MAKE" CONTACTS PLACES CLOSURES ACROSS TB AND RB AND G1 AND G2 LEADS TO CONNECT THE STATION TO THE AUDIO BUS AND TO INCREASE THE GAIN OF THE 9194, RESPECTIVELY.

WHEN TIP SIDE OF LINE IS GROUNDED, TIP SENSE CIRCUIT OPERATES THE SDI RELAY ON 9191 OR 9193.

SDI-RELAY "MAKE" CONTACT PLACES A CLOSURE ACROSS LG AND P LEADS. THIS APPLIES THE LG GROUND ON THE P LEAD.

SDI RELAY ON 9133 OPERATES

POSITION OF SWITCH S4 ON 9133 — A / B

SIREN CONTROL LEAD (HVR) APPLIES A CONTINUOUS GROUND TO SIREN AS LONG AS TIP LEAD ON 9191s GROUNDED.

SDI-RELAY "MAKE" CONTACT APPLIES A START PULSE TO THE DIGITAL TIMER WHICH OPERATES THE SR RELAY ON 9133. REFER TO PRACTICE FOR SPECIFIC TIME SETTINGS.

SIREN CONTROL LEAD (HVR) APPLIES AN INTERRUPTED GROUND TO SIREN. REFER TO PRACTICE FOR INTERRUPTER TIMING.

POSITION OF SWITCH S5 ON 9133 SET TO — B / A

SIREN CONTROL LEAD (HVR) APPLIES A CONTINUOUS GROUND TO SIREN.

DIGITAL TIMER EXPIRES AND SR RELAY RELEASES. SIREN CONTROL LEAD (HVR) OPENS.

SR RELAY OPERATES AND TRIPS RINGING.

SDI-RELAY "MAKE" CONTACT PROVIDES A GROUND TO OPERATE THE RAC RELAY. RAC RELAY LOCKS OPERATED TO THE LG SYSTEM GROUND.

THE OPERATED RAC RELAY ENABLES THE 9195 OR 9196 REMOTE ACCESS MODULES TO BE ACCESSABLE FROM THE CO THE RAC RELAY REMOVES THE GROUND TO THE CO C-LEAD AND CONNECTS THE C-LEAD TO ITS RESPECTIVE 9195.

WHEN A FIREMAN DIALS AN UNLISTED NUMBER IN RESPONSE TO THE SIREN, THE SWITCHING EQUIPMENT GROUNDS THE C-LEAD OF THE CONNECTOR NUMBER.

RM AND/OR RMS RELAYS OPERATE TO CONNECT THE 9195 TO THE AUDIO BUS AND INCREASE THE GAIN OF THE 9194.

FRONT-PANEL BUSY LED LIGHTS TO INDICATE THAT THE ASSOCIATED 9195 HAS ENTERED THE CONFERENCE.

ANS RELAY ON 9196 OPERATES

ANS-RELAY "MAKE" CONTACT COMPLETES THE OPERATE PATH FOR THE R RELAY.

R RELAY OPERATES ON NEXT RINGING CYCLE.

R-RELAY "MAKE" CONTACT HOLDS THE SL RELAY OPERATED.

R-RELAY CONTACT BRIDGES THE SG-RELAY CONTACT AND PROVIDES A LOCKING PATH.

R-RELAY "MAKE" CONTACT PROVIDES A 350-OHM LOOP CLOSURE TO TRIP RINGING AND HOLD UP THE INCOMING LINE.

R-RELAY "BREAK" CONTACT REMOVES THE OPERATE PATH OF THE SR RELAY.

SR RELAY RELEASES THE GROUND ON THE STR LEAD (PIN 25).

STR RELAY ON THE 9003 RELEASES AND REMOVES THE GROUND ON LEADS ST-A AND ST-B (PINS 49 AND 51).

ST RELAY OF ALL 9191's LOCKS OPERATED TO THE LG GROUND.

R-RELAY "MAKE" CONTACTS PLACE A CLOSURE ACROSS TB AND RB AND G1 AND G2 LEADS TO CONNECT THE 9196 TO THE AUDIO BUS AND TO INCREASE THE GAIN OF THE 9194, RESPECTIVELY.

AN RELAY ON 9192 OPERATES

AN RELAY LOCKS OPERATED VIA ITS OWN EMB CONTACTS, THROUGH THE OPERATED ST-RELAY CONTACT TO GROUND.

AN-RELAY "BREAK" CONTACT REMOVES THE GROUND PATH FROM THE C AND ST-RELAY CONTACTS TO THE STR LEAD OF THE 9192.

STR RELAY ON THE 9003 RELEASE AND THUS REMOVES THE GROUND ON LEADS ST-A AND ST-B (PINS 49 AND 51).

ST RELAY ON ALL 9191's LOCKS OPERATED TO THE LG GROUND.

AN-RELAY "MAKE" CONTACT COMPLETES THE OPERATE PATH FOR THE RT RELAY ON THE 9192.

RT RELAY LOCKS OPERATED TO THE GROUNDED ON LEAD.

RT-RELAY "MAKE" CONTACT MAINTAINS OPERATION OF THE ST RELAY AFTER THE C RELAY ON THE 9192 RELEASES.

OPERATED ST RELAY PREVENTS THE R RELAY FROM RELEASING.

RT RELAY OPENS THE GROUND PATH TO THE C RELAY, CAUSING THE C RELAY TO RELEASE.

RELEASE OF THE C RELAY CAUSES THE SR RELAY TO RESTORE AND REMOVES RINGBACK TONE TO INITIATING PARTY.

RT-RELAY "MAKE" CONTACTS PLACE A CLOSURE ACROSS TB AND RB AND G1 AND G2 LEADS TO CONNECT THE 9192 TO THE AUDIO BUS AND TO INCREASE THE GAIN OF THE 9194, RESPECTIVELY.

ANS RELAY ON 9193 OPERATES

ANS-AND A-RELAY "MAKE" CONTACTS PLACE A CLOSURE ACROSS TB AND RB AND G1 AND G2 LEADS TO CONNECT THE 9193 TO THE AUDIO BUS AND TO INCREASE THE GAIN OF THE 9194, RESPECTIVELY.

ANS AND B-RELAY "MAKE" CONTACTS PROVIDE A GROUND FOR OPERATING THE RB RELAY ON THE 9193.

RB-RELAY "BREAK" CONTACTS REMOVE RINGBACK TONE TO THE MASTER TELSET ONCE THE FIRST STATION HAS ANSWERED. RB RELAY THEN LOCKS OPERATED VIA ITS OWN MAKE CONTACT.

RB-RELAY "BREAK" CONTACT REMOVES THE GROUND FROM THE STR LEAD OF THE 9193.

STR RELAY ON THE 9003 RELEASES AND REMOVES THE GROUND ON LEADS ST-A AND ST-B (PINS 49 AND 51).

ST RELAY ON ALL 9191's LOCKS OPERATED TO THE LG GROUND.

CONFERENCE ACTIVATION COMPLETED. ALL STATIONS ENTER CONFERENCE.