

**§ 68.306**

**47 CFR Ch. I (10–1–00 Edition)**

accommodate cable capacitance. The leakage current limitation may be increased to  $(10N+0.13L)$  mA peak where L is the length of interconnecting cable in the leakage path in meters and N is the number of equipment units that the combination or assembly will place in parallel across a telephone connection.

(7) RF filters and surge protectors on the line side of power supplies may be disconnected before making §68.304 leakage measurements. As an alternative to disconnecting these filters and surge protectors, this measurement may be made using a dc voltage equal to the peak ac test voltage.

[62 FR 61667, Nov. 19, 1997]

**§ 68.306 Hazardous voltage limitations.**

(a) *General.* Under no condition of failure of registered terminal equipment or registered protective circuitry

that can be conceived to occur in the handling, operation or repair of such equipment or circuitry, shall the open circuit voltage on telephone connections exceed 70 volts peak after one second, except for voltages for network control signalling, alerting and supervision.

(1) *Type I E&M Leads.* Registered terminal equipment shall comply with the following requirements for terminal equipment on the “A” or “B” side of the interface as shown in Figures 68.3(e)(i):

(i) The dc current on the E lead shall not exceed 100 mA.

(ii) The maximum dc potentials to ground shall not exceed the following when measured across a resistor of 20 kohms  $\pm 10\%$ :

TABLE 68.306(a)—TYPE I E&M, DC POTENTIALS

	E lead	M lead
TE on “B” side originates signals to network on E lead.	$\pm 5$ V .....	$\pm 5$ V.
TE on “A” side originates signals to network on M lead.	–56.5 V; no positive potential with respect to ground.	–56.5 V; no positive potential with respect to ground.

(iii) The maximum ac potential between E&M leads and ground reference shall not exceed 5V peak.

(iv) M lead protection shall be provided so that voltages to ground do not exceed 60 volts. For relay contact implementation, a power dissipation capability of 0.5 watt shall be provided in the shunt path.

(v) If the registered terminal equipment contains an inductive component in the E lead, it must assure that the transient voltage across the contact as a result of a relay contact opening does not exceed the following voltage and duration limitations:

- (A) 300 volts peak,
- (B) A rate of change of one volt per microsecond, and
- (C) A 60-volt level after 20 milliseconds.

(2) *Type II E&M Leads.* Registered terminal equipment shall comply with the following requirements:

(i) For terminal equipment on the “A” side of the interface, the dc current in the E lead shall not exceed 100 mA. The maximum ac potential between the E lead and ground shall not exceed 5 V peak.

(ii) For terminal equipment on the “B” side of the interface, the dc current in the SB lead shall not exceed 100 mA. The maximum ac potential between the SB lead and ground shall not exceed 5 V peak.

(iii) The maximum dc potentials to ground shall not exceed the following when measured across a resistor of 20 kohms  $\pm 10\%$ :

TABLE 68.306(b)—TYPE II E&M, DC POTENTIALS

	E lead	M lead	SB lead	SG lead
TE on “B” side of the interface originates signals to network on E lead.	$\pm 5$ V .....	$\pm 5$ V	–56.5 V; no positive potential with respect to ground.	$\pm 5$ V.

TABLE 68.306(b)—TYPE II E&M, DC POTENTIALS—Continued

	E lead	M lead	SB lead	SG lead
TE on "A" side of the interface originates signals to network on M lead.	-56.5 V; no positive potential with respect to ground.	±5 V	±5 V .....	±5 V.

(iv) The maximum ac potential to ground shall not exceed 5V peak on the following leads, from sources in the terminal equipment:

(A) M, SG and SB leads for terminal equipment on the "A" side of the interface.

(B) E, SG and M leads for terminal equipment on the "B" side of the interface.

(v) If the registered terminal equipment contains an inductive component in the (E) or (M) lead, it must assure that the transient voltage across the contact as a result of a relay contact opening does not exceed the following voltage and duration limitations:

(A) 300 volts peak,

(B) A rate of change of one volt per microsecond, and

(C) A 60-volt level after 20 milliseconds.

(3) *Off premises station voltages.* (i) Talking battery or voltages applied by the PBX (or similar systems) to all classes of OPS interface leads for supervisory purposes must be negative with respect to ground, shall not be more than -56.5 volts dc with respect to ground, and shall not have a significant ac component.<sup>1</sup>

(ii) Ringing signals applied by the PBX (or similar systems) to all classes of OPS interface leads shall comply with requirements in paragraph (d) of this section. Ringing voltages shall be applied between the ring conductor and ground.

(4) *Direct Inward Dialing (DID).* Voltages applied by the PBX (or similar systems) to DID interface leads for supervisory purposes must be negative with respect to ground, shall not be more than -56.5 volts dc with respect

to ground, and shall not have a significant ac component.<sup>2</sup>

(5) *Local Area Data Channel Interfaces.* For Local Area Data Channel interfaces, during normal operating modes including terminal equipment initiated maintenance signals, registered terminal equipment shall ensure, except during the application of ringing (limitations specified in paragraph (d) of this section), with respect to telephone connections (tip, ring, tip 1, ring 1) that:

(i) Under normal operating conditions, the rms current per conductor between short-circuit conductors, including dc and ac components, does not exceed 350 milliamperes. For other than normal operating conditions, the rms current between any conductor and ground or between short-circuited conductors, including dc and ac components, may exceed 350 milliamperes for no more than 1.5 minutes;

(ii) The dc voltage between any conductor and ground does not exceed 60 volts. Under normal operating conditions it shall not be positive with respect to ground (though positive voltages up to 60 volts may be allowed during brief maintenance states);

(iii) AC voltages are less than 42.4 volts peak between any conductor and ground, (terminal equipment shall comply while other interface leads are both):

(A) Unterminated, and

(B) Individually terminated to ground); and,

(iv) Combined ac and dc voltages between any conductor and ground are less than 42.4 volt peak when the absolute value of the dc component is less than 21.2 volts, and less than  $(32.8 + 0.454 \times V_{dc})$  when the absolute value of the dc component is between 21.2 and 60 volts.

<sup>1</sup>The ac component should not exceed 5 volts peak, when not otherwise controlled by § 68.308.

<sup>2</sup>The ac component shall not exceed 5 volts peak, where not otherwise controlled by § 68.308.

(6) *Ringdown Voiceband Private Line and Voiceband Metallic Channel Interface.* During normal operation, registered terminal equipment for connection to ringdown voiceband private line interfaces or voiceband metallic channel interfaces shall ensure that:

(i) Ringing voltage does not exceed the voltage and current limits specified in paragraph (d) of this section, and is:

(A) Applied to the ring conductor with the tip conductor grounded for 2-wire interfaces, or

(B) Simplex on the tip and ring conductors with ground simplex on the tip 1 and ring 1 conductors for 4-wire interfaces.

(ii) Except during the signaling mode or for monitoring voltage, there is no significant positive dc voltage (not over +5 volts) with respect to ground:

(A) For 2-wire ports between the tip lead and ground and the ring lead and ground and

(B) For 4-wire ports between the tip lead and ground, the ring lead and ground, the tip 1 lead and ground, and the ring 1 lead and ground.

(iii) The dc current per lead, under short circuit conditions shall not exceed 140 milliamperes.

(b) *Connection of non-registered equipment to registered terminal equipment or registered protective circuitry—General.* Leads to, or any elements having a conducting path to telephone connections, auxiliary leads or E&M leads shall:

(1) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use the same connector as leads or metallic paths connecting power connections;

(2) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use adjacent pins on the same connector as metallic paths to lead to non-registered equipment, when specification details provided to the Commission, pursuant to, § 68.200(g), do not show that interface voltages are less than non-hazardous voltage source limits in paragraph (c) of this section.

(c) *Non-Hazardous Voltage Source.* A voltage source is considered a non-hazardous voltage source if it conforms with the requirements of § 68.302,

§ 68.304 and paragraph (b) of this section, with all connections to the source other than primary power connections treated as “telephone connections,” and if such source supplies voltages no greater than the following under all modes of operation and of failure:

(1) AC voltages less than 42.4 volts peak;

(2) DC voltages less than 60 volts; and

(3) Combined ac and dc voltages less than 42.4 volts peak when the absolute value of the dc component is less than 21.2 volts and less than  $(32.8 + 0.454 \times V_{dc})$  when the absolute value of the dc component is between 21.2 and 60 volts.

(d) *Ringling Sources.* Except for class A OPS interfaces, ringling sources shall meet all of the following restrictions:

(1) *Ringling Signal Frequency.* The ringling signal shall use only frequencies whose fundamental component is equal to or below 70 Hz.

(2) *Ringling Signal Voltage.* The ringling voltage shall be less than 300 V peak-to-peak and less than 200 V peak-to-ground across a resistive termination of at least 1 megohm.

(3) *Ringling Signal Interruption Rate.* The ringling voltage shall be interrupted to create quiet intervals of at least one second (continuous) duration each separated by no more than 5 seconds. During the quiet intervals, the voltage to ground shall not exceed the voltage limits given in paragraph (a)(3)(i) of this section.

(4) *Ringling Signal Sources.* Ringling voltage sources shall comply with the following requirements:

(i) If the ringling current through a 500 ohm(s) (and greater) resistor does not exceed 100 mA peak-to-peak, neither a ring trip device nor a monitoring voltage are required.

(ii) If the ringling current through a 1500 ohm (and greater) resistor exceeds 100 mA peak-to-peak, the ringling source shall include a current-sensitive ring trip device in series with the ring lead that will trip ringling as specified in Figure 68.306(a) in accordance with the following conditions:

(A) If the ring trip device operates as specified in Figure 68.306(a) with  $R=500$  ohm (and greater) no monitoring voltage is required;

(B) If, however, the ring trip device only operates as specified in Figure

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68.306(a) with  $R=1500$  ohm (and greater) then the ringing voltage source shall also provide a monitoring voltage between 19 V dc and 56.5 V dc, negative with respect to ground, on the tip or ring conductor.

(iii) If the ringing current through a 500-ohm (and greater) resistor exceeds 100 mA (peak-to-peak) but does not exceed 100 mA peak-to-peak with 1500-ohm (and greater) termination, the ringing voltage source shall include ei-

ther a ring trip device that meets the operating characteristics specified in Figure 68.306(a) with 500-ohm (and greater) resistor, or a monitoring voltage as specified in paragraph (d)(4)(ii)(B) of this section.

NOTE TO PARAGRAPH (d)(4)(iii): If the operating characteristics specified in Figure 68.306(a) are not met with both the 500-ohm and 1500-ohm terminations, then the terminal equipment under test fails (See Table 68.306(c)).

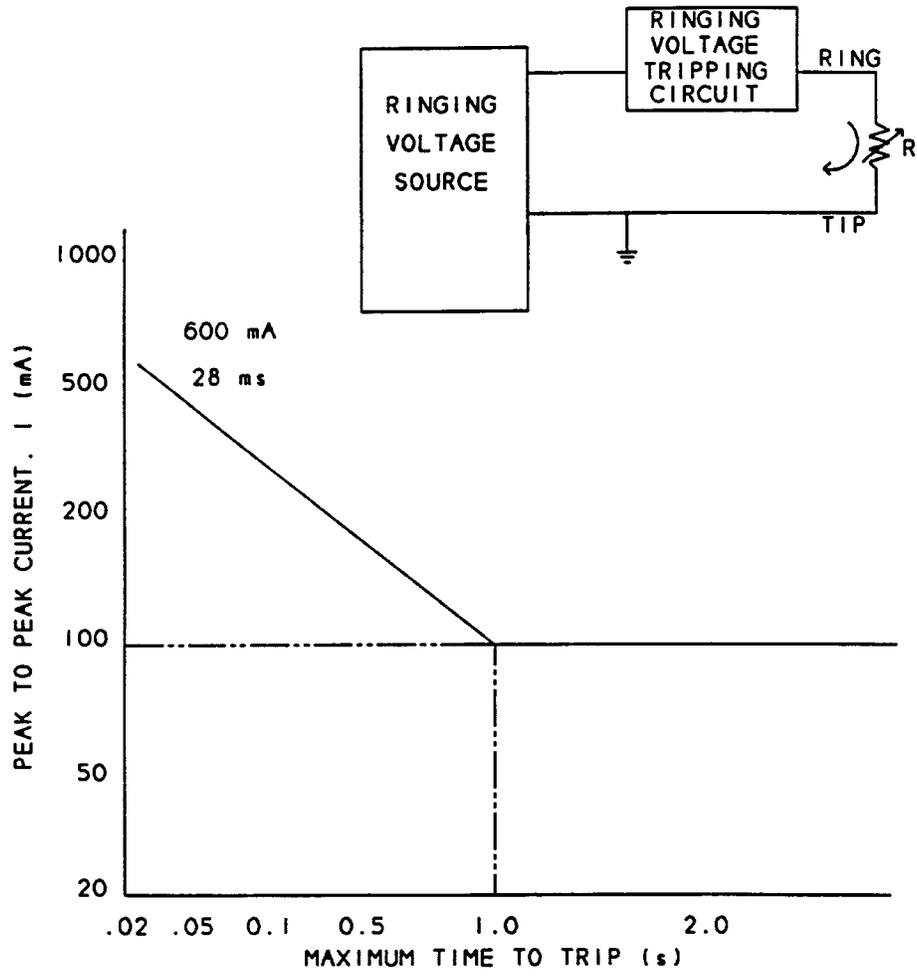


Figure 68.306(a)

Illustration of Ring Trip Requirement

TABLE 68.306(C)—SUMMARY OF RING TRIP REQUIREMENTS

Section 68.306 (d)(4).	Ringing current (mA p.p)		Function required		Ring trip device operates per figure 68.306(a)
	R=500 ohms and greater	R=1500 ohms and greater	Ring trip	Monitor voltage	
(i) .....	<100	<100	Optional .....	Optional .....	Optional.
(ii)(A) .....	N/A	>100	Yes .....	Optional .....	Yes for both resistances.
(ii)(B) .....	N/A	>100	Yes .....	Yes .....	Yes for R=1500 ohms and greater. No for R=500 ohms and greater.
(iii) .....	>100	<100			
(1) Either Ring-Trip device or Monitor Voltage required .....					Yes for R=500 ohms and greater, if Ring Trip Device is used.

(e) Intentional paths to ground (as required by §68.304). (1) Connections with operational paths to ground. Registered terminal equipment and registered protective circuitry having an intentional dc conducting path to earth ground at operational voltages that was excluded during the leakage current test of §68.304 shall have a dc current source applied between the following points:

- (i) Telephone connections, including tip, ring, tip 1, ring 1, E&M leads and auxiliary leads, and
- (ii) Earth grounding connections.

NOTE TO PARAGRAPHS (e)(1)(i) AND (e)(1)(ii): For each test point, gradually increase the current from zero to 1 ampere, then maintain the current for one minute. The voltage between paragraph (e)(1)(i) and paragraph (e)(1)(ii) of this section shall not exceed 0.1 volt at any time. In the event there is a component or circuit in the path to ground, the requirement shall be met between the grounded side of the component or circuit and the earth grounding connection.

(2) Connections with protection paths to ground. Registered terminal equipment and protective circuitry having an intentional dc conducting path to earth ground for protection purposes at the leakage current test voltage that was removed during the leakage current test of §68.304 shall, upon its replacement, have a 50 or 60 Hz voltage source applied between the following points:

- (i) Simplex telephone connections, including tip and ring, tip 1 and ring 1, E&M leads and auxiliary leads, and
- (ii) Earth grounding connections.

NOTE to paragraphs (e)(2)(i) and (e)(2)(ii): Gradually increase the voltage from zero to 120 volts rms for registered terminal equipment, or 300 volts rms for protective circuitry, then maintain the voltage for one minute. The current between (e)(2)(i) and (e)(2)(ii) of this section shall not exceed 10 mA peak at any time. As an alternative to carrying out this test on the complete equipment or device, the test may be carried out separately on components, subassemblies, and simulated circuits, outside the unit, provided that the test results would be representative of the results of testing the complete unit.

[62 FR 61667, Nov. 19, 1997; 63 FR 25173, May 7, 1998]

**§ 68.308 Signal power limitations.**

(a) *General.* Limits on signal power shall be met at the interface for all 2-wire network ports and, where applicable to offered services, both transmit and receive pairs of all 4-wire network ports. Signal power measurements shall be made using terminations as specified in each of the following limitations. The transmit and receive pairs for 4-wire network ports shall be measured with the pair not under test connected to a termination equivalent to that specified for the pair under test. Through gain limitations apply only in the direction of transmission toward the network.

(b) *Voiceband metallic signal power.* (1) Limitations at the interface on internal signal sources not intended for network control signaling: