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CENTRAL OFFICE EQUIPMENT

Control of Atmospheric Environment for Central Office K-itching Systems

AG Communication Systems

A Joint Venture of AT&T and GTE

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1. GENERAL

1.01 This practice provides recommendations for the control of atmospheric environments for switching systems manufactured by AG Communication Systems Corporation (AGCS).

1.02 This practice is reissued to provide new information. Underlined paragraph, table, and figure numbers indicate new or changed information. Remove the previous issue of this practice from the binder or microfiche file and replace it with this issue.

1.03 Systems covered in this practice are the No. 1 EAX, No. 2 EAX, GTD-3™ EAX, GTD-5" EAX, C-I EAX, No. 1 TSPS, CXP-5, No. 1 AE-CAMA, No. 1 XPT, SATT, Conversation Time Measuring System (CTMS), Traffic Data System (TDS), Ticketing Magnetic Tape Recorder (TMTR) System, Centralized Service Evaluation System (CSES), Directors, and SxS telephone equipment.

1.04 Refer to Practices in the 740 division for planning information on the specific switching system.

1.05 Printed wiring cards used in the AGCS systems described in this practice may use static-sensitive components.

1.06 For special handling instructions applicable for personnel working on these systems, refer to Practice 200-910-200AE.

2. FUNDAMENTAL INFORMATION

2.01 Recommendations provided in this practice apply to the equipment only, and are in no way to be used as a guide for personal comfort.

2.02 A suitable and desirable atmospheric environment is recommended for telephone equipment in areas where dust, atmospheric impurities, humidity, and temperature conditions are a problem. The recommendations in this practice are to be used as guidelines.

2.03 Telephone equipment has been used successfully in almost every part of the world under a wide variety of operating conditions. Providing a controlled environment for switching systems in localities subject to adverse atmospheric conditions results in improved equipment performance, fewer customer complaints, and lower maintenance costs. This is especially true for electronic switching systems where removal of heat from the switchroom can be a critical factor in system reliability.

2.04 Greater system reliability and lower maintenance costs often offset some of the initial costs as well as some of the annual cost of the environmental control equipment.

2.05 Each location must be studied to determine the degree of environmental control that can be economically provided so that potential savings in reduced maintenance aid in justifying the cost of environmental equipment.

3. AIR CONDITIONING

3.01 In some areas, it may not be possible to maintain switchroom temperature and humidity within recommended operating ranges without a cooling system (Table 1). For SxS-type switching systems, air conditioning is recommended whenever the outdoor dry bulb (no humidity) temperature exceeds 90°F for more than 300 hours during the 4 warmest months of the year.

3.02 The capacity of the air conditioning system should be planned according to growth conditions expected for each prospective Central Office (CO). Generally,

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the capacity of the air conditioning system should be as near optimum size as possible with future expansion to be provided by additional units.

3.03 Air conditioning is also recommended for electromechanical and electronic switching systems when it is anticipated that the equipment may be required to operate at, or near, its high design limits for short periods of time (Table 1). Because of the additional thermal stresses placed on the components when operating at the high limits, however, an increase in system malfunction may be expected and marginal or intrinsically weak devices and circuit assemblies may perform erratically.

3.04 The Heating, Ventilating, and Air Conditioning (WAC) system should incorporate standby capability so that temperature and humidity control can be maintained at all times in the equipment area.

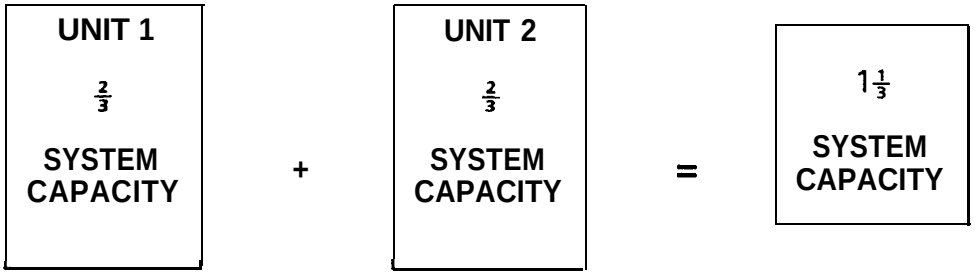
3.05 The most reliable method of obtaining this capability is by installing a multiple-unit cooling system, with each unit sized for a fixed percentage of required equipment capacity.

3.06 In general, the most reliable and economical installation uses two units, each sized for two-thirds of the required capacity (Figure 1). This arrangement should provide one-third spare capacity to cover intermittent ventilation loads and loads due to extreme conditions of telephone equipment heat generation and outdoor temperature and/or humidity. In the event of one cooling unit failure, and if ventilation is shut down, the remaining cooling unit of two-thirds system capacity would hold CO temperature and humidity within limits that can be tolerated for periods of short duration.

3.07 Air conditioning units should be of weather-tight construction with weatherproof gasketing between panels to prevent the entry of moisture and unfiltered outside air into the air conditioned area. Consideration should be given to use of an air conditioning system incorporating dual compressors or two separate air conditioning units connected to a common air duct network.

3.08 In the event of failure of one of the compressors or air conditioning units, the second compressor or air conditioning unit should be capable of maintaining temperature in the switchroom below the high limits. Air conditioning units should have cost-effective capabilities.

3.09 It is also desirable to provide emergency exhaust equipment capable of providing switchroom ventilation to minimize hot spots in the event of a complete air conditioning failure. Air drawn into the switchroom must be filtered as discussed in part 5.



NOTE: RESULT IS 1/3 SPARE SYSTEM CAPACITY.

Figure 1. HVAC Multiple-Unit Cooling System.

3.10 In the event of an air conditioning failure where an emergency exhaust system is not available, portable fans for circulating air within the switchroom should be used to reduce hot spots within the equipment. A switching system should never be taken off-line because of excessive temperatures.

3.11 A high-low temperature alarm system, consisting of an air temperature sensor that activates an alarm when temperature exceeds or drops below a predetermined allowable range, should be provided in the switching equipment room.

4. ENVIRONMENTAL CONDITIONS

Foreign Devices

4.01 When foreign devices are used in the switching room environment near electronic equipment, the following practices should be enforced:

(a) Make certain that motor-driven tools and cleaning equipment are in good working condition. All devices should have three-conductor grounded cords, including double-insulated tools, to bleed off static charges and Radio Frequency (RF) brush noise transients.

(b) Avoid starting or stopping appliance motors in close proximity to electronic equipment.

(c) Do not use the 110-Vac isolated

because they are designed for test equipment only. The isolated receptacle is orange.

(d) Avoid exposure of magnetic apparatus, such as tape transports or the tapes themselves, to magnets of any kind, including those found on flashlights or used to hold drawings on metal cabinets.

(e) Do not use steel wool, steel wool pads, or dry or untreated cloths and mops for floor maintenance.

(f) Fluorescent fixtures in good operating condition will not cause Radio Frequency Interference (RFI) problems in an electronic switching CO. Defective starters, flickering fluorescent tubes, or noisy (loose laminations) ballast transformers, however, should immediately be replaced to prevent the possibility of noise transients being induced into the supply line or radiated, if in close proximity, into the system.

(g) Do not allow utility transformers to be placed within the switchroom.

Temperature and Humidity Control

4.02 Table 1 lists recommended temperature and humidity operating ranges and design limits for various systems. The HVAC system should have a building occupied/unoccupied mode capability. During the unoccupied mode, the minimum/maximum temperature limits should be no more than 8 degrees apart and should be adjusted seasonally at energy-efficient levels.

4.03 During the occupied mode, temperatures should be maintained at the most energy efficient level permitted by the applicable local codes. In an effort to conserve energy, the temperature variation will be allowed to float within the 8-degree range. This variation should take place over a period of 30 minutes (minimum) to allow gradual temperature changes within the system.

4.04 The environment for the various systems should normally be maintained with the recommended operating ranges listed in Table 1. However, the operating limits may be exceeded for short periods of time without any appreciable effect detrimental to system performance. All CO equipment systems must be functional at

105°F ambient temperature, measured 5 feet from the floor and 15 inches from the front of the frame. In no case should the ambient temperature in the switchroom be allowed to exceed 105°F (120°F for C-I EAX), because degradation of electronic systems may occur.

4.05 The HVAC system should be designed to maintain a relative humidity range of 55 percent maximum, 30 percent minimum. The temperature and humidity controls should be adjusted by authorized personnel only.

Ventilation

4.06 All CO locations require cooling capability because the magnitude of equipment heat generation is large relative to heat transmission through the structure. Most CO locations require mechanical refrigeration cooling for some portion of the year. However, when outdoor temperatures permit, properly controlled outdoor air ventilation may be sufficient to remove equipment heat and control temperatures. In most instances, it is impractical to maintain the conditions listed in Table 1 with ventilation only.

4.07 Outdoor ventilation air should be provided in the CO in accordance with local codes when the area is to be occupied by personnel. In the interest of energy conservation and of obtaining minimal cooling and heating, provisions should be made to shut down outdoor ventilation air whenever the area is unoccupied. This can be accomplished by means of an occupied/unoccupied mode switch with a wind-up timer.

4.08 If the CO is to be unattended most of the time, this approach allows ventilation air loads to be excluded from the calculations of required cooling and heating equipment capacities by using spare capacity discussed in paragraphs 3.04 through 3.06.

Battery Room Ventilation

4.09 Storage batteries used with CO equipment are affected by both low and high temperatures. Therefore, in relation to storage batteries, the temperature of a dial CO must not drop below 15°F. For each degree below 77°F, the reserve capacity of the storage battery decreases approximately one-half of one percent. The temperature should be kept between 65°F and 80°F.

4.10 Cooling and heating equipment should be provided when required to maintain the temperature within the recommended operating ranges. For details on battery room and area ventilation, refer to Practice 742-205-070.

Natural Cooling

4.11 Where local climatic conditions permit, the use of filtered outdoor air for cooling should be a definite consideration. While there may be few areas where full-time natural cooling can be used, most areas have both daily and seasonal periods when outdoor temperatures are low enough. When natural cooling is used, the HVAC system controls should incorporate an automatic override feature to shut down the natural cooling mode when outdoor humidity conditions cause unacceptable relative humidity buildup in the equipment area.

Smoke Purge

4.12 A method of purging smoke from the building is not required for small CO's. For large CO's, smoke purging should be considered, using components of the HVAC system. The purpose of the system is to remove smoke from the building in a reasonable period of time so that fire control and damage assessment can proceed unhampered. Activation of the smoke purging feature should be manual.

5. AIR FILTRATION

5.01 Air filtration must be provided in the HVAC system to remove dust and other airborne materials from the air being supplied to the CO. Filters should be located in the system so that both recirculated air and outdoor air are filtered. In general, filters with a minimum American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) efficiency of 30 percent are adequate when supplemented with good cleaning procedures.

5.02 In certain geographical locations, such as industrial areas or highly populated urban areas where high levels of airborne particulate or chemical fume contamination may be present, higher-efficiency dust filters and/or fume filters may be required.

5.03 In locations where higher-efficiency dust filters and/or fume filters are not presently required, consideration should be given to their possible future need by providing space in the HVAC system. Refer to Practices in the 740 division for filter considerations and selection.

6. TELEPHONE SWITCHROOMS OTHER THAN CO SWITCHROOMS

6.01 Community dial offices in which carrier equipment is located should not exceed the recommended operating high temperatures listed in Table 1 for SxS equipment. To avoid excessive maintenance in larger community dial offices, it is preferable that the same temperature, humidity, and filter requirements be applied as were used for the telephone CO switchroom.

Table 1. Recommended Operating Environmental Ranges for Switchrooms and Desiqn Limits for Switches.

SYSTEM	RECOMMENDED OPERATING RANGES						DESIGN LIMITS			
	COLD WEATHER TEMPERATURE (°F)		WARM WEATHER TEMPERATURE ("F)		HUMIDITY		TEMPERATURE (°F) MAXIMUM ALLOWED		HUMIDITY (%RH) MAXIMUM ALLOWED	
	PERSONNEL PRESENT	NO PERSONNEL PRESENT	PERSONNEL PRESENT	NO PERSONNEL PRESENT	LOW	HIGH	LOW	HIGH	LOW	HIGH
NO. 1 EAX	68	60	78	86	30	55	50	100	20	80
NO 1 TSPS	68	60	78	86	30	55	50	100	20	80
NO. 1 XPT	68	60	78	86	30	55	50	100	20	80
NO 1 AE-CAMA	68	60	78	86	30	55	50	100	20	80
CXP-5	68	60	78	86	30	55	50	100	20	80
SATT	68	60	78	86	30	55	50	100	20	80
sxs	68	60	78	86	30	55	50	100	20	80
DIRECTORS	68	60	78	86	30	55	50	100	20	80
TMTR	68	60	78	86	30	55	50	100	20	80
TDS	68	60	78	86	30	55	50	100	20	80
NO.2 EAX	68	60	78	86	30	55	45	105	20	80
GTD-3 EAX	68	60	78	86	30	55	45	105	20	80
CTMS	68	60	78	86	30	55	45	105	20	80
CSES	68	60	78	86	30	55	45	105	20	80
C-I EAX	68	60	78	86	30	55	40	120	20	80
GTD-5 EAX	68	60	78	86	30	55	45	105	20	80

NOTE: The recommended operating ranges may be exceeded for limited durations without permanent degradation of the system; however, the design limits should not be exceeded. The high relative humidity operating range should not be exceeded for longer than 3 days at one time and totaling no more than 15 days per year These ranges and limits are for the overall swrtchroom temperature measured at a height of 5 feet above floor level and 15 inches from the front of equipment. Envrronmental requirements for specific components are governed by each manufacturer's ratings, derating factors, heat generatron, and packaging design, and the location of the components within the swrtchroom