

E-TYPE SIGNALING SYSTEM SIGNALING COMPATIBILITY

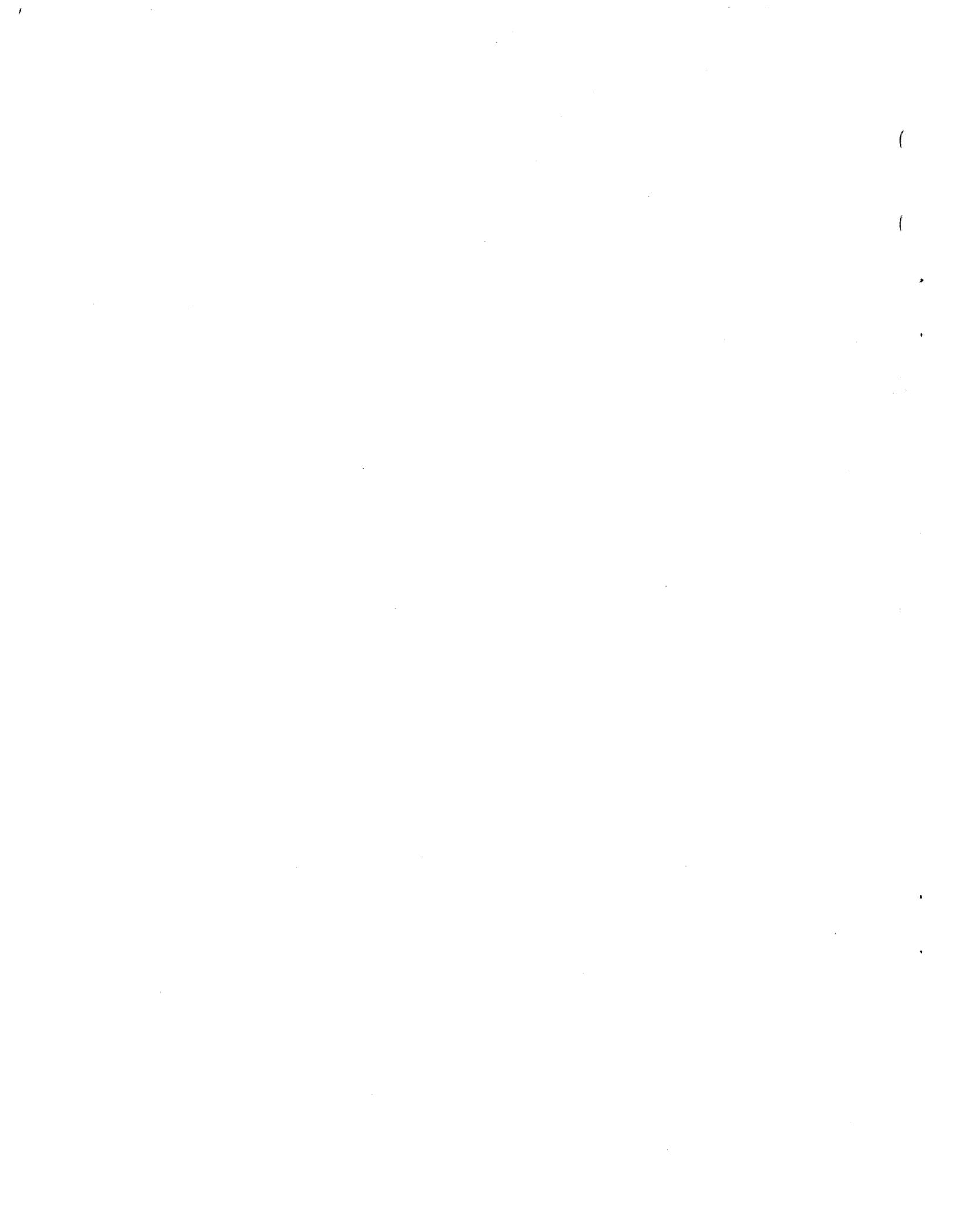
1. GENERAL

1.01 This section furnishes information on the signaling compatibility of E-type signaling systems with various switching systems.

1.02 This section is reissued to include the latest compatibility information. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

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1N04
COMMON SYSTEMS

TYPE E SIGNALING SYSTEM
SIGNALING COMPATIBILITY
WITH SWITCHING CIRCUITS

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GENERAL INFORMATION

1. DESCRIPTION OF THIS DRAWING

1.1 Vertical lines in the margin to indicate changes or additions in the text since the last issue of the drawing have been omitted in this issue because of extensive revisions throughout the drawing.

1.2 This document was issued primarily to assure signaling compatibility between switching systems and the type E signaling system. A comprehensive laboratory analysis and test program was undertaken to establish a basis for the signaling compatibility information herein provided. Although a similar program was not undertaken to verify transmission it is believed that all circuits and circuit arrangements herein described as compatible will meet applicable transmission requirements.

1.3 Any questions on signaling or transmission compatibility for circuits connected to type E signaling units should be brought to the attention of the local Bell Laboratories Field Representative.

1.4 The compatibility information in this drawing is based upon field or laboratory tests of the actual or similar circuits. Other arrangements are workable and are in actual use. These latter arrangements and other proposed arrangements will be listed as they are verified by analysis or laboratory tests.

1.5 When a trunk circuit is operated over metallic facilities, the circuit note information should be followed. When the trunk circuit is associated with E-type signaling circuits and there is a conflict between circuit notes and the compatibility information in this drawing, the information in this drawing should be followed.

1.6 Section B of this drawing describes the general signaling characteristics of E-type signaling units and the general nature of compatibility considerations. Section C describes the individual signaling units and their applications in greater detail.

1.7 Section D lists switching circuits followed by the type E signaling units with which they are compatible. The standard or preferred unit is listed first followed by the other units which will provide satisfactory operation. The old E1A, E1B, E1C and E1D series of units is not included in Section D. If one insists on using one of these E1() series units, the necessary information for possible compatibility will be found in Sections B and C. Where special

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provisions are required for compatible operation these are listed under Notes or a reference is made to Section B or C of this drawing. If no units are compatible the major reasons are listed under Notes. If a circuit is not listed, the reason is that no one requested it to be considered; it does not mean the circuit is not compatible.

1.8 In Crossbar No. 1 and Tandem the outgoing side of incoming trunk circuits commonly connects to signaling facilities after passing through only the crossbar switch network. Compatibility information for the switch side of such trunk circuits is shown in Section D for the Crossbar No. 1 and Tandem Office Link and Connecting Circuit SD-25033-01. Compatibility information for the various Crossbar No. 1 and Tandem trunk circuits applies to their appearances away from the switching network.

1.9 A misunderstanding sometimes arises in the words that are used in SD's, CD's, and BSP's to describe type E signaling functions as compared with those that describe switching functions. For example, when an on-hook signal is passed forward, the SF system sends tone-on which operates the terminating SF receiver which, in turn, releases or disconnects the terminating switching circuit; also conversely. In this drawing the words that are used are those that are most appropriate to the function being described.

2. GENERAL DESCRIPTION OF E-SIGNALING UNITS

2.1 Applications

2.1.1 Type E single-frequency signaling is applicable to central office trunks, PBX tie trunks and tie lines, and PBX and central office lines. Units are available for E&M lead, loop, or revertive pulse signaling. When properly chosen, these signaling units provide a means for converting local-exchange-area DC signaling or 20 Hz ringing to single-frequency tone, usually 2600 Hz, using the normal speech transmission path of a carrier channel or a voice-frequency line facility. In general, single-frequency tone-on signifies on-hook, but exceptions will be described. Partial pulse correction of dial pulse and wink signals is also provided by certain of these units. Conversion from loop to E&M or E&M to loop signaling may also be accomplished by using the proper signaling units. Dial pulsing is limited to dials or senders with a nominal speed of 10 pulses per second.

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2.2 Improvement Program

2.2.1 The very early E-type signaling units proved to be deficient in several respects. Consequently an improvement program was started in order to eliminate most of the deficiencies, both in installed units and those being manufactured. The compatibility information in this drawing assumes that the talk-off and any necessary signaling modifications have been made in the signaling units. These improvements have been made if the signaling units are marked with the following series numbers or higher.

E1A-10, E1B-10, E2B-10, E3B-7, E4B-20, E1C-10, E2C-10,
E1D-10, E2D-10, E3D-10, E4D-20, E1E-10, E1F-10, E1J-20,
E2L-10, E2S-10, E2SA-10, E2LA-10

2.2.2 In addition, the E1A, E1B, E2B, E3B, E1C, E1D, E1E, and E1F units which have been modified are stenciled with the compatibility designation K as a means to identify modified units. Other basic codes do not require this marking because they all include the basic talkoff improvements. Where signaling compatibility requires the use of type E signaling units with additional modifications, the series number of the required signaling unit and the compatibility designation where applicable will be listed in Sections B, C and D in addition to the basic code.

3. TYPE E SIGNALING CHARACTERISTICS

For compatible operation of type E signaling with switching equipment, the following characteristics and requirements must be considered.

3.1 Voice Simulation of SF Tone (Talk-Off)

3.1.1 Voice simulation of single frequency tone may cause clicks, false disconnects, or false ringing signals. Protection against talk-off is provided partly by guard action in the SF receiver and partly by timing. The timing that can be provided in the SF unit is limited by the need to pass dial pulses and ring-forward signals. Consequently, the drawings of all standard incoming trunk circuits (except reverte pulsing circuits), and all outgoing CAMA trunk circuits which can be disconnected by an on-hook signal from the terminating end, have been modified to provide a minimum of 140 ms disconnect time to assist in preventing false disconnects due to talk off. This disconnect time was achieved in some circuits by changing the disconnect relay, on others by adding a diode across the relay winding. In

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existing circuits a 446F or similar diode may be used, rather than replacing the relay, provided the 140 ms minimum release time is achieved.

3.1.2 The E1D and E3D units have long receiver operate times and consequently provide a long delay before signaling the incoming switching circuit to release. These units were designed for use with installed trunk circuits which have nominal disconnect times of 40 ms and which will not be modified to provide the longer disconnect times. However, some of these units may also be used on long disconnect time trunk circuits. The E1D and E3D units cannot pass the 100 plus-or-minus 30 ms ring-forward signal.

3.1.3 The E1E/E1F revertive pulse units also have a long disconnect time. These units perform satisfactorily, from a talk-off standpoint, with fast-disconnect incoming trunk circuits having release times of nominal 40 ms. The E1E/E1F units also are not able to pass a ring-forward signal.

3.1.4 The E1C and E2C units do not provide adequate talk off protection for outgoing trunk circuits which can be disconnected from the terminating end even though the outgoing trunk circuit has a minimum disconnect time of 140 ms. The E3C, E4C and E5C do provide this protection and are satisfactory for such applications.

3.1.5 Although SXS circuits provide ample disconnect time to override false on-hooks generated by voice-simulated signals, any false on-hook generated in an SF link between SXS circuits will be passed along immediately. Thus, when SXS is used as a tandem to any machine switching office having fast disconnect trunks, these trunks must also be modified to be slow disconnect if SF signaling is used in the SXS link. Similarly, for built-up trunks having E&M links, a slow disconnect trunk circuit must be provided in the connecting loop facility even though the SF signaling equipment is in the E&M links.

3.1.6 On non-coin E&M lead type recording-completing, TSP, TSPS, and controlled-ring toll-switching trunks, a wink signal is used to control ringing to the customer. When SF signaling is used on these trunks, a low probability exists that a voice simulation of the signaling tone can cause a false ring during the call. These trunk circuits are rated compatible because the probability of a false ring is so low that circuit modifications to improve the situation are not considered justified. However, consideration should be given to assigning these trunks to facilities that

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do not use SF signaling, when such facilities are available.

3.2 Voice Interference With SF Tone Detection (Talk-Down)

3.2.1 During a "free call" the operator at the terminating end does not provide answer supervision. She, therefore, superimposes her speech on the 2600-Hz tone. The originating-end signaling unit assumes its broadband state under these conditions to insure that her speech will help to hold the originating-end receiver operated and thereby prevent false release of the originating-end SF receiver and clicks to the customer.

3.2.2 Delayed-seizure type toll-connecting trunks having operator access and terminating in loop-type SF units should have an originating SF unit which provides a transmission cut during idle. This will prevent operator speech from being superimposed on the 2600-Hz tone, which might then release the terminating SF unit and thereby register false dial pulses before the actual dial pulsing begins. Loop-type terminating units are vulnerable to this effect because they do not interpose a 2600-Hz filter at the input to the signaling receiver when receiving 2600-Hz tone. The originating E()C units and all the E&M units except E1A and E1B have the transmission cut feature.

3.2.3 See 3.16 for interference with SF tone detection caused by dial tone or other tone.

3.3 Shortening or Obliteration of Dial Pulses Due to Originating-End Relay Transients

3.3.1 Where the originating-end relay equipment receives pulses over a metallic loop and repeats these pulses into the type E signaling equipment, the build-up and collapse of the loop current in a transformer winding may generate transient noise pulses which depress the carrier gain in compandored systems and raise the guard level in the terminating SF unit at the beginning of the first dial pulse. During the first dial pulse and for the duration of the dial pulse train, the outgoing trunk circuit, or the originating SF unit or the transmission path cut circuit SD-99778-01 must terminate the transmit pair to exclude further noise originating in the drop. In addition, when E-type signaling is used on compandored carrier systems, the compandor should generally be of the design which provides varistor transient voltage suppression and fast recovery from the effects of switching transients to reduce the effect of that part of the first pulse transient that passes before the cut takes place. The various carrier SD number and options required

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for this feature are listed below.

0, ON	SD-95118-01	Iss. 33B, BW option (remove BT)
N1	SD-95118-01	Iss. 33B, BW option (remove BT)
N2	SD-95294-01	Iss. 13AR, AC option
N3	SD-97174-01,02	Standard on Issue 1

Even with these features, some residual noise will be transmitted on the first dial pulse. The type E signaling compatibility recommendations in this drawing take into account the residual effect of this first transient.

3.4 False Dial Pulses Arising From Start-Dial Signals

3.4.1 The start-dial signal from terminating senders or incoming registers is a return-to-normal battery on the T and R leads. This restoral of the terminating trunk conductors to normal battery produces a transient which delays the operation of the RG relay and the subsequent receiving cut in the originating SF receiver. With a loop SF unit at the originating end, associated with a sender, the return loss may be poor. The resulting 2600 Hz tone reflection could cause the terminating SF unit to operate and cause the terminating sender or incoming register to score a false pulse. This type of failure is prevented by using a terminating SF unit which delays the application of tone to allow the effects of the transient to subside and cuts the transmit pair to prevent the transmission of any further noise from the drop. All E&M units have these features. Additional margin is provided in all dial pulse loop terminating units and the E4B E&M unit by a pre-cut feature which cuts the transmit pair for a period prior to the application of tone.

3.5 False Stop Signals Arising From MF Tones on MF Trunks

3.5.1 When the MF register at the terminating end is ready to receive MF pulses it changes to on-hook. The on-hook signal causes the SF receiver at the originating end to operate and to assume its broadband state. The MF tones from the originating sender may echo if the incoming register is in a 2-wire office, due to the poor termination at the terminating end, but they will help to hold the originating-end receiver operated, provided the originating-end receiver has achieved its broadband state. If the MF echo comes back before the originating end has

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achieved its broadband state the R and RG relays in the originating SF unit may release (a false stop signal). Since an E&M unit, or an E3C, E4C or E5C unit, generally requires 200 to 250 ms to achieve this broadband state (operate the RG and release the G relay), it must not be used at the originating end of MF trunks unless the terminating-end unit has a transmission-cut feature. All E&M units, and the E(D) units except ELD, have a cut circuit which satisfies this requirement. The ELD loop unit does not have a cut circuit and should only be used with an originating EIC which has no delay in achieving the broadband state.

3.6 False Stop-Dial Signals Arising from Transients Generated By Incoming Trunk Pulse Repeating Relays and Selectors

3.6.1 When dial pulses are repeated by the terminating SF unit into an incoming relay circuit, transients generated in the incoming relay circuit by the pulse repetition may be sent back over the transmit pair. These transients decrease the tone level through compandored carrier systems and increase the guard in the SF receiver, tending to release the originating SF receiver and generating a false stop-dial signal.

Terminating-end units which provide a cross-control cut to block noise transmission from the drop for a timed interval starting with the onset or termination of signaling tone from the originating unit are not likely to produce this trouble.

To further insure against failure, E&M units used at the originating end of dial pulse trunks should have the increased holdover feature. All E4B units and all E1A, E1B and E2B units with compatibility designation K have this feature. E3B units with dash numbers 11, 12, 13, 14 and 21 or units with compatibility designation KA also have the feature.

3.7 Return of Answer Supervision on Test Lines

3.7.1 Certain test lines make a change from on-hook to off-hook followed immediately or after a time delay by the application of an audible tone of a frequency other than 2600 Hz. While receiving 2600 Hz tone, the originating-end SF unit assumes its broadband state. With an E&M lead unit at the originating end, if the audible tone follows too soon after the off-hook, the SF unit will not have enough time to remove the broadband state (release the RG and operate the G relay) and it may hold operated from

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audible tone. A guaranteed minimum delay of 150 ms is required between sending the off-hook signal and sending the audible tone when terminating E1A, E1B or E1D units are used because they do not provide a transmission path cut circuit under these conditions. All other units have cut circuits which block the transmission path for a sufficient period to prevent this type of trouble. For universal compatibility the tone should be delayed 150 ms and it should be assumed that the first 50 ms may be lost.

This 150 ms delay between the off-hook supervision and the application of tone in the test line is not sufficient to allow for supervisory delay in the incoming trunk circuit of a local office where ringing must be tripped. Therefore local office test line circuits require a delay of 300 ms for universal compatibility.

3.8 Tone and Flash

3.8.1 Tone and flash is the repetitive alternation of off-hook and on-hook switching signals from the terminating end accompanied by audible tone during the on-hook intervals. Since most SF units temporarily cut the transmit path during such flashing, the audible tone signals may be shortened or obliterated. In the case of the E1D unit where there is no cut, the presence of the audible tone simultaneously with the 2600 Hz tone may prevent the originating-end SF receiver from detecting the 2600 Hz on-hook signal causing a false charge. Therefore, for proper operation of all SF units, flash must be removed from customer and circuit busy signals.

3.9 Compatibility of Leads

3.9.1 Compatibility must be assured between the signal leads of the SF units and the switching equipment. That is, these leads must have the proper polarity, voltage, and resistance and each circuit must provide the signals needed by the other with proper timing and in proper sequence.

3.9.2 All MF and/or DP loop type E signaling units are designed to work with connecting circuits in which battery is on the ring lead for the on-hook state. The RP type E signaling units are designed to work with connecting circuits in which battery is on the tip lead for the on-hook state. This design is adequate for most applications, but there may be a few cases where the proper polarities are not available in the connecting circuits by means of standard wiring options. Therefore it may be necessary in a few

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cases to reverse the T and R leads on a job basis.

3.9.3 All E&M lead type E signaling units are designed with a Type I interface arrangement. There are three standard E&M lead interface arrangements, called Types I, II and III, which are defined below. When a trunk circuit having a Type II or III interface must work with a type E signaling unit it is necessary to use an intermediate conversion circuit, such as the E&M Lead Applique Circuit, SD-99774-01.

3.9.4 Type I interface is the original two-wire E&M lead interface. Signaling from trunk circuit to signaling circuit is by means of ground and battery signals (on-hook and off-hook, respectively) over the M lead. Signaling from signaling circuit to trunk circuit is by means of open and ground signals (on-hook and off-hook, respectively) over the E lead.

3.9.5 Type II interface is a looped four-wire E&M lead interface arrangement. Signaling in either direction is by means of an open for on-hook and a closure for off-hook. The M and SB leads are used for signaling from trunk circuit to signaling circuit. The E and SG leads are used for signaling from signaling circuit to trunk circuit.

3.9.6 Type III interface is a compromise partially looped four-wire E&M lead interface arrangement. Signaling over the M lead is similar to that of Type I interface with the distinction being that battery and ground for the signaling are provided to the trunk circuit by the signaling circuit over leads SB and SG, respectively. All aspects and requirements of signaling over the E lead are identical to those of Type I interface.

3.10 Ring-Forward Distortion

3.10.1 The E&M and some loop type units will pass ring-forward signals of 100 plus-or-minus 30 ms in length. These units will not distort ring-forward signals sent toward an off-hook. When signaling toward an on-hook, these ring-forward signals are shortened about 15 ms by the pulse correction of the receiver. This distortion must be taken into consideration particularly where links are operated in tandem or where ring-forward signals are below the nominal 100ms.

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3.11 Short Seizure Time Before Out-Pulsing

3.11.1 Dial-pulse originating E&M lead units operating from Crossbar No. 5 or Crossbar Tandem senders and working to a terminating office without a delay dial signal must have the reduced high-level, HL, relay operate time feature provided by the E3B-22 unit or its equivalent. This restriction is necessary to insure that the sender will not start outpulsing before the HL relay can operate to apply high-level tone. If the HL relay has not operated, the dial pulses will be transmitted with low-level tone.

3.12 Trunk Pumping and False Seizures

3.12.1 In reverse-battery supervision trunks, when the battery is reversed at the terminating end toward the originating end, a false pulse is sometimes reflected from the originating end toward the terminating end. This false pulse may be an on-hook pulse (momentary loop open) or an off-hook pulse (momentary loop closure) depending on the supervisory state at the originating end when the reverse-battery signal is received. This false pulse alone will not cause trunk pumping unless it occurs with the incoming trunk circuit arrangements described in the next paragraphs. In some cases the false pulse may result in a momentary false seizure of the incoming trunk circuit.

3.12.2 Trunk pumping on answer can occur with E1D, E2D, E3D, and E5D units at the terminating end of an SF link. The signaling state transmitted by these units depends on the signaling state transmitted by the originating end. That is, these units always send on-hook toward the originating end when on-hook is received from the originating end regardless of the signaling state of the associated incoming trunk circuit. Consequently, if these units are used on a trunk which sends a false on-hook pulse toward the terminating end, as described in paragraph 3.12.1, trunk pumping may result.

These signaling units should not be used at the terminating end of a trunk where step-by-step outgoing repeater, SD-31147-01, is used at the originating end of the same trunk because the step-by-step repeater momentarily goes on-hook when answer supervision is received, resulting in trunk pumping. The E4D should be used in this application because the signal transmitted by this unit toward the originating end is independent of the signaling state being transmitted by the originating end. The E4D unit is also required when the SD-31147-01 repeater is used at the originating end of a trunk to a step-by-step tandem office and the SF link is in

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the outgoing trunk from the tandem office. In summary, the E4D unit is required at the terminating end of the SF link in a single or multilink trunk arrangement where repeater SD-31147-01 precedes the SF link.

3.12.3 Trunk pumping on disconnect can occur due to a large idle circuit terminating capacitor across the outgoing trunk circuit T and R leads or due to other large capacitance on the T and R leads to the E1C, E2C, E3C, or E4C originating units and with the E1D, E2D, E3D, or E5D units at the terminating end. In the case of an outgoing trunk from a non-senderized SXS office, trunk pumping can be eliminated by using an E5C at the originating end (preferred method) or an E4D at the terminating end. For common control originating offices using an E1C, E2C, E3C or E4C, trunk pumping can be eliminated by using an E4D at the terminating end of the trunk.

3.12.4 When an E1C, E2C, E3C or E4C is used with an outgoing trunk circuit having greater than 0.5 μ F idle circuit termination a false seizure may be generated when the called end has disconnected. When this trouble is encountered it can be eliminated by reducing the outgoing trunk circuit idle circuit termination to not more than 0.5 μ F.

3.13 E&M To Loop Conversion

3.13.1 Loop-type incoming trunk circuits such as SD-26070-01 are frequently used with an E&M trunk circuit at the distant end. E&M to loop conversion is accomplished by an auxiliary trunk circuit which immediately precedes the incoming trunk circuit. When this arrangement is used with an incoming trunk circuit that returns a delay dial signal and is off-hook while idle, the off-hook is not passed through the auxiliary circuit until the trunk is seized at the originating end. This is required to prevent the normal off-hook of the incoming trunk circuit from holding the outgoing trunk circuit permanently busy.

A similar arrangement can be provided with SF signaling by using an E&M unit at the originating end and a loop unit at the terminating end. The auxiliary trunk circuit is not required because E&M to loop conversion is accomplished within the SF link. However, if the off-hook when idle delay dial option is used then the loop terminating SF unit must also provide the blocking feature of the auxiliary trunk circuit. The required blocking feature is provided by all the E()D series of loop units except the E4D. The E4D unit has full duplex signaling and cannot be used where the

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blocking feature is required.

3.14 Glare Detection

Two way E&M trunks always have the possibility of simultaneous seizures at both ends. When SF signaling is used, the probability of such an occurrence is increased because of the delay in transmitting a signal through the system. Some Crossbar No. 5 offices have a glare detection feature which can be used to minimize this unguarded interval, provided the round trip delay through the signaling system exceeds 100 milliseconds. This feature, when available, should be used with SF signaling because the round trip time always exceeds this value.

3.15 Satellite Transmission Facilities

Use of a satellite link in the transmission facility requires increased trunk guard time and anti-pumping features in the trunk circuit because of the long propagation time in the satellite link. Trunk circuit options providing these features must be used when there is a satellite link in the transmission facility.

3.16 Trunk Disabling By Tone Interference

3.16.1 In order to minimize talk-off, SF units are designed to be narrowbanded during the off-hook state. A guard channel detects voice and other voice-frequency signals other than those near 2600 Hz. The guard channel output keeps the 2600 Hz detector from operating, with its possible resultant disconnect. This scheme works well as long as the non-2600 Hz energy is intermittent. When 2600 Hz SF tone is present it will be detected during an interval of low guard energy.

3.16.2 Guard channel operation is not, however, without its hazards. As an example, if E&M SF units are used on a two-way trunk between PBXs, the trunk can be disabled by a short carrier interruption. When the carrier is interrupted, each SF unit goes off-hook towards its connected PBX, each of which returns dial tone. If the carrier is now restored and the SF units are narrowbanded, the dial tone energy will cause the guard channel to overcome the 2600 Hz SF tone, leaving the two PBXs sending dial tone until the trunk is manually restored to idle.

3.16.3 It is not necessary for a trunk to have dial tone supplied at each end to be disabled as described above. If one end is connected to a permanent signal

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holding tone as a result of a prolonged carrier failure, it is possible for the tone to be reflected back from the distant hybrid as sufficient level to hold the near end SF unit off-hook.

3.16.4 In order to eliminate the possibility of trunks being held off-hook as described above, it is necessary that they never have a continuous tone or voice-frequency signal sent on them. It is recommended that dial tone or other signal source should be interrupted for at least 300 ms at convenient intervals.

4. COMPATIBILITY OF TYPE E SF UNITS WITH OTHER TYPE E SF UNITS

4.1 In addition to assuring the signaling compatibility of the E signaling unit at each end of the trunk with its connecting switching circuits, it is necessary that the E signaling units at each end be compatible with each other. The following rules apply.

4.1.1 The E1E and E1F revertive pulse units are only compatible with each other.

4.1.2 All E&M units are compatible with all other E&M units.

4.1.3 All loop originating units are compatible with all loop terminating units.

4.1.4 All E&M units are compatible with all loop terminating units except the E1D and in some cases the E4D. See section 3.13.

4.1.5 All loop originating units are compatible with all E&M units.

4.1.6 All customer line units, station end, are compatible with all customer line units, central office or PBX line circuit end.

5. TSPS TRUNKS

5.1 Certain TSPS trunk circuits have 4-wire transmission paths with separate SX and SX1 leads for loop reverse battery supervision. These trunk circuits always interpose a separate voice-frequency repeater in either or both directions of voice transmission. When metallic facilities are

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used the SX and SX1 leads connect to simplexes on the 4-wire path, but when carrier facilities with SF signaling are used it is necessary to convert the loop signaling on the SX and SX1 leads to E&M lead signaling. Thus, the SF unit E&M leads always connect to the appropriate converter circuit as described below, never to the TSPS trunk circuit itself.

5.2 The first generation of these particular TSPS trunk circuits use a 424V4B repeater per SD-97047-01. The loop to E&M lead conversion was originally done by means of a plug-in 333A relay in the repeater. The 333A relay has been rated M.D. and replaced by a 333B relay. The 333A relay provides a non-standard pseudo Type II E&M lead interface that requires a certain M lead current in order to operate a ferrod. Signaling facilities are not required to guarantee any particular minimum M lead current; however, when E-type SF units are used the M lead current will always be high enough to satisfy the ferrod requirements. The 333B relay provides a standard Type II and III E&M lead interfaces, selectable by means of screw switches.

5.3 The second generation trunk circuits use a 3-way 4-wire bridging repeater per SD-99782-01. This arrangement requires the use of a separate circuit, SD-1B145-01, for the loop to E&M lead conversion. This converter circuit can also be used with the 424V4B repeater arrangement in place of the 333-type relay. Care must be exercised in using SD-1B145-01 in that its Note 102 shows connections to signaling facilities with Type I E&M lead interface per option Q or options T and W. However, in neither case does the converter circuit itself provide a Type I interface. All connections to E-type E&M lead units must be made via the E&M applique circuit per SD-99774-01 with the Type II or Type III interface options in SD-1B145-01.

5.4 The third generation trunk circuits use a 3-way 4-wire repeater per SD-7C022-01. This repeater uses a plug in 333B relay to convert the loop signaling on the SX and SX1 leads to E&M lead signaling. Screw switches on the 333B relay permit the selection of a Type II or a Type III E&M lead interface.

5.5 In all the arrangements described the signaling facilities never connect directly to the SX and SX1 leads of the TSPS trunk circuits, rather they connect to the appropriate loop to E&M lead converter. Therefore, the D section of this drawing provides compatibility information under the appropriate associated SD number as summarized in the following table.

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<u>Associated Repeater</u>	<u>Loop to E&M Converter</u>	<u>For Compatibility See Section D Under</u>
424V4B/SD-97047-01	333A 333B SD-1B145-01	(Note 1) SD-97047-01 SD-1B145-01
3W 4-wire/SD-99782-01	SD-1B145-01	SD-1B145-01
3W 4-wire/SD-7C022-01	333B SD-1B145-01	SD-7C022-01 SD-1B145-01

Note 1: This converter provides a false Type II interface but it will function properly with Figures 1 and 2 of applique circuit SD-99774-01.



DETAILED CIRCUIT INFORMATION

1. E&M LEAD UNITS E1A, E1B, E2B, E3B, E4B

1.1 At Originating End

1.1.1 All dial-pulse originating E&M units require M-lead pulse corrector, SD-99766-01, when the dial pulses originate from customers dials without adequate pulse correction. The M-lead pulse corrector is not required if the dial pulses originate from senders with loop option, or from senders directly as M-lead pulses, or from operators dials, unless the pulses have been repeated by two or more trunk circuits without adequate pulse correction.

Outgoing trunk circuit SD-31795-01, Fig. 2 (pulse correction option), does not provide adequate pulse correction for E&M SF units and requires the use of the M-lead pulse corrector.

When pulsing from a sender into a trunk circuit which repeats pulses on the M lead, the loop pulsing option in the sender should normally be used. Where it is essential that battery and ground pulsing be used on split trunk groups because some of the trunks are on loop physical facilities an M-lead pulse corrector is required on those trunks which use E&M type SF.

When pulsing directly from E&M PBX trunk or tie trunk circuits an M-lead pulse corrector is not required provided all of the PBX stations have modern dials (6-type or higher) with a speed range of 8 to 11 pulses per second and a percent break range of 58 to 64 percent and no more than three ringers are used on any station.

1.1.2 Dial-pulse originating E&M lead units operating from Crossbar No. 5 or Crossbar Tandem senders and working without a delay-dial or wink start signal require fast operation of the high-level HL relay. This feature is provided by the following units E1A-12 or higher, E1B-12 or higher, E2B-12 or higher, E3B-15, -16, -17, -18, -22, or higher, and E4B. All E1A and E1B units with compatibility designation K or KD have this feature. E2B and E3B units, with this feature, have compatibility designation KA.

1.1.3 All dial-pulse originating E&M lead units require a transmission-cut circuit during dial-pulsing. This feature is provided in all E&M lead units except E1A and E1B. When using either of these latter units, transmission path cut circuit SD-99778-01 is required. The SF units must be E1A-13 or higher, or E1B-13 or higher. Use option Z of SD-99778-01 with E1A-13 or higher and option Y with E1B-13

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or higher. E1A and E1B units modified for use with the external cut circuits have compatibility designation KD.

All dial pulse originating E&M lead units also require the improved holdover feature. This is provided in all E4B units, E1A and E1B units with compatibility designation K or KD, E2B units with compatibility designation KA, E3B units with dash numbers 11, 12, 13, 14, 21 or units with compatibility designation KA.

1.1.4 All E&M lead units are compatible for MF pulsing. However, originating E&M lead units operating with Crossbar No. 5 or Crossbar Tandem senders, require the terminating SF unit to have a timed transmission cut when the originating SF unit responds to the start-dial signal, in order to avoid false stop signals. All E&M units provide such a cut. All loop units except the E1D unit provide such a cut. The combination of an originating E&M unit and a terminating E1D unit should therefore, not be used.

1.1.5 The transmission characteristics of the E1A unit will not meet the requirements of toll connecting trunks at other than class 5 offices.

1.2 At Terminating End

1.2.1 All E&M units are compatible for MF pulsing but require slow-disconnect incoming trunk circuits.

1.2.2 All E&M lead units are compatible for all dial-pulsing but require pulse correction in the incoming trunk circuit for step-by-step when the pulsing originates from customer dials. An M lead pulse corrector at the originating end does not obviate the need for this incoming trunk pulse correction.

1.2.3 Dial pulse receiving circuits generally provide contact protection on the E lead. Where such protection is provided on an optional basis and it is required to prevent damage to components in the SF unit, the required option is shown in section D.

1.2.4 The incoming trunk circuit must be on-hook toward the terminating E&M SF unit during dial pulsing. If dial pulsing against an off-hook is attempted, the slowed response of the SF receiver will cause too much distortion to the pulses. The on-hook requirement is generally met in switching systems but it must be considered in some PBX tie-trunk and trunk applications. Type F signaling units do not have this limitation.

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1.3 E&M Lead Applique Ckt SD-99774-01 for Interface Conversion

1.3.1 Interconnection of a trunk circuit having a Type II or III E&M lead interface arrangement and an E-type E&M signaling unit (Type I interface) requires the use of the E and M Lead Applique Circuit, SD-99774-01, as an interface conversion circuit. Use Applique Circuit Figures per the following table.

Interface Conversion

<u>Trk. Ckt.</u>	<u>E Sig. Unit</u>	<u>SB+M Lead Resistance</u>	<u>SD-99774-01 Figures</u>
Type III	Type I	50 ohms max.*	1
Type III	Type I	over 50 ohms*	1 and 2
Type II	Type I	1000 ohms max.	4

*For supervision only the resistance limit is 180 ohms instead of 50 ohms.

1.4 M Lead Working Limits

1.4.1 For supervision only, the M lead or M plus SB lead resistance should not exceed 180 ohms. For dial pulsing which originates from dials without pulse correction the maximum allowable M lead or M plus SB lead resistance is 25 ohms. For all other dial pulsing the M lead or M plus SB lead resistance should not exceed 50 ohms. The limits given here superseded the limits given in the CDs of the various E()B and E1A units.

2. ORIGINATING LOOP-TRUNK UNITS

2.0.1 All originating loop-trunk units are limited to 2240 ohms external circuit loop for supervision. Dial-pulse units are limited to 1500 ohms external loop for loop pulsing and 2400 ohms conductor loop for battery and ground pulsing.

DETAILED CIRCUIT INFORMATION

2.1 E1C Unit

2.1.1 The E1C unit is compatible with MF pulsing trunks.

2.1.2 It is not compatible with dial-pulse trunks except on an interim basis with senders which have output limits of 9.5 to 10.5 pulses per second and 59.5 to 68 percent-break. This use is not recommended on a permanent basis because of the difficulty in maintaining the senders to these readjust requirements.

2.1.3 The E1C-10 and later units are still subject to talk-off and are not compatible with outgoing trunk circuits which can be disconnected from the terminating end, such as outgoing trunk circuits to CAMA.

2.2 E2C Unit

2.2.1 The E2C unit is compatible with dial-pulse arrangements.

2.2.2 It is not compatible with MF pulsing arrangements.

2.2.3 The E2C-10 and later units are still subject to talk-off and are not compatible with outgoing trunk circuits which can be disconnected from the terminating end, such as outgoing trunk circuits to CAMA.

2.2.4 The use of an E2C unit eliminates the need for an outgoing repeater on Step-By-Step outgoing trunks because the E2C supplies both pulse correction and a sleeve holding ground.

2.2.5 In some applications where the E2C unit is exposed to high longitudinal ac voltages it has been found that the diode used in series with the A relay causes improper operation. Where this condition exists the diode may be strapped out. Units that have been modified to remove the diode are designated -11, -17, -18, -22, or -23.

2.3 E3C Unit

2.3.1 The E3C unit is not compatible with dial-pulse arrangements.

2.3.2 It is compatible with MF pulsing arrangements.

2.3.3 It is compatible with outgoing trunk circuits which can be disconnected from the terminating end.

DETAILED CIRCUIT INFORMATION

2.4 E4C Unit

- 2.4.1 The E4C unit is compatible with dial-pulse arrangements.
- 2.4.2 It is compatible with MF pulsing arrangements.
- 2.4.3 It is compatible with outgoing trunk circuits which can be disconnected from the terminating end.
- 2.4.4 The use of an E4C unit eliminates the need for an outgoing repeater on Step-By-Step outgoing trunks because the E4C supplies both pulse correction and a sleeve holding ground.
- 2.4.5 In some applications where the E4C unit is exposed to high longitudinal ac voltages it has been found that the diode used in series with the A relay causes improper operation. Where this conditions exists the diode may be strapped out. Units that have been modified to remove the diode are designated -22 or -23.

2.5 E5C Unit

- 2.5.1 The E5C unit is compatible with dial-pulse arrangements only with immediate dial (Step-By-Step), except that it can be used with either MF or DP with delay dial or wink start providing outpulsing is delayed at least 250 ms after the delay dial or wink signal ends. See 2.5.6 below.
- 2.5.2 It is not compatible with MF pulsing arrangements, except as covered in 2.5.6 below.
- 2.5.3 It is compatible with outgoing trunk circuits which can be disconnected from the terminating end.
- 2.5.4 The use of an E5C unit eliminates the need for an outgoing repeater on Step-By-Step outgoing trunks because the E5C supplies both pulse correction and a sleeve holding ground.
- 2.5.5 The E5C is similar to the E4C with the improved immunity to longitudinal ac voltages as described in paragraph 2.4.5. The E5C also has improved immunity to trunk pumping.
- 2.5.6 The feature which provides immunity to trunk pumping has a side effect which makes it unsuitable for use with wink start or delay dial trunks, unless outpulsing is delayed at least 250 ms after the delay dial or wink signal

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ends. Only certain AIS circuits are known to guarantee this delay (about 300 ms). A simple field modification can be made to convert the E5C to an E4C, which should then be identified as E4C-24. The modification consists of opening the short circuiting path across the grounded winding of the A relay. Details are shown on issue 9B of the schematic drawing.

3. TERMINATING LOOP-TRUNK UNITS

3.0.1 All terminating loop-trunk units are limited to 1040 ohms external circuit resistance for supervision. This restriction applies to both MF and DP operation. All compensating resistance should be removed from the associated incoming trunk circuit or selector.

3.0.2 Crossbar DP incoming trunk circuits from SXS (by-link) may use either long or short range A relays provided the above limitation is met.

3.0.3 The connected incoming trunk circuit must be on-hook (battery on the ring lead) during dial pulsing.

3.1 E1D Unit

3.1.1 The E1D unit is suitable for MF but not dial-pulsing. The E1D-10, -11, -20, or -21 are slow responding to disconnect signals and should be used only with fast disconnect-time trunk circuits. If these units are used with slow disconnect-time trunk circuits there is too high a probability of reseizure before disconnect has been completed. E1D-12 or -22 units are slower in responding to seizure, thus lessening the reseizure problem, and they can be used with either slow or fast disconnect-time trunk circuits; however, their use will increase the outgoing sender holding time. Units with compatibility designation K are for use on fast disconnect trunk circuits only. Those with compatibility designation KC may be used with either fast or slow disconnect trunk circuits.

3.1.2 The E1D unit is not compatible with trunk circuits which require a reverse make busy feature.

3.1.3 The E1D does not have a cut feature and it therefore must be used only with the E1C originating unit, which has immediate broadbanding upon responding to 2600 Hz.

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3.2 E2D Unit

3.2.1 The E2D unit is suitable for MF pulsing. It should be used with slow disconnect-time trunk circuits only.

3.2.2 It is suitable for all dial pulsing applications. Pulse correction in the incoming trunk circuit is not required for SXS, if the loop limitation between the SF unit and the succeeding circuit, as described in 3.2.3, is observed. When pulsing into common control offices the 1040-ohm external circuit loop supervisory limit of the E2D is controlling rather than pulsing.

3.2.3 The E2D unit uses 1400/1400-ohm battery and ground pulsing which supplies less energy to the pulsed relay than conventional loop pulsing. The conductor loop range between the E2D and the incoming trunk or selector must therefore be restricted for pulsing into Step-By-Step. With Step-By-Step selectors which use a 221A relay such as SD-30200-01 the loop between the E2D and the selector should not exceed 50 ohms. With toll transmission selectors, such as SD-31723-01, the long-range option (221FAF relay) is preferred and will provide a conductor loop range of 0 to 600 ohms. The 221FAE relay may be used with the adjustment specified for a 1200-ohm loop but the loop between the E2D and the selector should not exceed 50 ohms.

Other selector or incoming repeaters require similar loop limitations dependent on the type of A relay used. The 221FAC relay is electrically equivalent to the 221FAF and the same limitations apply. The 221R relay (optional on SD-31346-01 and SD-31454-01) should not be used. On circuits such as SD-64482-01 with 280-type A relays the loop between the SF unit and the incoming trunk circuit should not exceed 50 ohms. The bias resistance should be adjusted for a 1200-ohm loop resistance and a percent break input of 49 to 72 percent.

The loop limitations noted above may be increased by 600 ohms provided the pulsing originates in senders in the same building as the originating SF unit and the 1040-ohm external circuit resistance supervisory limit of the E2D is not exceeded.

3.2.4 An E2D on an incoming trunk to a tandem office may be used to pulse a loop outgoing repeater in the same building which in turn pulses selectors in a distant office. No pulse correction is required with this arrangement.

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3.2.5 The E2D unit is not compatible with trunk circuits which require a reverse make busy feature or where full duplex signaling is required. An E4D must be used.

3.2.6 The E2D unit is not compatible with arrangements where Step-By-Step outgoing repeater SD-31147-01 precedes the SF link. An E4D must be used.

3.3 E3D Unit

3.3.1 The E3D unit is suitable for MF but not dial-pulsing. It is suitable for use on an A&M basis with existing fast disconnect-time trunk circuits which have not been modified to provide the slow disconnect-time feature. It can also be used with slow disconnect-time trunk circuits. This unit is not recommended for general use because it increases the outgoing sender holding time.

3.3.2 The E3D is not compatible with trunk circuits which require a reverse make busy feature.

3.4 E4D Unit

3.4.1 The E4D is similar to and has the same supervisory and pulsing ranges as the E2D. It may be used with trunk circuits which require a reverse make busy feature or where full duplex signaling is required. The associated incoming trunk circuit or selector A relay must have a release value of at least 1.7 mA.

3.4.2 The E4D should not be used on delay dial trunks with an E&M unit at the originating end where the trunk circuit at the terminating end is off-hook when idle. See Sect B 3.13.

3.4.3 The trunk composed of two-way trunk circuit SD-2H110-01 and a trunk facility made up of an E4D at the SD-2H110-01 end and an E()B E&M unit at the other end connected to SD-56525-01 is subject to talkdown by transients and should not be used unless SD-56525-01 is issue 12B or higher.

3.5 E5D Unit

3.5.1 The E5D is similar to and has the same supervisory and pulsing ranges as the E2D. It also has transmission improvements. It is the preferred unit for delay dial operation with an E&M unit at the originating end. See Sect B 3.13.

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4. SUMMARY OF LOOP-TRUNK UNIT ARRANGEMENTS

4.0.1 There are several combinations of originating and terminating loop-trunk signaling units that can be used satisfactorily, subject to a variety of restrictions. The following tables show the recommended combinations with references to notes pertaining to the various restrictions. The units are listed in each case in decreasing order of preference, based on cost and performance.

DIAL PULSING
WITHOUT OUTGOING TRUNK CIRCUIT

If Originating Unit Is:	The Terminating Unit Can Be:	But See Notes:
E5C	E5D, E4D, E2D	None
E4C	E4D	1
E2C	E4D	1

DIAL PULSING
WITH OUTGOING TRUNK CIRCUIT

If Originating Unit Is:	The Terminating Unit Can Be:	But See Notes:
E5C	E5D, E4D, E2D	2, 3
E4C	E5D, E4D, E2D	3, 4
E2C	E5D, E4D, E2D	3, 4, 5

MF PULSING

If Originating Unit Is:	The Terminating Unit Can Be:	But See Notes:
E3C	E5D, E4D, E2D, E3D	3, 4
E4C	E5D, E4D, E2D, E3D	3, 4
E1C	E5D, E4D, E2D, E3D, E1D	3, 4, 5

Notes:

1. The E4D unit is required at the terminating end to prevent trunk pumping upon disconnect because of customer line capacitance. See Section B 3.12.
2. The E5C should not be used on delay dial or wink start trunks. See Section C 2.5.6.

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3. The E2D, E3D and E5D units cannot be used with trunks having reverse make-busy. See Section C 3.2.5, 3.3.2 and 3.5.1.
4. The E1C, E2C, E3C and E4C units cannot be used with outgoing trunk circuits having idle circuit termination capacitance over 0.5 mf. See Section B 3.12.
5. The E1C and E2C units are subject to talk-off by the called customer and therefore should not be used with trunks that can be disconnected from the terminating end. See Sections B 3.1.4, C 2.1.3 and C 2.2.3.
6. The E1D unit does not have a transmit cut feature and should be used only with the E1C unit. See Section B 3.5.1.

5. E1E, E1F AND E2F REVERTIVE PULSE UNITS

5.1 Originating End, E1E Unit

5.1.1 The E1E unit is used at the originating end of a revertive pulse trunk. It is compatible with all versions of Panel and Crossbar originating revertive pulsing senders.

5.1.2 The E1E unit requires a sleeve lead which is grounded by the outgoing trunk circuit upon seizure and is opened upon disconnect. This assures that the E1E unit is always in its normal condition when seized. This sleeve lead is designated S in Panel, S1 in Crossbar No. 1 and Tandem, and ON in Crossbar No. 5. ESS No. 1 does not provide this lead, nor is programming available for a signal distributor applique circuit for this application. Thus, the E1E is not compatible with ESS No. 1 trunk circuits.

5.2 Terminating End, E1F and E2F Units

5.2.1 The E1F, or its replacement, the E2F unit, is used at the terminating end of a revertive pulsing trunk. The E2F is identical to the E1F except that it has a timer that restores the unit to normal if it is left off-normal too long, as described in 5.2.2.

5.2.2 When used with certain switching facilities, the E1F unit has been involved in stuck sender troubles. This condition has been traced to the E1F having been left off-normal by a previous call sequence. The E2F unit has a timer that eventually restores the unit to normal if the

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previous call sequence left it off-normal.

5.2.3 Another problem with ELF and E2F units when used in common control offices is that they generate false trunk closures which release the terminating sender prematurely. When the legitimate trunk closure occurs, a second terminating sender is seized which goes to telltale. The resulting revertive tone pulses have caused this failure to be called whistle-off or birdies. This condition is most likely to occur on test calls because of the longer delay between incoming advance and trunk closure. The problem can be cleared by insulating contact 4 make of the AL relay in the ELF or E2F unit. This is easily accomplished by lifting the 4 make spring from its normal slot and placing it in the vacant number 3 slot of the comb. This change is of value only when the signaling unit is associated with common control offices having trunk circuits with the more sensitive A relays, but it can be made in all ELF or E2F units with no harmful effects.

5.3 ELF and E2F Compatibility With Incoming Circuits

5.3.1 The ELF and E2F units are compatible with Panel ground-cutoff repeating incoming selectors if the selectors have been properly modified for this usage. The typical selector circuit, SD-21949-01, requires Figure E for use with ELF or E2F units. The balanced versions using a 280DG relay for the L relay are not suitable because that relay will not release with the 38,000-ohm release condition presented by the ELF or E2F unit. Other optional terminations are not suitable because of their excessive L relay release times.

5.3.2 ELF and E2F units are compatible with all crossbar and No. 1 ESS terminating revertive pulsing circuits, including balanced, unbalanced and wire spring versions.

5.3.3 ELF and E2F units are not compatible with Panel ground-cutoff direct incoming selectors because the selectors have an external working limit of only 1488 ohms and the ELF and E2F units present a resistance of about 2300 ohms.

5.3.4 ELF and E2F units are not compatible with Panel battery-cutoff short range incoming selectors because the selectors have an external working limit of only 1830 ohms, while the signaling units present a resistance of about 2300 ohms.

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5.3.5 Elf and E2F units are compatible with Panel long-range incoming selectors using N-type relays for the L relay.

5.3.6 Incoming selector circuits used with Elf or E2F units must be equipped with fast release (nominal 40 ms) disconnect relays.

5.3.7 When Panel battery-cutoff incoming selectors per SD-21115-01, or SD-21116-01 are used with Elf or E2F units, separators per KS-7246 should be applied to the D relay, coded R1590 or R1351, to insure a fast release upon disconnect. When the separators are applied, no change in the current flow requirements for the relays is necessary.

5.3.8 The A relay in a trunk circuit, such as SD-25517-01, which is connected to an Elf or E2F unit must have a release current value of at least 1.7 mA. This is to insure release in the presence of the 38,000-ohm release condition presented by the signaling unit.

5.3.9 Loop compensation should not be used in the incoming trunk or selector circuit since the Elf or E2F unit already presents a resistance of about 2300 ohms.

5.4 Miscellaneous Comments

5.4.1 The use of loaded cable in conjunction with ELE and Elf or E2F units is not recommended for Panel incoming selectors because of its long propagation delay. Sufficient margins are available in Crossbar-type incoming circuits to permit the use of up to 50 miles of loaded cable.

5.4.2 Where revertive pulse signaling is used, the last revertive selection is followed by an incoming advance signal. The revertive pulsing signaling units use this signal to cut through the transmission path for talking. Incoming advance is always supplied on revertive pulse calls between local offices. Crossbar Tandem also provides incoming advance if a full complement of revertive pulse digits are used, even if the call is completed on a dial pulse basis beyond the crossbar Tandem. Where only two revertive pulse digits (office brush and office group) are used, Crossbar Tandem completes on a straight forward basis and no incoming advance is furnished. In this case the E-type revertive pulsing units will not cut through for talking. Therefore, three digit calls, such as 911, cannot be completed through Crossbar Tandem when the facilities between the originating local office and Crossbar Tandem use ELE and Elf or E2F signaling units. Transmission tests to

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Crossbar Tandem may be made by using a full complement of revertive pulses and arranging the Crossbar Tandem to complete to the test jack on a dial pulse basis.

6. CUSTOMER LINES, PBX TRUNKS AND PBX OFF-PREMISES STATIONS, STATION END

6.1 ElR Unit

6.1.1 The ElR unit is compatible with customer lines, loop start or ground start PBX trunks and PBX off-premises stations.

6.1.2 The ElR may be used either with a local terminating set and a two wire extension or a four wire extension with the A and B leads simplexed on the four wire circuit. The external circuit resistance including the simplexed resistance of the A and B leads, if any, should not exceed 1800 ohms. If this resistance is less than 600 ohms the building out resistance (BOR) in the unit should be cut in.

6.1.3 A terminating set which provides simplex inductors should be used. The simplex inductors should be cut into the A and B leads whether the terminating set is local or remotely located.

6.1.4 When the signaling is via E&M leads, the resistance of the M lead should not be over 1000 ohms. The E lead resistance limit is dependent on the connecting circuit. A contact protection network is required on the E lead of the connecting circuit.

6.1.5 The ElR cannot be used on two party or multi-party lines.

6.2 E2S Unit

6.2.1 The E2S is compatible with customer-line use, including loop start PBX trunks and PBX off-premises stations.

6.2.2 The external circuit resistance should not exceed 1500 ohms.

6.2.3 The E2S cannot be used on two party or multi-party lines. No more than 3 C4A ringers should be used on the station loop.

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6.2.4 The E2S in conjunction with the E2SA auxiliary unit may be used on ground start lines or PBX trunks with the same loop limitations as the E2S when used alone.

6.2.5 The E2S should not be used with external circuit loops of less than 650 ohms because of the possibility of ring trip failures. The E3S should be used in these applications.

6.3 E3S Unit

6.3.1 The E3S is equivalent to the E2S except as noted in 6.2.5.

6.4 E4B or E3B Unit

6.4.1 The E4B or E3B in conjunction with dial long line circuit SD-96252-01 and an external terminating set may be used on customer lines, loop start PBX trunks and PBX off-premises stations. An M lead pulse corrector is not required with this arrangement.

6.4.2 Modern dials (6-type or higher) with a speed range of 8 to 11 pulses per second and percent break range of 58 to 64 percent should be used.

6.4.3 The external circuit resistance on the station end of SD-96252-01 should not exceed 3000 ohms and the leak resistance on this loop should be maintained to a minimum of 30K ohms.

6.4.4 The receive T1 and R1 leads of the 4-wire terminating set must be connected to the shorting leads provided by the dial long line circuit in the idle condition. The resistance of these leads should not exceed 25 ohms.

6.4.5 The option that provides a diode shunt on the E relay of dial long line circuit SD-96252-01 should normally be used. This provides additional delay in the application of ringing and therefore minimizes the possibility of false rings due to voice simulation of the signaling tone. The ringing interval is of course shortened by the total delay in the system, including that added by the diode. This is not serious provided that a standard two second ringing interval is used. In those cases where the number assignment is such that one half second code ringing is used it may be necessary to remove the diode and tolerate the higher probability of false rings.

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6.4.6 This arrangement cannot be used on two party or multiparty lines. No more than 3 C4A ringers should be used on the station loop.

7. CUSTOMER-LINES, PBX TRUNKS AND PBX OFF-PREMISES STATIONS, CENTRAL OFFICE OR PBX LINE CIRCUIT END

7.1 ELP Unit

7.1.1 The ELP unit is compatible with customer-lines, loop start or ground start PBX trunks and PBX off-premises stations.

7.1.2 The ELP unit may be used either with a local terminating set and a two-wire extension or with a four-wire extension to a remotely located terminating set. With a local terminating set, the A and B leads of the ELP unit connect directly through the simplex inductors of the terminating set to the A and B leads of the terminating set. With a remotely located terminating set, the A and B leads of the ELP unit connect via the simplexes of the four-wire line through the simplex inductors of the terminating set to the A and B leads of the terminating set. Note that a terminating set which provides simplex inductors is required whether the terminating set is locally or remotely located.

7.1.3 With either a two-wire or a four-wire extension, the maximum loop resistance of the A and B leads, including the simplexed resistances of the T, R and T1, R1 pairs, if any, and including the resistance of the simplex inductors and terminating set, should not exceed 1300 ohms, or the conductor loop limit of the switching equipment involved, whichever is less. Since the total resistance of the simplex inductors and the terminating set amounts to about 100 ohms, the conductor loop resistance of the A and B leads alone should not exceed 1200 ohms. If the loop resistance of the A and B leads, including simplexed conductor resistances if any, and including the resistance of the simplex inductors and terminating set, is less than 520 ohms, the building-out resistance (BOR) in the ELP unit should be cut in. When computing the total external circuit resistance connected to the central office, the off-hook resistance in the ELP unit across the A and B leads can be taken to be 160 ohms. The leak resistance should be maintained to 30K ohms, minimum.

7.1.4 In cases where the resistance limit of the A and B leads is exceeded, E&M lead signaling may be used with a circuit such as SD-96251-01 at the distant end of the

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intervening E&M link. With this arrangement ground start operation cannot be used. The resistance of the M lead may not be over 1000 ohms and the E lead resistance limit is dependent on the connecting circuit. A contact protection network is required on the E lead of the connecting circuit.

7.1.5 The ELP cannot be used on two party or multi-party lines.

7.1.6 The 60 Hz longitudinal voltage on either a two-wire or four-wire extension must not exceed 10 volts as measured with the conductors tied together and grounded through a 500 ohm resistor. Where this voltage is exceeded a dial long line circuit such as SD-96555-01 may be used for isolation.

7.2 E2L Unit

7.2.1 The E2L unit is compatible with customer line use, including loop start PBX trunks.

7.2.2 At the station end modern dials (6-type or higher) with a speed range of 8 to 11 pulses per second and a percent break range of 58 to 64 percent should be used.

7.2.3 The E2L cannot be used on two party or multi-party lines.

7.2.4 When the E2L is used with common control offices, the loop resistance between the E2L and the switching equipment should not exceed 1200 ohms or the loop limit of the office involved, whichever is less. The leak resistance should be maintained to 30K ohms minimum.

7.2.5 When the E2L is used with Step-By-Step offices with an E1R at the station end, the loop resistance between the E2L and the serving central office should not exceed 600 ohms and the leak resistance should be maintained to 30K ohms minimum. This range may be extended to 1200 ohms by providing dial long line circuit SD-96555-01 or SD-96234-01 in the central office where the line circuit appears. Use 10K ohms bias resistance in the dial long line circuit for this application.

7.2.6 When the E2L is used with Step-By-Step offices with an E4B or E3B at the station end, the loop resistance between the E2L and the serving central office should not exceed 600 ohms and the leak resistance should be maintained to a minimum of 30K ohms. This range may be extended to 1200 ohms by providing dial long line circuit SD-96555-01 or

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SD-96234-01 in the central office where the line circuit appears. In this application, use 10K ohms bias resistance in the dial long line circuit.

7.2.7 When the E2L is used with Step-By-Step offices and an E2S at the station end, the 1500 ohm loop capability of the E2S may only be achieved if the E2L is in the same building as the switching equipment. Loop range at the E2L end may be increased by limiting the external circuit resistance at the E2S end to less than 1000 ohms. In this case, the sum of the external circuit resistance at the E2S end and the conductor loop resistance at the E2L end should not exceed 1000 ohms. Additional loop range may be achieved at the E2L end by providing dial long line circuit SD-96555-01 or SD-96234-01 in the central office where the line circuit appears. In this case the full 1500-ohm range at the E2S end can be used and a 1200-ohm conductor loop can be used between the E2L and the dial long line circuit. Use 10K ohms bias resistance in the dial long line circuit for this application.

7.2.8 The E2L may be used on PBX off-premises stations within the loop limits specified above. In this case the type of serving central office must be considered and the loop limit must include not only the loop between the E2L and the PBX but also the PBX to central office trunk loop.

7.2.9 The E2L in conjunction with the E2LA auxiliary unit is compatible with ground start operation within the limits specified above.

7.2.10 The E2L does not provide a balanced termination to the two wire line due to the ringing detector circuitry. If a high longitudinal noise level is present on the cable between the E2L and the switching equipment, it may be necessary to provide a dial long line circuit between the E2L and the cable pair to isolate the unbalance from the noise source. The addition of such a dial long line circuit does not affect the loop ranges described above. From a signaling standpoint a dial long line circuit is required if the 60 Hz longitudinal voltage exceeds 5 volts measured with the conductors tied together and grounded through a 500-ohm resistor.

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
ES-20139-02	ElF	Fig. L required
ES-20292-01	ElF	Fig. K required
ES-20293-01	ElF	Fig. H required
ES-20545-01	No	Wet-dry supv
SD-20746-01	E3C, E4C	Reverse tip and ring
ES-21030-01	ElE	Not comp with rem zone reg
SD-21031-01	ElE	
SD-21031-02	ElE	
SD-21032-02	ElE	
SD-21032-03	ElE	Not comp with rem zone reg
SD-21036-01	No	See Sect C 5.3.3
SD-21043-01	No	See Sect C 5.3.3
SD-21053-01	No	See Sect C 5.3.3
SD-21053-02	No	High-low supv
SD-21115-01	ElF	See Sect C 5.3.4, 5.3.7
SD-21115-03	No	High-low supv
SD-21115-05	ElF	See Sect C 5.3.4, 5.3.7
SD-21115-07	No	High-low supv
SD-21116-01	ElF	See Sect C 5.3.4, 5.3.7
SD-21116-03	No	High-low supv
SD-21130-01	No	Wet-dry supv, 20-Hz ring
SD-21339-01	No	20-Hz ring
SD-21349-01	No	Wet-dry supv, 20-Hz ring
SD-21364-01	No	Wet-dry supv
SD-21370-01	No	See Sect C 5.3.3
SD-21441-01	E3C, E5C, E4C, E2C	Reverse tip and ring
SD-21451-01	No	Wet-dry supv
SD-21504-01	No	Wet-dry supv, 20-Hz ring
SD-21504-02	No	Wet-dry supv, 20-Hz ring
SD-21504-03	No	20-Hz ring
SD-21504-04	No	20-Hz ring
SD-21504-05	No	Wet-dry supv, 20-Hz ring
SD-21504-06	No	Wet-dry supv, 20-Hz ring
SD-21505-01	No	20-Hz ring
SD-21505-02	No	Wet-dry supv, 20-Hz ring
SD-21505-03	No	Wet-dry supv, 20-Hz ring
SD-21542-01	No	Wet-dry supv, +110, -48 coin
SD-21544-01	No	Wet-dry supv
SD-21545-01	No	Wet-dry supv
SD-21560-01	E3C, E5C, E4C, E2C	For use with AIC and Fig. G only
SD-21572-01	E3C, E5C, E4C, E2C	Reverse tip and ring
SD-21578-01	ElF	See Sect C 5.3.4, 5.3.7
SD-21600-01	No	3-wire
SD-21627-01	ElE	Not comp with rem zone reg
SD-21628-01	ElE	
SD-21630-01	ElE	Not comp with rem zone reg

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-21821-01	E1E	Not comp with rem zone reg
SD-21822-01	E1E	
SD-21823-01	No	Wet-dry supv, 20-Hz ring
SD-21859-01	No	20-Hz ring
SD-21917-01	No	See Sect C 5.3.3
SD-21918-01	No	See Sect C 5.3.3, 20-Hz ring
SD-21946-01	No	See Sect C 3.2.2, disc time
SD-21949-01	E1F	Fig. E required
SD-21972-01	E3C, E4C	Reverse tip and ring
SD-21974-01	No	PCI pulsing
SD-21981-01	No	+130, -48 volt coin control
SD-21982-01	No	+130, -48 volt ring back
SD-25020-01	E1E	
SD-25022-01 RP	E1F	See Sect C 5.3.6
SD-25022-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25022-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25024-01	No	3-wire
SD-25033-01 MF	E3C, E4C	See Sect B 1.8
SD-25033-01 DP	E5C, E4C, E2C	See Sect B 1.8, C 4.
SD-25033-01 RP	E1E	See Sect B 1.8
SD-25119-01	No	Wet-dry supv
SD-25120-01	E1P, E2L	
SD-25124-01	No	Wet-dry supv, 20-Hz ring
SD-25127-01	E1E	
SD-25210-01	E1E	
SD-25218-01	No	Wet-dry supv, 20-Hz ring
SD-25259-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25259-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25259-01 RP	E1F	See Sect C 5.3.6
SD-25292-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25292-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25292-01 RP	E1F	See Sect C 5.3.6
SD-25295-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25295-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25295-01 RP	E1F	See Sect C 5.3.6
SD-25302-01	No	20-Hz ring
SD-25303-01	No	3-wire
SD-25304-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25304-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25304-01 RP	E1F	See Sect C 5.3.6
SD-25305-01 RP	E1F	
SD-25329-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25329-01 RP	E1F	
SD-25351-01	No	3-wire
SD-25356-01	No	Through supv
SD-25357-01	No	Rem zone reg
SD-25420-01 RP	E1F	Verification only,

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-25420-01 MF	E5D, E4D, E2D, E3D	See Sect C 5.3.6 Verification only,
SD-25420-01 DP	E5D, E4D, E2D	See Sect C 3. Verification only
SD-25428-01	No	See Sect C 3. Wet-dry supv
SD-25446-01	No	SX or 20-Hz ring, 3rd wire coin
SD-25462-01	No	SX or 20-Hz ring, 3rd wire coin
SD-25503-01	No	2-way trunk
SD-25517-01 MF	E5D, E4D, E2D, E3D	See Sect C 3., use adj B on A relay
SD-25517-01 DP	E5D, E4D, E2D	See Sect C 3., use adj B on A relay
SD-25517-01 RP	E1F	See Sect C 5.3.6, 5.3.8
SD-25519-01	No	SX ring
SD-25520-01	No	PCI pulsing
SD-25552-01	E5D, E4D, E2D	See Sect C 3.
SD-25578-02 MF	E3C, E4C	
SD-25578-02 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25578-02 RP	E1E	
SD-25578-03 MF	E3C, E4C	
SD-25578-03 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25578-03 RP	E1E	
SD-25581-01	E5D, E4D, E2D	See Sect C 3.
SD-25582-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25582-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25582-01 RP	E1F	See Sect C 5.3.6
SD-25583-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25583-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25583-01 RP	E1F	See Sect C 5.3.6
SD-25655-01	E4B, E3B, E2B	See Sect C 1.1
SD-25663-01	E5D, E4D, E2D, E3D	Verification only, See Sect C. 3.
SD-25665-01	No	SX ring
SD-25666-01	No	3-wire
SD-25667-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-25673-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-25687-01	No	Wet-dry supv
SD-25689-01	E3C, E5C, E4C, E2C	
SD-25690-01	E3C, E5C, E4C, E2C	
SD-25694-02 MF	E3C, E4C	
SD-25694-02 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25694-02 RP	E1E	
SD-25696-01	No	Wet-dry supv
SD-25698-01	No	Wet-dry supv

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-25701-01	No	Wet-dry supv
SD-25708-01	No	Needs metallic ckt for test
SD-25708-02	No	Needs metallic ckt for test
SD-25708-03	No	Needs metallic ckt for test
SD-25711-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25711-01 RP	No	No off-normal ground lead
SD-25721-01	No	Requires metallic path
SD-25736-01	No	Requires metallic path
SD-25739-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25739-01 MF	E3C, E4C	
SD-25739-01 RP	E1E	
SD-25739-02 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25739-02 MF	E3C, E4C	
SD-25739-02 RP	E1E	
SD-25739-03 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25739-03 MF	E3C, E4C	
SD-25739-03 RP	E1E	
SD-25739-04 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25739-04 MF	E3C, E4C	
SD-25739-04 RP	E1E	
SD-25766-01	No	Requires metallic path
SD-25768-01	E4B, E3B, E2B	
SD-25816-01	E4C	
SD-25823-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25823-01 MF	E3C, E4C	
SD-25823-01 RP	E1E	
SD-25823-02 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25823-02 MF	E3C, E4C	
SD-25823-02 RP	E1E	
SD-25832-01 RP	E1F	
SD-25832-01 DP	No	See Sect C 3.2.2, disc time
SD-25832-01 MF	No	See Sect C 3.2.1
SD-25833-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25833-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25833-01 RP	E1F	See Sect C 5.3.6
SD-25842-02	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-25843-01	E4B, E3B, E2B	
SD-25844-01	E4B, E3B, E2B	
SD-25845-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-25846-02	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-25847-01	E4B, E3B, E2B	
SD-25849-01 RP	E1E	
SD-25849-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25849-01 MF	E3C, E4C	
SD-25850-01	No	3-wire
SD-25851-01	No	Ringdown trunk
SD-25853-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-25868-01	E1E	
SD-25875-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25875-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25875-01 RP	E1F	See Sect C 5.3.6
SD-25887-01 RP	E1F	See Sect C 5.3.6
SD-25887-01 DP	E5D, E4D, E2D	Comp with rering Fig.D only. Not comp with distant MB ckt, See Sect C 3.
SD-25887-01 MF	E5D, E4D, E2D, E3D	Comp with rering Fig.D only, See Sect C 3.
SD-25889-01	No	Wet-dry supv
SD-25893-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-25893-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-25893-01 RP	E1F	See Sect C 5.3.6
SD-25895-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-25902-01	No	Wet-dry supv
SD-25905-01	E4B, E3B, E2B	
SD-25909-01	E4B, E3B, E2B	
SD-25910-01	No	SX ring
SD-25911-01	No	SX ring
SD-25913-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25913-01 MF	E3C, E4C	
SD-25913-01 RP	E1E	
SD-25913-02 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-25913-02 MF	E3C, E4C	
SD-25913-02 RP	E1E	
SD-25923-01	No	+110, -48 volt coin Wet-dry supv
SD-25925-01	E3C, E5C, E4C, E2C	
SD-25926-01	No	Wet-dry supv
SD-25928-01	E1P, E2L	
SD-25934-01	No	SX ring
SD-25943-01	No	Rev bat sig on phantom
SD-25956-01	No	PCI pulsing
SD-26047-01 LP	No	High-low supv
SD-26047-01 E&M	E4B, E3B, E2B	When working with SD-96482-01 and N option is used (standard wiring prior to issue 13D) transpose E&M leads of talk and KP paths
SD-26070-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26070-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26070-01 RP	E1F	See Sect C 5.3.6
SD-26071-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26071-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26071-01 RP	E1F	See Sect C 5.3.6

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-26073-01 E&M	E4B, E3B, E2B	
SD-26073-01 LPMF	E5D, E4D, E2D, E3D	Verification only, See Sect C 3.
SD-26073-01 LPDP	E5D, E4D, E2D	Verification only, See Sect C 3.
SD-26074-01 LP	No	
SD-26074-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6
SD-26077-01	E5D, E4D, E2D	See Sect C 3.
SD-26078-01 MF	E3C, E4C	
SD-26078-01 DP	E4C, E2C	
SD-26078-01 RP	E1E	
SD-26079-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26079-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26079-01 RP	E1F	See Sect C 5.3.6
SD-26083-01 E&M	No	On hook toner ringing
SD-26083-01 LP	No	SX ring 3rd wire coin
SD-26085-01 MF	E3C, E4C	
SD-26085-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-26085-01 RP	E1E	
SD-26086-01 MF	E3C, E4C	
SD-26086-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-26086-01 RP	E1E	
SD-26087-01 MF	E3C, E4C	
SD-26087-01 RP	E1E	
SD-26087-01 DP	E4C, E2C	
SD-26090-01	No	Wet-dry supv
SD-26091-01	No	Wet-dry supv, +110, -48 coin
SD-26094-01	E4B, E3B, E2B	
SD-26095-01	No	Wet-dry supv
SD-26096-01	E4B, E3B, E2B	
SD-26098-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-26099-01	E4B, E3B, E2B	
SD-26100-01	E4D	See Sect C 3.
SD-26101-01 E&M	E4B, E3B, E2B	
SD-26101-01 LP	E4D	See Sect C 3.
SD-26104-01	E4B, E3B, E2B	Fig. 3 only
SD-26108-01	No	Wet-dry supv, SX sig
SD-26110-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-26116-01	E3C, E5C, E4C, E2C	Refer to associated OGT ckt
SD-26117-01	No	SX coin sig
SD-26122-01 LP	No	Wet-dry supv, SX sig
SD-26122-01 E&M	E4B, E3B, E2B	
SD-26123-01 LPDP	E5D, E4D, E2D	See Sect C 3.
SD-26123-01 LPMF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26123-01 E&M	E4B, E3B, E2B	
SD-26126-01	E4B, E3B, E2B	
SD-26127-01	E5C, E4C, E2C	See Sect C 2.5.6

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-26144-01	E3C, E5C, E4C, E2C	
SD-26148-01	E3C, E5C, E4C, E2C	
SD-26149-01	No	SX ring 3rd wire coin
SD-26152-01 MF	E5D, E4D, E2D, E3D	Not comp with rering, See Sect C 3.
SD-26152-01 DP	E5D, E4D, E2D	Not comp with rering See Sect C 3.
SD-26178-01 DP	E5C, E4C, E2C	
SD-26178-01 MF	E3C, E4C	
SD-26183-01	E5D, E4D, E2D	See Sect C 3.
SD-26201-01	E1E	
SD-26204-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26204-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26204-01 RP	E1F	See Sect C 5.3.6
SD-26209-01	E3C, E4C	Reverse tip and ring
SD-26210-01	No	PCI pulsing
SD-26257-01 RP	E1F	See Sect C 5.3.6
SD-26257-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26257-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26282-01	E5D, E4D, E2D	See Sect C 3.
ES-26289-01	E1R, E2S+E2SA	Toll diversion feature not provided
SD-26378-01 LP	E3C, E4C	
SD-26378-01 E&M	E4B, E3B, E2B	
SD-26380-01 LP	E3C, E5C, E4C, E2C	
SD-26380-01 E&M	E4B, E3B, E2B	
SD-26391-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-26396-01	No	Rev high-low supv
SD-26398-01 MF	E3C, E4C	
SD-26398-01 DP	E4C, E2C	
SD-26398-01 RP	E1E	
SD-26399-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26399-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26399-01 RP	E1F	See Sect 5.3.6
SD-26400-01	E4B, E3B, E2B	
SD-26401-01	No	High-low supv
SD-26402-01	No	High-low supv
SD-26404-01 E&M	E4B, E3B, E2B	
SD-26404-01 LP	No	Wet-dry, SX
SD-26410-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-26410-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-26413-01	No	3-wire circuit
SD-26416-01	E4B, E3B, E2B	
SD-26417-01	E4B, E3B, E2B	
SD-26418-01 E&M	E4B, E3B, E2B	
SD-26418-01 LP	E5D, E4D, E2D	See Sect C 3.
SD-26419-01 LPMF	E5D, E4D, E2D, E3D	OK only if SX ringing is

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-26419-01	LPDP E5D, E4D, E2D	not used. See Sect C 3. OK only if SX ringing is not used. See Sect C 3.
SD-26419-01	E&M E4B, E3B, E2B	
SD-26420-01	E4B, E3B, E2B	
SD-26421-01	E4B, E3B, E2B	
SD-26422-01	E4B, E3B, E2B	
SD-26423-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-26424-01	E3C, E4C	Only with multi-wink (Fig. 3) and options V, W, X
SD-26425-01	E4B, E3B, E2B	
SD-26426-01	E4B, E3B, E2B	
SD-26427-01	No	High-low supv
SD-26428-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-26429-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-26430-01	E4B, E3B, E2B	See Sect C 1.1
SD-26432-01	No	Wet-dry supv
SD-26433-01	E3C, E5C, E4C, E2C	
SD-26445-01	E&M E4B, E3B	
SD-26445-01	LP E3C, E5C, E4C, E2C	
SD-26447-01	No	Wet-dry, rev bat both
SD-26448-01	No	Wet-dry, rev bat both
SD-27000-01	E4B, E3B, E2B	
SD-27001-01	No	Requires DC path
SD-27003-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-27008-01	E4B, E3B, E2B	
SD-27009-01	E4B, E3B, E2B	
SD-27010-01	E4D	Use options T, W, ZV and ZZ
SD-27012-01	No	Requires dc path
SD-27015-01	E4D	See Sect C 3.
SD-27016-01	No	Rev bat sig on phantom
SD-27036-01	E4B, E3B, E2B	
SD-27043-01	No	3-wire trk
SD-27044-01	E4B, E3B, E2B	
SD-27051-01	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-27061-01	E4D	See Sect C 3.
SD-27067-01	No	Rev bat ring
SD-27079-01	No	+130, -48 volt ring
SD-27080-01	No	+130, -48 ring or coin
SD-27081-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27082-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27083-01	E4D	Must use wink ringback
SD-27084-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27092-01	LP E4D	
SD-27092-01	E&M E4B, E3B, E2B	
SD-27097-01	No	+130, -48 volt ring
SD-27103-01	E4B, E3B, E2B	

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-27104-01 LP	No	+130,-48 coin
SD-27104-01 E&M	E4B, E3B, E2B	
SD-27148-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-27148-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-27516-01	See notes	For two wire station use E1P, Z, G and V options and E1R or E2S at distant end. For four wire stations use E4B or E3B with E4B or E3B plus SD-27517-01 at distant end.
SD-27517-01	E4B, E3B, E2B	
SD-27546-01	No	+130,-48 volt ring
SD-27550-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27551-01	E4B, E3B, E2B	
SD-27554-01	No	+130,-48 ring
SD-27555-01	No	+130,-48 ring
SD-27580-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-27580-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-27580-01 RP	No	Slow disc see Sect C 5.3.6
SD-27581-01	E5D, E4D, E2D	See Sect C 3.
SD-27593-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27611-01 MF	E4B, E3B, E2B	
SD-27611-01 DP	E4B, E3B, E2B	See Sect C 1.1.2, 1.1.3
SD-27617-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-27618-01	No	2-way loop
SD-27654-01	E4B, E3B, E2B	
SD-27655-01	E4B, E3B, E2B	
SD-27669-01	E4B, E3B, E2B	
SD-27686-01 MF	E5D, E4D, E2D, E3D	See Sect C 3.
SD-27686-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-27686-01 RP	No	See Sect C 5.3.6
SD-27687-01	E5D, E4D, E2D	
SD-27711-01	E4B, E3B, E2B	
SD-27712-01	E4B, E3B, E2B	
SD-27721-01	No	3-wire trk
SD-27723-01	No	Cut ckt prevents passage of inband tones
SD-27729-01	E3C, E4C	
SD-27730-01	E4B, E3B, E2B	
SD-27735-01	E1J	
SD-27738-01	E4B, E3B, E2B	
SD-27744-01	E4B, E3B, E2B	
SD-27750-01	E3C, E4C	
SD-27751-01	E4B, E3B, E2B	
SD-27752-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-27753-01	No	2-way loop trk

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-27798-01 DP	E5D, E4D, E2D	Not comp with controlled ring, see Sect C 3.
SD-27798-01 MF	E5D, E4D, E2D, E3D	Not comp with controlled ring, see Sect C 3.
SD-27802-01	No	Cut ckt prevents passage of inband tones
SD-27803-01	E4B, E3B, E2B	
SD-27813-01 LP	No	+130, -48 volt ring
SD-27813-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6
SD-27814-01 LP	No	+130, -48 volt coin
SD-27814-01 E&M	E4B, E3B, E2B	
SD-27815-01 LP	No	+130, -48 volt ring
SD-27815-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6
SD-27816-01 LP	No	+130, -48 volt coin
SD-27816-01 E&M	E4B, E3B, E2B	
SD-27829-01	E3C, E5C, E4C, E2C	Option W must be used when class tone is required
SD-27830-01 LP	E5D, E4D, E2D, E3D	Rev bat option only, req APP Fig. 6 + T wiring
SD-27830-01 E&M	E4B, E3B, E2B	Requires APP Fig. 6
SD-27836-01	E4B, E3B, E2B	
SD-27838-01	E4B, E3B, E2B	
SD-27843-01	E4B, E3B, E2B	
SD-27844-01	E4B, E3B, E2B	
SD-27851-01	No	3-wire line
SD-27858-01	E4B, E3B, E2B	
SD-27866-01	E4B, E3B, E2B	Use option R
SD-27877-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-27892-01	E4B, E3B, E2B	
SD-27893-01	E3C, E4C	
SD-27912-01	E4B, E3B, E2B	
SD-27913-01	E4B, E3B, E2B	
SD-27927-01 LP	E4D	
SD-27927-01 E&M	E4B, E3B, E2B	
SD-27928-01 LP	E4D	
SD-27928-01 E&M	E4B, E3B, E2B	
SD-27929-01 LP	E3C, E4C	
SD-27929-01 E&M	E4B, E3B, E2B	
SD-27933-01	E4B, E3B, E2B	
SD-27942-01	E4B, E3B, E2B	
SD-27945-01	E4B, E3B, E2B	
SD-27946-01	E4B, E3B, E2B	
SD-27963-01	E3C, E4C	
SD-27964-01	E4B, E3B, E2B	
SD-27970-01	E4B, E3B, E2B	
SD-27981-01 LP	No	SX signal

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-27981-01	E&M E4B, E3B, E2B	
SD-27988-01	See notes	No sig required
SD-27989-01	See notes	No sig required
SD-27996-01	E1P, E2L	
SD-28040-01	LP E5D, E4D, E2D, E3D	Rev bat supv only and option V required
SD-28040-01	E&M E4B, E3B, E2B	
SD-28041-01	See notes	No sig required
SD-28042-01	See notes	No sig required
SD-28043-01	E&M E4B, E3B, E2B	With Fig. 2 E&M leads only. T, R, T1, R1 leads connect to assoc. 24V4C repeater.
SD-28043-01	LP E1R, E2S	With Fig. 4 Nothing compatible with Fig. 3.
SD-28045-01	LP No	4-wire
SD-28045-01	E&M E4B, E3B, E2B	
SD-28048-01	LP No	SX signals
SD-28048-01	E&M E4B, E3B, E2B	
SD-28049-01	See notes	No sig required
SD-28062-01	E4B, E3B, E2B	
SD-28063-01	E3C, E4C	Use Fig. 3 and opt. T, V, W. Max. loop is 1700 ohms.
SD-28066-01	E4B, E3B, E2B	
SD-28080-01	LP E3C, E4C	
SD-28080-01	E&M E4B, E3B, E2B	
SD-30200-01	IN E5D, E4D, E2D	See Sect C 3.
SD-30200-01	OUT E5C, E4C, E2C	See Sect C 2.2.4, 2.4.4, 2.5.4
SD-30205-01	E5C, E4C, E2C	
SD-30214-01	E5C, E4C, E2C	
SD-30503-01	No	Wet-dry supv
SD-30855-01	No	Make busy ckt
SD-30864-01	E5D, E4D, E2D	See Sect C 3.0.1
SD-30868-01	E5C, E4C, E2C	
SD-30974-01	E5D, E4D, E2D	See Sect C 3.
SD-30976-01	E5D, E4D, E2D	See Sect C 3.
SD-30990-01	No	Wet-dry, rev bat, SX supv
SD-30991-01	No	Wet-dry, rev bat supv
SD-30994-01	E5D, E4D, E2D	See Sect C 3.
SD-31028-01	No	T&R Leads are used separately
SD-31114-01	No	Busy flash over R Lead
SD-31123-01	No	20 Hz ring, wet dry supv
SD-31127-01	No	Wet-dry supv
SD-31147-01	E5C, E4C, E2C	See Sect B 3.14
SD-31162-01	No	Dry ckt at term end
SD-31179-01	No	Wet-dry supv

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-31180-01	No	Wet-dry supv, 20-Hz ring
SD-31188-01	No	Wet-dry supv
SD-31214-01	No	Wet-dry supv
SD-31225-01	No	Requires dc path
SD-31233-01	No	Wet-dry supv
SD-31241-01	E5D, E4D, E2D	See Sect C 3.
SD-31242-01	No	Wet-dry supv, 20-Hz ring
SD-31302-01	No	Wet-dry supv
SD-31314-01	No	SX coin control, 20-Hz ring
SD-31315-01	No	Wet-dry supv, +110, -24 coin
SD-31375-01	No	Wet-dry supv, 20-Hz ring
SD-31409-01	No	Wet-dry supv
SD-31410-01	No	Wet-dry supv, rev bat sig
SD-31425-01	No	Use open loop for test
SD-31428-01	No	Requires 3800 ohm trk loop
SD-31432-01	No	Wet-dry supv, 20-Hz ring
SD-31449-01	No	2-way LP trk, 20-Hz ring
SD-31457-01	No	Wet-dry supv
SD-31522-01	No	Wet-dry supv, 20Hz ring
SD-31532-01	E5D, E4D, E2D	See Sect C 3.
SD-31534-01	No	CX sig. and VF repeater
SD-31538-01	No	Wet-dry supv
SD-31540-01	No	Wet-dry supv
SD-31542-01	E5D, E4D, E2D	See Sect C 3.
SD-31588-01	No	High-low supv
SD-31602-01	No	2-way loop trk
SD-31609-01	E5C, E4C, E2C	
SD-31609-02	E5C, E4C, E2C	See Sect C 2.2.4, 2.4.4, 2.5.4
SD-31622-01	E5D, E4D, E2D, E3D	
SD-31648-01 OGT	E5C, E4C, E2C	
SD-31648-01 IT	E5D, E4D, E2D	See Sect C 3.
SD-31651-01	No	Wet-dry supv
SD-31656-01	E5D, E4D, E2D	
SD-31658-01	No	2-way loop trk
SD-31668-01	No	20 Hz ringdown
SD-31670-01	E4D	See Sect C 3.
SD-31674-01	No	2-way loop trk
SD-31678-01	No	Wet-dry supv
SD-31678-02	No	Wet-dry supv
SD-31681-01	No	SX pulsing
SD-31683-01	E4D	See Sect C 3.
SD-31692-01	E3C, E5C, E4C, E2C	
SD-31693-01	E5C, E4C, E2C	
SD-31703-01	No	Wet-dry supv,
SD-31708-01	No	20 Hz ringdown
SD-31709-01	E4D	See Sect C 3.

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-31710-01	E4B, E3B, E2B	
SD-31712-01	E4D	
SD-31714-01	No	3-wire trunk
SD-31723-01	E5D, E4D, E2D	See Sect C 3.
SD-31726-01	E4B, E3B, E2B	Fig. B required
SD-31744-01	No	4-wire
SD-31745-01	No	Wet-dry supv
SD-31747-01	E4D	
SD-31749-01	E4B, E3B, E2B	
SD-31752-01	No	Coin battery
SD-31753-01	No	High-Low bridged supv
SD-31771-01	No	3- or 4-wire trunk
SD-31775-01	E4B, E3B, E2B	See Sect C 1.1, 1.2 requires ZO option
SD-31779-01	E5C, E4C, E2C	
SD-31795-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3 requires ZG option
SD-31840-01	E3C, E5C, E4C, E2C	
SD-31841-01	E5D, E4D, E2D	Not comp with SX ring
SD-31842-01	E5C, E4C, E2C	
SD-31851-01	No	Interrupted grd on ring lead
SD-31853-01	No	Coin voltage
SD-31856-01	E5D, E4D, E2D	See Sect C 3.
SD-31862-01	E5D, E4D, E2D	
SD-31865-01	E4B, E3B, E2B	
SD-31866-01	No	Ground Outgoing
SD-31867-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3 requires E option
SD-31874-01	E4D	See Sect C 3.
SD-31885-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-31886-01 OGT	E5C, E4C, E2C	
SD-31886-01 IT	E5D, E4D, E2D	
SD-31887-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-31888-01	E4B, E3B, E2B	
SD-31892-01	E5C, E4C, E2C	
SD-31902-01	No	Wet-dry supv
SD-31914-01	E5C, E4C, E2C	
SD-31925-01	No	Wet-dry supv
SD-31929-01 OGT	E5C, E4C, E2C	
SD-31929-01 IT	E5D, E4D, E2D	See Sect C 3.
SD-31965-01	No	Wet-dry supv, rev bat sig
SD-32007-01	E5D, E4D, E2D	Verification only
SD-32008-01 OGT	E5C, E4C, E2C	
SD-32008-01 IT	E5D, E4D, E2D	See Sect C 3.
SD-32042-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-32061-01 LP	E5D, E4D, E2D	See Sect C 3.

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-32061-01 E&M	E4B, E3B, E2B	
SD-32067-01	No	Customer line SF units cannot pass rev bat
SD-32077-01	E5D, E4D, E2D	See Sect C 3.
SD-32087-01	E5C, E4C, E2C	
SD-32133-01	E2L, E1L, E2LA	
SD-32136-01	No	Wet-dry supv, 20-Hz ring
SD-32162-01	No	2-way supv
SD-32163-01	No	3-wire trunk
SD-32167-01	E3C, E5C, E4C, E2C	
SD-32168-01	No	Wet-dry supv, 20-Hz ring
SD-32170-01	No	Wet-dry supv
SD-32178-01	No	Wet-dry supv
SD-32183-01	E5D, E4D, E2D	See Sect C 3.
SD-32184-01 OGT	E5C, E4C, E2C	
SD-32184-01 IT	E5D, E4D, E2D	See Sect C 3.
SD-32184-02 OGT	E5C, E4C, E2C	
SD-32184-02 IT	E5D, E4D, E2D	
SD-32199-01	E5C, E4C, E2C	Requires N option
SD-32202-01 IT	E5D, E4D, E2D, E3D	Fig. 2 only
SD-32204-01	E5C, E4C, E2C	
SD-32216-01	E2L, E1L, E2LA	
SD-32240-01	E5C, E4C, E2C	Uss options M, X, Y or N, J, Y
SD-32241-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-32244-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-32245-01	E5C, E4C, E2C	Use Opt Y, Z
SD-32253-01	E5C, E4C, E2C	
SD-32255-01 LP	E4D	See Sect C 3.
SD-32255-01 E&M	E4B, E3B, E2B	
SD-32256-01 LP	E4D	See Sect C 3.
SD-32256-01 E&M	E4B, E3B, E2B	
SD-32288-01	See notes	Compatibility depends on associated trk ckt
SD-32289-01	See notes	Compatibility depends on associated trk ckt
SD-32309-01	E4B, E3B, E2B	
SD-32311-01	E4B, E3B, E2B	
SD-32312-01	E4B, E3B, E2B	
SD-32317-01	E5C, E4C, E2C	
SD-32340-01	E4B, E3B, E2B	
SD-32342-01 LP	No	+130, -48 ring
SD-32342-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-32344-01 LP	E5C, E4C, E2C	Multiwink only
SD-32344-01 E&M	E4B, E3B, E2B	See Sect C 1.1
SD-32346-01	E5C, E4C, E2C	
SD-32367-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-32367-01 MFLP	E3C, E4C	Not compatible 0 + traffic +130, -48 ring
SD-32367-01 DPLP	E5C, E4C, E2C	
SD-32369-01 MF	E3C, E4C	See Sect B 3.14.3 if opt Z is used +130, -48 ring
SD-32508-01 LP	No	
SD-32508-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-32532-01 LP	E3C, E4C	
SD-32532-01 E&M	E4B, E3B, E2B	
SD-32542-01	E4B, E3B, E2B	
SD-32543-01	E4B, E3B, E2B	See Sect C 1.1
SD-32551-01	E4B, E3B, E2B	
SD-33017-01	E5D, E4D, E2D	See Sect C 3.
SD-33018-01	E5D, E4D, E2D	See Sect C 3.
SD-33019-01	E5D, E4D, E2D	See Sect C 3.
SD-35004-01	E1P, E2L	Use option W
SD-35006-01 LP	E3C, E4C	
SD-35006-01 E&M	E4B, E3B, E2B	
SD-35012-01	E2L, E1L, E2LA	
SD-35020-01 LP	E5C, E4C, E2C	See Sect B 3.14, use opt V, W
SD-35020-01 E&M	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-35021-01 LP	No	+130, -48 ringback signal
SD-35021-01 E&M	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1.3
SD-35022-01	E4B, E3B	See Sect B 3.1.6
SD-35023-01 LP	E5C, E4C, E2C	Multiwink only, use opt W, X, Y
SD-35023-01 E&M	E4B, E3B, E2B	
SD-35024-01	E4B, E3B, E2B	
SD-35036-01 LP	E3C, E5C, E4C, E2C	
SD-35036-01 E&M	E4B, E3B, E2B	
SD-35037-01 LP	E3C, E4C	
SD-35037-01 E&M	E4B, E3B, E2B	
SD-35059-01 LP	E5C, E4C, E2C	Fig. 1&2, options Y&Z
SD-35059-01 E&M	E4B, E3B, E2B	Fig. 1
SD-36009-01	No	Wet-dry supv
SD-55015-01	No	CX signaling
SD-55062-01	No	SX control
SD-55109-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-55113-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-55151-01 LP	E5C, E4C, E2C	
SD-55151-01 E&M	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.3
SD-55158-01 LP	E4D	See Sect C 3.
SD-55158-01 E&M	E4B, E3B, E2B	
SD-55184-01	No	Wet-dry supv
SD-55213-01	No	High-low supv

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-55224-01	E3C, E4C	Not comp with controlled ring
SD-55255-01 LP	E5C, E4C	
SD-55255-01 E&M	E4B, E3B, E2B	See Sec C 1.1.1, 1.1.2, 1.1.3
SD-55256-01 LP	E5C, E4C, E2C	
SD-55256-01 E&M	E4B, E3B, E2B	See Sec C 1.1.1, 1.1.2, 1.1.3
SD-55275-01	E4B, E3B	
SD-55291-01 RP	E1E	Comp with rev bat supv and no ringing start signal
SD-55291-01 DP	E5C, E4C, E2C	Comp with rev bat supv and no ringing start signal
SD-55301-01	E5C, E4C, E2C	Not comp with ring start sig
SD-55346-01	E5C, E4C, E2C	Not comp with wet dry supv and controlled ring
SD-55358-01	E4B, E3B, E2B	
SD-55379-01	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-55380-01	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-55381-01	E4B, E3B, E2B	Not comp with rering wink too short
SD-55386-01	E4B, E3B, E2B	Use option ZN or ZP if controlled ring is required, See Sect B 3.1.6
SD-55776-01	No	Wet-dry supv
SD-55778-01	No	High-low supv
SD-55844-01	No	Requires metallic path
SD-55852-01	E4B, E3B, E2B	
SD-55872-01	No	Wet-dry supv
SD-55875-01	No	Wet-dry supv, +110, -48V coin
SD-55879-01	E3C, E4C	Not compatible with controlled ring or for use as test trunk.
SD-55889-01	No	Requires metallic path
SD-55917-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-55952-01	No	Wet-dry supv dist end
SD-56010-01	E4B, E3B, E2B	
SD-56032-01	No	Requires metallic path
SD-56045-01	No	SX ring
SD-56055-01	No	SX sig on phantom
SD-56056-01	No	SX sig on phantom
SD-56062-01	E4B, E3B, E2B	Requires G option
SD-56105-01	E5C, E4C, E2C	Not compt with controlled ring or wet-dry supv. See Sect C 2.5.6
SD-56109-01	E4B, E3B, E2B	ZD option required
SD-56119-01	No	Requires metallic path
SD-56121-01	No	Wet-dry supv
SD-56123-01	No	Requires metallic path

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-56128-01 RP	E1E	Not comp with controlled ring or wet-dry supv
SD-56128-01 DP	E5C, E4C, E2C	Not comp with controlled ring or wet-dry supv, See Sect C 2.5.6
SD-56131-01	E4B, E3B, E2B	
SD-56133-01	No	Not comp with rering wink too short
SD-56146-01	No	SX ring
SD-56153-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-56154-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.2,
SD-56159-01	E4B, E3B, E2B	1.1.3
SD-56163-01	E4B, E3B, E2B	Requires Fig.5 or M&H opt
SD-56172-01	No	Requires 2-way loop trunk ckt
SD-56199-01	No	20-Hz applied to T&R
SD-56209-01	No	SX sig on phantom
SD-56210-01	No	SX sig on phantom
SD-56211-01	No	SX sig on phantom
SD-56214-01	E4B, E3B, E2B	
SD-56219-01	No	SX sig on phantom
SD-56225-01	No	Requires DC path
SD-56241-01	No	Wet-dry supv dist end
SD-56257-01	E4B, E3B, E2B	Requires ZA wiring. See Sect C 1.1.1, 1.1.2, 1.1.3 1.1.3
SD-56314-01	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-56355-01	No	SX ring
SD-56358-01	No	Wet-dry supv dist end 20-Hz ring
SD-56371-01	No	SX signaling
SD-56389-01	E1P, E2L	
SD-56413-01	No	On-hook tone ringing
SD-56414-01	No	On-hook tone ringing
SD-56415-01	No	On-hook tone ringing
SD-56416-01	No	On-hook tone ringing
SD-56420-01	No	On-hook tone ringing
SD-56421-01	No	On-hook tone ringing
SD-56422-01	No	On-hook tone ringing
SD-56423-01	No	On-hook tone ringing
SD-56424-01	E4B, E3B, E2B	
SD-56434-01	E4B, E3B, E2B	See Sect B 3.1.6, C 1.1
SD-56435-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-56474-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-56475-01	E4B, E3B, E2B	See Sect C 1.1, 1.2
SD-56477-01	E4B, E3B, E2B	See Sect C 1.1, 1.2

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-56478-01	E4B, E3B, E2B	
SD-56479-01	E4B, E3B, E2B	
SD-56480-01	E4C, E2C	See Sect C 2.
SD-56481-01	E4B, E3B, E2B	See Sect C 1.1
SD-56482-01	E3C, E4C	
SD-56483-01	E4B, E3B, E2B	
SD-56487-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-56488-01	E4B, E3B, E2B	See Sect B 3.1.6
SD-56492-01	No	High-low supv
SD-56496-01	E4D	
SD-56501-01	E1P, E2L+E2LA	
SD-56507-01	E4B, E3B, E2B	See Sect C 1.1
SD-56509-01	E4B, E3B, E2B	
SD-56525-01 LP	See notes	2-way trunk not compatible. Recording completing not comp because of SX or 20-Hz ring. Toll switch not comp with SX or 20-Hz ring. Toll switch without ring with high-low supv may be used with E4C or E2C for DP, E3C, E4C, E2C, or E1C for MF, E1E for RP.
SD-56525-01 E&M	E4B, E3B, E2B	See Sect C 1.1, B 3.1.6
SD-61609-01	No	Ringdown
SD-62085-01	No	3-wire trk
SD-62209-01	No	High-low supv
SD-62210-01	No	3-wire trk
SD-62213-01	No	3-wire trk
SD-62285-01	No	3-wire trk
SD-62290-01	No	3-wire trk
SD-62313-01	No	3-wire trk
SD-62352-01	No	Ringdown trk
SD-62403-01	No	Wet-dry supv
SD-62409-01	No	20-Hz ring
SD-62423-01	No	Wet-dry supv dist end
SD-62487-01	E2L, E1L	Use option K
SD-62496-01	No	3-wire trk
SD-62521-01	No	3-wire trk
SD-62533-01	No	Ringdown trunk
SD-62576-01	No	CX signaling
SD-62611-01	No	Wet-dry supv dist end
SD-62648-01	No	3-wire trk
SD-62650-01	No	Wet-dry supv
SD-62745-01	No	High-low supv
SD-62825-01	No	Ringdown trk
SD-62833-01	No	Ringdown trk

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-62884-01	No	Ringdown trk
SD-63820-01	No	Wet-dry supv
SD-63823-01	No	Arranged for use with repeater
SD-63824-01	No	Arranged for use with repeater
SD-64221-01	No	High-low supv.
SD-64469-01	E4B, E3B, E2B	Issue 34B or later
SD-64472-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.2, 1.1.3
SD-64473-01	No	4-wire trunk
SD-64474-01	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.2, 1.1.3
SD-64475-01	E4B, E3B, E2B	
SD-64482-01	E4D, E3D	See Sect C 3.
SD-64484-01	E4B, E3B, E2B	
SD-64487-01	No	SX supv
SD-64501-01	E2L, E1L	
SD-64531-01	E4B, E3B, E2B	
SD-64538-01	E4B, E3B, E2B	Requires ZX option. See Sect C 1.1.3, 1.1.2, 1.1.3
SD-64539-01	No	Wet-dry supv
SD-64553-01	E5D, E4D, E2D, E3D	E4D required for reverse make busy
SD-64571-01	No	Wet-dry supv dist end
SD-64590-01	E4B, E3B, E2B	
SD-64626-01	No	High-low supv
SD-64649-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-64662-01	E4B, E3B, E2B	
SD-64663-01	E4B, E3B, E2B	
SD-64680-01	E4B, E3B, E2B	
SD-64697-01	No	20-Hz applied to T&R
SD-64698-01	No	Off-hook ring
SD-64767-01	E1R, E2S, E1S	X option not comp.
SD-64824-01	E4B, E3B, E2B	See Sect C 1.2.2, 1.2.3
SD-64832-01	E5C, E4C, E2C	Not comp with wet-dry supv or controlled ring. See Sect C 2.5.6
SD-65066-01	No	Ringdown trunk
SD-65067-01	No	Ringdown trunk
SD-65125-01	No	Wet-dry supv
SD-65176-01	No	Ringdown trunk
SD-65530-01	E5C, E4C, E2C	Outgoing only
SD-65531-01	E5C, E4C, E2C	Outgoing only
SD-65535-01	E5C, E4C, E2C	Outgoing only
ES-65602-01	No	E-type signaling units can not pulse into an off-hook

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
ES-65625-01	No	Circuit at other end has too short a wink to start ringing
SD-65652-01	No	Sel. sig. tie trunk
SD-65657-01	E1R, E1S+E1SA	Not good for toll diversion
ES-65669-01	No	Circuit at other end has too short a wink to start ringing.
SD-65718-01	E4B, E3B, E2B	See Sect C 1.1, 1.2. Opt UP is required.
SD-65718-02	E4B, E3B, E2B	See Sect C 1.1, 1.2. Opt ZY is required.
SD-65733-01	E3C, E5C, E4C, E2C	Use opt W and conn. to T1, R1 reversed.
SD-65755-01	No	2-way tie trk
SD-65788-01	No	3-wire
SD-65791-01	E5C, E4C, E2C	
SD-65792-01	E5D, E4D, E2D	
SD-65793-01	E5D, E4D, E2D, E3D	
SD-65812-01	E5D, E4D, E2D	E4D only if MB is used.
SD-65813-01	No	3-wire trunk
SD-65823-01	E5C, E4C, E2C	Use option Y and connect to T2, R2 reversed.
SD-65831-01	E5C, E4C, E2C	OK w/o camp-on and ring/busy flash. See Sect C 2.5.6
SD-65952-01	E5D, E4D, E2D	For verification only
SD-65978-01	E5D, E4D, E2D	Reverse T&R
SD-66013-01	No	Ringdown trunk
SD-66025-01	No	Ringdown trunk
SD-66040-01	E5C, E4C, E2C	
SD-66042-01	E5D, E4D, E2D	Strap out res. E, F, G&H
SD-66043-01	E5D, E4D, E2D	Strap out res. D, E, F&G
SD-66044-01	No	Wet-dry supv
SD-66065-01	E3C, E5C, E4C, E2C	Use opt F and reverse T&R
SD-66066-01	E3C, E5C, E4C, E2C	Use opt ZB and reverse T&R
SD-66098-01	No	Wet-dry supv
SD-66099-01	No	Wet-dry supv
SD-66100-01	No	Wet-dry supv
SD-66101-01	No	Wet-dry supv
SD-66102-01	No	Wet-dry supv
SD-66192-01	E1R or E1P	Use E1R toward C.O. or E1P towards PBX.
SD-66211-01	No	Wet-dry supv
SD-66241-01	No	2-way tie trk
SD-66257-01	No	Wet-dry supv
SD-66268-01	No	Ringdown trunk

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-66296-01	No	Wet-dry supv
SD-66298-01	E5C, E4C, E2C	See Sect C 2.5.6
SD-66305-01	No	Wet-dry supv
SD-66310-01	No	Wet-dry supv
SD-66310-02	No	Wet-dry supv
SD-66311-01	No	Wet-dry supv
SD-66311-02	No	Wet-dry supv
SD-66359-01	No	Wet-dry flash
SD-66360-01	No	Wet-dry flash
SD-66401-01	No	Ringdown trunk
SD-66470-01	No	Ringdown tie trunk
SD-66470-02	No	Ringdown trunk
SD-66470-03	No	Ringdown trunk
SD-66470-04	No	Ringdown trunk
SD-66470-05	No	Ringdown trunk
SD-66523-01	E5C, E4C, E2C	
SD-66524-01	E3C, E5C, E4C, E2C	Use option F and reverse TR
SD-66578-01	No	Ringdown trk
SD-66592-01	E1R, E2S	
SD-66605-01	No	Ringdown trunk
SD-66606-01	No	Ringdown trunk
SD-66617-01	No	Requires +48 on Tip
SD-66715-01	E1P, E2L	
SD-66740-01	E4D	See Sect C 3. Do not use trunk simplex.
SD-66741-01	E4D	See Sect C 3.
SD-66749-01	No	Ringdown trunk
SD-66766-01	No	Ringdown trunk
SD-66777-01	E4D	With rev bat option
SD-66777-01	E1R, E2S+E2SA	With high-low option
SD-66799-01	E4B, E3B, E2B	Use opt Y (E&M)
SD-66861-01	No	3- or 4-wire trunk
SD-66896-01	E4B, E3B, E2B	
SD-66979-01	No	ACD req. forward disconnect
SD-68097-01	E4D	Fig. B
SD-68097-01	E3C, E5C, E4C, E2C	Fig. C
SD-68102-01	No	Wink ring too short
SD-68135-01	E4B, E3B, E2B	
SD-68142-01	No	Ringdown trunk
SD-68154-01	E4B, E3B, E2B	
SD-68230-01	E4B, E3B, E2B	
SD-68231-01	E4B, E3B, E2B	See Sect C 1.1.3
SD-68232-01	E4B, E3B, E2B	See Sect C 1.1.3
SD-68233-01	E4B, E3B, E2B	
SD-68239-01	No	SX ring
SD-68240-01	No	Wet-dry supv, 20-Hz ring
SD-68242-01 DP	E5C, E4C, E2C	Rev bat supv only

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-68242-01 MF	E3C, E4C	See Sect C 2.5.6.
SD-68259-01	No	Rev bat supv only
SD-68260-01	No	Wink ring too short
SD-68289-01	No	Ringdown
SD-68290-01	No	Rev bat sig on phantom
SD-68299-01	No	SX signaling
SD-68302-01	No	SX supv
SD-68307-01	No	SX ringing
SD-68308-01	No	SX ringing
SD-68309-01	No	Wink ring too short
SD-68312-01	No	Rev bat sup on phantom
SD-68314-01	No	Wink ring too short
SD-68315-01	No	Rev bat sup on phantom
SD-68318-01	No	20-Hz ring
SD-68323-01	No	20-Hz ring
SD-68325-01	E3C, E4C	Rev bat sup on phantom
SD-68326-01 RP	E1E	Requires Fig. A. Not compatible with rering
SD-68326-01 DP	E4C	Rev bat sup only
SD-68331-01	No	Rev bat sup only
SD-68332-01	No	SX ring
SD-68355-01	E4B, E3B, E2B	Wet-dry supv
SD-68357-01	No	SX ring
SD-68358-01	No	SX ring
SD-68362-01	No	Ringdown trunk
SD-68363-01	No	Ringdown trunk
SD-68364-01	No	Ringdown trunk
SD-68366-01	No	Eqpt. with repeater
SD-68397-01	No	4-wire with SX
SD-68401-01	No	Requires DC path
SD-68459-01	No	Built in DX sig
SD-68479-01	E4B, E3B, E2B	
SD-68480-01	E4D	
SD-68481-01	E4B, E3B, E2B	
SD-68482-01	E4D	
SD-68485-01	No	Requires DC path
SD-68508-01	E4B, E3B, E2B	
SD-68513-01	E4B, E3B, E2B	
SD-68514-01	E4B, E3B, E2B	
SD-68527-01 LP	No	20-Hz ring
SD-68527-01 E&M	No	SX ring on trans pair
SD-68529-01	E4B, E3B	Q option required
SD-68537-01	E4B, E3B, E2B	
SD-68547-01	No	SX supv
SD-68564-01	E1P, E2L	
SD-68579-01	E4B, E3B, E2B	See Sect C 1.1.3

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-68581-01	E4B, E3B, E2B	
SD-68582-01	E4B, E3B, E2B	See Sect C 1.1.3
SD-68595-01	E4B, E3B, E2B	
SD-68596-01	E4B, E3B, E2B	
SD-68621-01	E4B, E3B, E2B	
SD-68623-01 LP	E3C, E5C, E4C, E2C	E3C with MF only. Use Fig. 4 and option Q, but not H. Max. cond. Loop = 150 ohms. Better to use E&M option.
SD-68623-01 E&M	E4B, E3B, E2B	
SD-68625-01 LP	E5D, E4D, E2D, E3D	Use Fig. 2 and option H. Max conductor Loop = 400 ohms. Better to use E&M option.
SD-68625-01 E&M	E4B, E3B, E2B	Use Fig. 5
SD-68626-01	E4B, E3B, E2B	
SD-68627-01	E4B, E3B, E2B	
SD-68961-01	E4D	Use Fig. 2 & YQ option (2-wire w/o ring forward)
SD-68962-01 DP	E4C, E2C	Requires R option
SD-68962-01 MF	E3C, E4C	Requires R option
SD-68966-01	No	Rev bat sig on phantom
SD-69286-01	E1P, E2L	Reverse ringing leads to terminal 9 & 10 of 225 KTU if E2L is used.
SD-90000-01	E5D, E4D, E2D, E3D	Rev bat supv and -48V battery required
SD-90036-01	No	Wet-dry supv
SD-90077-01	E1P, E2L	
SD-90257-01	No	24V rev bat supv
SD-90275-01	No	Wet-dry supv
SD-90403-01	No	Req. metallic loop
SD-90434-01	E5D, E4D, E2D, E3D	Fig.1 and 1A or 1C, Reverse tip and ring
SD-90439-01	No	For use on phantom group
SD-90451-01	No	High-low supv
SD-90506-01	No	Requires metallic ckt
SD-90527-01	No	24V rev bat supv
SD-90555-01	No	3- or 4-wire trunk
SD-90566-01	E5D, E4D, E2D, E3D	
SD-90580-01	No	Wet-dry rev bat supv
SD-90581-01	No	Wet-dry rev bat supv
SD-90647-01	No	PCI pulsing
SD-95037-01	E3C, E5C, E4C, E2C	
SD-95060-01	E4B, E3B, E2B	Use B option for rering, See Sect C 1.1

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-95061-01	E4B, E3B, E2B	See Sect C 1.2
SD-95095-01	E4B, E3B, E2B	
SD-95405-01	No	Bat and grd signaling
SD-95413-01	No	Grd start trk
SD-95425-01	E3C, E5C, E4C, E2C	
SD-95426-01	No	High-low supv
SD-95436-01	No	SX ring
SD-95443-01	E4B, E3B, E2B,	4-wire end
SD-95459-01	E3C, E5C, E4C, E2C	
SD-95462-01	No	Uses 24V rev-bat sup
SD-95467-01	E3C, E4C	Fig. B only
SD-95470-01	No	Wet-dry supv
SD-95471-01	No	SX or 20-Hz ring
SD-95474-01	No	Multistate signaling
SD-95475-01	No	SX or 20-Hz ring
SD-95486-01	No	SX ringing
SD-95487-01	No	Signal ckt
SD-95488-01	E4B, E3B, E2B	
SD-95489-01	E4B, E3B, E2B	
SD-95495-01	No	Wet-dry supv
SD-95504-01	No	CX or SX supv
SD-95513-01	E5D, E4D, E2D, E3D	Use Fig. C for supervision. With Fig. S use only E4D.
SD-95530-01	No	Requires DC path
SD-95538-01	E4D	
SD-95542-01	E3C, E5C, E4C, E2C	Requires Y wiring
SD-95543-01	E5D, E4D, E2D, E3D	B&G sig options only
SD-95545-01	No	Requires metallic loop
SD-95546-01	E3C, E5C, E4C, E2C	
SD-95560-01	E3C, E4C	Fig. 6 only, Fig. 5 not comp (wet-dry supv)
SD-95563-01	No	Requires DC path
SD-95564-01	No	Requires DC path
SD-95565-01	No	SX or 20-Hz ring
SD-95566-01	No	SX or 20-Hz ring
SD-95569-01 E&M	E4B, E3B, E2B	
SD-95569-01 LP	E5D, E4D, E2D, E3D	
SD-95585-01	E5D, E4D, E2D, E3D	Fig. C, D or E, rev T and R for Fig. D or E
SD-95615-01	No	High-low supv
SD-95617-01 DP	E4C, E2C	Requires FDA or FDB at distant end
SD-95617-01 MF	E3C, E4C	
ES-95668-01	No	E-type signaling units can not pulse into an off-hook
SD-95673-01	No	High-low supv
SD-95691-01	No	Wet-dry supv

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-95704-01	No	SX ringing
SD-95711-01	No	SX ringing
SD-95731-01	No	3-wire trunk
SD-95740-01	No	Requires metallic ckt
SD-95744-01	No	2-way loop trk
SD-95745-01	No	Wet-dry supv
SD-95777-01	E5D, E4D, E2D, E3D	
SD-95782-01	No	Wet-dry supv
SD-95789-01	No	Requires metallic ckt
SD-95793-01	No	3- or 4-wire trunk
SD-95846-01	E4B, E3B, E2B	
SD-95850-01	E4B, E3B, E2B	
SD-95851-01	No	DX signal & coin control
SD-95861-01	E5D, E4D, E2D	
SD-95862-01	E5D, E4D, E2D, E3D	
SD-95962-01	E4B, E3B, E2B	
SD-95964-01	E4B, E3B, E2B	
SD-95974-01	E4B, E3B, E2B	
SD-95976-01	E4B, E3B, E2B	
SD-95979-01	E1R, E2S OR E3C, E5C, E4C, E2C	Proper choice depends on SF unit and circuit at distant end.
SD-96098-01	E5D, E4D, E2D, E3D	
SD-96117-01	No	CX sig w/o E&M leads
SD-96149-01	E3C, E5C, E4C, E2C	
SD-96169-01	No	High-low supv
SD-96189-01	E5D, E4D, E2D, E3D	
SD-96195-01	No	3-wire trunk
SD-96202-01	No	PCI pulsing
SD-96209-01	No	Wet-dry supv
SD-96210-01	No	Wet-dry supv
SD-96216-01	No	Ringdown trunk
SD-96221-01	No	Ringdown trunk
SD-96250-01	No	Wet-dry supv
SD-96251-01	E1P	See Sect C 7.1.4
SD-96252-01	E4B, E3B, E2B	See Sect C 6.4
SD-96268-01	E5D, E4D, E2D	
SD-96279-01	E5D, E4D, E2D, E3D	
SD-96283-01	E3C, E5C, E4C, E2C	
SD-96301-01	No	2-way loop trk
SD-96333-01	E5D, E4D, E2D, E3D	
SD-96334-01	No	20 Hz ringing
SD-96340-01	E5D, E4D, E3D	
SD-96352-01	No	High-low or 24V rev bat supv
SD-96355-01	E5D, E4D, E2D, E3D	OK with Fig. B, C or D
SD-96363-01	E5D, E4D, E2D, E3D	OK with Fig. D or H

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-96365-01	No	Wet-dry supv, SX coin
SD-96366-01	No	PCI pulsing
SD-96369-01	No	Simplex
SD-96370-01	E3C, E5C, E4C, E2C	
SD-96384-01	See Notes	Comp at depends on assoc. trunk ckts
SD-96389-01	No	PCI pulsing
SD-96394-01	No	Ringdown trk
SD-96395-01	No	Wet-dry supv
SD-96398-01 LP	E5C, E4C, E2C	See Sect C 2.5.6
SD-96398-01 E&M	E4B, E3B, E2B	See Sect C 1.1.1, 1.1.2, 1.1.3
SD-96412-01	No	High-low supv
SD-96413-01	E5D, E4D, E2D, E3D	
SD-96459-01	E5C, E4C, E2C	
SD-96461-01	No	SX or 20 Hz ringing
SD-96463-01	E4B, E3B, E2B	
SD-96467-01	E3C, E5C, E4C, E2C	Fig. 3, 9 and 14
SD-96469-01	No	SX ring
SD-96481-01 LP	No	High-low supv
SD-96481-01 E&M	E4B, E3B, E2B	When working with SD-96482-01 and T option is used (standard wiring prior to issue 13D) transpose E&M leads of talk and KP paths
SD-96482-01 LP	No	High-low supv
SD-96482-01 E&M	E4B, E3B, E2B	When N option is used (standard wiring prior to issue 2D), transpose E&M leads of talk and KP paths.
SD-96487-01	E4B, E3B, E2B	
SD-96488-01	E4B, E3B, E2B	
SD-96517-01	See Notes	Compat depends on assoc. trun ckts
SD-96541-01	E5C, E4C, E2C	
SD-96544-01	No	Requires DC path
SD-97047-01	E4B, E3B, E2B	See Sect B 5., C 1.2
SD-97570-01	E4B, E3B	
SD-97571-01 LP	E5D, E4D, E2D, E3D	
SD-97571-01 E&M	E4B, E3B	
SD-97572-01 LP	E5D, E4D, E2D, E3D	Rev. bat. supv only
SD-97572-01 E&M	E4B, E3B	
SD-97573-01	No	+130 V SX
SD-97574-01	E4B, E3B	
SD-97577-01 LP	E5D, E4D, E2D, E3D	RB supv only. NG for HL or DX conversion

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-97577-01 E&M	E4B, E3B, E2B	
SD-97578-01	E4B, E3B, E2B	
SD-98060-01	No	130v simplex
SD-98061-01	No	SX ring
SD-99309-01	E4B, E3B, E2B	
SD-99311-01	E4B, E3B, E2B	
SD-99378-01	E4D	See Sect C 3.
SD-99388-01	E3C, E5C, E4C, E2C	Option Y required
SD-99415-01	E4B, E3B, E2B	
SD-99419-01	E4B, E3B, E2B	Requires T option
SD-99420-01	E4B, E3B, E2B	Requires SD-95061-01
SD-99434-01	E3C, E5C, E4C, E2C	
SD-99435-01	E4B, E3B, E2B	Requires option Z in SD-1C004-01 or SD-1C234-01
SD-99446-01	E4B, E3B, E2B	Requires option YI in SD-1E007-01
SD-99449-01	E4B, E3B, E2B	
SD-99782-01	No	Transmission only
SD-1A156-01 LP	E5D, E4D, E2D, E3D	
SD-1A156-01 E&M	E4B, E3B, E2B	
SD-1A157-01	No	Metallic circuit for tests
SD-1A163-01	E4B, E3B, E2B	Option Z for Type III interface, opt Y for Type II interface. See Sect C 1.3.
SD-1A165-01 DP	E5C, E4C, E2C	See Sect B 3.14.3, C 2.5.6
SD-1A165-01 MF	E3C, E4C	See Sect B 3.14.3
SD-1A165-01 RP	No	See Sect C 5.1.2
SD-1A165-02 DP	E5C, E4C, E2C	See Sect B 3.14.3 or Iss 6B use options R&W. See Sect C 2.5.6.
SD-1A165-02 MF	E3C, E4C	See Sect B 3.14.3 or Iss 6B use options R&W
SD-1A165-02 RP	No	See Sect C 5.1.2
SD-1A165-05 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-1A165-05 MF	E3C, E4C	
SD-1A165-05 RP	No	See Sect C 5.1.2
SD-1A166-01 DP	E4D	
SD-1A166-01 MF	E4D	
SD-1A166-01 RP	E1F, E2F	
SD-1A166-02 DP	E4D	
SD-1A166-02 MF	E4D	
SD-1A166-02 RP	E1F, E2F	
SD-1A166-05 DP	E4D	
SD-1A166-05 MF	E4D	
SD-1A166-05 RP	E1F, E2F	
SD-1A167-01	E4B, E3B, E2B	See Sect C 1.1.3

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-1A169-01	No	Wet-dry supv
SD-1A177-01	No	Wet-dry & SX supv
SD-1A178-01	E5D, E4D, E2D	
SD-1A180-01	No	See Sect C 5.1.2
SD-1A181-01	No	See Sect C 5.1.2
SD-1A184-01	No	SX ring & 3rd wire coin
SD-1A184-05	No	SX ring & 3rd wire coin
SD-1A185-01	No	DC ring & coin
SD-1A186-01	No	Req dc path for test
SD-1A187-01	No	3-wire trk
SD-1A187-05	No	3-wire trk
SD-1A190-01	No	Wet-dry supv
SD-1A190-05	No	Wet-dry supv
SD-1A192-01	E4D	
SD-1A192-05	E4D	
SD-1A193-01	E5D, E4D, E2D, E3D	
SD-1A195-01	No	PCI pulsing
SD-1A198-01	No	Req DC path
SD-1A203-01	E3C, E4C	
SD-1A203-05	E3C, E4C	
SD-1A220-01	E4D	
SD-1A236-01	E4B, E3B, E2B	Opt W for Type III interface. Opt V for Type II interface See Sect C 1.3.
SD-1A236-05	E4B, E3B, E2B	See Sect C 1.3
SD-1A237-01	E4B, E3B, E2B	Opt X for Type III interface. Opt W for Type II interface See Sect C 1.1.3, 1.3
SD-1A237-05	E4B, E3B, E2B	See Sect C 1.3
SD-1A238-01	No	Two-way loop
SD-1A239-01	No	4-wire loop
SD-1A240-01	E1R, E2S+E2SA	
SD-1A241-01	E1R, E2S+E2SA	
SD-1A245-01	E3C, E5C, E4C, E2C	
SD-1A248-01	No	4-wire loop
SD-1A252-01	E4B, E3B, E2B	Type III interface. See Sect C 1.3
SD-1A252-05	E4B, E3B, E2B	See Sect C 1.3
SD-1A254-01	No	Req DC path
SD-1A255-01	No	Req DC path
SD-1A264-01	E3C, E5C, E4C, E2C	Outgoing only
SD-1A264-01	E5D, E4D, E2D, E3D	Incoming only
SD-1A266-01	E5D, E4D, E2D, E3D	See Sect C 3.
SD-1A266-05	E5D, E4D, E2D	
SD-1A287-01	E4B, E3B, E2B	Opt Z for Type III interface.

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-1A301-01	No	Opt Y for Type II interface See Sect C 1.1.3, 1.3 SX signaling, use SD-99435-01
SD-1A311-01	E4D	
SD-1A312-05	E4B, E3B, E2B	
SD-1A315-01 IN	E5D, E4D, E2D	Use E-D on T&R Leads
SD-1A315-01 OUT	E5C, E4C, E2C	Use E-C on KP & KPR Leads
SD-1A316-01	E4B, E3B, E2B	See Sect C 1.3
SD-1A317-01	No	Too many signaling states
SD-1A318-01	E4B, E3B, E2B	See Sect C 1.3
SD-1A319-01	E1P, E2L	Option Z
SD-1A362-01	E4B, E3B, E2B	
SD-1A366-01	E4B, E3B, E2B	
SD-1A368-01	No	SX signaling
SD-1A393-01	E4B, E3B, E2B	
SD-1B002-01 IN	E4D	Comp with wink ringback only
SD-1B002-01 OUT	E3C, E4C	
SD-1B003-01 IN	E4D	Use wink and/or inband coin and ringback signals
SD-1B003-01 OUT	E3C, E4C	
SD-1B004-01	E4B, E3B, E2B	Use CAD 12 for Type III or CAD 13 for Type II interface. See Sect C 1.3
SD-1B004-01 OUT	No	4-wire loop sig.
SD-1B005-01 IN	E4B, E3B, E2B	Use CAD 11 for Type III or CAD 13 for Type II interface. See Sect C 1.3
SD-1B005-01 OUT	E3C, E4C	
SD-1B006-01 IN	E4B, E3B, E2B	See Sect C 1.3
SD-1B006-01 OUT		See Sect B 5., C 1.3
SD-1B007-01 IN	E4B, E3B, E2B	See Sect C 1.3
SD-1B007-01 OUT		See Sect B 5., C 1.3
SD-1B008-01	No	Not suitable for transmission reasons
SD-1B009-01	E4B, E3B, E2B	See Sect B 5.
SD-1B010-01	E3C	Z option req.
SD-1B016-01 LP	No	High-low supv
SD-1B016-01 E&M	E4B, E3B, E2B	Type III interface, see Sect C 1.3
SD-1B102-01 LP	E4D	Incoming port
SD-1B102-01 LP	E3C, E4C	Outgoing port
SD-1B102-01 E&M	E4B, E3B, E2B	Two channels required
SD-1B103-01 LP	E3C, E4C	Two channels required
SD-1B103-01 E&M	E4B, E3B, E2B	Two channels required
SD-1B110-01	E4B, E3B, E2B	

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-1B113-01	E4B, E3B, E2B	
SD-1B115-01	DPO E5C, E4C, E2C	Wink RF only
SD-1B115-01	MFO E3C, E4C	Wink RF only
SD-1B115-01	IN No	Resistance too high
SD-1B116-01	IN E4B, E3B, E2B	Type II or III interface, See Sect C 1.3
SD-1B116-01	OGT E5C, E4C, E2C	Do not use opt. V
SD-1B117-01	IN E4B, E3B, E2B	Type II or III interface, See Sect C 1.3
SD-1B117-01	OGT No	SX signaling
SD-1B118-01	IN E4B, E3B, E2B	Type II or III interface, See Sect C 1.3
SD-1B118-01	OGT E4B, E3B, E2B	Type II or III interface, See Sect 3 1.3
SD-1B145-01	E4B, E3B, E2B	Opt W&T or W&V. See Sect B 5., C 1.3.
SD-1B154-01	OGT E3C, E4C	
SD-1B154-01	IT No	High-low supv
SD-1B183-01	E3C, E5C, E4C, E2C	High-low supv
SD-1B185-01	OGT E4D	
SD-1B185-01	IT E4D	E5D or E2D may be used where rev MB is not req, Use Fig. 4, see Sect C 3.
SD-1B186-01	E4D	
SD-1B188-01	IT No	SX supv
SD-1B191-01	OGT No	Outpulses too soon
SD-1B191-01	IT E3C, E5C, E4C, E2C	
SD-1B193-01	OGT E3C, E5C, E4C, E2C	
SD-1B193-01	IT E3C, E5C, E4C, E2C	
SD-1B195-01	E3C, E5C, E4C, E2C	See Sect C 1.3
SD-1B197-01	E3C, E5C, E4C, E2C	
SD-1B198-01	E3C, E5C, E4C, E2C	
SD-1B250-01	OGT E3C, E5C, E4C, E2C	
SD-1B250-01	IT No	High-low supv
SD-1B276-01	E4B, E3B, E2B	Use option X
SD-1B283-01	E4B, E3B, E2B	
SD-1C004-01	No	SX signaling, use SD-99435-01
SD-1C234-01	No	SX signaling, use SD-99435-01
SD-1C353-01	No	E-type signaling units can not pulse into an offhook. Requires F-type at dist end
SD-1C354-01	E4B, E3B, E2B	
SD-1E000-01	E1P, E2L	
SD-1E003-01	E4D	See Sect C 3.
SD-1E004-01	E4D	See Sect C 3.
SD-1E007-01	No	SX Signaling, Use

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
		SD-99446-01
SD-1E011-01	E1R, E2L	
SD-1E088-01	E1R, E2S + E2SA	
SD-1E201-01	E1R, E2S + E2SA	NG with toll conn. or rev bat
SD-1E202-01	E1R, E2S + E2SA	
SD-1E213-01	E1R, E2S+E2SA	
SD-1E219-02	No	Ringdown
SD-1E220-02	E4B, E3B, E2B	See Sect C 1.1, 1.2
SD-1E240-01	E5D, E4D, E2D	
SD-1E304-01	E1P, E2L	NG with toll diversion
SD-1E306-01	E1R, E2S + E2SA	NG with toll diversion
SD-1E307-01	E1R, E2S + E2SA	NG with toll diversion
SD-1E318-01	No	20 Hz ringdown
SD-1E321-01	E4B, E3B, E2B	
SD-1E446-01	E4B, E3B, E2B	See Sect C 1.1, 1.2
SD-1E500-01	E4B, E3B, E2B	See Sect C 1.1, 1.2
SD-1E500-02	E4B, E3B, E2B	See Sect C 1.1, 1.2
SD-1E505-01	No	SX signaling
SD-1G228-01	No	High-low supv
SD-1G235-01	E4B, E3B, E2B	Requires W or Y wiring
SD-1H017-01	No	SX signaling
SD-1H042-01	E4B, E3B, E2B	
SD-1H043-01	E5D, E4D, E2D	
SD-1H044-01	No	Wet-dry supv
SD-1H061-01	E4B, E3B, E2B	
SD-1H065-01	E4B, E3B, E2B	
SD-1H083-01	E4B, E3B, E2B	
SD-1H084-01	E4B, E3B, E2B	
SD-2A014-01	E4B, E3B, E2B	See Sect C 1.1.3, use E1J for AUTOVON interoffice trunks
SD-2H101-01 MF	E5D, E4D, E2D	See Sect C 3.
SD-2H101-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-2H103-01 MF	E3C, E4C	
SD-2H103-01 DP	E5C, E4C, E2C	See Sect C 2.5.6
SD-2H103-02 MF	E3C, E4C	Issue 4 or later.
SD-2H103-02 DP	E5C, E4C, E2C	Issue 4 or later
SD-2H104-01 MF	E5D, E4D, E2D, E3D	See Sect C 2.5.6
SD-2H104-01 DP	E5D, E4D, E2D	See Sect C 3.
SD-2H105-01	No	Hi-low, wet-dry
SD-2H107-01	No	Wet-dry sup
SD-2H108-01	No	3-wire, SX rering
SD-2H109-01	No	Sleeve supervision
SD-2H110-01	E4D	See Sect C 3., 3.4.3
SD-2H111-01	E5D, E4D, E2D	See Sect C 3.

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-2H112-01	E4B, E3B, E2B	Use trunk ckt option H or S for Type III interface, or option J or T for Type II interface. See Sect C 1.3
SD-2H113-01	No	SX signals
SD-2H141-01	No	Req sleeve lead
SD-2H144-01	E3C, E4C	
SD-2H147-01	No	Wet-dry supv
SD-2H148-01	No	2-way loop
SD-2H149-01	E5D, E4D, E2D	
SD-2H151-01	No	+130, -130 sig
SD-2H154-01	E5D, E4D, E2D	See Sect C 3.
SD-2H155-01	No	Sleeve supv
SD-2H156-01	No	Sleeve supv
SD-2H157-01	E4B, E3B, E2B	Use trunk ckt option X for Type III interface, or option W for Type II interface, See Sect C 1.3
SD-2H158-01	E4B, E3B, E2B	Use trk ckt option Y for Type III interface, or option Z for Type II interface. See Sect C 1.3
SD-2H173-01	E1P, E2L	
SD-2H174-01	E1R, E2S+E2SA	
SD-2H180-01	No	Signaling on A&B Leads
SD-2H186-01	E2L	
SD-3B204-01	E4B, E3B, E2B	
SD-3B205-01	E4B, E3B, E2B	
SD-3H220-01	See Notes	See CPS's below
CPS-FB360 DP	E5C, E4C, E2C	
CPS-FB360 MF	E3C, E4C	
CPS-FB361	E4B, E3B, E2B	Type II interface, See Sect C 1.3
CPS-FB370	No	Incompatible at distant end
CPS-FB371	E5D, E4D, E2D	
CPS-FB382	E4B, E3B, E2B	Type II interface, See Sect C 1.3
CPS-FB391	E4B, E3B, E2B	Type III interface, See Sect C 1.3
CPS-FB399 DP	E5C, E4C, E2C	
CPS-FB399 MF	E3C, E4C	
SD-5E001-01	E1R, E1S+E1SA	Not good for toll diversion
SD-5E004-01	E4B, E3B, E2B	
SD-5E028-01	E4B, E3B, E2B	
SD-5E041-01	E4B, E3B, E2B	E&M option only

SWITCHING CIRCUIT COMPATIBILITY LIST

CKT. NUMBER AND TYPE OF PULSING	COMPATIBILITY	NOTES
SD-5E046-01	E4D	
SD-5E047-01	E4D	
ES-6G108-01	E4B, E3B, E2B	For associated audio fac. Type II Interface.
SD-7C005-01	E4B, E3B, E2B	See Sect C 1.3
SD-7C022-01	E4B, E3B, E2B	Type II or III interface. See Sect C 1.3