FIGURE C.3 Illustration of the numbering scheme for determining the transmission-line capacitance matrix from the generalized capacitance matrix for a ribbon cable.

```
1       2      -6.26613E-12           =C (  1,   2)
2       2       2.49819E-11           =C (  2,   2)
1       1       1.65812E-11           =C0(  1,   1)
1       2      -5.33434E-12           =C0(  1,   2)
2       2       1.65812E-11           =C0(  2,   2)

NUMBER OF WIRES=   3
NUMBER OF FOURIER COEFFICIENTS= 20
REFERENCE WIRE=   2
WIRE RADIUS (mils)= 7.500E+00
DIELECTRIC INSULATION THICKNESS (mils)= 1.00E+01
DIELECTRIC CONSTANT OF INSULATION= 3.500E+00
CENTER-TO-CENTER SEPARATION (mils)= 5.000E+01
```

C.3 PCB.FOR FOR COMPUTING THE PUL PARAMETER MATRICES OF PRINTED CIRCUIT BOARDS

Required Input File: PCB.IN

Output File: PUL.DAT

This code computes the per-unit-length parameter matrices for a printed circuit board consisting of N lands on one side of a dielectric substrate as shown in Fig. C.4. The lands have identical width W and are assumed of zero thickness. The edge-to-edge spacings are denoted as S. The board thickness is designated as T and the substrate has relative permittivity of ε_r. The scheme for designating the reference land is illustrated in Fig. C.5. The lands are numbered left to right from
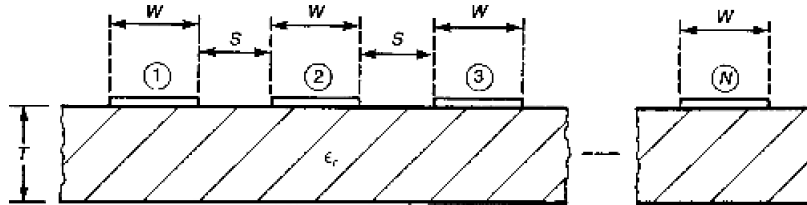
FIGURE C.4   Cross-sectional definition of the printed circuit board parameters for the PCB.FOR FORTRAN program input data.

1 to N. With this numbering the reference land is chosen and then the lands are renumbered left to right from 1 to $N - 1 = n$.

The following input file, PCB.IN, is for the problem in Section 9.6.2 and shown in Fig. 9.51. The outer land, land 1, is chosen as the reference land and the land widths are 15 mils and assumed zero thickness. The edge-to-edge separations are 45 mils. The board thickness is 47 mils, and the substrate has a relative permittivity of 4.7. Each land was divided into 30 subsections for the analysis:

```
3      =TOTAL NUMBER OF LANDS
30     =NUMBER OF CONDUCTOR SUBSECTIONS
3      =NUMBER OF REFERENCE LAND
15.0   =LAND WIDTH (mils)
45.0   =EDGE-TO-EDGE LAND SEPARATION (mils)
47.    =BOARD THICKNESS (mils)
4.7    =BOARD RELATIVE DIELECTRIC CONSTANT
```

The output is in PUL.DAT:

```
1      1    1.38315E-06      =L(  1,   1)
1      2    6.91573E-07      =L(  1,   2)
2      2    1.10707E-06      =L(  2,   2)
1      1    2.96949E-11      =C(  1,   1)
1      2   -2.02619E-11      =C(  1,   2)
2      2    4.05238E-11      =C(  2,   2)
1      1    1.16982E-11      =C0(  1,   1)
1      2   -7.30774E-12      =C0(  1,   2)
2      2    1.46155E-11      =C0(  2,   2)


NUMBER OF LANDS=   3
NUMBER OF DIVISIONS PER LAND= 30
REFERENCE LAND=   3
LAND WIDTH (mils)= 1.500E+01
EDGE-TO-EDGE SEPARATION (mils)= 4.500E+01
```
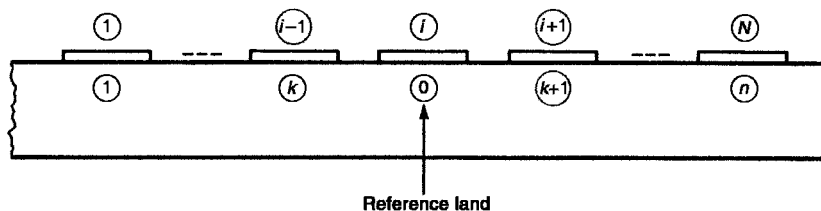
Reference land

FIGURE C.5 Illustration of the numbering scheme for determining the transmission-line capacitance matrix from the generalized capacitance matrix for a printed circuit board.

```
BOARD THICKNESS (mils)= 4.700E+01
RELATIVE DIELECTRIC CONSTANT= 4.700E+00
```

C.4 MSTRP.FOR FOR COMPUTING THE PUL PARAMETER MATRICES OF COUPLED MICROSTRIP LINES

Required Input File: MSTRP.IN

Output File: PUL.DAT

This code computes the per-unit-length parameter matrices for a coupled microstrip consisting of n lands on one side of a dielectric substrate as shown in Fig. C.6. The reference conductor is a ground plane on the other side of the substrate. The lands have identical width W and are assumed to be of zero thickness. The edge-to-edge spacings are denoted as S. The board thickness is designated as T, and the substrate has a relative permittivity of ε_r. The following input file, MSTRP.IN, is for the problem in Section 9.4.1.2 and shown in Fig. 9.31. The land widths are 100 mils and assumed to be of zero thickness. The edge-to-edge separations are 100 mils. The board thickness is 62 mils, and the substrate has a relative permittivity of 4.7. Each land was divided into 30 subsections for the analysis:

```
2      =TOTAL NUMBER OF LANDS (EXCLUSIVE OF GND PLANE)
30     =NUMBER OF CONDUCTOR SUBSECTIONS
100.   =LAND WIDTH (mils)
100.   =EDGE-TO-EDGE LAND SEPARATION (mils)
62.    =BOARD THICKNESS (mils)
4.7    =BOARD RELATIVE DIELECTRIC CONSTANT
```

The output file is PUL.DAT:

```
1      1      3.35327E-07          =L( 1,    1)
1      2      3.71527E-08          =L( 1,    2)
2      2      3.35327E-07          =L( 2,    2)
1      1      1.15511E-10          =C( 1,    1)
```