Appendixes

# Appendix A   Exercises

Exercise 1: Use the following Field Values Table and Record Reconstruction Table to reconstruct the suppliers file:

```
Field Values Table                      Record Reconstruction Table
      1        2         3        4            1        2         3        4

   ┌──────┬────────┬────────┬────────┐     ┌──────┬────────┬────────┬────────┐
   │  S#  │ SNAME  │ STATUS │ CITY   │     │  S#  │ SNAME  │ STATUS │ CITY   │
   ├──────┼────────┼────────┼────────┤     ├──────┼────────┼────────┼────────┤
 1 │  S1  │ Adams  │     10 │ Athens │   1 │   5  │    4   │     4  │    5   │
 2 │  S2  │ Blake  │     20 │ London │   2 │   4  │    5   │     2  │    4   │
 3 │  S3  │ Clark  │     20 │ London │   3 │   2  │    2   │     3  │    1   │
 4 │  S4  │ Jones  │     30 │ Paris  │   4 │   3  │    1   │     1  │    2   │
 5 │  S5  │ Smith  │     30 │ Paris  │   5 │   1  │    3   │     5  │    3   │
   └──────┴────────┴────────┴────────┘     └──────┴────────┴────────┴────────┘
```

The following diagram should serve to remind you how the reconstruction algorithm works (it shows the pointer rings for the record obtained by starting at cell [*1,1*] in each of the two tables):
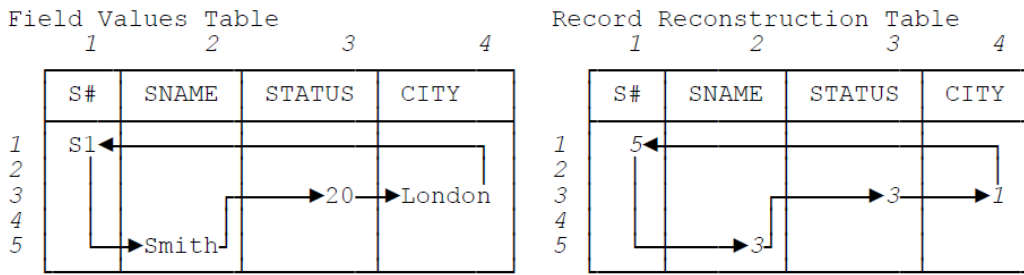
The "first" reconstructed record is thus as shown below. You should be able to fill in the rest (begin with cell [*2,1*] in the Field Values Table, then cell [*3,1*], then cell [*4,1*], and finally cell [*5,1*]—in other words, proceed down column *1*).

```
          1        2         3        4

       ┌──────┬────────┬────────┬────────┐
       │  S#  │ SNAME  │ STATUS │ CITY   │
       ├──────┼────────┼────────┼────────┤
     1 │  S1  │ Smith  │     20 │ London │
     2 │      │        │        │        │
     3 │      │        │        │        │
     4 │      │        │        │        │
     5 │      │        │        │        │
       └──────┴────────┴────────┴────────┘
```

Your answer should look like Fig. 3.2.

Exercise 2: Use the following suppliers file and corresponding Permutation Table to build a Record Reconstruction Table:

File

	S#	SNAME	STATUS	CITY
	1	2	3	4
1	S4	Clark	20	London
2	S5	Adams	30	Athens
3	S2	Jones	10	Paris
4	S1	Smith	20	London
5	S3	Blake	30	Paris

Permutation Table

	S#	SNAME	STATUS	CITY
	1	2	3	4
1	4	2	3	2
2	3	5	1	1
3	5	1	4	4
4	1	3	2	3
5	2	4	5	5

Here's the algorithm:

Step 1: Let *PT* be the Permutation Table. Build a table *RRT* with the same number of rows and columns as *PT* and with all cells empty.

Step 2: For all records in the user file, do *Step 3*.

Step 3: For all columns of *PT*, do *Step 4*.

Step 4: Let the current record of the user file be the rth record, and let the current column of *PT* be the jth column. Let cell $[i,j]$ of *PT* be the cell of column j that contains the record number r. At cell $[i,j]$ of *RRT*, place the value i', where cell $[i',j+1]$ of *PT* is the cell of column $j+1$ that contains the record number r. If column j is the last column, take column $j+1$ as the first column.

After this algorithm has been executed, table *RRT* is the desired Record Reconstruction Table:

	S#	SNAME	STATUS	CITY
	1	2	3	4
1				
2				
3				
4				
5				

Your answer should look like the Record Reconstruction Table shown in Exercise 1.

Exercise 3: Use the following suppliers file to build a corresponding Field Values Table:

File	1	2	3	4
	S#	SNAME	STATUS	CITY
1	S1	Smith	20	London
2	S2	Jones	10	Paris
3	S3	Blake	30	Paris
4	S4	Clark	20	London
5	S5	Adams	30	Athens

Field Values Table	1	2	3	4
	S#	SNAME	STATUS	CITY
1				
2				
3				
4				
5				

Your answer should look like the Field Values Table shown in **Exercise 1**. Now construct a corresponding Permutation Table and (using that Permutation Table) a corresponding Record Reconstruction Table:

Permutation Table	1	2	3	4
	S#	SNAME	STATUS	CITY
1				
2				
3				
4				
5				

Record Reconstruction Table	1	2	3	4
	S#	SNAME	STATUS	CITY
1				
2				
3				
4				
5				

Does your Record Reconstruction Table look like Fig. 3.5? If not, why not?

Exercise 4: Use the following Permutation Table to build a corresponding Inverse Permutation Table:

Permutation Table

	S#	SNAME	STATUS	CITY
1	4	2	3	2
2	3	5	1	1
3	5	1	4	4
4	1	3	2	3
5	2	4	5	5

Inverse Permutation Table

	S#	SNAME	STATUS	CITY
1				
2				
3				
4				
5				

Recall that if you think of any given permutation as a vector V, then the inverse permutation V' can be obtained in accordance with the rule that if $V[i] = i'$, then $V'[i'] = i$. Your answer should look like the Inverse Permutation Table shown in **Exercise 5**.

Exercise 5: Use the following Inverse Permutation Table to build a Record Reconstruction Table:

	S#	SNAME	STATUS	CITY
	1	**2**	**3**	**4**
1	4	3	2	2
2	5	1	4	1
3	2	4	1	4
4	1	5	3	3
5	3	2	5	5

Inverse Permutation Table

	S#	SNAME	STATUS	CITY
	1	**2**	**3**	**4**
1				
2				
3				
4				
5				

Record Reconstruction Table

Here's the algorithm:

Go to cell [*i,1*] of the Inverse Permutation Table. Let that cell contain the value *r;* also, let the next cell to the right, cell [*i,2*], contain the value *r′*. Go to the *r*th row of the Record Reconstruction Table and place the value *r′* in cell [*r,1*].

Executing this algorithm for *i = 1, 2, ..., 5* yields the entire S# column of the Record Reconstruction Table. The other columns are built analogously. Your answer should look like the Record Reconstruction Table shown in **Exercise 1**.
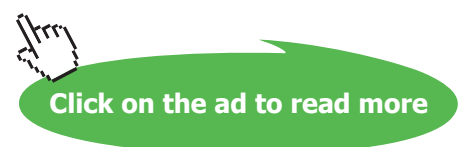
Exercise 6: Given the following suppliers file—

```
File
        1        2         3          4
     ┌──────┬────────┬─────────┬──────────┐
     │  S#  │ SNAME  │ STATUS  │ CITY     │
     ├──────┼────────┼─────────┼──────────┤
   1 │  S4  │ Clark  │      20 │ London   │
   2 │  S5  │ Adams  │      30 │ Athens   │
   3 │  S2  │ Jones  │      10 │ Paris    │
   4 │  S1  │ Smith  │      20 │ London   │
     └──────┴────────┴─────────┴──────────┘
```

—check that the following Field Values Table and Record Reconstruction Table are correct:

```
Field Values Table                    Record Reconstruction Table
      1       2        3        4           1       2        3        4
   ┌──────┬────────┬────────┬────────┐   ┌──────┬────────┬────────┬──────┐
   │  S#  │ SNAME  │ STATUS │ CITY   │   │  S#  │ SNAME  │ STATUS │ CITY │
   ├──────┼────────┼────────┼────────┤   ├──────┼────────┼────────┼──────┤
 1 │  S1  │ Adams  │     10 │ Athens │ 1 │  4   │   4    │   4    │  4   │
 2 │  S2  │ Clark  │     20 │ London │ 2 │  3   │   2    │   2    │  3   │
 3 │  S4  │ Jones  │     20 │ London │ 3 │  2   │   1    │   3    │  1   │
 4 │  S5  │ Smith  │     30 │ Paris  │ 4 │  1   │   3    │   1    │  2   │
   └──────┴────────┴────────┴────────┘   └──────┴────────┴────────┴──────┘
```

Exercise 7: Given the following suppliers file—

```
File
        1           2           3           4
    ┌──────┬─────────┬─────────┬──────────┐
    │  S#  │  SNAME  │ STATUS  │  CITY    │
    ├──────┼─────────┼─────────┼──────────┤
  1 │  S4  │  Clark  │   20    │  London  │
  2 │  S5  │  Adams  │   30    │  Athens  │
  3 │  S2  │  Jones  │   10    │  Paris   │
  4 │  S1  │  Smith  │   20    │  London  │
  5 │  S3  │  Blake  │   30    │  Paris   │
  6 │  S6  │  Brady  │   30    │  Athens  │
  7 │  S7  │  Patel  │   40    │  Haifa   │
    └──────┴─────────┴─────────┴──────────┘
```

—check that the following Field Values Table and Record Reconstruction Table are correct:

```
Field Values Table                    Record Reconstruction Table
      1       2       3       4              1       2       3       4
   ┌──────┬───────┬────────┬───────┐      ┌──────┬───────┬────────┬───────┐
   │  S#  │ SNAME │ STATUS │ CITY  │      │  S#  │ SNAME │ STATUS │ CITY  │
   ├──────┼───────┼────────┼───────┤      ├──────┼───────┼────────┼───────┤
 1 │  S1  │ Adams │   10   │ Athens│    1 │  7   │   4   │   6    │   5   │
 2 │  S2  │ Blake │   20   │ Athens│    2 │  5   │   6   │   4    │   6   │
 3 │  S3  │ Brady │   20   │ Haifa │    3 │  2   │   5   │   5    │   7   │
 4 │  S4  │ Clark │   30   │ London│    4 │  4   │   3   │   1    │   1   │
 5 │  S5  │ Jones │   30   │ London│    5 │  1   │   1   │   2    │   4   │
 5 │  S6  │ Patel │   30   │ Paris │    5 │  3   │   7   │   7    │   2   │
 5 │  S7  │ Smith │   40   │ Paris │    5 │  6   │   2   │   3    │   3   │
   └──────┴───────┴────────┴───────┘      └──────┴───────┴────────┴───────┘
```

Exercise 8: Use the following Field Values and Record Reconstruction Tables to reconstruct the shipments file, starting at cell [*1,1*] of each of the two tables for the first record in that reconstruction and continuing down column *1*. Then do the same thing again, but this time going down column 2; and then again, going down column 3; and then again, going down column 4.

	Field Values Table			
	1	2	3	4
	S#	P#	J#	QTY
1	S1	P1	J1	100
2	S1	P1	J1	100
3	S2	P1	J1	200
4	S2	P1	J1	200
5	S2	P2	J2	200
6	S3	P2	J2	200
7	S3	P3	J2	500
8	S3	P3	J2	500
9	S3	P3	J2	500

	Record Reconstruction Table			
	1	2	3	4
	S#	P#	J#	QTY
1	2	1	2	2
2	8	2	3	6
3	3	3	4	1
4	4	7	5	3
5	5	8	1	8
6	1	9	6	9
7	6	4	7	4
8	7	5	8	5
9	9	6	9	7

Your answers should be as shown in Fig. 6.5.

Exercise 9: Use the following Inverse Permutation Table to build a "preferred" Record Reconstruction Table for shipments:

```
Inverse Permutation Table     Record Reconstruction Table
       1    2    3    4
```

	S#	P#	J#	QTY
1	1	2	2	3
2	2	8	5	1
3	3	3	3	4
4	4	4	7	7
5	5	5	8	8
6	6	1	1	2
7	7	6	9	9
8	8	7	4	5
9	9	9	6	6

	S#	P#	J#	QTY
1				
2				
3				
4				
5				
6				
7				
8				
9				

Your answer should look like Fig. 6.4.

Exercise 10: Given the following shipments file, show a Permutation Table corresponding to the following sort orders:

- For column S# :   S# – P# – J#
- For column P# :   P# – J# – S#
- For column J# :   J# – S# – P#
- For column QTY :   QTY – S# – P# – J#

```
        File                                Permutation Table
          1    2    3    4                      1    2    4    5

       | S# | P# | J# | QTY |               | S# | P# | J# | QTY |

    1  | S1 | P1 | J1 | 200 |          1    |    |    |    |    |
    2  | S1 | P3 | J2 | 100 |          2    |    |    |    |    |
    3  | S2 | P1 | J1 | 200 |          3    |    |    |    |    |
    4  | S2 | P1 | J2 | 500 |          4    |    |    |    |    |
    5  | S2 | P2 | J2 | 500 |          5    |    |    |    |    |
    6  | S3 | P1 | J1 | 100 |          6    |    |    |    |    |
    7  | S3 | P2 | J2 | 500 |          7    |    |    |    |    |
    8  | S3 | P3 | J1 | 200 |          8    |    |    |    |    |
    9  | S3 | P3 | J2 | 200 |          9    |    |    |    |    |
```

Use this Permutation Table to build a corresponding Inverse Permutation Table and a corresponding Record Reconstruction Table:

```
    Inverse Permutation Table        Record Reconstruction Table
       1    2    3    4                  1    2    3    4

    | S# | P# | J# | QTY |            | S# | P# | J# | QTY |

 1  |    |    |    |    |         1   |    |    |    |    |
 2  |    |    |    |    |         2   |    |    |    |    |
 3  |    |    |    |    |         3   |    |    |    |    |
 4  |    |    |    |    |         4   |    |    |    |    |
 5  |    |    |    |    |         5   |    |    |    |    |
 6  |    |    |    |    |         6   |    |    |    |    |
 7  |    |    |    |    |         7   |    |    |    |    |
 8  |    |    |    |    |         8   |    |    |    |    |
 9  |    |    |    |    |         9   |    |    |    |    |
```

Your Record Reconstruction Table should look like Fig. 6.6. Check that this Record Reconstruction Table does exhibit the desired behavior regarding major-to-minor orderings.

Exercise 11: Use the following Field Values Table and Record Reconstruction Table to reconstruct the parts file. Start with column *5* in order to obtain the result in ascending city name sequence.

```
Field Values Table
        1                2              3              4              5
   ┌─────┬──────────────┬──────────────┬──────────────┬──────────────┐
   │ P#  │ PNAME        │ COLOR        │ WEIGHT       │ CITY         │
   ├─────┼──────────────┼──────────────┼──────────────┼──────────────┤
 1 │ P1  │ Bolt   [1:1] │ Blue  [1:2]  │ 12.0 [1:2]   │ London [1:3] │
 2 │ P2  │ Cam    [2:2] │ Green [3:3]  │ 14.0 [3:3]   │ Oslo   [4:4] │
 3 │ P3  │ Cog    [3:3] │ Red   [4:6]  │ 17.0 [4:5]   │ Paris  [5:6] │
 4 │ P4  │ Nut    [4:4] │              │ 19.0 [6:6]   │              │
 5 │ P5  │ Screw  [5:6] │              │              │              │
 6 │ P6  │              │              │              │              │
```

```
Record Reconstruction Table
        1       2      3      4      5
   ┌─────┬───────┬───────┬────────┬──────┐
   │ P#  │ PNAME │ COLOR │ WEIGHT │ CITY │
   ├─────┼───────┼───────┼────────┼──────┤
 1 │ 4   │ 3     │ 2     │ 1      │ 1    │
 2 │ 1   │ 1     │ 4     │ 6      │ 4    │
 3 │ 5   │ 6     │ 5     │ 2      │ 6    │
 4 │ 6   │ 4     │ 1     │ 4      │ 3    │
 5 │ 2   │ 2     │ 3     │ 5      │ 2    │
 6 │ 3   │ 5     │ 6     │ 3      │ 5    │
```

To remind you, here's the crucial revision to the reconstruction algorithm:

> Consider cell $[i,j]$ of the Record Reconstruction Table. Instead of going to cell $[i,j]$ of the Field Values Table, go to cell $[i',j]$ of that table, where cell $[i',j]$ is that unique cell within column j of that table that contains a row range that includes row i.

Your answer should look like Fig. 7.2, except that the records should appear in ascending city name sequence.

Exercise 12: Use the following Field Values Table and Record Reconstruction Table to reconstruct the parts file. Start with column *5* in order to obtain the result in ascending city name sequence.

```
Field Values Table
       1              2              3            4             5
    ┌─────┬───────────┬──────────────┬──────────────┬──────────────┐
    │ P#  │ PNAME     │ COLOR        │ WEIGHT       │ CITY         │
    ├─────┼───────────┼──────────────┼──────────────┼──────────────┤
  1 │ P1  │ Bolt [1:1]│ Blue  [1:2]  │  12.0 [1:2]  │ London [1:3] │
  2 │ P2  │ Cam  [2:2]│ Green [3:3]  │  14.0 [3:3]  │ Oslo   [4:4] │
  3 │ P3  │ Cog  [3:3]│ Red   [4:6]  │  17.0 [4:5]  │ Paris  [5:6] │
  4 │ P4  │ Nut  [4:4]│              │  19.0 [6:6]  │              │
  5 │ P5  │ Screw[5:6]│              │              │              │
  6 │ P6  │           │              │              │              │
    └─────┴───────────┴──────────────┴──────────────┴──────────────┘

Record Reconstruction Table
       1        2        3        4        5
    ┌──────┬────────┬────────┬────────┬────────┐
    │ P#   │ PNAME  │ COLOR  │ WEIGHT │ CITY   │
    ├──────┼────────┼────────┼────────┼────────┤
  1 │  4   │ 1•3    │ 1•2    │ 1•1    │ 1•1    │
  2 │  1   │ 2•1    │ 1•4    │ 1•6    │ 1•4    │
  3 │  5   │ 3•6    │ 2•5    │ 2•2    │ 1•6    │
  4 │  6   │ 4•4    │ 3•1    │ 3•4    │ 2•3    │
  5 │  2   │ 5•2    │ 3•3    │ 3•5    │ 3•2    │
  6 │  3   │ 5•5    │ 3•6    │ 4•3    │ 3•5    │
    └──────┴────────┴────────┴────────┴────────┘
```

To remind you, in those columns of the Record Reconstruction Table that include two row numbers instead of one, the first is the number of the desired row within the Field Values Table, and the second is the number of the next row to be inspected within the Record Reconstruction Table. As in **Exercise 11,** your answer should look like Fig. 7.2, except that the records should appear in ascending city name sequence.

Exercise 13: Given the following bill-of-materials file—

```
                    File
                         1              2        3
              ┌──────────────┬──────────────┬───────┐
              │  MAJOR_P#    │  MINOR_P#    │  QTY  │
              ├──────────────┼──────────────┼───────┤
          1   │  P3          │  P4          │   3   │
          2   │  P1          │  P3          │   4   │
          3   │  P2          │  P4          │   8   │
          4   │  P1          │  P4          │   1   │
          5   │  P2          │  P5          │   6   │
          6   │  P3          │  P6          │   4   │
          7   │  P1          │  P2          │   2   │
          8   │  P5          │  P6          │   3   │
          9   │  P2          │  P3          │   3   │
              └──────────────┴──────────────┴───────┘
```

—check that the following Field Values Table and Record Reconstruction Table are correct:

```
        Field Values Table                    Record Reconstruction Table
              1         2        3                    1           2         3
      ┌───────────┬──────────┬──────┐        ┌──────────┬──────────┬──────┐
      │ MAJOR_P#  │ MINOR_P# │ QTY  │        │ MAJOR_P# │ MINOR_P# │ QTY  │
      ├───────────┼──────────┼──────┤        ├──────────┼──────────┼──────┤
   1  │ P1        │ P2       │  1   │     1  │    1     │    2     │  3   │
   2  │ P1        │ P3       │  2   │     2  │    2     │    6     │  1   │
   3  │ P1        │ P3       │  3   │     3  │    4     │    3     │  4   │
   4  │ P2        │ P4       │  3   │     4  │    3     │    1     │  7   │
   5  │ P2        │ P4       │  3   │     5  │    5     │    9     │  9   │
   6  │ P2        │ P4       │  4   │     6  │    7     │    4     │  2   │
   7  │ P3        │ P5       │  4   │     7  │    6     │    8     │  8   │
   8  │ P3        │ P6       │  6   │     8  │    8     │    7     │  6   │
   9  │ P5        │ P6       │  8   │     9  │    9     │    5     │  5   │
      └───────────┴──────────┴──────┘        └──────────┴──────────┴──────┘
```

Note: The Record Reconstruction Table is intended to reflect the following sort orders:

- For column MAJOR_P#:   MAJOR_P# – MINOR_P# – QTY
- For column MINOR_P#:   MINOR_P# – MAJOR_P# – QTY
- For column QTY: QTY – MAJOR_P# – MINOR_P#

Exercise 14: Given the Field Values Table and Record Reconstruction Table from **Exercise 13,** check that the following condensed and expanded versions (respectively) are correct.

```
Field Values Table                          Record Reconstruction Table
          1            2          3                    1          2        3
   ┌─────────────┬────────────┬──────────┐      ┌──────────┬──────────┬───────┐
   │ MAJOR_P#    │ MINOR_P#   │ QTY      │      │ MAJOR_P# │ MINOR_P# │ QTY   │
   ├─────────────┼────────────┼──────────┤      ├──────────┼──────────┼───────┤
 1 │ P1 [1:3]    │ P2 [1:1]   │ 1 [1:1]  │    1 │   1■1    │   1■2    │  1■3  │
 2 │ P2 [4:6]    │ P3 [2:3]   │ 2 [2:2]  │    2 │   1■2    │   2■6    │  2■1  │
 3 │ P3 [7:8]    │ P4 [4:6]   │ 3 [3:5]  │    3 │   1■4    │   2■3    │  3■4  │
 4 │ P5 [9:9]    │ P5 [7:7]   │ 4 [6:7]  │    4 │   2■3    │   3■1    │  3■7  │
 5 │             │ P6 [8:9]   │ 6 [8:8]  │    5 │   2■5    │   3■9    │  3■9  │
 6 │             │            │ 8 [9:9]  │    6 │   2■7    │   3■4    │  4■2  │
   └ ─ ─ ─ ─ ─ ─ ┴ ─ ─ ─ ─ ─ ┴ ─ ─ ─ ─ ┘    7 │   3■6    │   4■8    │  4■8  │
                                               8 │   3■8    │   5■7    │  5■6  │
                                               9 │   4■9    │   5■5    │  6■5  │
                                                 └──────────┴──────────┴───────┘
```

Exercise 15: Use the following Field Values Table and Record Reconstruction Table to reconstruct the bill-of-materials file. Start with column *1* in order to obtain the result in sequence by minor part number within major part number.

```
Field Values Table                              Record Reconstruction Table
                        1            2                          1         2        3
  ┌───────────────────────┬─────────┐         ┌──────────┬──────────┬───────┐
  │ MAJOR_P# + MINOR_P#   │ QTY     │         │ MAJOR_P# │ MINOR_P# │ QTY   │
  ├───────────────────────┼─────────┤         ├──────────┼──────────┼───────┤
1 │ P1 [1:3]    [  :  ]   │ 1 [1:1] │       1 │   1•1    │   2•2    │  1•3  │
2 │ P2 [4:6]    [1:1]     │ 2 [2:2] │       2 │   1•2    │   3•6    │  2•1  │
3 │ P3 [7:8]    [2:3]     │ 3 [3:5] │       3 │   1•4    │   3•3    │  3•4  │
4 │ P4 [  :  ]  [4:6]     │ 4 [6:7] │       4 │   2•3    │   4•1    │  3•7  │
3 │ P5 [9:9]    [7:7]     │ 6 [8:8] │       5 │   2•5    │   4•9    │  3•9  │
4 │ P6 [  :  ]  [8:9]     │ 8 [9:9] │       6 │   2•7    │   4•4    │  4•2  │
  └───────────────────────┴─────────┘       7 │   3•6    │   5•8    │  4•8  │
                                             8 │   3•8    │   6•7    │  5•6  │
                                             9 │   5•9    │   6•5    │  6•5  │
                                               └──────────┴──────────┴───────┘
```

Your answer should be a file that's a direct image of relation MMQ as shown in Fig. 8.1.

Exercise 16: Given the following suppliers file—

```
File
      1       2        3        4
    ┌─────┬────────┬────────┬────────┐
    │ S#  │ SNAME  │ STATUS │ CITY   │
    ├─────┼────────┼────────┼────────┤
  1 │ S1  │ Smith  │    20  │ London │
  2 │ S2  │ Jones  │    10  │ Paris  │
  3 │ S3  │ Blake  │    30  │ Paris  │
  4 │ S4  │ Clark  │    20  │ London │
  5 │ S5  │ Adams  │    30  │ Athens │
    └─────┴────────┴────────┴────────┘
```

—check that the following Field Values Table and Record Reconstruction Table are correct:

```
Field Values Table
      1                2            3            4
    ┌─────┬──────────────┬─────────────┬─────────────────┐
    │ S#  │ SNAME        │ STATUS      │ CITY            │
    ├─────┼──────────────┼─────────────┼─────────────────┤
  1 │ S1  │ Adams [1:1]  │ 10 [1:1]    │ Athens [1:1]    │
  2 │ S2  │ Blake [2:2]  │ 20 [2:3]    │ London [2:3]    │
  3 │ S3  │ Clark [3:3]  │ 30 [4:5]    │ Paris  [4:5]    │
  4 │ S4  │ Jones [4:4]  │             │                 │
  5 │ S5  │ Smith [5:5]  │             │                 │
    └─────┴──────────────┴─────────────┴─────────────────┘
```

```
Record Reconstruction Table
      1       2        3       4
    ┌─────┬────────┬────────┬────────┐
    │ S#  │ SNAME  │ STATUS │ CITY   │
    ├─────┼────────┼────────┼────────┤
  1 │  5  │  1▪5   │  1▪4   │  1▪5   │
  2 │  4  │  2▪4   │  2▪2   │  2▪1   │
  3 │  2  │  3▪3   │  2▪3   │  2▪4   │
  4 │  3  │  4▪1   │  3▪5   │  3▪2   │
  5 │  1  │  5▪2   │  3▪1   │  3▪3   │
    └─────┴────────┴────────┴────────┘
```

Likewise, given the following shipments file—

```
File
      1    2    3    4
    ┌─────┬─────┬─────┬─────┐
    │ S#  │ P#  │ J#  │ QTY │
    ├─────┼─────┼─────┼─────┤
  1 │ S1  │ P1  │ J1  │ 200 │
  2 │ S1  │ P3  │ J2  │ 100 │
  3 │ S2  │ P1  │ J1  │ 200 │
  4 │ S2  │ P1  │ J2  │ 500 │
  5 │ S2  │ P2  │ J2  │ 500 │
  6 │ S3  │ P1  │ J1  │ 100 │
  7 │ S3  │ P2  │ J2  │ 500 │
  8 │ S3  │ P3  │ J1  │ 200 │
  9 │ S3  │ P3  │ J2  │ 200 │
    └─────┴─────┴─────┴─────┘
```

—check that the following Field Values Table and Record Reconstruction Table are correct:

```
Field Values Table
            1           2           3           4

     │ S#      │ P#      │ J#      │ QTY      │
     │         │         │         │          │
  1  │ S1 [1:2]│ P1 [1:4]│ J1 [1:4]│ 100 [1:2]│
  2  │ S2 [3:5]│ P2 [5:6]│ J2 [5:9]│ 200 [3:6]│
  3  │ S3 [6:9]│ P3 [7:9]│ ─ ─ ─ ─ │ 500 [7:9]│
```

```
Record Reconstruction Table
          1     2     3     4

     │ S#  │ P#  │ J#  │ QTY │
     │     │     │     │     │
  1  │ 1▪2 │ 1▪1 │ 1▪2 │ 1▪2 │
  2  │ 1▪8 │ 1▪2 │ 1▪3 │ 1▪6 │
  3  │ 2▪3 │ 1▪3 │ 1▪4 │ 2▪1 │
  4  │ 2▪4 │ 1▪7 │ 1▪5 │ 2▪3 │
  5  │ 2▪5 │ 2▪8 │ 2▪1 │ 2▪8 │
  6  │ 3▪1 │ 2▪9 │ 2▪6 │ 2▪9 │
  7  │ 3▪6 │ 3▪4 │ 2▪7 │ 3▪4 │
  8  │ 3▪7 │ 3▪5 │ 2▪8 │ 3▪5 │
  9  │ 3▪9 │ 3▪6 │ 2▪9 │ 3▪7 │
```

Finally, check that the following merged Field Values Table is correct:

```
Field Values Table
        1           2          3            4          5          6          7

  │ S#      │ SNAME     │ STATUS  │ CITY        │ P#      │ J#      │ QTY      │
  │         │           │         │             │         │         │          │
1 │ S1[1:2] │ Adams[1:1]│ 10[1:1] │ Athens[1:1] │ P1[1:4] │ J1[1:4] │ 100[1:2] │
2 │ S2[3:5] │ Blake[2:2]│ 20[2:3] │ London[2:3] │ P2[5:6] │ J2[5:9] │ 200[3:6] │
3 │ S3[6:9] │ Clark[3:3]│ 30[4:5] │ Paris [4:5] │ P3[7:9] │ ─ ─ ─ ─ │ 500[7:9] │
4 │ S4[ : ] │ Jones[4:4]│ ─ ─ ─ ─ │ ─ ─ ─ ─ ─ ─ │ ─ ─ ─ ─ │         │ ─ ─ ─ ─  │
5 │ S5[ : ] │ Smith[5:5]│         │             │         │         │          │
```

Appendix B   References and Bibliography

What follows is a consolidated list of references for the entire book. Let me immediately apologize for the embarrassingly large number of references to publications for which I'm the author or a coauthor; such a state of affairs is more or less unavoidable, however, given the nature of this book and the history of my own involvement in this field.

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