

**ELECTRONIC SWITCHING SYSTEMS**  
**5ESS®**  
**AC POWER DISTRIBUTION**  
**CIRCUIT**

**SECTION I - GENERAL DESCRIPTION****1. Purpose of Circuit**

This circuit is used for the distribution of AC power in a 5ESS switch. The document includes information on AC distribution panels for typical commercial ac power, wiring diagrams for conduit and wire-way, rectifier service, protected ac inverter arrangements, and ac surge protection. To see Figures mentioned in this CD document refer to SD-5D004-01.

**2. General Description of Operation**

The basic power required by the 5ESS is -48V DC. This power is obtained from any of five different power plants, which generate the -48V DC by rectifying and filtering commercial AC power. This circuit specifies what power plants are acceptable, what commercial AC voltages and phases are typically used to operate the power plants, and how all of the applicable equipment is interconnected. This circuit also specifies procedures for meeting other AC needs, such as lightning, protected AC inverter, and convenience outlets. AC surge protection against lightning voltages is also covered by this circuit.

**SECTION II - DETAILED DESCRIPTION****1. Circuit and Physical Arrangement**

Many different commercial ac system voltages can be used in the 5ESS. Small size installations typically use a 120/240 1-phase 3-wire and ground ac service. This is classified as essential ac meaning that during an interruption of commercial AC, a standby engine alternator energized to power the 5ESS and maintain office battery charge. The distribution cabinet circuit for this voltage is shown in Figure 1 in SD-5D004-01.

1.01 Another typical commercial ac voltage is a 480/277 3-phase 4-wire wye and ground ac service. This is also classified as essential ac and is used to operate the 5ESS system and maintain office battery charge. The distribution cabinet circuit for this voltage is shown in Figure 2.

1.02 A third typical commercial ac voltage is a 240/120 3-phase 4-wire delta and ground ac service. This is also classed as essential and used like the previous voltages. The distribution cabinet circuit for this voltage is shown in Figure 3.

1.03 A fourth typical commercial ac voltage is a 208Y/120 3-phase 4-wire wye and ground ac service. This is classified as essential and is used like the previous voltages. The distribution cabinet circuit for this voltage is given in Figure 4.

1.04 Wiring diagrams for conduit and wire-way for all of the commercial ac power system voltages are provided in Figures 5, 6, 7, and 8 corresponding to Figures 1, 2, 3, and 4 respectively. Specifications include wire gauges and colors, conduit sizes, grounding, and using circuits.

1.05 Figure 11 specifies the conduit sizes, wire colors, and connections for the step-down transformer required for appliance outlets and lighting as required when 480V power is available.

1.06 Figure 12 specifies the power plant rectifier input conduit, wire colors, and output connections that apply to single phase rectifiers for 208/240 volts.

- 1.07 Figure 13 specifies the power plant and rectifier input conduit, wire colors, and output connections that apply to three phase rectifiers for 480 volts.
- 1.08 Figure 14 specifies the power plant rectifier input conduit, wire colors, and output connections for 208/240 volts.
- 1.09 A protected ac inverter is supplied to power the video display and receive-only printer of the maintenance control center (MCC) and certain selected data sets in the data set cabinet or frame. Since the power rating of the inverter is presently only 1 KVA, only critical loads that must run in the interval between loss of commercial power and the availability of emergency power must be connected to the inverter. (In large installations, a second miscellaneous frame containing another protected ac inverter may be required.) During normal system operation (on commercial ac power), items powered from this inverter are powered from the commercial ac. If the commercial ac fails, the inverter takes dc power from the -48V office battery and generates 115 volt 1-phase 0-1KVA 3-wire power automatically. When the commercial power returns, the inverter shuts itself down after a guard time interval that protects against transient or cyclic operation. A test feature is available to ensure proper functioning of inverter transfer operation in both directions (switching on and switching off). Specifications for incorporating the inverter into a 5ESS installation are included in Figure 15.
- 1.10 An ac surge protector against lightning transients must be installed on the ac power service in areas with high lightning exposure. The surge protector is connected to the office alarm system and to the 048 volt office battery. Specifications for protector use with different types of ac input are included in Figures 17, 18, 19, and 20.
- 1.11 Figure 21 specifies the conduit size, wire colors, and connections for the first data set cabinet, which is connected to the protected ac inverter (Figure 15).
- 1.12 Figure 22 specifies the conduit size, wire colors, and connections for the second and up data set cabinets, which are connected to the essential ac power source (Figures 5, 7, 8, or 11).
- 1.13 Figure 23 specifies the conduit size, wire colors, and connections for the MCC frame or cabinet connections to protected ac (Figure 15).
- 1.14 Figure 24 specifies the conduit size, wire colors, and connections for the MCC frame or cabinet to essential ac (Figures 5, 7, 8, or 11).
- 1.15 Figure 25 specifies the conduit size, wire colors, and connections for the Modem Pooling cabinet for protected ac.
- 1.16 Figure 27 specifies the conduit size, wire colors, and connections for the CNI Ring Node Digital Facility Access cabinet.
- 1.17 Figure 28 specifies the conduit size, wire colors, and connections for the Protected ac inverter mounted in the miscellaneous cabinet.
- 1.18 Figures 29-32 specify the conduit size, wire colors, and connections for various -48V rectifiers.
- 1.19 Figure 33 specifies the conduit size, wire colors, and connections for the Miscellaneous cabinet outlet strip.
- 1.20 Figure 34 specifies the Job condition arrangement which eliminates the requirement for 117V power from power service cabinet.
- 1.21 Figure 35 specifies the conduit size, wire colors, and connections to a Miscellaneous cabinet equipped with Music on Que and 117V 60Hz outlet strip.
- 1.22 Figure 36 specifies the connection for the essential ac input AC distribution panel (230V, 1-phase, 3 wire and ground, 50Hz).

- 1.23 Figure 37 specifies the conduit size, wire colors, and connections for 230V, w wire and ground, 50Hz service.
- 1.24 Figure 38 specifies the conduit size, wire colors, and connections to a Miscellaneous cabinet equipped with Music on Que and 115V 50Hz outlet strip.
- 1.25 Figure 39 specifies the AC distribution panel for 240/480V 1-phase, 3 wire and ground service.
- 1.26 Figure 40 specifies the wiring diagram for conduit and wire way (240/480V, 1-phase, 3-wire and ground).
- 1.27 Figure 41 specifies the wiring diagram for the 5KVA protected AC inverter as used in E911.
- 1.28 Figure 42 specifies the wiring diagram for the 1KVA protected AC inverter and 9-track tape drive as used in E911.
- 1.29 Figure 43 specifies the wiring diagram for the 1KVA inverter protected AC inverter and peripheral cabinet outlet strip as used in E911.
- 1.30 Figures 44-50 specify Auxiliary Work Station (AWS) protected AC loads.
- 1.31 Figure 51 specifies the conduit size, wire colors, and connections for the AWS protected AC inverter.

## 2. Alarms and Alarm Testing

Alarms for power plants are covered in the plant documentation and in the office alarm circuit SD-5D008-01. Alarms from the power plants are connected to the 3B Processor scan points. At present, all rectifier failure alarms (RFA) are connected together and associated with one scan point. The protected ac inverter has two alarms, a transfer alarm and an output fail alarm, these are also connected to scan points in the 3B Processor. Alarms associated with the ac surge protectors, if required, are likewise connected to scan points in the 3B Processor.

- 2.01 Alarm testing can be performed on the protected ac inverter by use of its test-reset switch, in accordance with instructions in CD-82179-01 and SD-82179-01 for the inverter.

## SECTION III - REFERENCE DATA

### 1. Working Limits

The limits on the 120V (nominal) ac voltage are 110 volts minimum to 125 volts maximum.

- 1.01 The ac input voltage range for the 208/240V ac single phase or 3-phase rectifier is:

- 1. 208V input: 184V minimum to 220V maximum
- 2. 240V input: 212V minimum to 254V maximum

- 1.02 The ac input voltage range for the 480V ac 3-phase rectifier is:

- 1. 480V input: 424V to 508V maximum

- 1.03 The temperature limits are 32 to 115 degrees Fahrenheit.

### 2. Functional Designations

Functional designations are provided in the circuit, equipment, and information notes.

### 3. Functions

This drawing provides a distribution circuit for all 5ESS protected and essential ac power in the switch-room equipment.

**4. Connecting Circuits**

When this circuit is listed on a key sheet, the connecting information thereon must be followed:

1. Appliance Outlets: ED-1A157-72
2. Grounding Methods and Requirements: ED-5D022-01
3. AC Lighting Arrangement: ED-5D072 and SD-4C003-01
4. AC Power Distribution for Utilized 151C Power Plant Hardware: ED-5D094-30.
5. AC Power Distribution Hardware: ED-5D131.
6. AC Power Distribution Circuit: ED-5D021-11.
7. Lightning Protection: T-81968-30.

4.01 The following is a list of equipment requiring protected ac power (see portions of SD-5D011-01):

1. KS-22497, L1 video terminal (MCC)
2. Model 40P2F receive only printer (MCC)
3. Some 201C data sets (SCC).
4. Some 829A data auxiliary inits (AMARC).
5. Some 2024A data sets (AMARC).
6. The following can be required on a particular job and, if so, can require protected ac, per job conditions, although they typically are connected to essential AC:
  1. KS-22497, L1 video terminal for recent change/verify.
  2. Texas instruments OMNI 800 Model 810 Receive Only Printer for recent change/verify.

**5. Manufacturing Testing Requirements****Immediate Requirements**

None.

**End Requirements**

Test this circuit to verify that it is wired in accordance with schematic and wiring drawings, to ensure that the specifications of the circuit requirements table are met, and that the circuit is capable of performing all functions specified in this circuit description.

**Alarm Information**

Alarm information is provided in the Office Alarm circuit, SD-5D008-01, in 3B Processor drawings, in appropriate power plant drawings, and in CD-82179-01 for the protected ac inverter.

**Taking Equipment Out of Service**

Procedures for removing portions of a power plant from service are covered in the appropriate power plant circuit descriptions. Removing the ac power distribution circuit from service requires interruption of all essential ac power to ESS switch-room equipment except for loads on the protected ac inverter, which derives its input from the -48V dc power plant.

**SECTION IV - REASON FOR REISSUE**

1. Added Figure 42 which specifies the Enhanced Service Adjunct AC power distribution for the 9-track tape drive.

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2. Added Figure 43 which specifies the Enhanced Service Adjunct AC power distribution for the outlet strips located in the peripheral cabinet.
3. Added Figures 44-50 which specify Auxiliary Work Station (AWS) protected AC loads.
4. Add Figure 51 which specifies the conduit size, wire colors, and connections for the AWS inverter.

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