SBC-812-000-029

Common Systems **48V dc Power Distribution System Single Line Diagram Records**

This practices captures for reference a concept developed to enable the systematic de-powering of network equipment facilities.

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Issuing Department:	Enterprise Technology Support
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INTRODUCTION

This practice covers in general form the creation and maintenance of single line diagrams of 48V dc power distribution systems within a building. The purpose of this practice is to capture for reference the concept and methods and procedures developed to enable a systematic de-powering of network equipment during emergency situations.

1. REASON FOR REISSUE

Issue Number	Date Modified	Brief Description of Changes	Author
1	-	renumbered from PBS-005-400PT Iss.A and -400PT Appx.1 Iss.A	bm1924

2. GENERAL

As illustrated in Fig. 1 a single line diagram is a simple yet comprehensive depiction of a building's 48V dc power distribution between the office power plant(s) and equipment battery distribution fuse boards (BDFBs) in their various forms. The diagram illustrates the relative locations of dc power distribution frames, the routes of primary dc power cable fused at 200 amps and greater, and the interior characteristics of a building that can be used as logistical points of reference during emergency conditions.

The purpose of a 48V dc single line diagram is to enable the logical de-powering of network equipment by equipment type or by equipment location within a building during arcing fault or equipment area fire situations. Single line diagrams can minimize the need for carte blanche disconnection of a facility's dc power sources and the need for tracing power cable routes during an emergency condition to selectively identify dc power sources (circuit breaker locations). Using the single line diagram, it should be possible for a person who knows where an emergency is occurring within a building or equipment area to determine which sources of dc power at the dc power plant should be disconnected.

3. APPLICATIONS

Single line diagrams may be created and maintained in office record form to establish an on-going reference to facilitate a sequential de-powering of network equipment within a building. This application may be a reasonable alternative to the carte blanche dc cut-off switch capabilities desired by some fire service jurisdictions. Single line diagrams may also be created as a one-time reference to support emergency de-powering needs that may arise from cable mining activities. This application may be appropriate for cable mining that will occur over long periods of time or on multiple floors within a building.

The need to create a single line diagram for a particular network facility is determined at the local level based on office conditions and business influences. Single line diagrams should be created when a facility's dc power distribution arrangement is such that power source and circuit breaker identification may be hampered during emergency situations. The following dc power distribution characteristics may hamper power source determination during emergency situations:

A. The existence of multiple dc power plants.

B. The use of multiple cable rack paths between power boards and equipment power distribution frames.

C. Primary dc power cables are installed on cable racks containing other types of cable.

4. CREATING SINGLE LINE DIAGRAMS

For new facilities single line diagrams are created and maintained using the engineering and installation information associated with network power jobs. For existing facilities single line diagrams are created by physically tracing dc power cables fused at 200 amps and greater from battery distribution fuse boards (BDFB, PDF, etc.) back to 48 dc power boards. To the extent possible the actual cable routes taken from each BDFB and the 48V dc power boards the cables terminate at should be recorded using colored lines to distinguish different power distribution systems within a building. The following are suggested colors for distinguishing different power distribution systems:

- Red - Cable routes between transport equipment BDFBs and 48V dc power boards.
- Blue - Cable routes between Lucent ESS switch PDFs and 48V dc power boards.
- Green - Cable routes between Nortel DMS switch PDFs and 48V dc power boards.

- Orange - Cable routes for equipment frames cabled directly to 48V dc power boards.

Office records of 48V dc power boards must be updated to indicate the existence of single line diagrams when single line diagrams are created in office record form (for continued use and maintenance during the life of a building). A note similar to the below should be added to power board records to indicate the possible need to update the single line diagram(s) when changes are made to the 48V dc power distribution scheme.

"A schematic of the 48V dc power distribution scheme for this office is depicted on T-(office base)-E911 office record. The –E911 record(s) must be updated whenever changes to the 48V dc distribution scheme involves circuit breakers and cabling rated at 200 amps and larger."

5. RECORDING DIAGRAMED INFORMATION

Office floor plans or a variation thereof should be used to construct office records and one-time application records associated with cable mining jobs. One-time application records should contain the power source and logistical elements used with single line diagram office records as discussed in this part.

5.1. Office Record Numbering

It is important to records familiarization and maintenance that a consistent numbering scheme be used throughout a business unit. The following records numbering scheme is suggested for use where permitted by local office records databases.

- DOC Type = SL (for Single Line diagram)
- DOC Type Title = Single Line Diagram Of 48V dc Power Distribution Scheme ___ Floor
- Unique Record Number = E911 (example: T-1234-E911, T-1234-XX-E911, or T-1234-XX-E911-A, -B, etc.).

In the above numbering examples a –E911 number would be used with single story buildings including single story buildings having dc power plants in a basement (the record is intended to identify power sources for the network equipment area only). An –XX-E911 number would be used with multi-story buildings with the –XX indicator used to indicate which floor the record is associated with. The –E911-A, - B, etc, numbering scheme would be used when it is necessary to split information over two separate diagrams.

5.2. Records Content

A single line diagram should be kept as simple and easy to read as possible while depicting all building features necessary for logistical reference and human orientation. In addition to the building's physical characteristics single line diagrams should only depict primary power distribution frames and those equipment frames/entities that are interconnected to 48V dc power boards via 200 amp and larger circuit breakers. Doing so will minimize diagram clutter and provide more room for specific power source (disconnect) information.

Single line diagrams will primarily be used during emergency situations. It is therefore more important to illustrate the relative locations of dc power distribution components to obvious building features rather than their scaled relationships. Approximate boundaries of major equipment entities should be depicted when that information might be of assistance to the diagram's user. Power distribution frames within equipment entities should be depicted in their relative locations and at a size that will cause them to stand out to the diagram user.

DC power distribution elements located on other floors should also be shown as close as practical to the cable hole their power distribution cable passes through when doing so will not create unnecessary clutter for the user. This practice will minimize the distance a person's eye has to travel along a line to determine power source information. It is not necessary that power distribution elements located on other floors be depicted within the confines of the building itself.

Power cable runs fused at 200 amps and larger shall be depicted using the relative routes they take across an equipment area. When applicable, depictions of power cable runs shall include the cable rack coordinate path or cross sectional cable routing information used to communicate cable routing information to cable installers. This information will be used to determine if and how existing single line diagrams need to be updated to accurately reflect the building's dc distribution scheme.

Portions of overhead cable rack arrangements should be depicted when doing so might assist in the identification or distinction of power cable runs from other cable runs during an emergency. Cable rack arrangements should only be depicted to the extent necessary to convey their particulars using the double line cable rack illustration convention.

Each single line diagram shall indicate where within the building single line diagrams are stored to facilitate replacement of updated records. Generally, single line diagrams will be stored at a building's main entrance.

5.3. Records Conventions

The below colors and conventions should be used to depict the various elements comprising a single line diagram. Black is the default color for items not listed.

Red	BDFBs and associated cable routes
Blue	Lucent switch PDFs, associated cable routes and equipment boundaries
Green	Nortel switch PDFs, associated cable routes and equipment boundaries
Orange	Frames and cable routes of equipment cabled directly to 48V dc power boards
Heavy Solid	Building features, cable routes, frames on the same floor, and SLD locator
Heavy Broken	Cable on other floors
Light Solid	Non-structural building features, cable holes in floors and logistical references
Light Broken	Frames on other floors and cable holes in ceilings

6. UPDATING RECORDS

Once established, single line diagrams shall be updated when either of the below changes are made to the building's 48V dc power distribution scheme.

A. New power distribution frames (BDFBs) are added.

B. Power distribution cable fused at 200 amps and larger is added via cable routes not already depicted on the single line diagram.

C. The source of power for power distribution frames and equipment frames/entities change.

Example: A new 48V dc power board is added to supply a "B" load to an existing BDFB and cable is installed using existing cable routes. This would cause an update to the power source information associated with the BDFB. A similar update would be caused if power for a BDFB was moved from one power board to another.

7. STORING RECORDS

Single line diagrams should be produced in a size no smaller than 11- x 17-inches and stored in a conspicuous place and holder located at the primary entrances to the building and floors of multi-story buildings. Unless otherwise required, diagrams may be stored in ordinary wall mounted pocket files available from most office supply outlets. When diagrams are stored separately from other emergency response information, the storage apparatus shall be stamped or other wise labeled with the words SINGLE LINE DIAGRAM OF 48V DC POWER SYSTEM.

8. GENERAL PROCESS

8.1. One-Time Application Diagrams

One-time applications of single line diagrams will generally be associated with cable mining jobs of long duration or complexity. The need or appropriateness of using a one-time application records will therefore be determined and managed by the SBC equipment engineer responsible for the cable mining job. The availability of one-time application records should be socialized with the building wire chief or other SBC representative likely to respond to a fire or other emergency. On-time records should be stored in a uniquely identified yellow job wallet and stored in an agreed upon location at the building's main entrance for at least two weeks after the cable mining is complete.

8.2. Office Record Diagrams

Signal line diagrams are considered network power records because of what they record and who directly impacts their content and accuracy. Accordingly, SBC's local network power engineering group will manage the implementation and maintenance of single line diagram office records.

The need for single line diagrams in office record form will generally be determined by external business influences relating to building emergency response and/or the network de-powering issues/requirements of local jurisdictions. Such external business influences are likely to be managed (negotiated) by SBC's property management and likely in conjunction with network power engineering.

Implementation and maintenance of single line diagram office records include the following activities:

A. Initialization of the T-base office record number.

B. Population of the office record with relevant content information. This may be accomplished via office surveys for existing buildings or via the EF&I information of the power job(s) associated with new buildings.

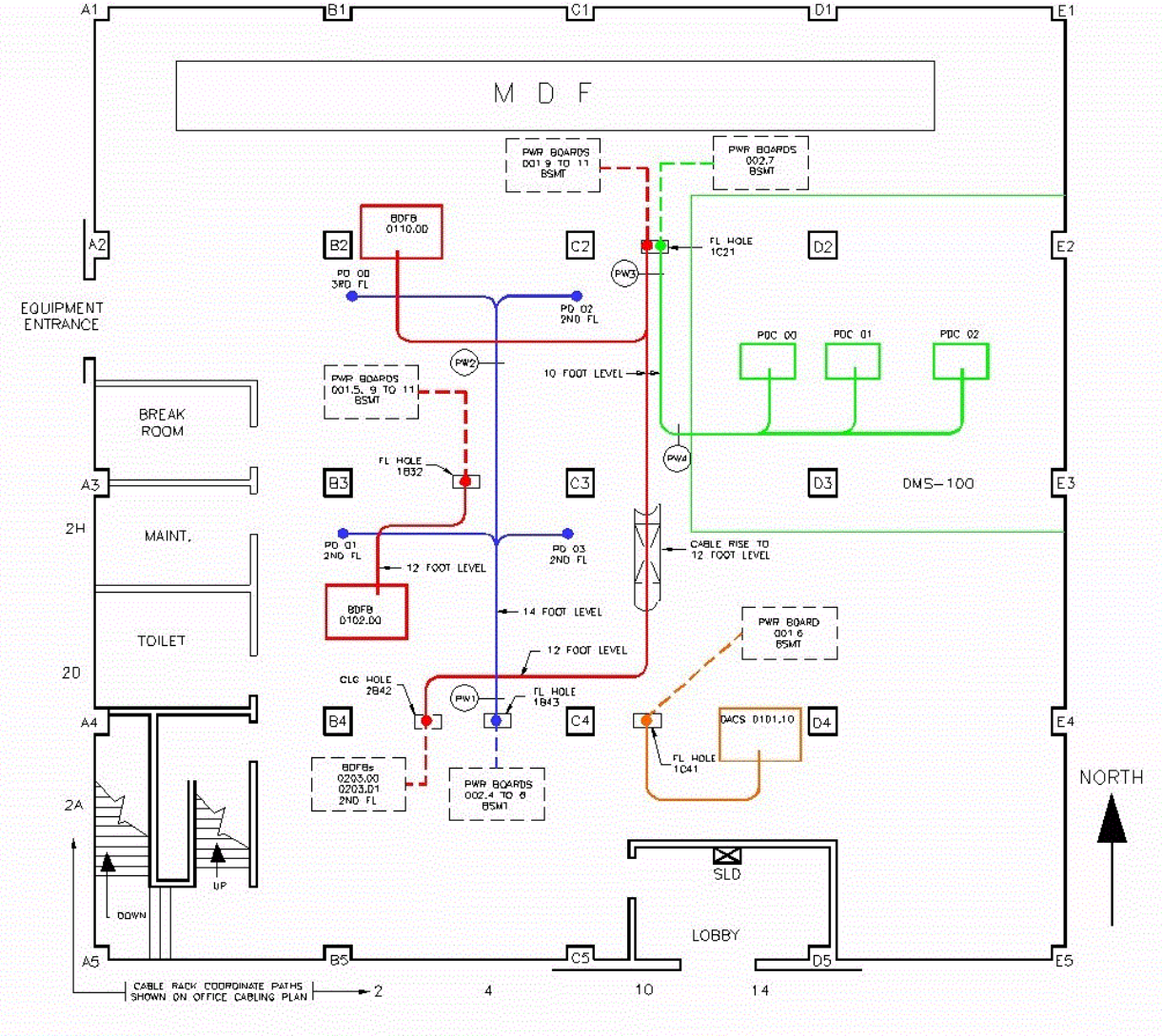
C. Selection of diagram storage location and means of storage. This may be via directions from SBC's property management.

D. Printing/plotting and distribution of completed office records.

E. Socializing diagram availability among network operations building tenants and local real estate representative.

9. FIGURES AND SKETCHES

Figure 1. Example Of Single Line Diagram - Ist Floor



A black and white version of Fig. 1 may be colored as follows to resemble and actual office record:

Red	Facilities BDFBs and related cable runs.
Blue	Lucent switch power dist. frames and related cable paths.

Green Nortel switch power dist. frames and related cable paths.

Orange Eqpt. cabled directly to 48V dc power boards.

Using the above color codes BDFB 0102 and linework connectingit to the power board in the basement would be colored red. Linework between power board 002.4 to .6 and PD frames on 2nd floor would be colored blue. DACS 0101.10 and linework connecting it to power board 001.8 inbasement would be colored orange.