POWER PLANT

GENERAL INSTRUCTIONS AND DAILY INSPECTIONS

Contents Page

1. GENERAL

1.01 This section covers general instructions and protective measures that should be followed to minimize power plant troubles and provide service continuity during commercial AC power outages.

1.02 It is reissued to:

- Revise the section title
- Include information on performing daily power plant inspections (formerly contained in Section 167-229-901PT)
- Add Form P 529, Daily Power Plant Inspection.

Note: Marginal arrows used to denote changes are omitted.

1.03 The term ***emergency engine*** rather than standby engine can be found in some Bell System Practices (BSPs). This usage of the term emergency engine is being phased out as practices are reissued. This section uses the current terminology of ***standby engine.***

1.04 The purpose of the telephone power plant is to furnish power, signals and tones in the proper amount and form at all times. To assure telephone power availability under abnormal conditions (such as interruption of the commercial AC power source) engine-alternators and batteries are usually provided.

1.05 Because of the differences in power plant arrangements, it is necessary for the individual offices to prepare local instructions to cover operations during commercial power outages. The local instructions should contain procedures for transfer from commercial AC power to standby AC power, and vice versa, methods of switching loads, operating automatic equipment in a manual mode, and other pertinent information applicable to power room operation.

1.06 For detailed information on operation and maintenance of individual power plants or equipment, refer to the appropriate BSP or manufacturer's manual if an applicable practice is not available.

1.07 Work operations in power plants are dependent upon using the proper practices, instructions, tools, and accurate instruments. These items should be available and in usable condition.

2. SAFETY PRECAUTIONS

2.01 It is essential that all personnel recognize and be alert to the hazards involved when working on power plant equipment. Standard sections for each unit of power equipment cover safety precautions to be exercised. These precautions and those following, outline safety practices for personnel engaged in power plant maintenance.

2.02 ***Rotating machinery can catch hands or draw dust cloths, ties, or loose clothing into the rotating parts.***

(a) Prevent tools, pens, and pencils from falling into rotating machinery from tool pouches or shirt pockets.

(b) Guards are sometimes provided to protect personnel from exposed rotating parts. These guards must be kept in place and in good condition.

2.03 Interlock switches are provided as a safety feature on some power plant equipment. These switches alone should not be depended upon. Test with a voltmeter to see if the equipment to be worked on is de-energized. ***Do not disable interlock switches;*** they are for your protection.

2.04 Automatic start machines must be so marked with an appropriate warning sign. The automatic start circuits must be blocked and fuses removed before working on these machines.

2.05 ***Battery acid is corrosive;*** it will attack clothes, skin, and metal. Use approved aprons, acid gloves, and splash-proof goggles when handling acid or making specific gravity readings. Keep water and soda available for neutralizing and washing away spilled acid.

2.06 The caustic solution in counter cells and nickel cadmium batteries is also corrosive. It will attack paint, skin, and eyes. Use approved aprons, acid gloves, and splash-proof goggles. Keep water and boric acid solutions available for neutralizing and washing away the caustic solutions.

2.07 ***Gas from batteries and counter cells is explosive.*** Maintain good ventilation around battery racks. ***Do not smoke.*** Avoid using open flames or the creation of sparks including those caused by static electricity.

2.08 ***Contact with any power leads is dangerous.*** Even exposure to 110 volts is enough to electrocute a person. Insulated gloves and insulated test leads must be used whenever working on energized equipment. Where possible, power should be removed before working on the equipment.

CAUTION: In making the inspections: DO NOT touch fuses or switches carrying a potential higher than 60 volts. DO check for signs of heat in insulated areas around fuses and switches carrying a potential higher than 60 volts.

2.09 Metallic objects such as key chains, watchbands, rings, etc. should not be worn while working on live equipment.

2.10 Use the proper tools as listed in the standard sections. Examine the tools for defects before using. Tools to be used on live equipment shall be taped.

2.11 Good housekeeping is essential in the power room. Adequate storage space should be provided for the storage of power plant tools and supplies. Every effort must be made to protect the equipment from dirt and lint.

2.12 When noise levels are considered excessive in the engine-alternator room, approved ear protectors shall be worn. The protectors can be ordered from Western Electric (WE).

2.13 Certain areas are considered extremely hazardous, such as transformer vaults. Entry to such areas should be limited to authorized personnel. Adequate control should be maintained to guard against unauthorized access.

2.14 General safety precautions can be found in the following BSPs:

- 010-1 division-layer — First Aid, Rescue, Fire Fighting, Safety Precautions, Restrictions of Plant Activities, and Radiation
- 075-191-501 — Electric Soldering Coppers and Irons — Tests and Inspections

- 155-000-910PT — Power Maintenance Notes
- 157-601-701 — Lead-Acid Type — Requirements and Procedures

2.15 Specific safety precautions for power equipment or materials can be found in the related BSPs.

3. LOCAL INSTRUCTIONS

3.01 Power plant arrangements vary at each location. Individual offices must prepare local instructions pertaining to commercial and standby AC power.

3.02 The local instructions should be current and in a conspicuous location within the power plant equipment area. These instructions should include B, ES or E-numbered wallcharts (Operating Instruction Charts) for KS engine-alternators, or locally prepared instruction charts for General Trade (nonstandard) engine-alternators.

3.03 If the power plant is remotely surveilled, the local instruction at the power plant should include information relating to remote surveillance arrangements. If these arrangements include the ability of the surveilling location(s) to control certain functions at the surveilled power plant (such as START REMOTE ENGINE or RESTORE AC TO NORMAL), they shall be included in the local instruction.

3.04 BSPs, drawings, and CD sheets can be used as references in preparing local instructions.

A. Description of Commercial AC Power Service

3.05 This instruction should contain a description of the commercial AC power service, including all manual and automatic methods and functions of the house service board.

3.06 A simplified single line sketch or block diagram should be prepared locally showing the house service board AC distribution. Figures 1 and 2 show typical office sketches. The following items should be included in this sketch:

(a) Commercial and standby power buss.

(b) Designation and size of circuit breakers and/or fuses.

(c) Designation and type of (automatic or manual) transfer switches.

(d) Indication of the type of load (essential equipment, nonessential equipment, building or artificial).

B. Power Failure Routine

3.07 The Power Failure Routine — Method of Procedure (MOP) is referenced in Section 171-120-301. A MOP should be locally prepared for use during and after a commercial power failure. This MOP is part of the local instructions.

3.08 Form P 2380, AC Power Failure Instructions, should be prepared locally according to Section 171-120-301. Form P 2380 is part of the power failure routine.

3.09 Directions for local preparation of Form P 4175, Record of Power Plant Outage, are contained in Section 171-120-301. Form P 4175 is part of the power failure routine.

C. Description of Standby AC Power Service

3.10 This instruction should cover the following items:

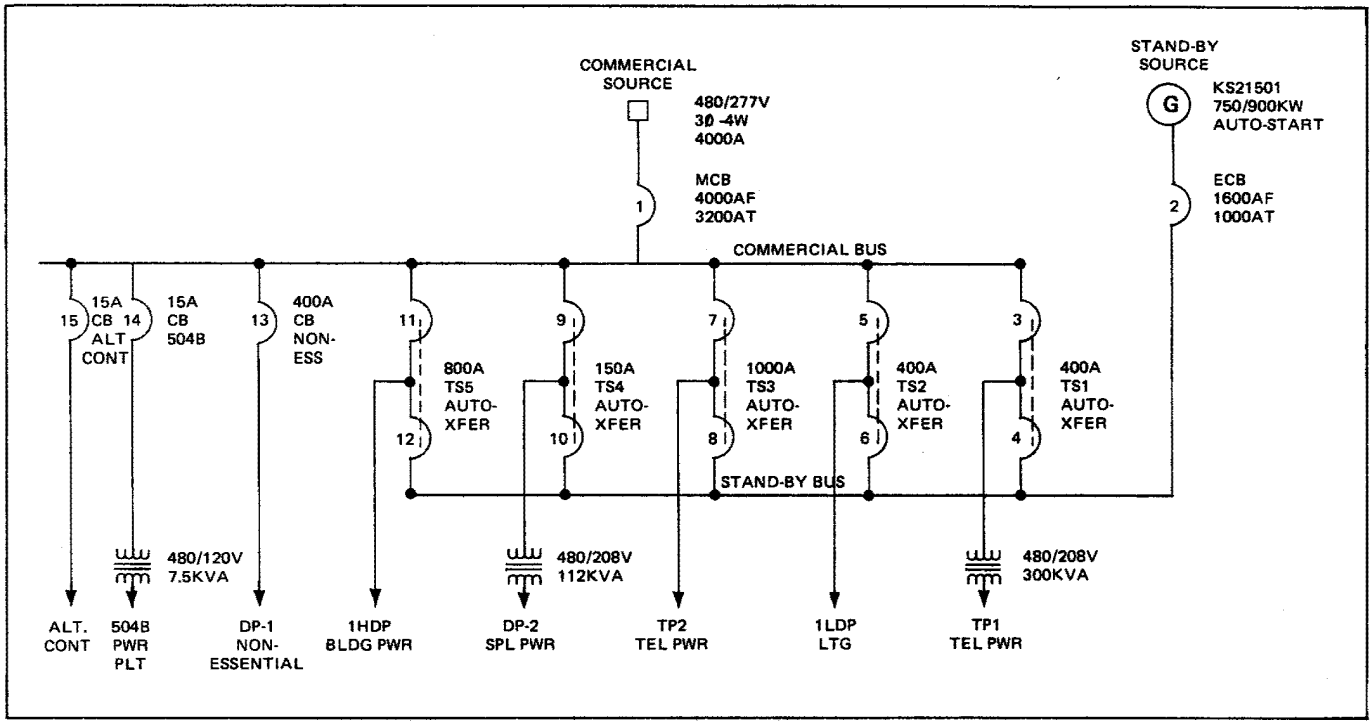
(a) ***Description of Standby Engine-Alternator:*** This is a reference to the appropriate BSP, or location of the latest issue of the manufacturer's manual if an applicable practice is not available.

(b) Type of fuel used and rate of consumption.

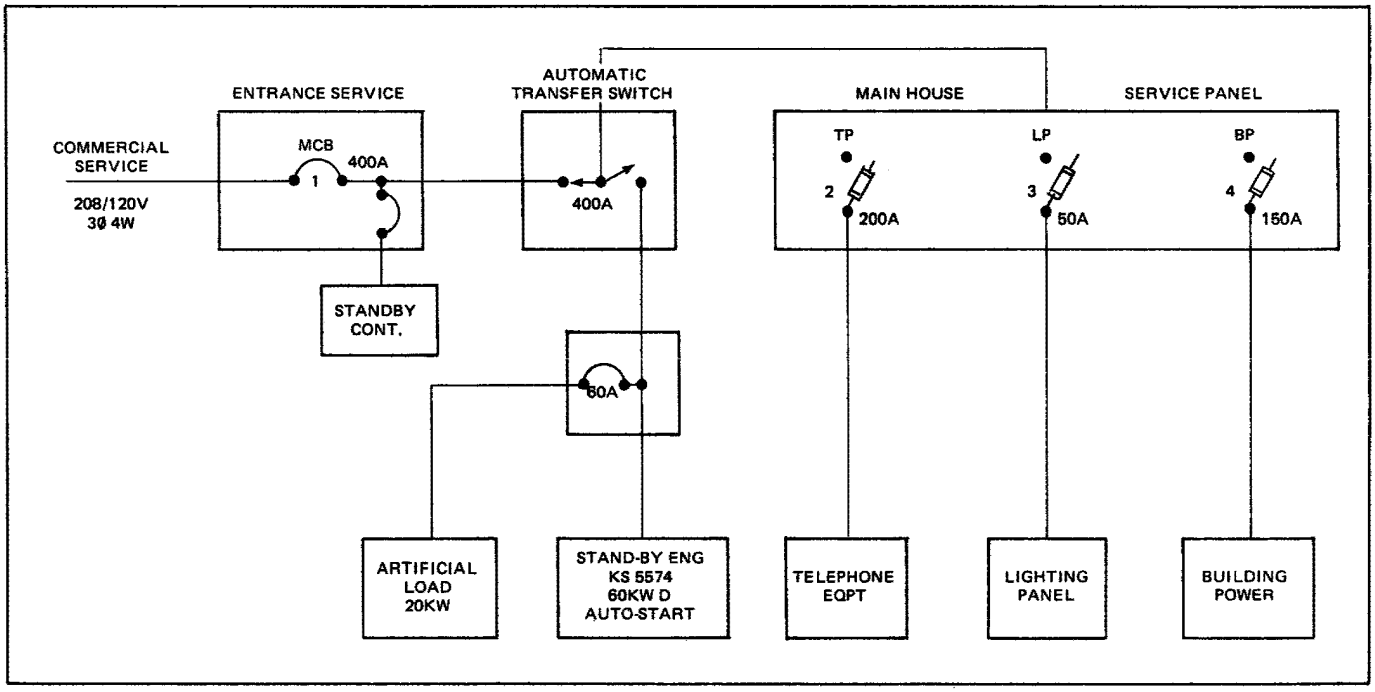
(c) Procedure for obtaining fuel and fuel storage tank capacity.

(d) Brief step-by-step procedure for automatic and manual operation of engine-alternator.

(e) Procedures involving remote surveillance arrangements (alarm receiving, TASC, SCOTTS, E-3 telemetry, General Trade Product systems, etc). These procedure shall be located at the power site and surveilling location(s). They must be concurrent, explicit and mutually agreed on by the supervision responsible for the power plant and remote surveilling locations.



AC Distribution — Single Line Sketch
Fig. 1



AC Distribution — Block Diagram
Fig. 2

4. COMMUNICATION FACILITIES

4.01 Each site should analyze its power room communication needs. The following requirements should be met:

(a) When power rooms, engine rooms, power panels, maintenance centers, and testboard locations are some distance apart, provide adequate communication facilities between them.

(b) The facilities and their associated signaling should not be disabled by the loss of AC power.

5. AC AND DC LIGHTING

5.01 The standard battery operated DC emergency lighting is provided to permit personnel to evacuate the area without accident and is not normally intended to provide illumination for work operations. Areas requiring lighting for work operations during commercial power outages should be provided with AC lighting served by the standby power source.

5.02 The wattage of bulbs used in DC emergency lighting should not be increased to the point that the normal battery reserve is jeopardized.

5.03 Test and inspect the emergency lighting equipment periodically and following any equipment or building addition.

6. TRAINING

6.01 Personnel assigned to power plant operation and maintenance or to office coverage that includes responsibility for the power room should be thoroughly trained in emergency operating arrangements and procedures.

6.02 Local instructions, basic training courses, BSPs on individual power plants and equipment, and associated drawings and CD sheets should be used as the basis for on-the-job training. Be sure that the local instructions and drawings ***are*** up-to-date.

6.03 The most effective training will be the actual participation in power failure routines, standby engine test runs and routine maintenance on power plant equipment.

6.04 Power plant routines or the assigned personnel may be rotated to enable personnel to become thoroughly familiar with power plant operations.

7. PRINCIPLES OF POWER PLANT OPERATION

7.01 The primary goal of power plant operations and maintenance procedures should be the prevention of service interruptions.

7.02 Generally, most power plant operating and maintenance activities, when ***properly performed according to standard instructions,*** are not hazardous. Restrictions on such activities, confining them to off-tour periods, should not be imposed unnecessarily.

7.03 With activities that require extra precautions or restrictions, off-tour work may be proper to confine a possible interruption to a minimum of service. In any case, proper supervision on the job is required.

7.04 The following factors should be considered when planning operating or maintenance activities:

- The safety of the personnel involved.
- The availability of experienced personnel.
- The availability of adequate supervision.
- The method that would cause the least service reaction.

8. NORMAL OPERATION AND MAINTENANCE

8.01 Normal power plant operation and maintenance are activities which, when properly performed according to standard practices, will create no hazard to service. The following are some examples:

- Interchange of rectifiers, generators, and ringing machines
- Normal battery maintenance such as cell voltage readings, specific gravity readings, cleaning and neutralizing cell cases, and inspection of cell cases and covers

- Routine maintenance on idle rectifiers and generators

- Routine emergency engine test runs (see ***Note***).

  Note: If the routine full load test run causes hits or service impairments and these conditions cannot be corrected locally, a report outlining the situation should be forwarded via lines of organization.

8.02 ***CONSIDER ALL POWER ROUTINES AS "INSURANCE ROUTINES", AS POWER EQUIPMENT FAILURES HAVE A SERIOUS AND WIDESPREAD EFFECT ON SERVICE.***

8.03 Proper and economical power plant maintenance demands careful observations of the equipment and intelligent management of routine schedules. Schedule routine tests, inspections or work items in accordance with the appropriate Equipment Test List (ETL) and/or BSP.

A. In-Service Inspections

8.04 When the capacity of the charging equipment, batteries, fuses, discharge leads, or other power plant equipment appears to be inadequate, ***notify*** the Power Maintenance Engineering District ***immediately.*** Do this informally by telephone, and follow with a written report via lines of organization.

B. Maintenance

8.05 ***Commercial AC Service Centers:*** Check commercial AC voltages at prescribed intervals and following any change in the building power service. At the same time, check the current in each phase to ensure against an excess unbalance and overload of the primary power service. When discrepancies exist or other potential hazards are noted, a report outlining the situation should be forwarded via lines of organization.

DC Panel Meters

8.06 Power plant voltmeters should be calibrated at prescribed intervals. The panel meter indicating battery float voltage should be calibrated to indicate ***the voltage across the battery terminals.*** The secondary standard meter should be calibrated periodically.

Fuses and Discharge Leads

8.07 No duplication of fuse numbering shall be permitted on a fuse board. Each alarm fuse or breaker should be clearly designated to indicate its associated discharge fuse.

8.08 An indication that a fuse may be nearing failure is its temperature. Sections 026-370-701 and 026-371-501 describe methods used to check fuse temperature. When fuses are hot, the current through them may be excessive. However, the heat may be caused by bent fuse holders, loose connections, incorrect size fuse and high temperature of adjacent equipment. Make good visual inspection with the temperature test periodically.

8.09 Following an installation, when additional load has been added and/or whenever an overload is indicated by a temperature check, use a clamp-on ammeter to measure the current through the fuses or leads in question.

8.10 When the load is excessive, take ***immediate*** corrective action. The situation may be reported informally by telephone followed by a report via lines of organization showing the current drain in the questionable circuit and the corrective action taken.

9. DAILY POWER PLANT INSPECTION

9.01 Items to be checked during each inspection include:

(a) AC Switchgear Boards. Check that:

(1) Indicating lights are lit or out in accordance with normal and/or emergency operations.

(2) Meter readings indicate normal loads and voltages.

(3) The cover panels are cool to the touch.

(b) Battery Control and Distribution Boards. Check that:

(1) The emergency cell switches are in their normal positions.

(2) Readings of such meters as load meters and main and emergency battery float voltage meters indicate satisfactory operating conditions.

(3) All "ACO Lamps" are extinguished.

(4) All keys are in their regular positions.

(c) Batteries. Check that:

(1) Floors and racks near batteries are free of electrolyte.

(2) The solution level of CEMF (Counter Electromotive Force) cells is within the proper limits.

(d) Charging Equipment.

(1) Motor Generator Sets. Check that:

- Units are free from oil and grease leaks.
- All exposed commutators are burnished.
- There is no excessive bearing, brush noise, or brush sparking.
- Bearing temperatures are not excessive. Check by touch.
- All motor - generators are available for service.
- The temperature of fuses and switches is not excessive. Check by touch.
- The output of generators indicates satisfactory plant operating conditions.

(2) Rectifiers. Check that:

- The output of rectifiers indicates satisfactory plant operating conditions.
- The temperature of fuses and switches is not excessive. Check by touch. (See 2.08, ***CAUTION.***)
- All rectifiers are available for service.

(e) Inverters. Check that:

(1) Readings of such meters as load and voltage meters indicate satisfactory operating conditions.

(2) The standby inverter is available for service.

(3) All transfer switches are in their regular positions.

(4) The temperature of fuses and switches is not excessive. Check by touch. (See 2.08, ***CAUTION.***)

(f) Converters. Check that:

(1) Readings of such meters as load and voltage meters indicate satisfactory plant operating conditions. (It is not necessary that the converters share the load equally.)

(2) The temperatures of the units are not excessive. Check by touch. (See 2.08, ***CAUTION.***)

(3) All units are available for service.

(g) Ringing Plants. Check that:

(1) Meter readings indicate satisfactory plant operation.

(2) Units are free from oil and grease leaks.

(3) There is no excessive bearing, brush noise, or brush sparking.

(4) Bearing temperatures are normal. Check by touch.

(5) All exposed commutators are burnished.

(6) All transfer keys are in their normal positions.

(7) Spare fuses are available.

(8) Ring transfer lamps are extinguished.

(h) Emergency Engines. Check that:

(1) The engine and the engine room are free from fuel, water, and oil leaks.

(2) Control switches are in their normal positions.

(3) The immersion water heater is working.

(4) The rectifier for starting batteries is operating properly.

(5) Starting batteries and their racks are free of electrolyte.

(6) Air starting tanks are fully charged.

(7) All air valves for round robin interconnection are set for normal operation.

(8) There is no leakage of air in tanks or piping.

(9) Compressors are operating properly.

(i) Compressor Dehydrators. Check that:

(1) Gauge readings indicate satisfactory operating conditions.

(2) The unit is free of oil and water leaks.

(3) The unit is free of excessive noise and vibration.

(4) There is no leakage of air in tanks or piping.

(5) The condensation tank is not filled with water.

(j) Alarms. Check that power alarms can be transmitted throughout the office and/or to an attended maintenance center.

(k) General. Check that:

(1) Lighting is normal and that there are no safety hazards to personnel.

(2) All equipment and rooms are clean.

9.02 This list should not be considered complete; each power room operator and supervisor will probably be able to add items for a specific power plant. The point to remember is the inspections are necessary and do not require a great deal of time to complete.

Recording Inspections

9.03 Log the results of each inspection on Form P 529 (Exhibit 1) and retain the form for 90 days in the Power Log Book under local information. Before destroying any forms, review them for information or trouble conditions that should be logged under the appropriate sections in the Power or Battery Log books.

10. RESTRICTED OPERATIONS AND MAINTENANCE

10.01 Restricted operations and maintenance are those activities which, because of their nature, require special procedures and extra precautions. The following are some examples of restricted operations:

- Planned discharge of a power plant.
- Abnormal battery maintenance such as replacing cells or intercell connectors.
- Installation work and acceptance testing on additions or modifications of power plant equipment.

10.02 Some of the extra precautions necessary to prevent service interruptions are as follows:

(a) The employees who will actually perform the job must have a thorough and complete understanding of the work to be done.

(b) A ***detailed*** method of procedure should be prepared and approved before starting the job.

(c) All restricted operations should be performed between the hours of 11 pm and 7 am.

11. MAINTENANCE OF STANDBY ENGINES

11.01 ***All*** standby engines employed or held in reserve by the company ***must*** be maintained. This includes: on site, portable, or leased engines.

11.02 Standby engines should be maintained according to the applicable BSP and ETL.

Note: If a standby engine does not have an applicable BSP, it shall be maintained in accordance with the latest issue of the manufacturer's manual. Maintenance must be as stringent as specified by the manual.

11.03 Manufacturer's manual supported maintenance should be scheduled by an ETL prepared locally using a blank Form E 5450 (Section 010-300-011). This ETL is associated with Section 155-001-014.

Pacific Telephone

P 529 (4-81)
BSP 167-600-900PT

DAILY POWER PLANT INSPECTION

Month _____

DATE	TIME	INIT'S.	A.C. SWITCH GEAR BOARDS	A.C. SWITCH GEAR BOARDS	BATT. CONT. and DIST. BOARDS	BATTERIES	MOTOR-GENERATORS	RECTIFIERS	INVERTERS	CONVERTERS	RINGING PLANTS	EMERGENCY ENGINES	COMPRESSOR DEHYDRATORS	ALARMS	GENERAL					
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LOOK **LISTEN**

SMELL

TOUCH **THINK**

REMARKS

APPROVED _____ TITLE _____ DATE _____

Exhibit 1