

BT NETWORK REQUIREMENT

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BTNR 2511

ISSUE 06

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**INTERFACE BETWEEN TELECOMMUNICATIONS
EQUIPMENT AND NOMINAL 48V NEGATIVE DC
POWER SUPPLIES**

BT NETWORK REQUIREMENT
FOR THE INTERFACE BETWEEN TELECOMMUNICATIONS EQUIPMENT AND
NOMINAL 48V NEGATIVE DC POWER SUPPLIES

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1 General

This document is to be used in conjunction with the following document published by the European Telecommunications Standards Institute (ETSI):

ETSI EN 300 132-2 V2.1.1 (2003-01)
Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (DC)

Issue 6 of BTNR2511 has been completely revised to augment the requirements of ETSI EN 300 132-2. Its main purpose is to define the “fuse blowing” transient voltage characteristics for conventional and RCSE power distribution systems.

This document is only to be used for $-48V_{dc}$ power interfaces as defined in ETSI EN 300 132-2.

Issue 6 of BTNR2511 supersedes ALL previous issues of BTNR2511 and BTR2511.

2 Definitions

EQUIPMENT is the telecommunications equipment served by the power supply. When equipment is a sub-rack, any rack wiring and distribution system within the rack shall be deemed to form part of that equipment.

POWER SUPPLY is defined in ETSI EN 300 132-2

EQUIPMENT POWER INTERFACE (EPI) is defined as interface “A” in ETSI EN 300 132-2

RADIAL CABLE SINGLE EARTH (RCSE) DISTRIBUTION SYSTEM is a twin cable distribution system from a common point and having the return cables of all cables connected to the equipment rack frames to create a voltage-stable plane usable as a reference. This system is described in section 5.1 of this document.

CONVENTIONAL DISTRIBUTION SYSTEM means any system that is not an RCSE system. Power distribution systems of this type are described in section 5.2 of this document.

3 Power Equipment Interface

This is defined as interface “A” in ETSI EN 300 132-2.

Interface “A” is described in the Scope section of ETSI EN 300 132-2.

The normal location of Interface “A” within BT’s network is shown in appendix 8.3. If Interface “A” is at a different point to that shown in issue 6 of BTNR2511, this shall be specified by the design authority.

3.1 Voltage Polarity and Limits

Voltage polarity and limits are covered in the Requirements section of ETSI EN 300 132-2.

4 Power Supply and Telecommunications Equipment Requirements

Noise levels applied to interface “A” by telecommunications equipment and power supplies is covered in ETSI EN 300 132-2.

5 Telecommunications Equipment Requirements

This section sets out BT’s specific requirements under the “Voltage Transients” and “Recovery from voltage transients” sections of ETSI EN 300 132-2.

It outlines the different types of DC power distribution system used within BT’s telecommunication network and specifies Fuse Blowing Transient (FBT) characteristics for each of the systems described. Equipment performance under FBT conditions is also stated

Note: The incidence of voltage transients due to fuse blowing is a rare isolated event that is expected to be confined to periods of working party activity.

A description of the FBT phenomena is given in Appendix 8.1

Test circuits for checking conformity to the specified FBT characteristics are given in figures 3 and 4 of appendix 8.2.

The Equipment Under Test (EUT) shall be subjected to five (5) FBT tests spaced by an interval of not less than 10 minutes (to allow for thermal stability).

Equipment inrush current performance is covered in ETSI EN 300 132-2

5.1 RCSE power distribution systems

RCSE DC distribution systems were specifically designed for, and are only used in, BT’s “System X” network switching units. RCSE design incorporates special features to reduce the magnitude of voltage transients such as low-transient fuses, close-coupled twin distribution cable and +ve / –ve distribution from a common location. Early “System X” exchanges were fed from centralised power plants utilising large, lengthy busbar runs. Later System X exchanges were powered from End-Of-Suite (EOS) Power Equipment Racks (PERs).

5.2 Conventional Power Distribution Systems

DC power distribution systems other than RCSE are classified as conventional. A conventional DC power distribution system does not incorporate any special design features aimed at reducing stored energy and hence limiting the voltage transient magnitude. For example, network element circuits are normally fused using standard BS 88 pt2 HRC fuse links and the main supply cabling from the power source (PER) to the circuit distribution point are not run together (not closely coupled).

Examples of conventional –48V d.c. power system configurations used within BT’s network are shown in appendix 8.3

5.2.1 Transient Disturbance Immunity – RCSE systems

Equipment connected to RCSE distribution systems shall withstand without damage, or need for manual restoration, the series mode transient disturbance at interface “A” shown in figure 1.

A stored energy level of 10J shall be assumed for RCSE power distribution systems.

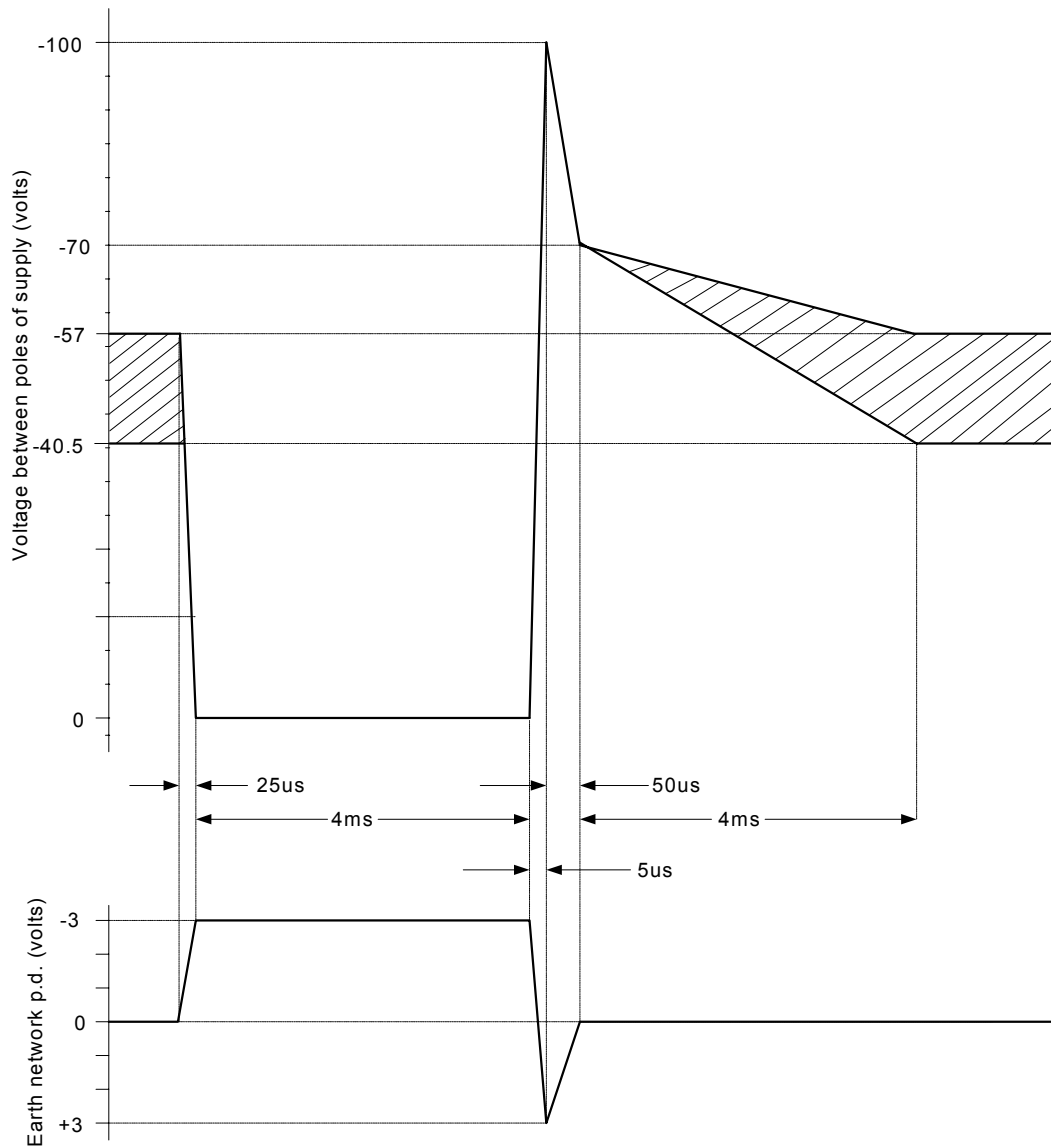


Figure 1 – FBT characteristic for RCSE DC power distribution systems

5.2.2 Transient Disturbance Immunity – Conventional systems

Equipment connected to conventional power distribution systems shall withstand without damage, or need for manual restoration, the series mode transient disturbance at interface “A” shown in figure 2.

A stored energy level of 32J shall be assumed for all conventional power distribution systems.

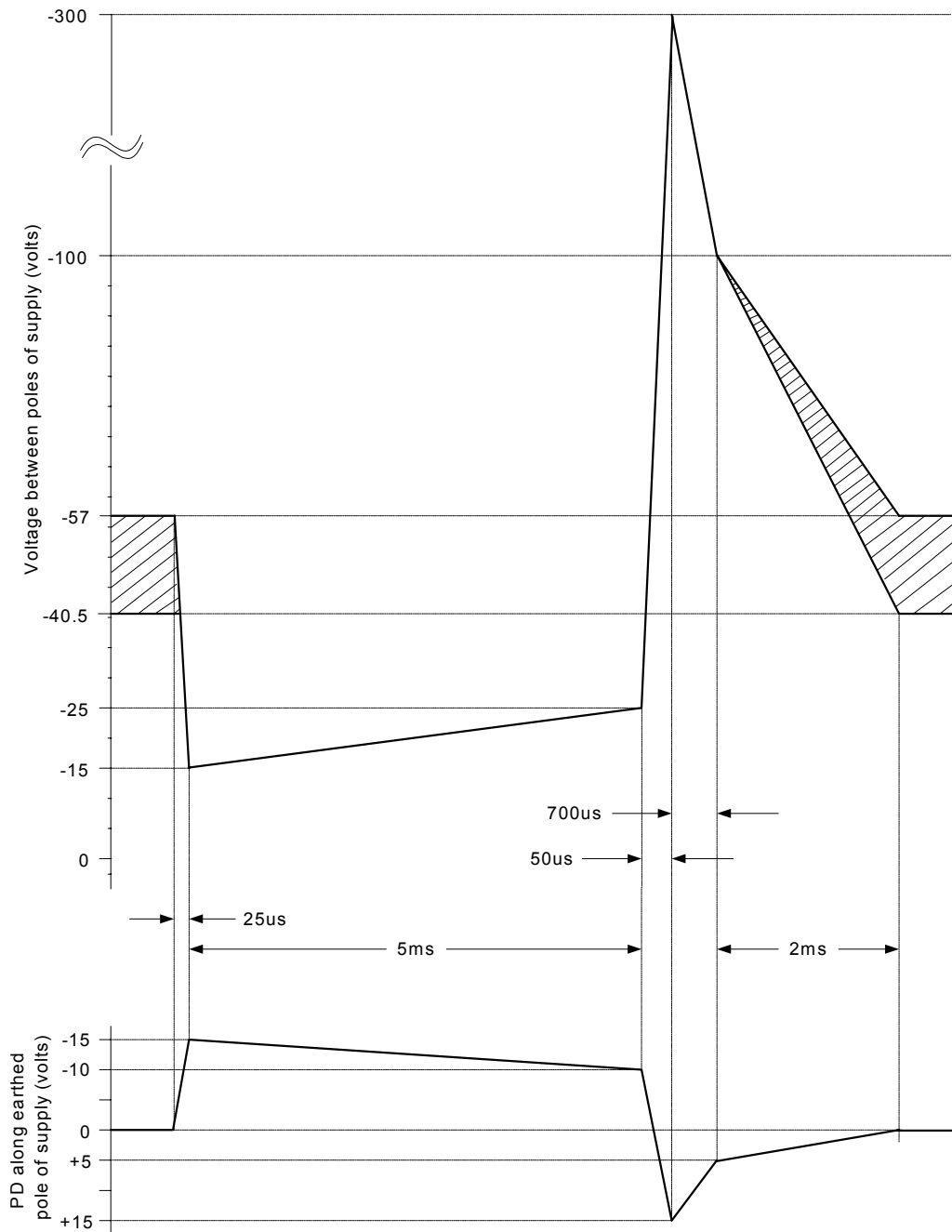


Figure 2 – FBT characteristic for conventional DC power distribution systems

6 References

- ETSI EN 300 132-2 Environmental Engineering (EE)
Power supply interface at the input to telecommunications
equipment;
Part 2: Operated by direct current (DC)
- ETSI TR 100 283 Environmental Engineering (EE)
Transient voltages at interface “A” on telecommunications
direct current distributions

7 History

| Issue | Date | Amendment |
|-------|------------|---|
| 1 | Pre - 1981 | |
| 2 | July 1981 | Complete revision to take account of BTNR 2512 and to include wider voltage limits for equipment design. |
| 3 | June 1985 | Voltage limits revised following introduction of rack mounted power systems: narrowband noise and inrush current limits brought into line with CEPT recommendations |
| 4 | May 1992 | Incorporates requirements from European Telecommunications Standards |
| 5 | Dec 1993 | Requirements removed for conventional DC power distribution systems, wide and narrow voltage limits |
| 6 | Jan 2003 | Complete revision detailing BT's specific Fuse Blowing Transient voltage characteristics for RCSE and conventional DC power distribution systems. This document is to be used in conjunction with ETSI standard ETSI EN 300 132-2 |

8 Appendices

8.1 The Fuse Blowing Transient

This document contains Fuse Blowing Transient (FBT) characteristics for conventional and RCSE type DC distribution systems. There are two main parts of the phenomena. When a fault occurs a voltage sag results, which is caused by fault current flowing through resistive and inductive components of the distribution system. During this period energy is stored within the inductive elements of the DC distribution. When the protective device interrupts the fault current, a high voltage transient is superimposed on to the DC distribution and the stored energy is released back into the connected network equipment.

Under a network-element power fault condition, energy is stored in the circuit inductance between the output of the power supply system (battery) and the point of fault. However, it is the energy stored in the circuit between the power supply battery and the fuse distribution board that is responsible for the transient over-voltage. Energy stored in the circuit between the distribution fuse board and the network element need only be considered if the network element is fused locally. This is the case in many of the System X exchanges and hence close-coupled twin cable was employed to reduce the circuit inductance. Local fusing is not always used, however, due to difficulties in achieving discrimination between protective devices.

In both conventional and RCSE power distribution systems the circuit between the power supply battery and the fuse distribution board can be formed from a short length of 95mm² copper cable (typically less than 6m), in the case of an EOS PER, or from a much longer length of cable / busbar in the case of an Island (distributed) or centralised power supply system. The inductance and hence energy storage capacity of the latter system being far greater. With RCSE distribution systems special “Low-transient” fuses are fitted in the fuse distribution board to control the rate at which the stored energy is released and thus limit the transient over-voltage.

A more detailed explanation of transient voltages at interface “A” is given in ETSI Technical Report ETSI TR 100 283

Note: BTNR2511 issue 6 assumes stored energy levels of 10J and 32J for RCSE and conventional type power distribution systems respectively. However, work is in progress to more accurately define the energy levels for power distribution systems currently used within BT's network.

8.2 Fuse Blowing Transient conformance test circuits

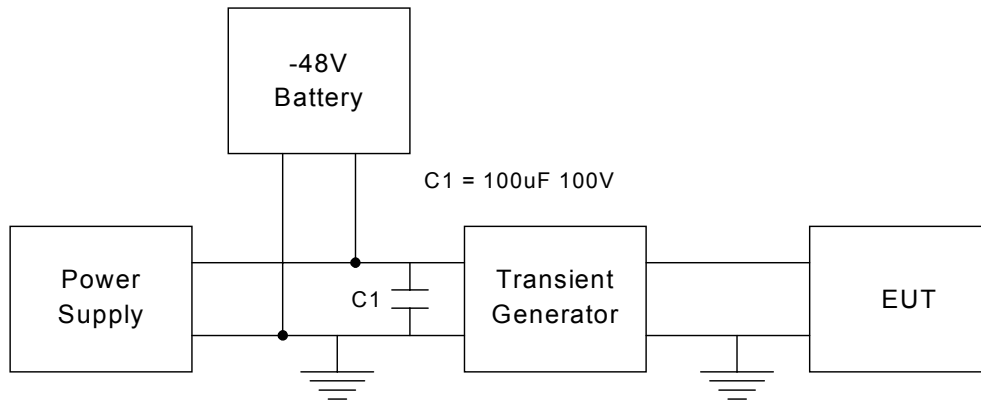


Figure 3 – FBT test circuit for equipment connected to RCSE DC power distribution systems

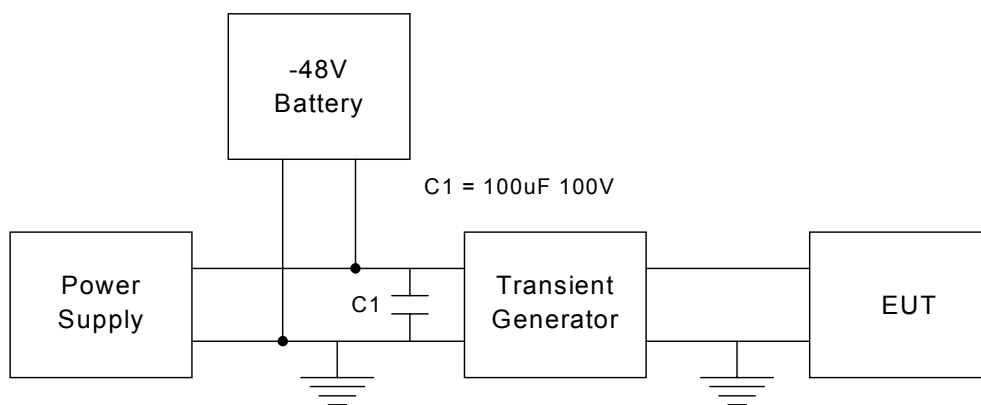
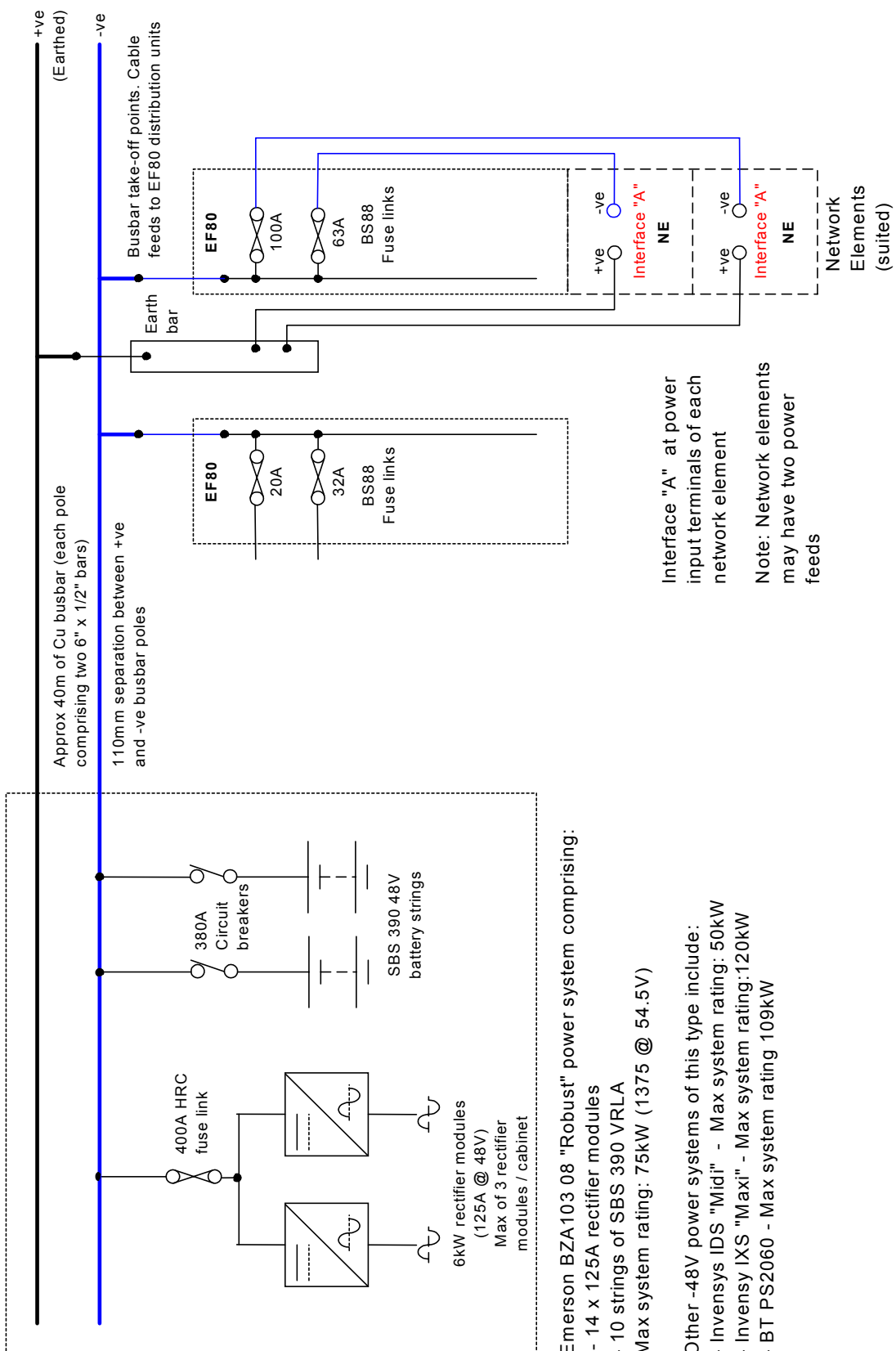


Figure 4 – FBT test circuit for equipment connected to conventional DC power distribution systems

8.3 Examples of conventional -48V d.c. power systems used by BT

Example of -48V "Island" power system with busbar distribution



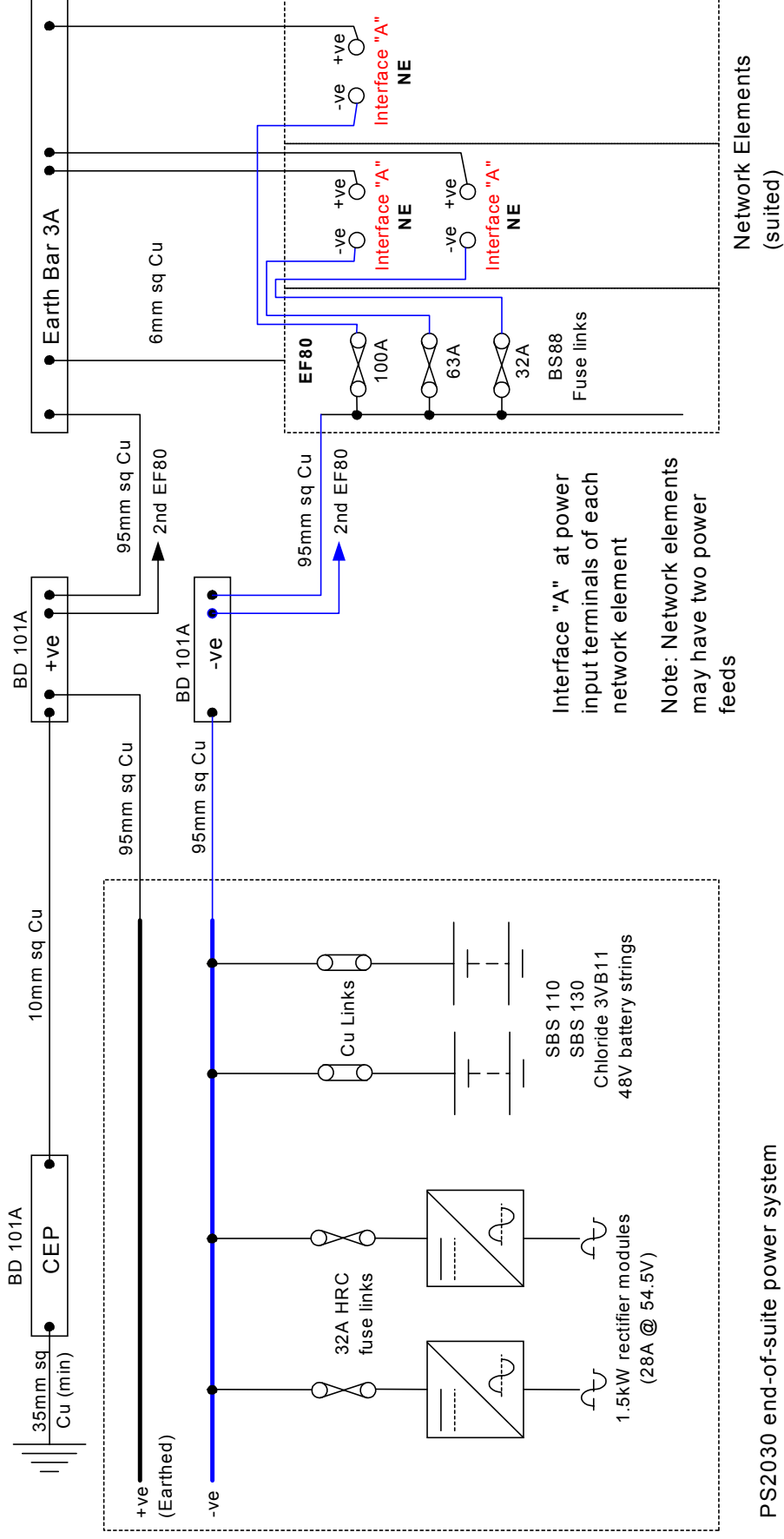
Emerson BZA103 08 "Robust" power system comprising:

- 14 x 125A rectifier modules
- 10 strings of SBS 390 VRLA
- Max system rating: 75kW (1375 @ 54.5V)

Other -48V power systems of this type include:

- Invensys IDS "Mid" - Max system rating: 50kW
- Invensys IXS "Maxi" - Max system rating: 120kW
- BT PS2060 - Max system rating 109kW

Example of -48V End-of-Suite" power system (PS2030) using cable distribution and EF80

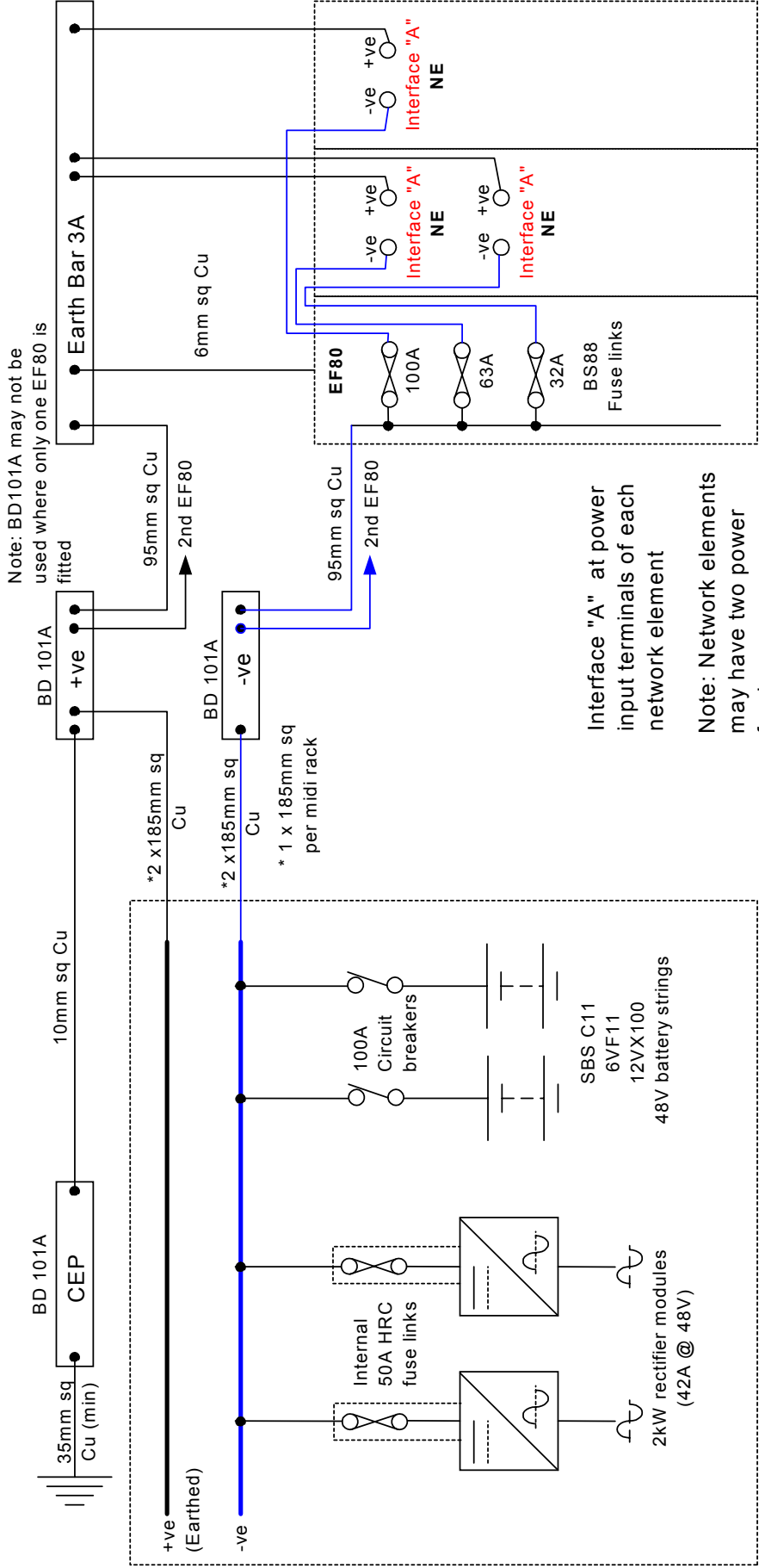


PS2030 end-of-suite power system

- Single rack max configuration comprising
 - 4 x 28A rectifier modules
 - 2 battery strings
- Max system rating: 4.5kW (84A @ 54.5V)

A maximum of three PS2030 power racks can be connected in parallel (max system rating 13.5kW)

Example of -48V End-of-Suite" power system (Invensys IDS "Midi") using cable distribution and EF80



Interface "A" at power input terminals of each network element

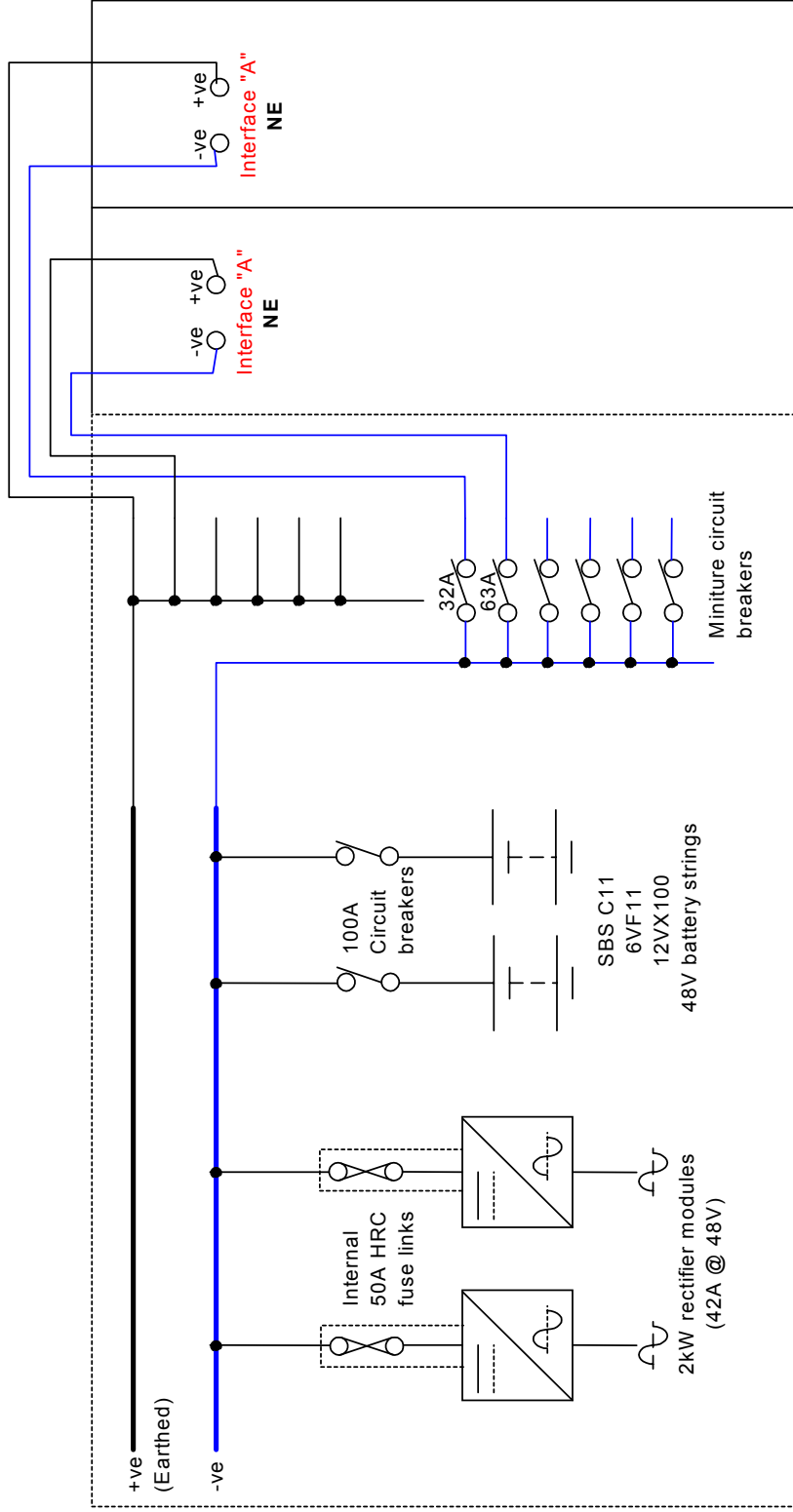
Note: Network elements may have two power feeds

Network Elements (suited)

- Invensys "Midi" end-of-suite power system
- Single rack max configuration comprising
 - 6 x 42A rectifier modules
 - 5 battery strings
- Max system rating: 10kW (183A @ 54.5V)

A maximum of two "Midi" power racks can be connected in parallel (max system 20kW)

Example of -48V End-of-Suite power system (Invensys IDS "Midi") using cable distribution and "Midi" on-board distribution panel



- Invensys "Midi" end-of-suite power system
- Single rack max configuration comprising
 - 6 x 42A rectifier modules
 - 5 battery strings
- Max system rating: 10kW (183A @ 54.5V)

A maximum of two "Midi" power racks can be connected in parallel (max system 20kW) per suite. Five "Midi" power racks can be connected in parallel when used as an island power system.