

ELECTRONIC SWITCHING EQUIPMENT
 5ESS®/INTERNATIONAL
 POWER LINE FILTER UNIT
 CIRCUIT

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There are industry limits, and sometimes legal limits, on the maximum level of EMI emissions from Information Technology Equipment (ITE).

1.02 The Power Line Filter Unit provides a means to connect the Return (RTN) line of the -48 V supply to frame ground at the cabinet. European Telecommunication Standards Institute (ETSI) requirements designate a specific manner in which this connection be made when a mesh earthing system is used on the International 5ESS® Switch. This filter will meet these requirements when installed in a cabinet designed for the mesh earthing system.

2. GENERAL: DESCRIPTION OF OPERATION

2.01 There is one Power Line Filter Unit for every pair of power feeder lines bringing power from the Power Control and Distribution Frame (PCDF) and the other cabinets. It is installed between the feeder lines and the fusing units inside the cabinets. It is located at the top of the cabinet at the interface of the cabinet and the overhead cable ducts. One mounting bracket ear is electrical and physically connected by a screw to the Rack Reference Potential Point (RRPP) grounding bar on top of the cabinet [2].

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The filter unit mitigates the Electromagnetic Interference (EMI) electrical noise on the external lines that supply the -48 V power to each cabinet. The power lines can act as radiators for the electrical noise generated within the cabinet, and can conduct the noise back to the battery plant and interfere with other apparatus.

3. APPLICATIONS

This unit mounts in the AT&T NSI International cabinet. It is the version designed to comply with European requirements for EMC and mesh earthing. It cannot be used on any installation that employs the single point method of system grounding. The Power Line Filter chassis grounds the power line RTN line to frame, which is a violation of the single point ground concept.

SECTION II - DETAILED DESCRIPTION

1. CONNECTIONS

1.01 The filtering elements are housed in a small metal box. There are four electrical connections to the box:

- A. The power input receptacle mounted on the box: power feeders from the PCDF plug into this point.
- B. The power output plug at the end of a three foot cable: this brings the power to the cabinet's fusing unit.
- C. The mounting bracket ear that is connected by a screw to the RRPP ground bar: this provides the mesh safety ground connection as well as support for the box.
- D. The second mounting bracket ear that is connected by a screw to the frame of the overhead cable rack: this provides a low inductance path to shunt EMI currents back to the frame.

2. FILTERING

2.01 The electrical interference voltages that must be suppressed are the voltages measured between the power feeder lines and the cabinet frame. The test methods prescribed by the standards divide the frequency

spectrum into two categories; conducted interference .150 - 30 MHz and radiated interference 30 - 1000 MHz. References [3] and [4] provide the limits and methods of measurement for a system. There are three electrical components and a chassis ground connection that provide the electrical filtering.

- A. The ground connection between the RTN lead on the three-foot feeder lead and chassis inside the box: this shunts interference voltages at all frequencies back to the cabinet frame ground. This is a perfect filter limited only by the inductive impedance of the mounting bracket connections at very high frequencies.
- B. The capacitor C1 4.7 uF: this provides the low frequency filtering. It shunts the electrical noise on the -48 V power feeder lead to chassis. It does the filtering in the .15 to 20 MHz spectrum. As the frequency of the noise increases, the capacitor's impedance rises due to self-inductance, and it becomes ineffective.
- C. Filter F1 3000 pF: this component is similar to a feed-through capacitor but has a small inductor inside, making it a PI circuit. It provides greater attenuation than a simple feed-through capacitor. This provides high frequency filtering on the -48 V power feeder lead. It is effective in the 10 - 1000 MHz spectrum.
- D. Ferrite Core E1: both the -48 V and RTN power feeder leads pass through this component. Noise power on these leads is induced into the lossy ferrite core and is dissipated. It reduces the amount of radiated energy emitted from the PCDF Cabinet feeder lines in the 30 - 300 MHz spectrum.

3. PERFORMANCE

3.01 Laboratory measurements indicate that the filter's attenuation on either power feeder line will exceed the limits listed below:

Freq. Range	Min. Attenuation
.15 - 30 MHz	25 dB
30 - 500 MHz	20 dB

SECTION III - REFERENCE DATA

1. J. R. Buckley, "Power Line Filter With Mesh Grounding," Engineer's Notes, September 7, 1990.
2. A. J. Tijhuis, J. F. Castro Cabezas, "FSD 803 - ETSI and Country Specific Earthing Requirements," December 12, 1990
3. T. V. Srinivasan, "FSD 1274 Electromagnetic Compatibility (EMC) Compliance," June 8, 1990
4. IEC Publication CISPR 16, "Specification for Radio Interference Measuring Apparatus, and Measurement Methods"

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