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C15 Compact Softswitch

Grounding System

Document Number: 297-3102-187
Status: Standard
For Release 07.00
Issue: 07.01
Date: January 2011

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The product name remains as CS1500 in Canada and France pending regulatory approvals for a name change.
## Publication history

<table>
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<th>Date</th>
<th>Rating</th>
<th>For Release</th>
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<td>00.03</td>
<td>January 2007</td>
<td>Preliminary</td>
<td>01.00</td>
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<tr>
<td>01.01</td>
<td>May 2007</td>
<td>Standard</td>
<td>01.00</td>
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<tr>
<td>02.01</td>
<td>July 2007</td>
<td>Preliminary</td>
<td>02.00</td>
</tr>
<tr>
<td>02.01</td>
<td>August 2007</td>
<td>Standard</td>
<td>02.00</td>
</tr>
<tr>
<td>03.01</td>
<td>March 2008</td>
<td>Preliminary</td>
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<td>May 2008</td>
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<td>January 2011</td>
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Section 1: Introduction

Scope and purpose

This document summarizes the requirements for the grounding of a Central Office (CO) building, the C15 System, and the interfacing support equipment.

The C15 System has been designed to be consistent with all guidelines in the Nortel Corporate Standard 4122.00, *Grounding of Communication Systems*, and is compliant for use in either Isolated Bonding Networks or in Common Bonding Networks when installed in accordance with all Sections of this document; however, Isolated Bonding Networks is the default installation environment in order to accommodate integration of the C15 System with pre-existing legacy products whose installations were strictly installed in past Isolated Ground Zones or Isolated Ground Planes.
Section 2: Central office grounding

General

Refer to Nortel Corporate Standard 4122.00, *Grounding of Communication Systems*. For legacy products remaining in the C15 System, the applicable documents (e.g., 297-3401-187, 297-3501-187, or 297-1001-156) also still apply where specific references beyond the content of the Standard are needed.
Section 3: Digital switch grounding

General

The latest Issue of the following document shall be consulted when evaluating grounding of the C15 product itself as well as confirming the grounding expectations of the CO Building environment:

- SD0T01-15, C15 Compact Softswitch (C15) System Application Schematic
Section 4: Interface equipment grounding

General

This section provides grounding guidelines for signaling equipment that interfaces directly with the C15 switch. Guideline emphasis is placed on direct-coupled interface equipment such as digital modems, video terminals, mini-computers, printers, TTYs, clock synchronization sources, alarm wiring, and some types of transmission equipment. Other ac-coupled interface equipment such as transformer-coupled DS-1 cable connection guidelines are also included. Figure 4-1 illustrates essential C15 interface equipment grounding.

Note: Failure to comply with these guidelines has been demonstrated to result in damage within equipment at either or both ends of the signaling interface during electrically dynamic conditions external to the central office such as utility power interruptions, and local electrical storms. Preventive or corrective actions that are identified in any installation should be considered urgent, and should be safely completed at the earliest prepared opportunity.

In addition to these guidelines, the latest issues of the following C15 System Application Schematic should be consulted when evaluating the grounding compliance of an existing interface or when planning an equipment addition:

- SD0T01-15 (for C15 applications in North America)
- SD0T01-06 (for remote installations in North America)
Selection of interface equipment

Before a specific model of interface equipment is selected for use with the C15 switch, it should be evaluated for compliance with the guidelines in the following sections to determine which equipment powering options can be made available. It is strongly recommended that -48V dc-powered interface equipment be used within C15 equipment frames because of the simplicity of the interface to the power distribution structure and because the additional potential for grounding violations associated with the use of ac-powered interface equipment is eliminated. Equipment intended for dc-powered telecom use is often equipped with internal power and grounding option features that enable the equipment to operate in compliance with isolated grounding schemes recognized by the telecom industry.
Figure 4-1: Interface Equipment Grounding

Note: The symbol $\Box$ indicates an interface grounding violation and must be urgently corrected.
Power and grounding guidelines for interface equipment

The selection of a power distribution source for interface equipment is governed by the type of interface circuitry employed rather than on the equipment's proximity to the intended power distribution panel. Interface equipment which connects directly to a C15 communications port by way of RS-232/RS-422, or by any other hard-wire interface method (excluding DS-1 transformer-coupled interfaces, ethernet interfaces, and optical interfaces) must be powered from the J0T75 Power Distribution Panel, PDC, CPDC, or SPDC, or from a downstream distribution panel within the C15 switch lineup, such as a distribution panel in the J0T81 Miscellaneous bay. The J0T75 panel is a circuit breaker panel located in the top shelf position of the PE-01 (peripheral equipment) bay. The battery return(s) for equipment powered from the J0T75 panel must terminate on the Ground Junction Bar (normally located within the cable trough on top of the PE-01 bay). If the power feeds for interface equipment originate at a downstream distribution panel, then the respective battery return(s) must connect to the designated ground collector bar or terminal strip associated with that panel (typically located adjacent to the panel's power distribution terminals).

Note: Under no circumstances should interface equipment battery returns be connected to the C15 framework, or to ground points outside of the C15 such as relay-rack/transmission equipment grounds.

When economic practicality or availability concerns dictate that ac-powered equipment be used, as in the case of video display terminals used to monitor maintenance activity, it is recommended that the equipment be powered from a telecom-grade dc-to-ac inverter. A 500VA inverter is normally sufficient to provide power for two or three maintenance terminals. Critical ac-powered equipment that has no dc-powered equivalent should be powered from a redundant dc-to-ac inverter arrangement. For dc-to-ac inverter connection depictions and guidelines, refer to the functional schematic “AC Protection and Distribution” in the applicable SD0T01 document.

Ground option straps within interface equipment

Equipment which is designed specifically for use in a telecom environment typically has one or more grounding options in the form of electrical straps, rotating screws, jumpers, switches, or other contact means. The purpose of such options is to provide either an open-circuit between the equipment's output signal ground and its chassis, or a short-circuit. Option points may also be present which connect or disconnect the equipment's chassis to battery return. For dc-powered interface equipment which connects directly to the C15, the “OPEN” option (the option which disconnects the equipment's output signal ground from its chassis) must always be selected; the “OPEN” option for battery return-to-chassis, if available, must also be selected.
To obtain specific guidelines for locating connection option points, it is necessary to refer to the equipment manual, or in some cases, to consult with the equipment manufacturer. On modem shelves with multiple plug-in modem cards, all of the cards (including spare cards) must have the “OPEN” option(s) selected; a single card with this option selected differently can defeat the “OPEN” option(s) on the other cards when plugged into the shelf.

**Optical interfaces for C15 Support Equipment**

To comply with the *C15 System Application Schematic* (SD0T01-15), all data terminal equipment (DTE) such as TTY, video terminal, mini-computer, and printer interfaces must have electrical isolation between their data port signal ground and chassis. The chassis for ac-powered equipment is connected directly to ac “green wire” ground (AC EG); consequently, isolation of the interfacing signal ground is needed so that the signal ground of one equipment unit is not corrupted by foreign AC EG activity from another equipment unit through the interface cable. Since most interfacing ac-powered DTEs do not have internal option points to provide this isolation, an optically-isolated interface between the DTE and the DCE craft post provides the most practical interface solution (Interfacing DTEs powered by an inverter are not excluded from this signal-to-chassis ground isolation requirement. Adapting the 3-wire power plug to 2-wire does not make ac-powered DTEs compliant with the grounding requirements). This optical option isolation is built-in on the NT6T10 "console" port, and on the NT6T11 "TTY" port, and consequently does not require an external optical isolation device.

An electrical continuity check will generally determine if an isolation means is necessary for the DTE. If continuity is detected between pins 1 and 7 of the DTE's DB-25 port (RS-232), or if electrical continuity is detected between pin 7 of the DTE's DB-25 port (RS-232) and the DTE's chassis (AC EG), and the DTE design has no internal provision specifically for separating signal ground and chassis, then isolation is necessary. Again, an optical fiber-optic interface provides the most practical interface solution; however, back-to-back modems may also be used to gain the necessary ground isolation if the modem grounding is compliant with the guidelines in this document.

Optical isolation devices are available from various vendors. See sheet B41 of schematic, SD0T01-15, for connectivity detail requirements for these devices, and the maintenance and craft ports where they are expected to be used.
Alarm wiring for interface equipment

The C15 switch alarm scanning circuitry detects the presence or absence of electrical continuity in alarm wire loops; consequently, each assignable alarm detection circuit appears at the Alarm Monitoring Facility MDF connector block as a pin pair. One of the pins in each pair is an extension of a special dedicated ground within the C15 alarm shelf; for example, Base 24 (alarm input 24) is paired with Base RT24 (alarm input ground 24). Equipment to be monitored by the C15 switch such as dc-to-ac inverters, or doors to the central office, must connect to these Base and Base RT alarm pins only by way of an isolated contact set which completes or breaks the alarm loop. A relay located in the monitored equipment typically provides a contact set for this purpose. A magnetic switch normally provides a contact set for a central office door alarm. Items which provide only a contact closure to a ground that is locally associated with the item, or within the item, is not acceptable to connect directly to the intended C15 alarm pin. Failure to comply exposes the alarm and control equipment to possible electrical damage. Un-isolated alarms of this type must first be used to drive a local relay coil so that an isolated contact can then be presented to the Base and Base RT alarm pins.

In response to a recognized alarm condition, the programmed C15 alarm reporting circuitry provides either a loop “CLOSURE” or a loop “OPEN” on the assigned alarm output point. For example, when programmed, alarm output pin CTRL 4 CO, will close its internal contact to alarm output pin, CTRL 4 NO.

Interface cabling to transmission equipment

The cable shields in twisted-pair transmission cable (for DS-1) connecting from C15 port modules to the transmission facilities (such as the DSX field, office repeater bay) are grounded internally within the port module end of the cable only. The opposite end of each cable (for example, NT6T57DA) must be prepared so that the cable shields are cut back and insulated so they cannot make electrical contact with any foreign ground at the transmission facilities. Electrical grounds which are considered foreign to the C15 switch include the MDF frame, patch panels, DSX frame, nearby equipment frames, their battery return, or connection terminals on interface equipment which may even be offered for the purpose of connecting to cable shields.

COAX transmission cables may connect to C15 equipment only where interfaces are designed to accommodate this interface (for example, the NT6T07 used for DS-3). The transmission facility may offer the option of a bond wire between the COAX cable shield and the transmission facility frame. If this option is present, then the bond wire can remain in place given that the NT6T07 possesses coax shield isolation circuitry which will prevent foreign ground currents from entering the C15 via this interface.
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Document Number: 297-3102-187
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Issue: 07.01
Date: January 2011

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