BUILDING ELECTRICAL SYSTEMS FOR DATA-PROCESSING BUILDINGS

1. GENERAL

1.01 This section describes electrical system design considerations for data-processing buildings.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 The design recommendations of other Building Electrical Systems sections should also be followed for data-processing buildings. However, there are significant special requirements of computer systems that require different emphasis in design.

2. SPECIAL CHARACTERISTICS

2.01 Many, if not most, data-processing buildings house at least some computer systems that require a very high order of reliability of ac power.

2.02 This involves not only no interruptions in the ac supply but a minimum tolerance for the disturbances that normally occur on commercial ac power lines.

2.03 As the computers will not function very long without air conditioning, the need for reliable power extends to the environmental system as well.

3. DESIGN PRECAUTIONS

3.01 Although most of the following precautions do not differ from what is good practice for any building, they are emphasized here because computers have less tolerance for power irregularities than most other electrical loads.

(a) Be sure the steady state voltage at the computers is correct (eg, 120 volts at full load).

(b) Provide lightning arresters on the electrical service.

(c) Where feasible, provide separate service transformers for the computer load.

(d) Provide separate feeders from the main switchboard for the computers.

(e) Make certain that all Bell System Grounding Practices are scrupulously adhered to. Section 802-001-196 should be followed for all Operations Support System computers and may be used for other data-processing installations, with the concurrence of the computer manufacturer.

4. AC PROTECTION

4.01 Even if the best design practices are carefully followed, there might be situations where further steps are required to ensure sufficiently reliable power.

4.02 Section 790-100-660 provides valuable information on power line disturbances and ac protection equipment.

5. NEW PROTECTION EQUIPMENT

5.01 Since Section 790-100-660 was published, an important new power protection device has become available and should be considered along with other equipment.

5.02 This device, called a magnetic synthesizer, generates output power by a magnetic and capacitive circuit. No moving parts, switching devices, feedback control loops, or power semiconductors are used in the power path. The magnetic synthesizer uses a combination of transformers, inductors, and capacitors to provide an output similar to that of an Uninterruptible Power Supply (UPS) without ever going through a dc stage. The output is fully isolated from the input and can be at the same voltage or a different voltage. The 3-phase

output will continue even on the loss of one incoming phase with only a small drop in output voltage at loads up to 60 percent of full load.

5.03 Although the method of operation is different, the quality of the output voltage and the complete independence of the output from any and all disturbances on the input voltage are similar to a UPS. There is one major difference. On loss of input power, the UPS will continue to provide undisturbed output power as long as the battery voltage lasts. The synthesizer, with no dc stage or battery, can continue to supply power for only about one cycle.

5.04 The combination of performance, cost, efficiency, reliability, and flexibility make the ac synthesizer the best choice in many cases.

6. ALTERNATIVE AC PROTECTION

6.01 Where it has been decided that maximum ac power protection can be justified, this has usually meant provision of a UPS with standby generator backup for both the UPS and building equipment.

6.02 An alternative means of providing reliable power would be to install continuous duty generation equipment operated in parallel with the electric utility, each system standing by for the other. The reliability of this type of system would be as good as, if not better than, a conventional standby system backing up the electric utility. Protection against utility line disturbances would of course still be necessary.

6.03 With an assured load for the "waste heat" of the generation equipment to power absorption air conditioning, the economics of such a cogeneration system could be very attractive.

6.04 The feasibility of this alternative has come about because of recent developments. One, of course, is the higher cost of energy. The other is the assurance by government regulation of an intertie with the electric utility and that the utility must sell standby power at a nondiscriminatory rate.

7. REFERENCES

7.01 Detailed information can be obtained from the following Bell System sections:

SECTION	TITLE
790-100-660	AC Power for Telecommunications Equipment
760-400-510	Building Electrical Systems—Grounding
802-001-196	General Grounding Requirements for Data Processing Computer—System Installation

7.02 Additional information can be obtained from the following documents:

(a) E.W. Courville, E.M. Gulachenski, and A.O. Kesterson, "A New Device for Improving the Quality of Distribution Feeder Power to Digital Computer and Other Voltage-Sensitive Loads," IEEE/PES, 1982 Winter Meeting, New York, NY—January 31 through February 5, 1982, Paper Number SL-2210H

(b) J.C. Solt "Intertied Cogeneration—Better Reliability Than Standby, Lower Cost Than Utility Power"—1982 Intelec - Chapter 1818 - 4/82 IEEE.