# Electronic Switching Systems

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The SP-1 Local (2W) ESS is a stored program controlled switching system, designed for use as a Class 5 local switching office. It is economical in initial installations with as low as 2000 lines depending on traffic, growth rate and features. The nominal maximum capacity of SP-1 ESS offices is 25,000 lines, based on average office traffic.

The system includes Centrex business services, a large system configuration, automatic number identification (ANI), local automatic message accounting (LAMA), and facilities for automatic fault recognition and trouble diagnosis of all major system components.

A special-purpose digital computer controls the SP-1 (2W) ESS. Two central processing units and their associated memory modules ensure reliability objectives of less than two hours downtime over a 40-year lifespan. Both CPUs independently process all calls with the results being compared by matching circuits. One of the CPUs then sets up the network. If a mismatch occurs between the processors, each goes through a prescribed test and the one that passes assumes control, diagnoses the other's trouble and prints out the result via teletypewriter. Duplicated central control also enables uninterrupted service to the customer during major modifications or extensions.

One of the most significant features of the SP-1 (2W) ESS is the ease with which it can be operated and maintained. The system is equipped with a maintenance center which provides a man/machine interface through one or more teletypewriters which can be situated local to, or remote from, the maintenance center. Remote system control via teletypewriter permits unattended operation of the office for extended periods of time. Using the teletypewriter, exchange personnel can change assignments, translation and routing information without any wiring changes; they can trace nuisance calls...
and implement line lock-out, and converse with the machine for maintenance, operation, and trouble diagnosis. The teletypewriters can also provide traffic data for administration and engineering purposes.

**Centrex Services**
The SP-1 (2W) ESS can include a wide range of stored-program-controlled business services referred to as Centrex. These services can be provided from switching facilities located either at the central office for Centrex-CO operation, or on the subscribers' premises for Centrex-CU. Employing Centrex-CU operation, the SP-1 (2W) ESS on the subscribers' premises is dedicated to provide business services only, and connects to the message network via interoffice trunks.

In the Centrex-CO operation each subscriber represents a customer group with one or more listed directory numbers, its own attendant facilities, and dedicated outside plant. In addition, unless so restricted by station class of service, each customer group has access to all subscribers and common trunk facilities in the Central Office.

Features such as transfer services, station and tie trunk restrictions and conference services are available to Centrex customers as standard services or as options. Special services, including such items as station hunting and custom calling are available. Special business features are also available to meet hotel/motel, hospital and airport needs.

Conversion of a non-Centrex office to Centrex is easy: the existing stored program package is simply replaced by the Centrex CO program. Additional equipment requirements consist of a data link, attendant console and a control cabinet.
Large System Configuration
The large system configuration uses a multiple arrangement of SP-1 (2W) ESS processor pairs with a Processor Information Exchange System (PIES). Functionally, PIES consists of a processor and associated memories which allow information such as the status of lines, trunks, and signaling, to be exchanged. This results in equipment savings in the Central Office, and reduces the amount of inter-office trunking and central processing real-time, especially in offices handling large amounts of tandem traffic.

References
Technical Bulletin TSB-1.01

For further information contact our nearest sales office

Technical Data

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<tbody>
<tr>
<td>Office Class</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Physical Line Network Capacity</td>
<td>37,800 lines</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Call Carrying Capacity</td>
<td>45,300 completed calls</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Network Traffic Capacity</td>
<td>110,000 CCS ABSH (approx. 3055 Erlangs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directory Numbers</td>
<td>64,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Network Frame Configuration</td>
<td>400 or 600 lines</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

| Inpulsing/Outpulsing DP/MF |                |                |                |                |                |                |
| Station Signaling          | Rotary Dial or DIGITONE* |                |                |                |                |                |
| Minimum Centrex Customer Group Size | 20 main stations |                |                |                |                |                |
| Minimum Centrex CO Installation | 500 main stations |                |                |                |                |                |
| Maximum Centrex CO Installation Limited by Central Office capacity | 2000 main stations |                |                |                |                |                |

Subscriber Loop Resistance (including subset)

| Message or Flat Rate Loop Start | 2000 Ω at 50 V and 21 mA | Coin Box Ground Start | 1500 Ω | Loop Leakage | 30,000 Ω (between conductors, and conductors to ground). |

Operating Conditions and Physical Data

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<tr>
<th>Power Requirements</th>
<th>Ambient Service Conditions</th>
<th>Building Data</th>
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<tbody>
<tr>
<td>Operating voltages</td>
<td>Temperature range</td>
<td>Recommended ceiling height</td>
</tr>
<tr>
<td>±48 Vdc nominal</td>
<td>-40°F to 100°F (4°C to 38°C)</td>
<td>Maintenance aisle</td>
</tr>
<tr>
<td>±24 Vdc nominal</td>
<td>Temperature range (short term)</td>
<td>Wiring aisle</td>
</tr>
<tr>
<td>±130 Vdc nominal</td>
<td>35°F to 120°F (2°C to 49°C)</td>
<td>Floor load</td>
</tr>
<tr>
<td>120 Vac nominal, single phase</td>
<td>Relative humidity</td>
<td>20% to 55%</td>
</tr>
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</table>
The SP-1 (4W) ESS is a stored program, four-wire switching system designed for toll office operation in the Direct Distance Dialing (DDD) network. The system is suitable as an initial (stand-alone) free-standing toll installation, and/or as a replacement for existing Step-by-Step or Crossbar offices. It serves incoming, outgoing, and toll tandem traffic, and is fully compatible with the DDD network. Local tandem operation is also available either as a separate entity or in conjunction with the toll office operation.

The system includes centralized automatic message accounting (CAMA) with data recorded on magnetic tape, semi-automatic trunk testing, optional automatic trunk testing, matrix scanning, automated service analysis, and many other features that will improve the efficiency of network planning and management.

A special-purpose digital computer controls the SP-1 (4W) ESS. Two central processing units and their associated memory modules ensure reliability objectives of less than two hours downtime over a 40-year lifespan. Both CPUs independently process all calls with the results being compared by matching circuits. One of the CPUs then sets up the network. If a mismatch occurs between the processors, each goes through a prescribed test and the one that passes assumes control, diagnoses the other’s trouble and prints out the result via teletypewriter. Duplicated central control also enables uninterrupted subscriber service during extensions.

One of the most significant features of the SP-1 (4W) ESS is ease of maintenance. The highly automated fault detection system includes supervisory, preventive and diagnostic maintenance routines. As an example, if a fault is detected in an essential circuit the faulty module is located, operation
is transferred to a good module, an alarm is
initiated, and a teletypewriter prints the
nature and location of the trouble — all
automatically.

This ease of maintenance is continued in the
design of the trunk circuits. The circuitry
comprising each SP-1 toll trunk is packaged
as a plug-in module. These plug-in facilities
not only enable the maintenance technician
to replace faulty equipment quickly, but also
provide for test bench adjustments or repairs
at convenient times.

A semi-automatic trunk test center provides
facilities for rapid trunk testing. Loss and
noise figures are checked on a transmission
test set while supervision and signaling tests
are performed using an NE-26B signaling test
set. Other facilities available include a volt-
meter circuit, a return loss test set and a 6HR
impulse noise counter. Similar tests can be
performed on a preset automatic basis by the
optional automatic trunk test circuit.

**SP-1 Local/Toll (2-/4-wire) ESS**
The SP-1 (4W) ESS can be combined with
an SP-1 (2W) ESS using only one central
control complex to provide both local and toll
switching. Later, when traffic volume
increases, the combined system can be split
into separate systems by the addition of
another central control complex.

**SP-1 Toll (4W) ESS Large System
Configuration**
The SP-1 toll system design has ample real-
time capacity to support in excess of 6000
working incoming trunks at 9 calls per trunk
in the busy hour. The large system configura-
tion, consisting of two or more SP-1 (4W) ESS
processor pairs, increases the upper limit to
more than 15,000 working incoming trunks
using similar traffic parameters. Thus the
system is suitable for initial applications in
toll offices ranging from a few hundred to
several thousand working incoming trunks.
Traffic Operator Position System (TOPS)
A cordless Traffic Operator Position System (TOPS) can be used in conjunction with the SP-1 (4W) ESS. TOPS makes full use of the flexibility inherent in SP-1 (4W) ESS in order to provide the latest in automated operator techniques, thus effecting substantial savings in operating costs.

Technical Data

Office Parameters

<table>
<thead>
<tr>
<th>Office Class</th>
<th>Capacity</th>
<th>Single Unit (with MOS)</th>
<th>Large System Configuration (with MOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,3,4</td>
<td></td>
<td>54,000</td>
<td>97,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100,000</td>
<td>180,000</td>
</tr>
</tbody>
</table>

Call-carrying: 54,000 97,000 135,000
Network CCS: 100,000 180,000 250,000

Trunk network:
- Incoming trunk appearances: 6,400 or 9,600 or 12,800
- Outgoing trunk appearances: 6,400 or 9,600 or 12,800

These trunk types are available with a complete selection of signaling and supervisory options.

Trunk Types

- Intertoll: incoming, outgoing, 2-way
- Toll connection: CAMA incoming, DDD access incoming
- Toll and EAS completing
- Tandem: incoming
- Switchboards: incoming, outgoing
- Operator office, 2-way
- Miscellaneous: CAMA position, test trunks, and many other features

Operating Conditions and Physical Data

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<tr>
<th>Power Requirements</th>
<th>Ambient Service Conditions</th>
<th>Equipment Specifications</th>
<th>Building Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltages</td>
<td>Temperature range: 40°F to 100°F (4°C to 38°C)</td>
<td>Frame dimensions: Height 7 ft (2.1 m)</td>
<td>Recommended ceiling height 11 ft (3.35 m)</td>
</tr>
<tr>
<td>- 48 Vdc nominal</td>
<td>Temperature range: 35°F to 120°F (2°C to 49°C)</td>
<td>Width (single bay) 28 in (711 mm)</td>
<td>Maintenance aisle 31 in (787.4 mm)</td>
</tr>
<tr>
<td>- 24 Vdc nominal</td>
<td>Relative humidity: 20% to 55%</td>
<td>Width (double bay) 56 in (1.4 m)</td>
<td>Wiring aisle 23 in (584.2 mm)</td>
</tr>
<tr>
<td>120 Vac nominal, single phase</td>
<td></td>
<td>Depth 12 in (305 mm)</td>
<td>Floor load 150 lb/ft² (732.4 kg/m²)</td>
</tr>
</tbody>
</table>

Information subject to change without notice.