

secure telephones, as defined by § 68.3, are exempt from this requirement.

[62 FR 61664, Nov. 19, 1997, as amended at 64 FR 3048, Jan. 20, 1999]

§ 68.302 Environmental simulation.

Unpackaged Registered Terminal Equipment and Registered Protective Circuitry shall comply with all the rules specified in this subpart, both prior to and after the application of the mechanical and electrical stresses specified in this section, notwithstanding that certain of these stresses may result in partial or total destruction of the equipment. Both telephone line surges, Type A and Type B, shall be applied as specified in paragraphs (b) and (c) of this section. Different failure criteria apply for each surge type.

(a) *Mechanical shock.* (1) Hand-Held Items Normally Used at Head Height: 18 random drops from a height of 1.5 meters onto concrete covered with 3 millimeters asphalt tile or similar surface.

(2) Table (Desk) Top Equipment 0–5 kilograms: Six random drops from a height of 750 millimeters onto concrete covered with 3 millimeters asphalt tile or similar surface.

(3) The drop tests specified in the mechanical shock conditioning stresses shall be performed as follows: The unit should be positioned prior to release to ensure as nearly as possible that for every six drops there is one impact on each of the major surfaces and that the surface to be struck is approximately parallel to the impact surface.

(b) *Telephone Line Surge—Type A—(1) Metallic.* Apply two metallic voltage surges (one of each polarity) between any pair of connections on which lightning surges may occur; this includes:

- (i) Tip to ring;
- (ii) Tip 1 to ring 1; and
- (iii) For a 4-wire connection that uses simplex pairs for signalling, tip to ring 1 and ring to tip 1.

NOTE TO PARAGRAPH (b)(1). The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(b) having a front time (t_f) of 10 μ s maximum and a decay time (t_d) of 560 μ s minimum, and shall have a short circuit current waveshape in accordance with Figure 68.302(c) having a front time (t_f) of 10 μ s (useconds) maximum and a

decay time (t_d) of 560 μ s minimum. The peak voltage shall be at least 800 volts and the peak short circuit current shall be at least 100 amperes. Surges are applied:

(A) With the equipment in all states that can affect compliance with the requirements of this part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially;

(B) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner that occurs in normal use;

(C) Under reasonably foreseeable disconnection of primary power sources, with primary power cords plugged and unplugged, if so configured.

(2) *Longitudinal.* Apply two longitudinal voltage surges (one of each polarity) from any pair of connections on which lightning surges may occur. This includes the tip-ring pair and the tip 1—ring 1 pair, to earth grounding connections, and to all leads intended for connection to non-registered equipment, connected together. Surges are applied as follows:

(i) With the equipment in all states that can affect compliance with the requirements of this part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially;

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner that occurs in normal use;

(iii) Under reasonably foreseeable disconnection of primary power sources, as for example, with primary power cords plugged and unplugged.

NOTE TO PARAGRAPH (b)(2): The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(b) with a front time (t_f) of 10 μ s (useconds) maximum and a decay time (t_d) of 160 μ s minimum, and shall have a short circuit current waveshape in accordance with Figure 68.302(c) having a front time (t_f) of 10 μ s (useconds) maximum and a decay time (t_d) of 160 μ s minimum. The peak voltage shall be at least 1500 volts and the peak short circuit current shall be at least 200 amperes.

(3) Failure Modes resulting from application of Type A telephone line surges. Regardless of operating state, equipment and circuitry are allowed to be in violation of the longitudinal balance requirements of § 68.310(b) and (c)

and, for terminal equipment connected to Local Area Data Channels, the longitudinal signal power requirements of § 68.308(f)(3), if:

(i) Such failure results from an intentional, designed failure mode that has the effect of connecting telephone or auxiliary connections with earth ground; and,

(ii) If such a failure mode state is reached, the equipment is designed so that it would become substantially and noticeably unusable by the user, or an indication is given (*e.g.*, an alarm), in order that such equipment can be immediately disconnected or repaired.

NOTE TO PARAGRAPH (b)(3)(ii): The objective of paragraph (b)(3)(ii) is to allow for safety circuitry to either open-circuit, which would cause a permanent on-hook condition, or to short-circuit to ground, as a result of an energetic lightning surge. Off-hook tests would be unwarranted if the off-hook state cannot be achieved. A short to ground has the potential for causing interference resulting from longitudinal imbalance, and therefore designs must be adopted which will cause the equipment either to be disconnected or repaired rapidly after such a state is reached, should it occur in service.

(c) *Telephone Line Surge—Type B—(1) Metallic.* Apply two metallic voltage surges (one of each polarity) to equipment between any pair of connections on which lightning surges may occur; this includes:

- (i) Tip to ring;
- (ii) Tip 1 to ring 1; and
- (iii) For a 4-wire connection that uses simplex pairs for signalling, tip to ring 1 and ring to tip 1.

NOTE TO PARAGRAPH (c)(1): The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(b) having a front time (t_f) of 9 μ s ($\pm 30\%$) and a decay time (t_d) of 720 μ s ($\pm 20\%$) and shall have a short circuit current waveshape in accordance with Figure 68.302(c) having a front time (t_f) of 5 μ s ($\pm 30\%$) and a decay time (t_d) of 320 μ s ($\pm 20\%$). The peak voltage shall be at least 1000 volts and the peak short circuit current shall be at least 25 amperes. The wave shapes are based on the use of ideal components in Figure 68.302(a) with S_2 in Position M. Surges are applied:

(A) With the equipment in all states that can affect compliance with the requirements of this part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially.

(B) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner that occurs in normal use.

(C) Under reasonably foreseeable disconnection of primary power sources, as for example, with primary power cords plugged and unplugged.

(2) *Longitudinal.* Apply two longitudinal voltage surges (one of each polarity) from any pair of connections on which lightning surges may occur. This includes the tip-ring pair and the tip 1—ring 1 pair to earth grounding connections and to all leads intended for connection to non-registered equipment, connected together. Surges are applied as follows:

(i) With the equipment in all states that can affect compliance with the requirements of this part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially.

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner that occurs in normal use.

(iii) Under reasonably foreseeable disconnection of primary power sources, as for example with primary power cords plugged and unplugged.

NOTE TO PARAGRAPH (c)(2): For each output lead of the surge generator, with the other lead open, the surge shall have an open circuit voltage waveform in accordance with Figure 68.302(b) having a front time (t_f) of 9 μ s ($\pm 30\%$) and a decay time (t_d) of 720 μ s ($\pm 20\%$) and shall have a short circuit current waveshape in accordance with Figure 68.302(c) having a front time (t_f) of 5 μ s ($\pm 30\%$) and a decay time (t_d) of 320 μ s ($\pm 20\%$). The peak voltage shall be at least 1500 volts and the peak short circuit current shall be at least 37.5 amperes. The wave shapes are based on the use of ideal components in Figure 68.302(a) with S_2 in Position L.

(3) *Failure Modes resulting from application of Type B telephone line surges.* Registered terminal equipment and registered protective circuitry shall be capable of withstanding the energy of Surge Type B without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with these rules.

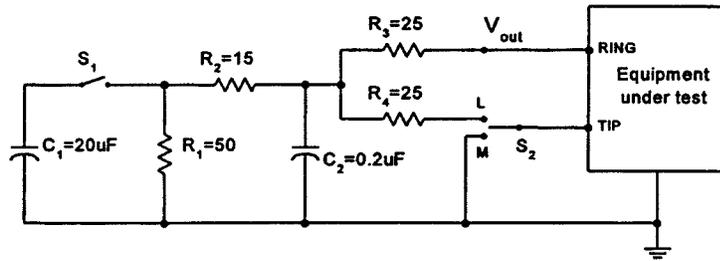


Fig. 68.302 (a) - Simplified Surge Generator

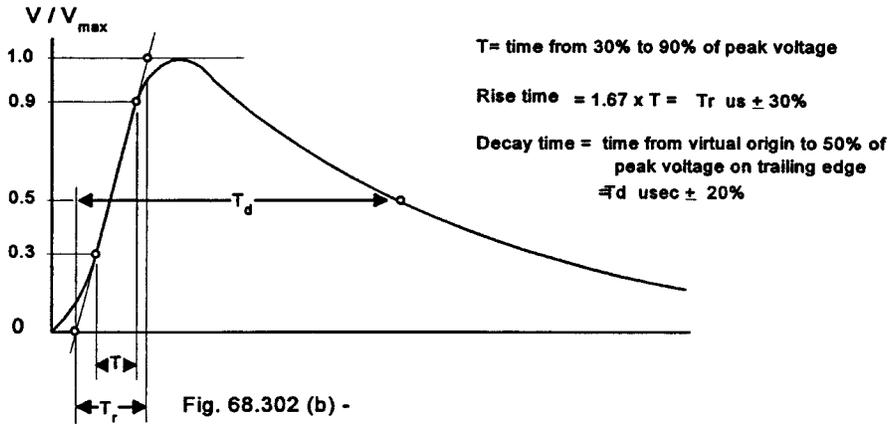


Fig. 68.302 (b) - Open Circuit Voltage Waveshape, $T_r \times T_d$

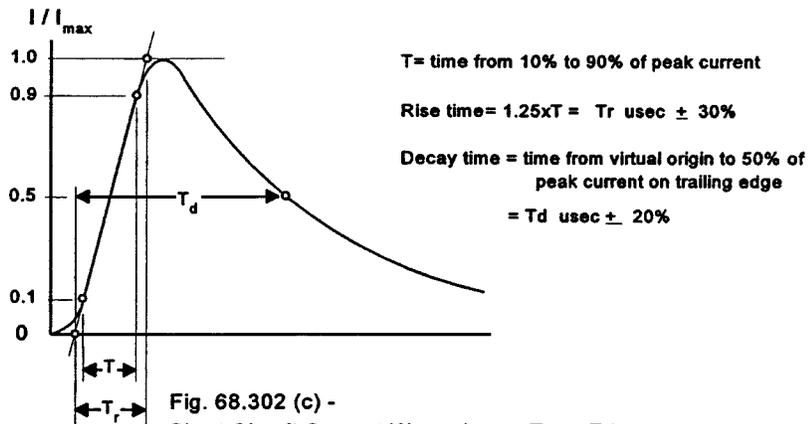


Fig. 68.302 (c) - Short Circuit Current Waveshape, $T_r \times T_d$

(d) *Power Line Surge.* (1) Apply six power line surges (three of each polarity) between the phase and neutral terminals of the ac power line while the equipment is being powered. The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(b) having a front time (t_f) of 2 μs

maximum and a decay time (t_d) of 10 μ s minimum and shall have a short circuit current waveshape in accordance with Figure 68.302(c) with a front time (t_f) of 2 μ s maximum and a decay time (t_d) of 10 μ s minimum. The peak voltage shall be at least 2500 volts and the peak short circuit current shall be at least 1000 amperes. Surges are applied:

(i) With the equipment in all states that can affect compliance with the requirements of this part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially;

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered/non-certified equipment) terminated in a manner which occurs in normal use.

(2) Failure Modes resulting from application of power line surge. Registered terminal equipment and registered protective circuitry shall comply with all the criteria contained in the rules and regulations in this subpart, both prior to and after the application of the power line surge specified in paragraph (d) of this section, not withstanding that this surge may result in partial or total destruction of the equipment under test.

[62 FR 61664, Nov. 19, 1997; 63 FR 25173, May 7, 1998]

§ 68.304 Leakage current limitations.

Registered terminal equipment and registered protective circuitry shall have a voltage applied to the combination of points listed in the table below. The test voltage shall be ac of 50 or 60 Hz rms.

- (a) All telephone connections;
- (b) All power connections;
- (c) All possible combinations of exposed conductive surfaces on the exterior of such equipment or circuitry including grounding connection points, but excluding terminals for connection to other terminal equipment;
- (d) All terminals for connection to registered protective circuitry or non-registered equipment;
- (e) All auxiliary lead terminals;
- (f) All E&M lead terminals, and
- (g) All PR, PC, CY1 and CY2 leads.

TABLE 68.304(a).—VOLTAGE APPLIED FOR VARIOUS COMBINATIONS OF ELECTRICAL CONNECTIONS

| Voltage source connected between: | ac value ¹ |
|---------------------------------------|-----------------------|
| (a) and (b) (see NOTES 1, 2, 3) | 1500 |
| (a) and (c) (see NOTES 1, 2) | 1000 |
| (a) and (d) (see NOTES 1, 2) | 1000 |
| (a) and (e) (see NOTES 1, 2) | 1000 |
| (a) and (f) (see NOTES 1, 2) | 1000 |
| (a) and (g) (see NOTES 1, 2) | 1000 |
| (b) and (c) (see NOTE 3) | 1500 |
| (b) and (d) (see NOTE 3) | 1500 |
| (b) and (e) (see NOTE 3) | 1500 |
| (b) and (f) (see NOTE 3) | 1500 |
| (b) and (g) (see NOTE 3) | 1500 |
| (c) and (e) (see NOTES 1, 2) | 1000 |
| (c) and (f) (see NOTES 1, 2) | 1000 |
| (d) and (e) (see NOTE 2) | 1000 |
| (d) and (f) (see NOTE 2) | 1000 |
| (e) and (f) (see NOTE 2) | 1000 |

¹ Value to which test voltage is gradually increased.

NOTES TO TABLE 68.304(a): (1) Gradually increase the voltage from zero to the values listed in Table 68.304(a) over a 30-second time period, then maintain the voltage for one minute. The current in the mesh formed by the voltage source and these points shall not exceed 10 mA peak at any time during this 90-second interval.

(2) Equipment states necessary for compliance with the requirements of this section that cannot be achieved by normal means of power shall be achieved artificially by appropriate means.

(3) A telephone connection, auxiliary lead, or E&M lead that has an intentional dc conducting path to earth ground at operational voltages (such as a ground start lead), may be excluded from the leakage current test in that operational state. Leads or connections excluded for this reason shall comply with the requirements of § 68.306(e)(1).

(4) A telephone connection, auxiliary lead, or E&M lead that has an intentional dc conducting path to earth ground for protection purposes at the leakage current test voltage (such as through a surge suppressor), may have the component providing the conducting path removed from the equipment for the leakage current test in that operational state. Components removed for this reason shall comply with the requirements of § 68.306(e)(2).

(5) Filter paths, such as capacitors used in EMI filters, are left in place during leakage current testing, since these components can be a path for excessive leakage.

(6) For multi-unit equipment interconnected by cables, that is evaluated and registered as an interconnected combination or assembly, the specified 10 mA peak maximum leakage current limitation other than between power connection points and other points, may be increased as described here to