# Data Analysis and Integration

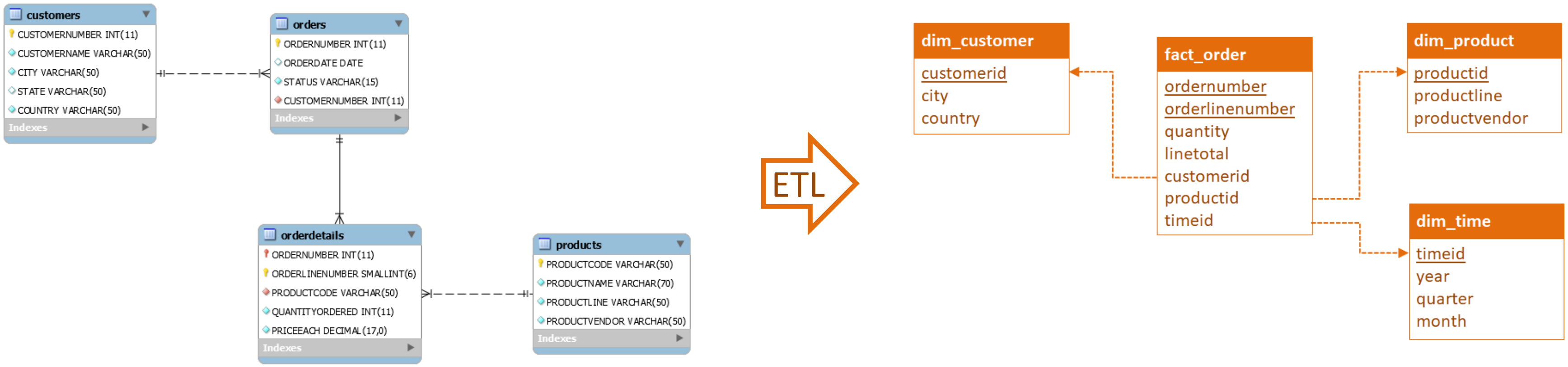
ETL process for a data warehouse

# Introduction

- How to build a data warehouse
  - ETL process
    - **extract** data from original database
    - **transform** data to fit star schema
    - **load** data onto data warehouse

database

data warehouse



customers
- CUSTOMERNUMBER INT(11)
- CUSTOMERNAME VARCHAR(50)
- CITY VARCHAR(50)
- STATE VARCHAR(50)
- COUNTRY VARCHAR(50)

orders
- ORDERNUMBER INT(11)
- ORDERDATE DATE
- STATUS VARCHAR(15)
- CUSTOMERNUMBER INT(11)

orderdetails
- ORDERNUMBER INT(11)
- ORDERLINENUMBER SMALLINT(6)
- PRODUCTCODE VARCHAR(50)
- QUANTITYORDERED INT(11)
- PRICEEACH DECIMAL(17,0)

products
- PRODUCTCODE VARCHAR(50)
- PRODUCTNAME VARCHAR(70)
- PRODUCTLINE VARCHAR(50)
- PRODUCTVENDOR VARCHAR(50)

dim_customer
- customerid
- city
- country

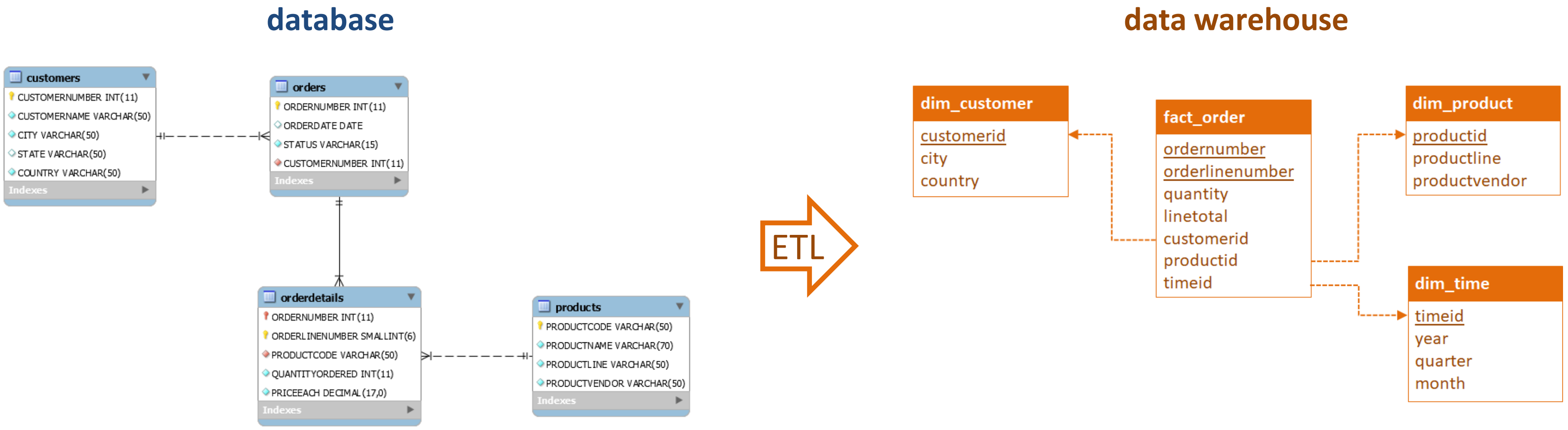
fact_order
- ordernumber
- orderlinenumber
- quantity
- linetotal
- customerid
- productid
- timeid

dim_product
- productid
- productline
- productvendor

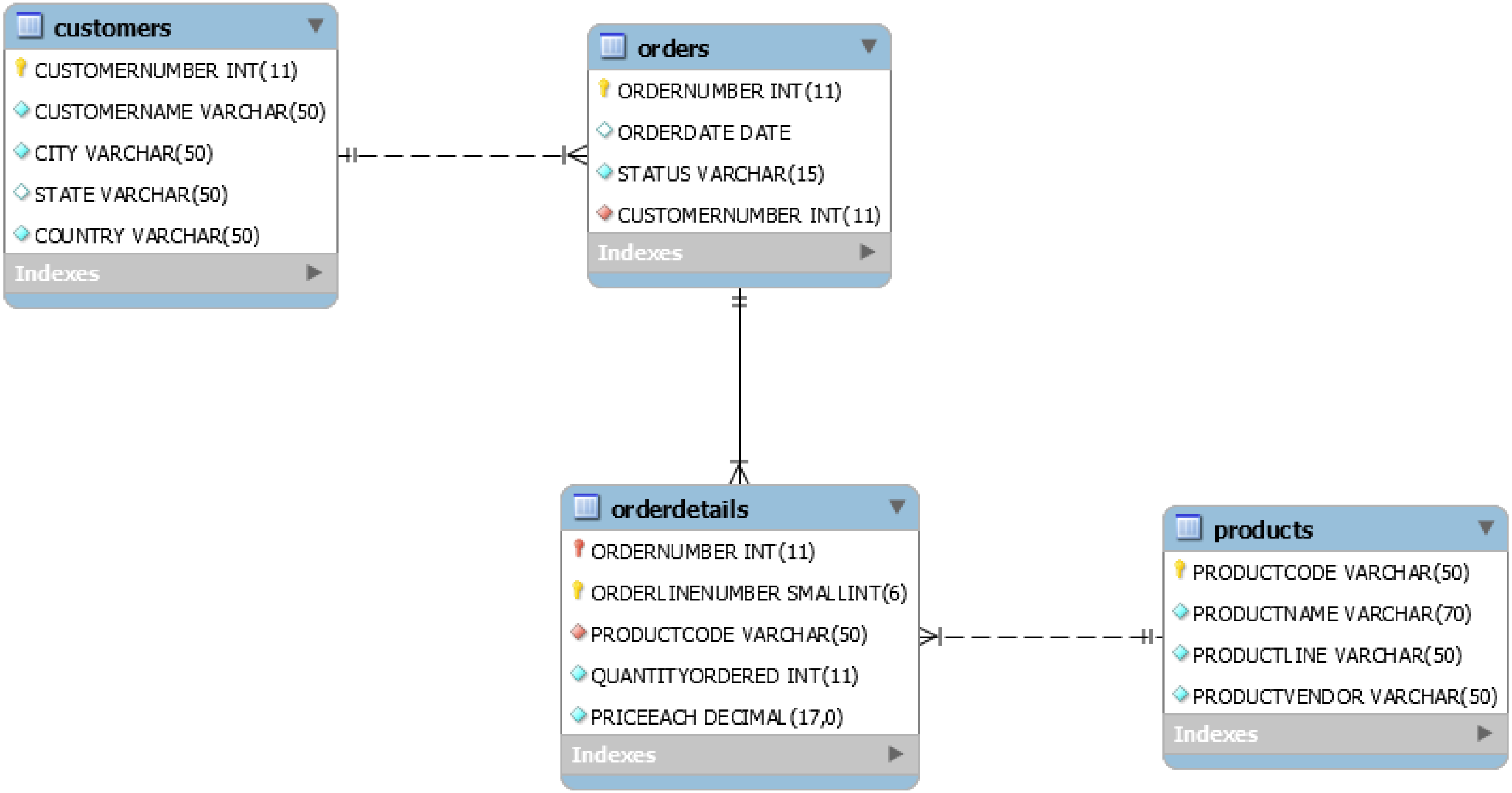
dim_time
- timeid
- year
- quarter
- month

# Introduction

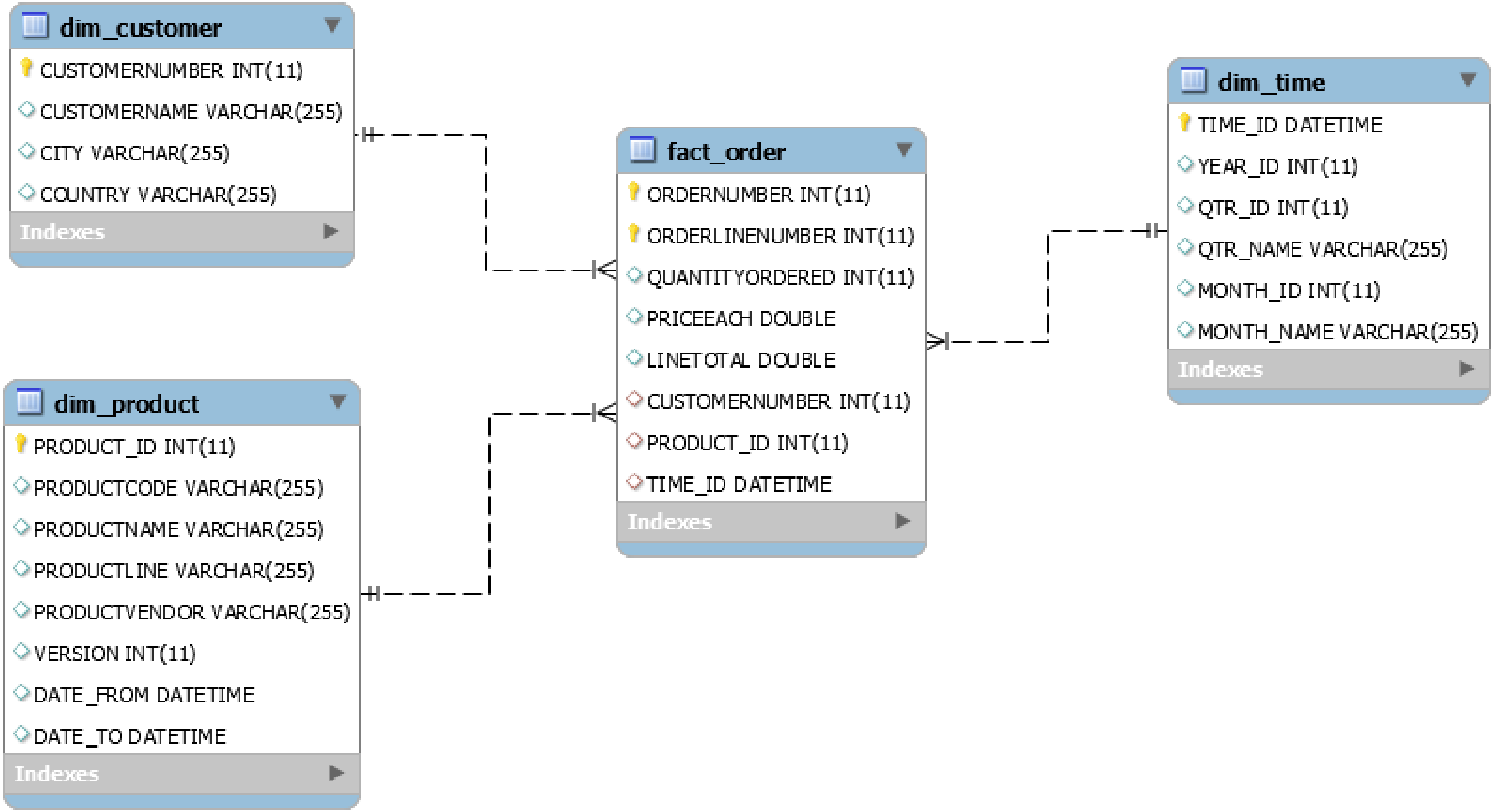
- How to build a data warehouse
  - this usually involves
    - one transformation for each dimension table
    - one transformation for the fact table
    - a job that runs all transformations in the correct sequence



# Database


customers
CUSTOMERNUMBER INT(11)
CUSTOMERNAME VARCHAR(50)
CITY VARCHAR(50)
STATE VARCHAR(50)
COUNTRY VARCHAR(50)
Indexes
orders
ORDERNUMBER INT(11)
ORDERDATE DATE
STATUS VARCHAR(15)
CUSTOMERNUMBER INT(11)
Indexes
orderdetails
ORDERNUMBER INT(11)
ORDERLINENUMBER SMALLINT(6)
PRODUCTCODE VARCHAR(50)
QUANTITYORDERED INT(11)
PRICEEACH DECIMAL(17,0)
Indexes
products
PRODUCTCODE VARCHAR(50)
PRODUCTNAME VARCHAR(70)
PRODUCTLINE VARCHAR(50)
PRODUCTVENDOR VARCHAR(50)
Indexes

# Data warehouse



**dim_customer**

CUSTOMERNUMBER INT(11)
CUSTOMERNAME VARCHAR(255)
CITY VARCHAR(255)
COUNTRY VARCHAR(255)

**fact_order**

ORDERNUMBER INT(11)
ORDERLINENUMBER INT(11)
QUANTITYORDERED INT(11)
PRICEEACH DOUBLE
LINETOTAL DOUBLE
CUSTOMERNUMBER INT(11)
PRODUCT_ID INT(11)
TIME_ID DATETIME

**dim_time**

TIME_ID DATETIME
YEAR_ID INT(11)
QTR_ID INT(11)
QTR_NAME VARCHAR(255)
MONTH_ID INT(11)
MONTH_NAME VARCHAR(255)

**dim_product**

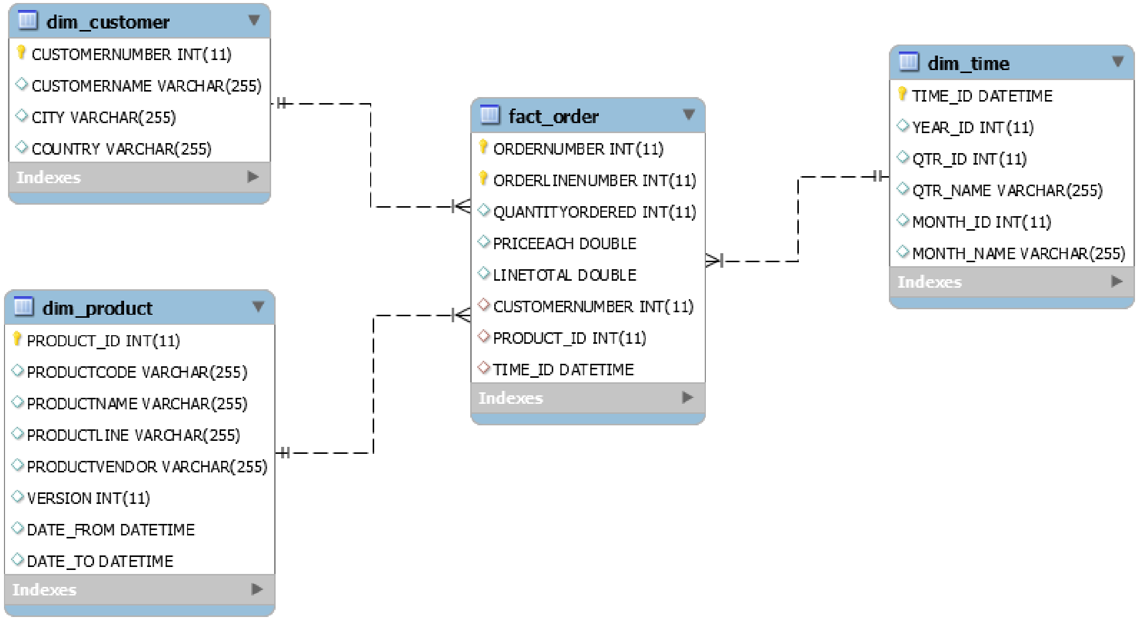
PRODUCT_ID INT(11)
PRODUCTCODE VARCHAR(255)
PRODUCTNAME VARCHAR(255)
PRODUCTLINE VARCHAR(255)
PRODUCTVENDOR VARCHAR(255)
VERSION INT(11)
DATE_FROM DATETIME
DATE_TO DATETIME

# Data warehouse

- Some notes on this example
  - ⚠ – dim_customer is simplified, it should have a surrogate key
    - e.g. CUSTOMER_ID of type INT
    - in this case, it was simplified by reusing the natural key
  - ⚠ – dim_time is simplified, it should have a proper surrogate key
    - e.g. TIME_ID of type INT
    - in this case, it was simplified by using ORDERDATE as key
  - ✓ – dim_product is a slowly-changing dimension of Type 2
    - surrogate key is PRODUCT_ID of type INT
    - includes version field and validity interval (date fields)

# Fact and dimension tables

- Building the data warehouse
  - star schema with fact table and dimension tables
  - fact table has FKs to dimension tables
    - dimension tables must be populated first



dim_customer
CUSTOMERNUMBER INT(11)
CUSTOMERNAME VARCHAR(255)
CITY VARCHAR(255)
COUNTRY VARCHAR(255)
Indexes

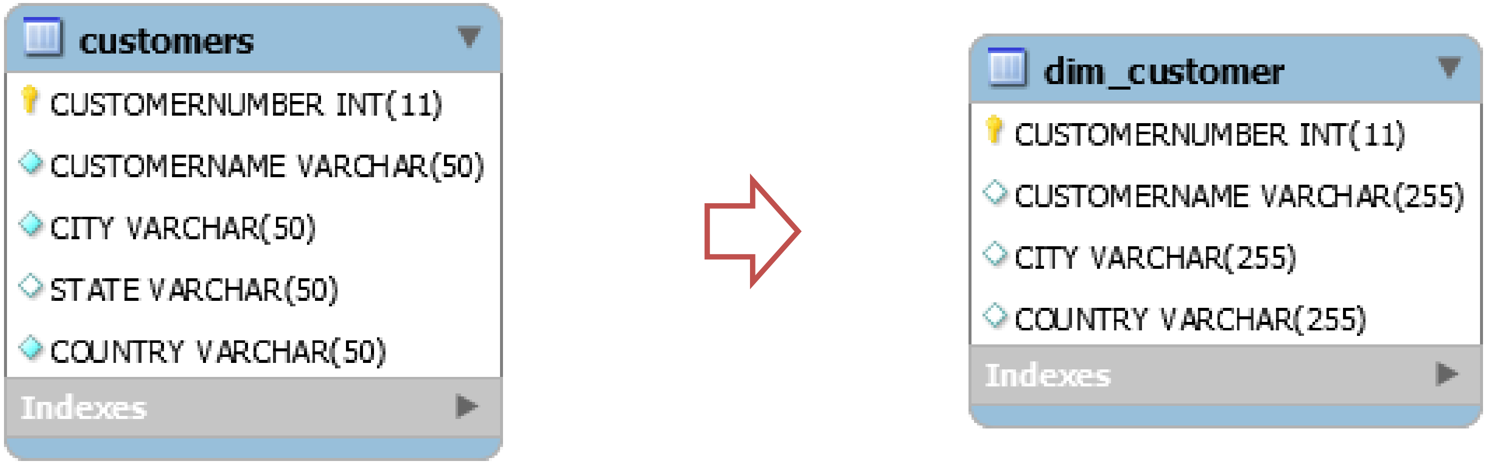
fact_order
ORDERNUMBER INT(11)
ORDERLINENUMBER INT(11)
QUANTITYORDERED INT(11)
PRICEEACH DOUBLE
LINETOTAL DOUBLE
CUSTOMERNUMBER INT(11)
PRODUCT_ID INT(11)
TIME_ID DATETIME
Indexes

dim_time
TIME_ID DATETIME
YEAR_ID INT(11)
QTR_ID INT(11)
QTR_NAME VARCHAR(255)
MONTH_ID INT(11)
MONTH_NAME VARCHAR(255)
Indexes

dim_product
PRODUCT_ID INT(11)
PRODUCTCODE VARCHAR(255)
PRODUCTNAME VARCHAR(255)
PRODUCTLINE VARCHAR(255)
PRODUCTVENDOR VARCHAR(255)
VERSION INT(11)
DATE_FROM DATETIME
DATE_TO DATETIME
Indexes

# Dimension tables

- The customer dimension
  - customer name, city and country (no state)
  - data comes from customers table
  - same key as customers table (natural key)



customers

CUSTOMERNUMBER INT(11)

CUSTOMERNAME VARCHAR(50)

CITY VARCHAR(50)

STATE VARCHAR(50)

COUNTRY VARCHAR(50)

dim_customer

CUSTOMERNUMBER INT(11)

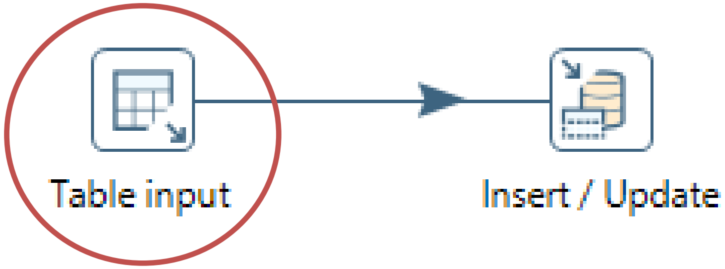
CUSTOMERNAME VARCHAR(255)

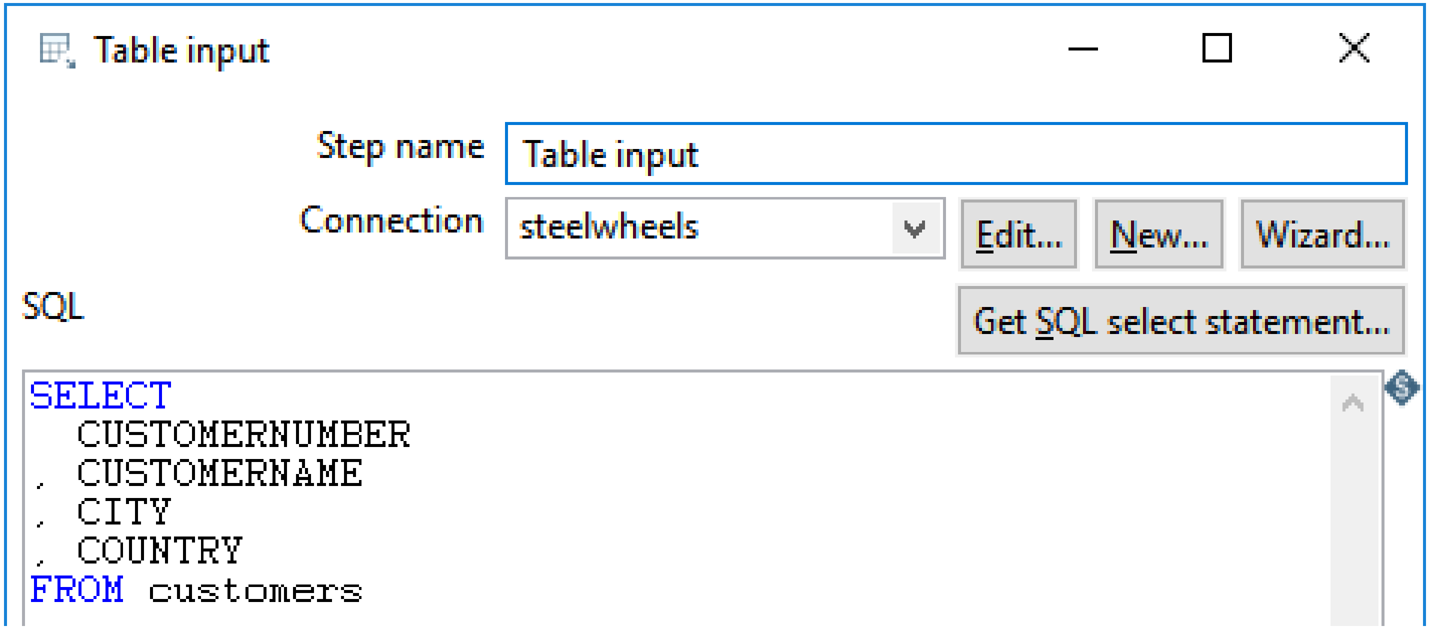
CITY VARCHAR(255)

COUNTRY VARCHAR(255)

# Dimension tables

- The customer dimension





Step name: Table input

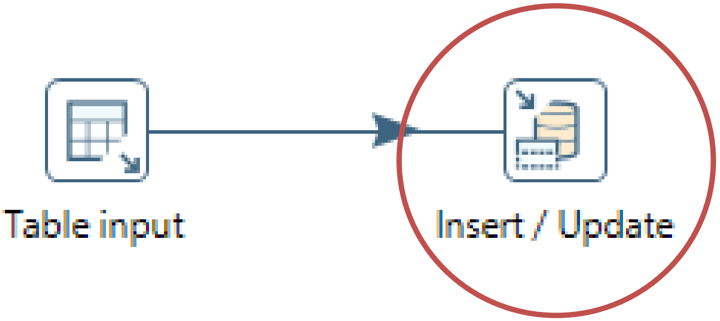
Connection: steelwheels

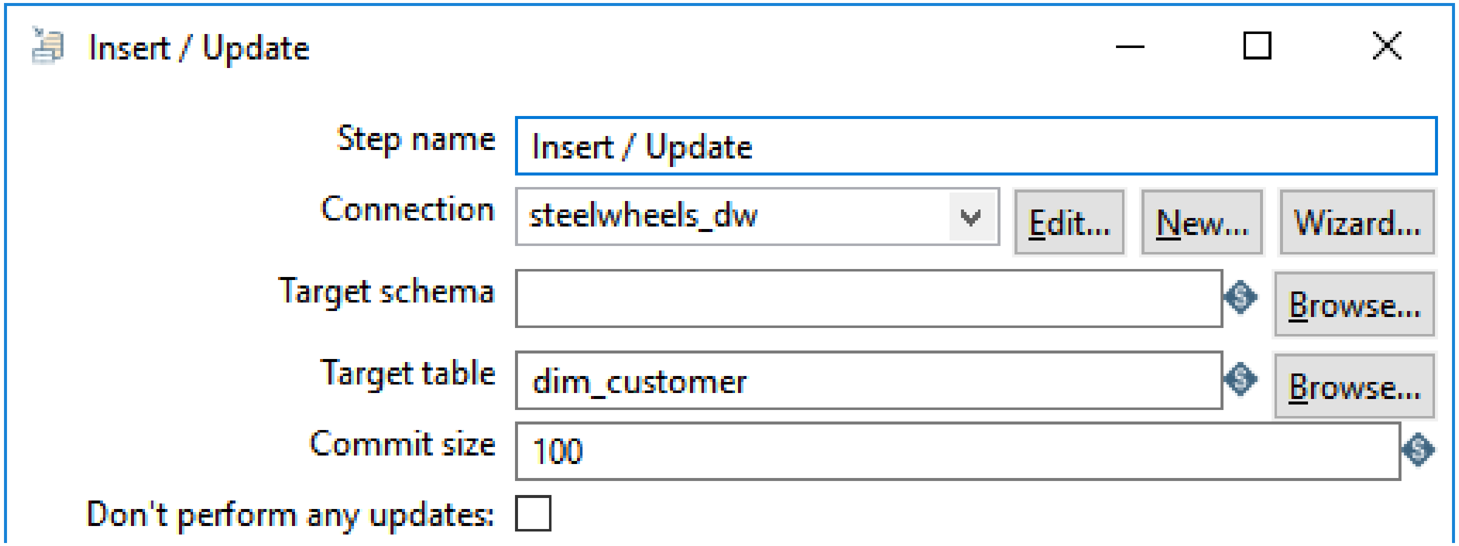
SQL

```
SELECT
  CUSTOMERNUMBER
, CUSTOMERNAME
, CITY
, COUNTRY
FROM customers
```

# Dimension tables

- The customer dimension

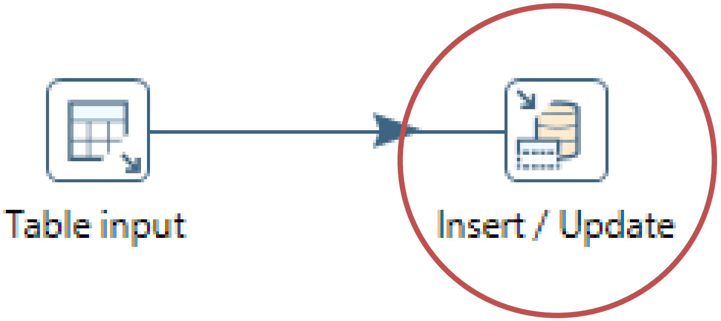


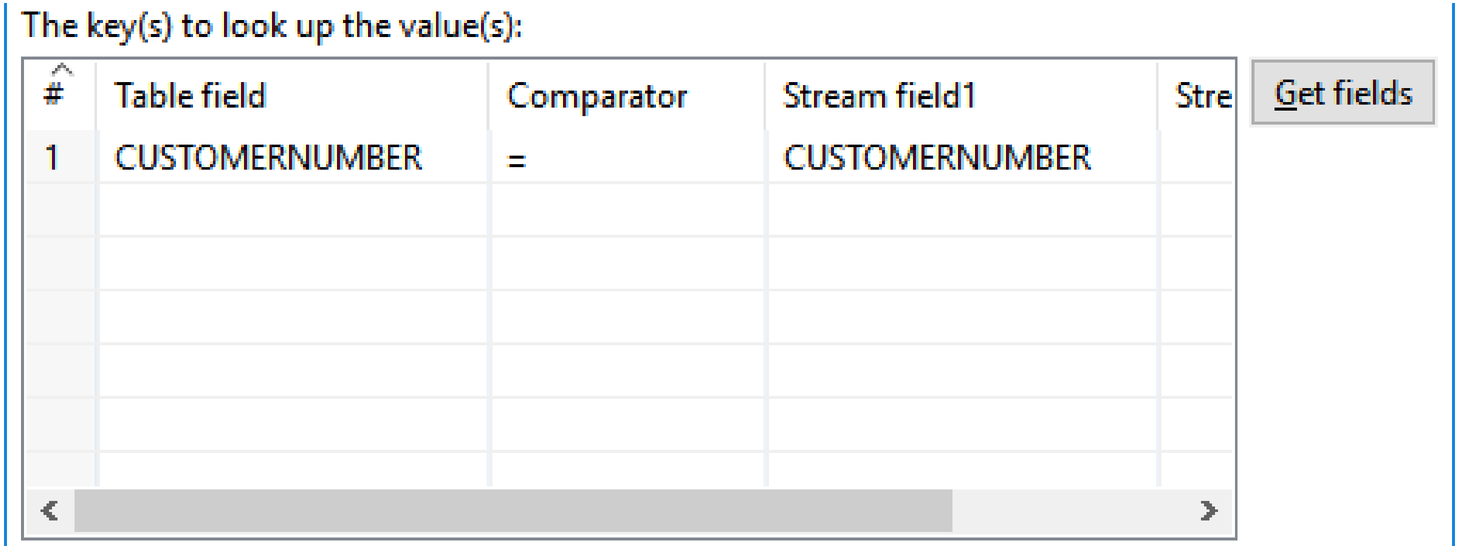


|  |  |
|---|---|
| Step name | Insert / Update |
| Connection | steelwheels_dw |
| Target schema |  |
| Target table | dim_customer |
| Commit size | 100 |
| Don't perform any updates: | □ |

# Dimension tables

- The customer dimension

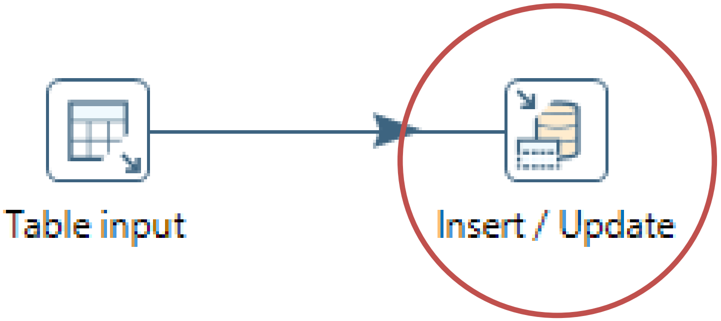


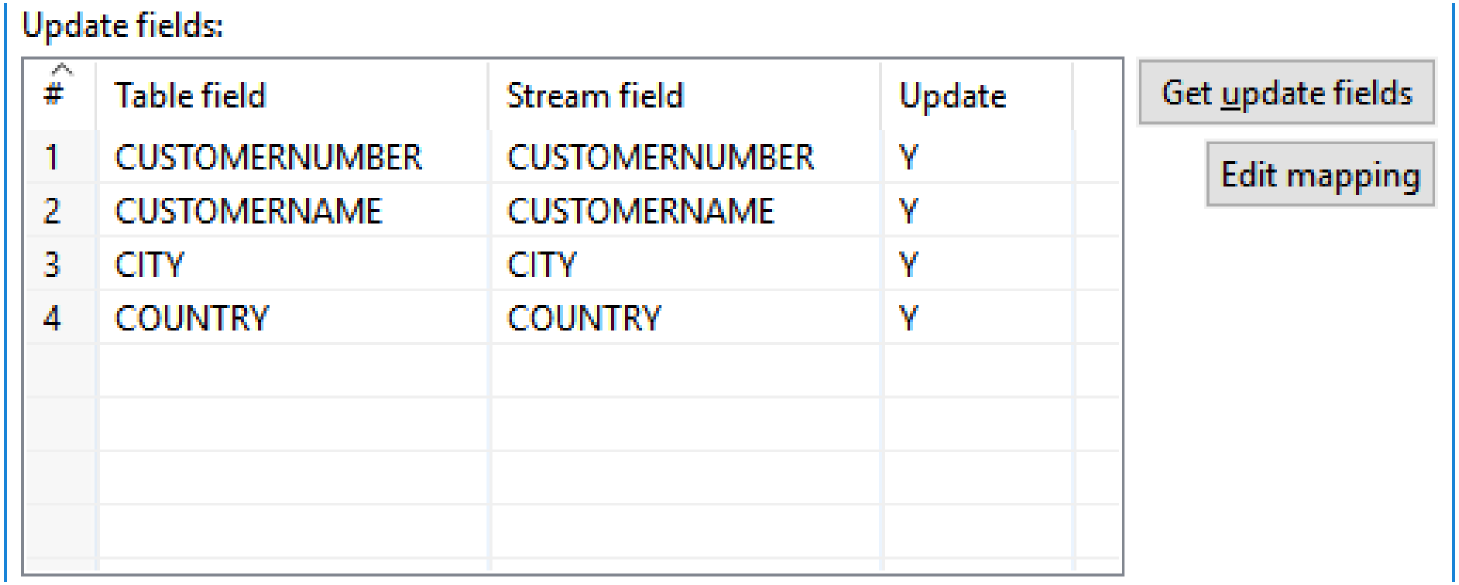

The key(s) to look up the value(s):

| # | Table field | Comparator | Stream field1 | Stre |
|---|---|---|---|---|
| 1 | CUSTOMERNUMBER | = | CUSTOMERNUMBER | |

# Dimension tables

- The customer dimension




Update fields:

| # | Table field | Stream field | Update |
|---|---|---|---|
| 1 | CUSTOMERNUMBER | CUSTOMERNUMBER | Y |
| 2 | CUSTOMERNAME | CUSTOMERNAME | Y |
| 3 | CITY | CITY | Y |
| 4 | COUNTRY | COUNTRY | Y |

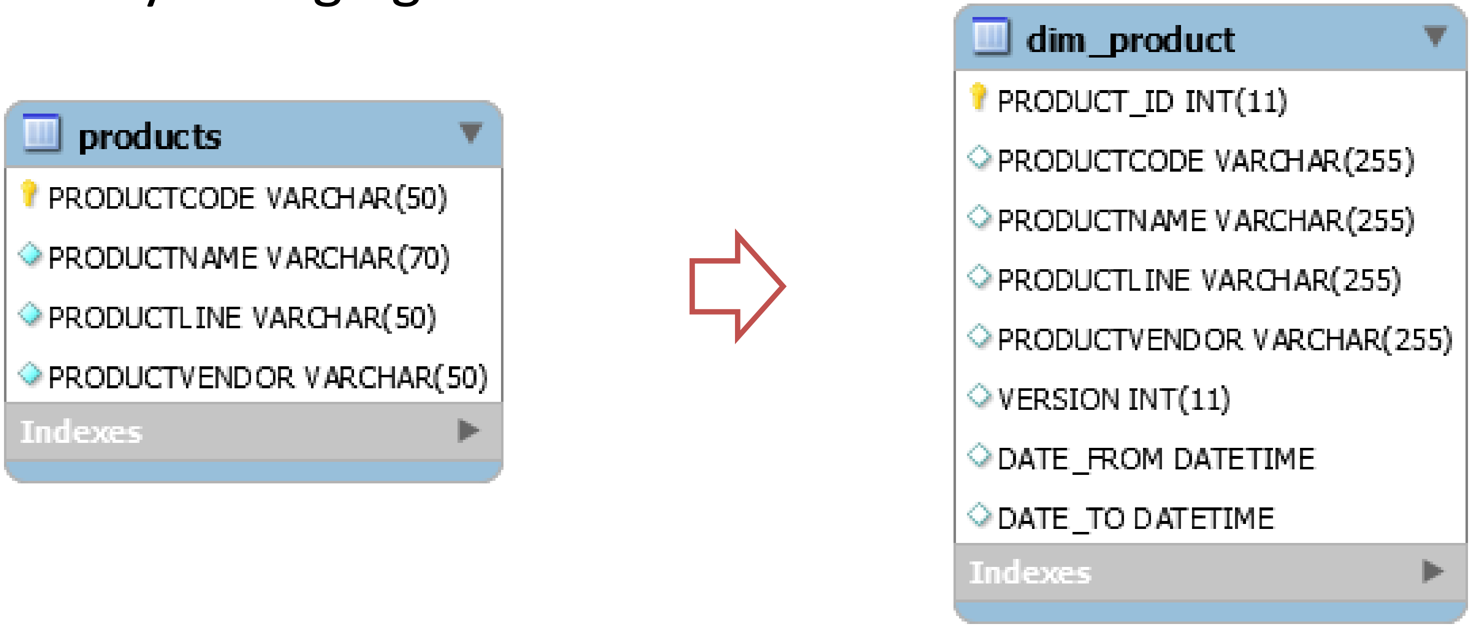
# Dimension tables

- The customer dimension

```
+----------------+------------------------------+---------------+-----------+
| CUSTOMERNUMBER | CUSTOMERNAME                 | CITY          | COUNTRY   |
+----------------+------------------------------+---------------+-----------+
|             97 | Madison Inc                  | ST  AUGUSTINE | USA       |
|             98 | Johnson Inc                  | ST Cloud      | USA       |
|             99 | Tarallo Inc                  | Sanford       | USA       |
|            100 | Audio Video 'R' Us           | Orlando       | USA       |
|            103 | Atelier graphique            | Nantes        | France    |
|            112 | Signal Gift Stores           | Las Vegas     | USA       |
|            114 | Australian Collectors, Co.   | Melbourne     | Australia |
|            119 | La Rochelle Gifts            | Nantes        | France    |
|            121 | Baane Mini Imports           | Stavern       | Norway    |
|            124 | Mini Gifts Distributors Ltd. | San Rafael    | USA       |
|            125 | Havel & Zbyszek Co           | Warszawa      | Poland    |
|            128 | Blauer See Auto, Co.         | Frankfurt     | Germany   |
|            129 | Mini Wheels Co.              | San Francisco | USA       |
|            131 | Land of Toys Inc.            | NYC           | USA       |
|            141 | Euro+ Shopping Channel       | Madrid        | Spain     |
|            144 | Volvo Model Replicas, Co     | Luleå         | Sweden    |
|            145 | Danish Wholesale Imports     | Kobenhavn     | Denmark   |
|            146 | Saveley & Henriot, Co.       | Lyon          | France    |
|            148 | Dragon Souveniers, Ltd.      | Singapore     | Singapore |
|            151 | Muscle Machine Inc           | NYC           | USA       |
+----------------+------------------------------+---------------+-----------+
```

# Dimension tables

- The product dimension
  - product name, line, vendor
  - data comes from products table
  - key is not product code but product id (surrogate key)
  - slowly-changing dimension



**products**

- PRODUCTCODE VARCHAR(50)
- PRODUCTNAME VARCHAR(70)
- PRODUCTLINE VARCHAR(50)
- PRODUCTVENDOR VARCHAR(50)

Indexes

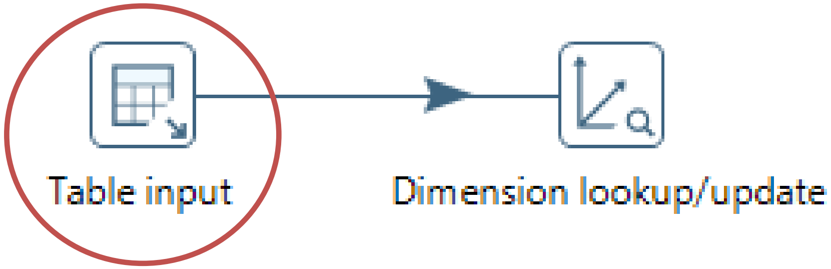
**dim_product**

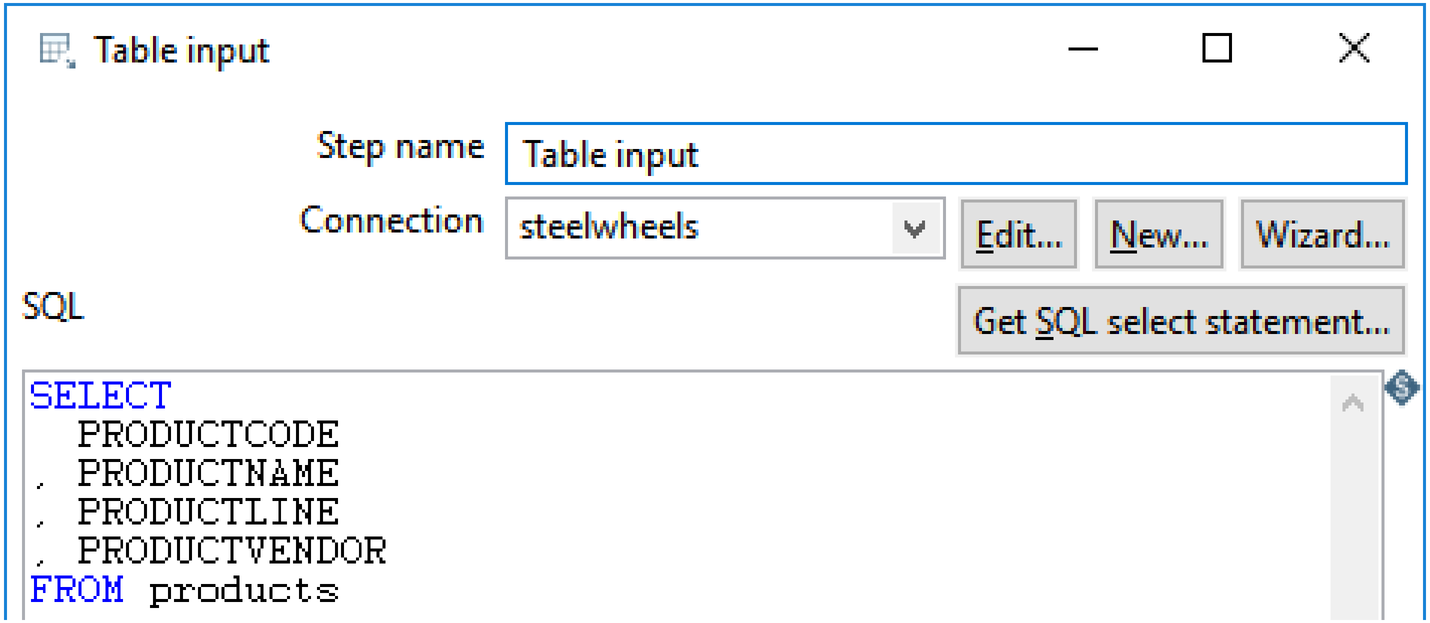
- PRODUCT_ID INT(11)
- PRODUCTCODE VARCHAR(255)
- PRODUCTNAME VARCHAR(255)
- PRODUCTLINE VARCHAR(255)
- PRODUCTVENDOR VARCHAR(255)
- VERSION INT(11)
- DATE_FROM DATETIME
- DATE_TO DATETIME

Indexes

# Dimension tables

- The product dimension





Step name: Table input

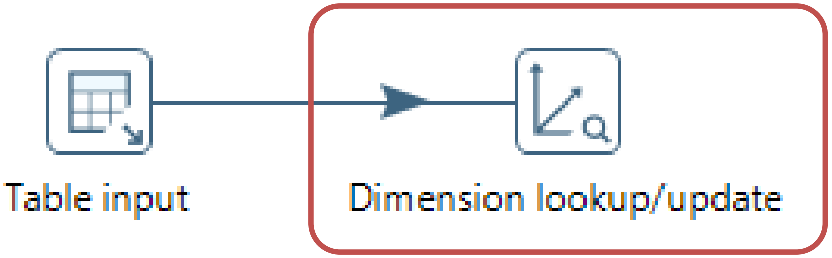
Connection: steelwheels

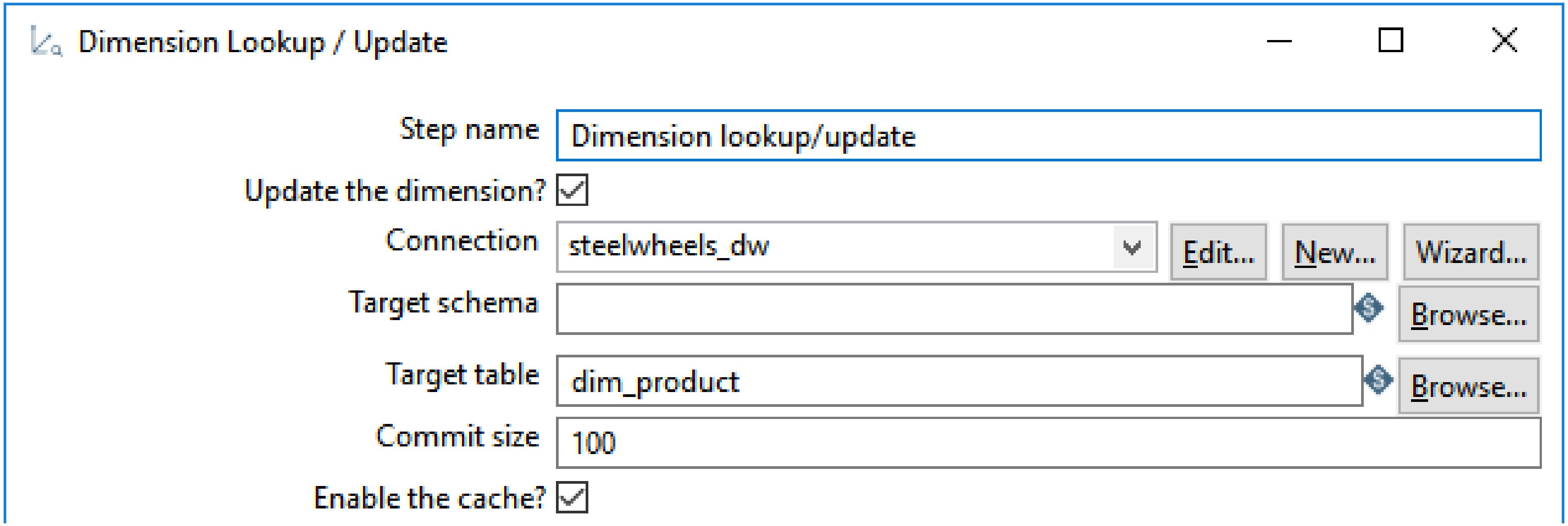
SQL

```
SELECT
  PRODUCTCODE
, PRODUCTNAME
, PRODUCTLINE
, PRODUCTVENDOR
FROM products
```

# Dimension tables

- The product dimension





Step name: Dimension lookup/update

Update the dimension? ☑

Connection: steelwheels_dw

Target schema:

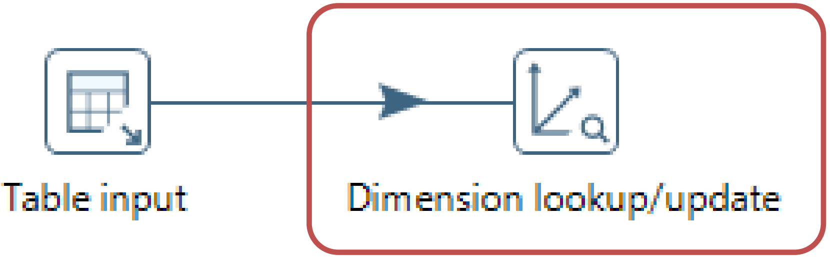
Target table: dim_product

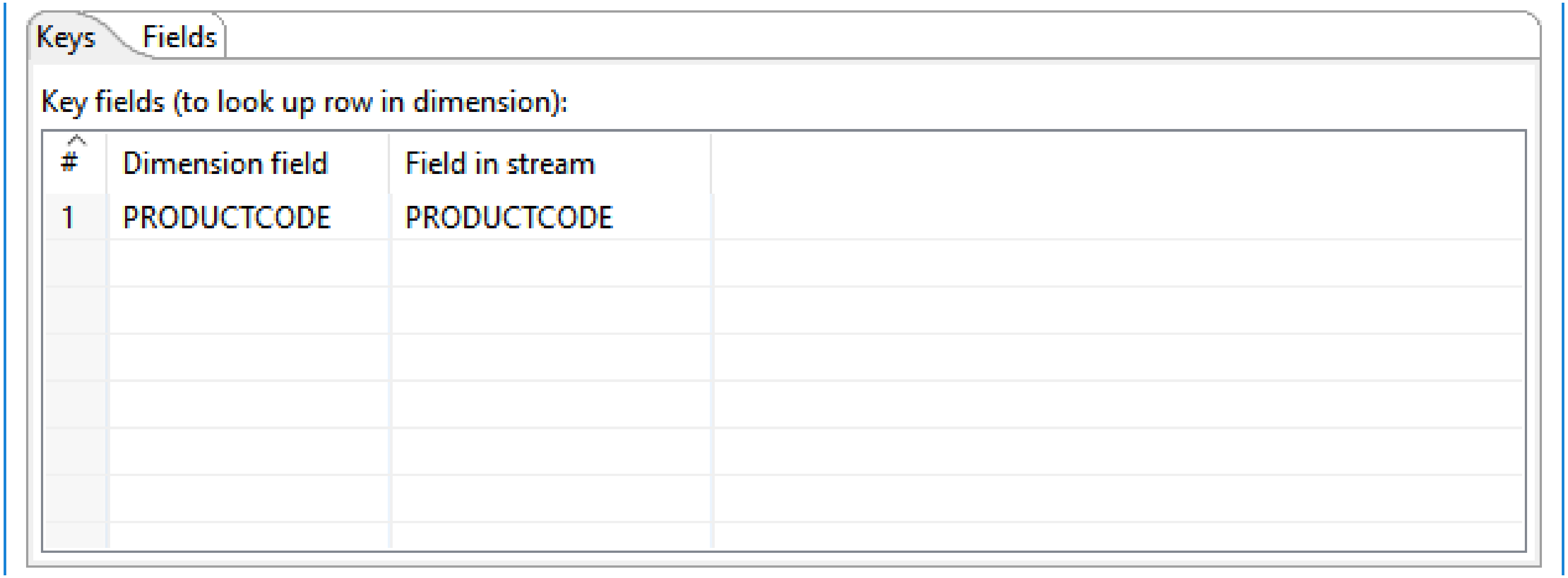
Commit size: 100

Enable the cache? ☑

# Dimension tables

- The product dimension



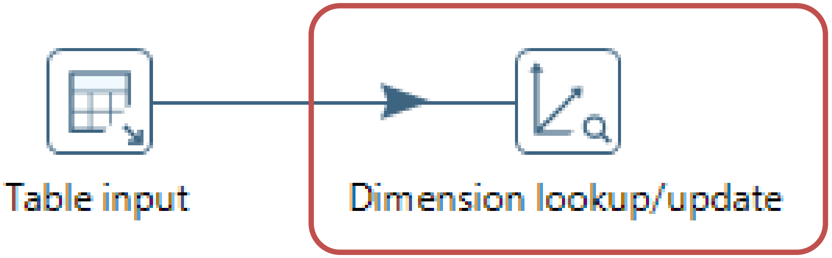


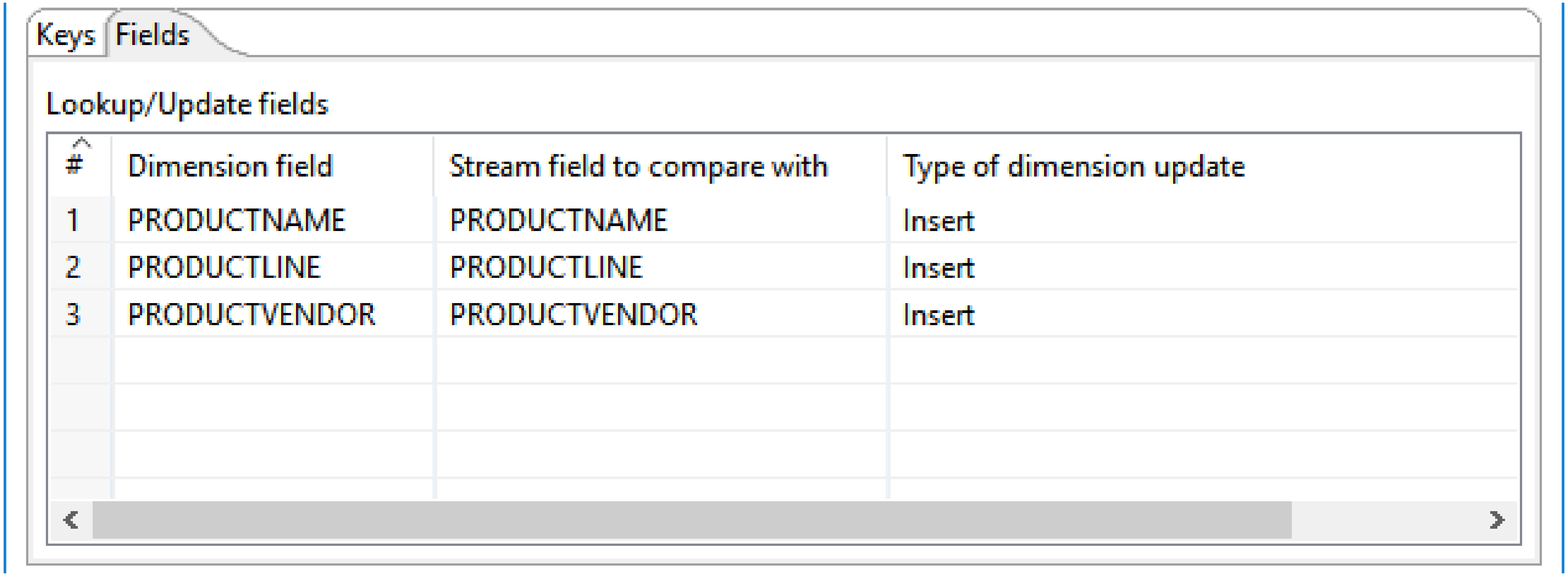
Key fields (to look up row in dimension):

| # | Dimension field | Field in stream |
|---|---|---|
| 1 | PRODUCTCODE | PRODUCTCODE |

# Dimension tables

- The product dimension



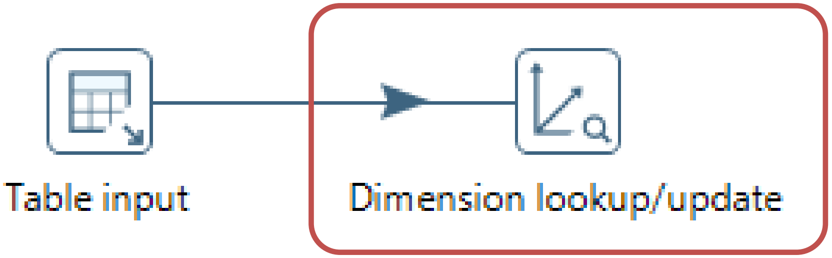


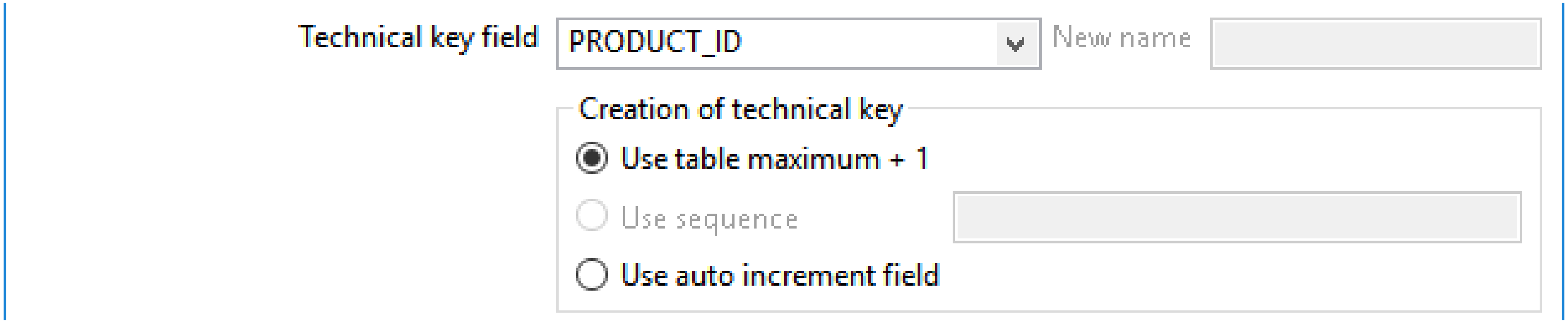
Lookup/Update fields

| # | Dimension field | Stream field to compare with | Type of dimension update |
|---|---|---|---|
| 1 | PRODUCTNAME | PRODUCTNAME | Insert |
| 2 | PRODUCTLINE | PRODUCTLINE | Insert |
| 3 | PRODUCTVENDOR | PRODUCTVENDOR | Insert |

# Dimension tables

- The product dimension





Technical key field PRODUCT_ID New name

Creation of technical key

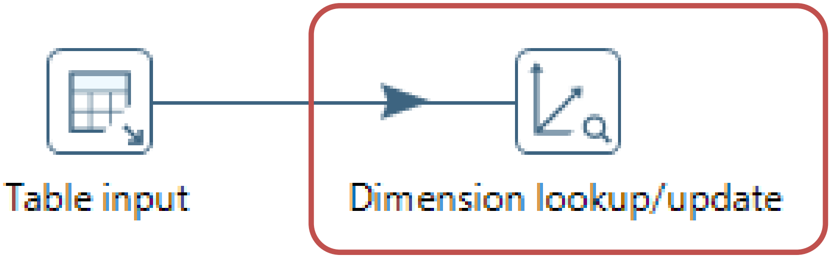
● Use table maximum + 1

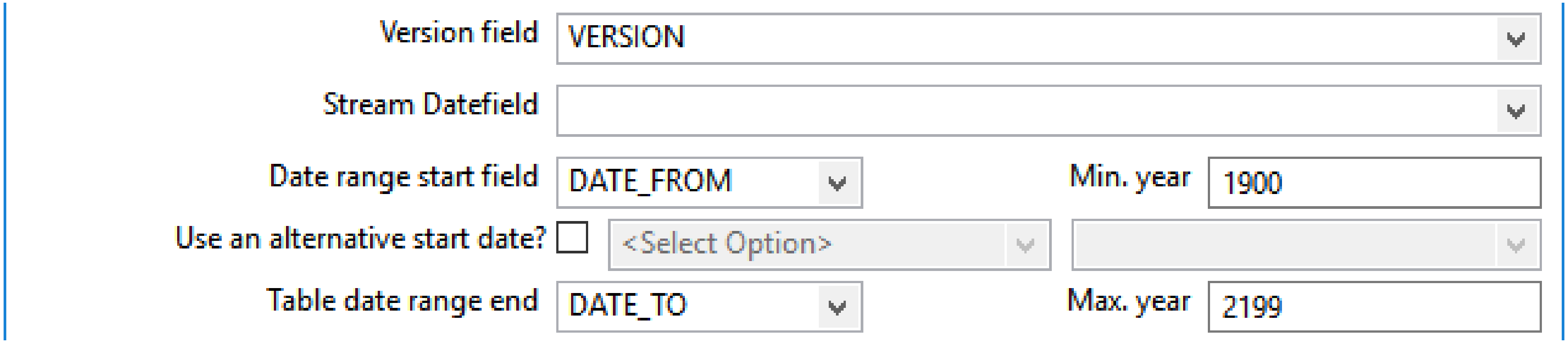
○ Use sequence

○ Use auto increment field

# Dimension tables

- The product dimension

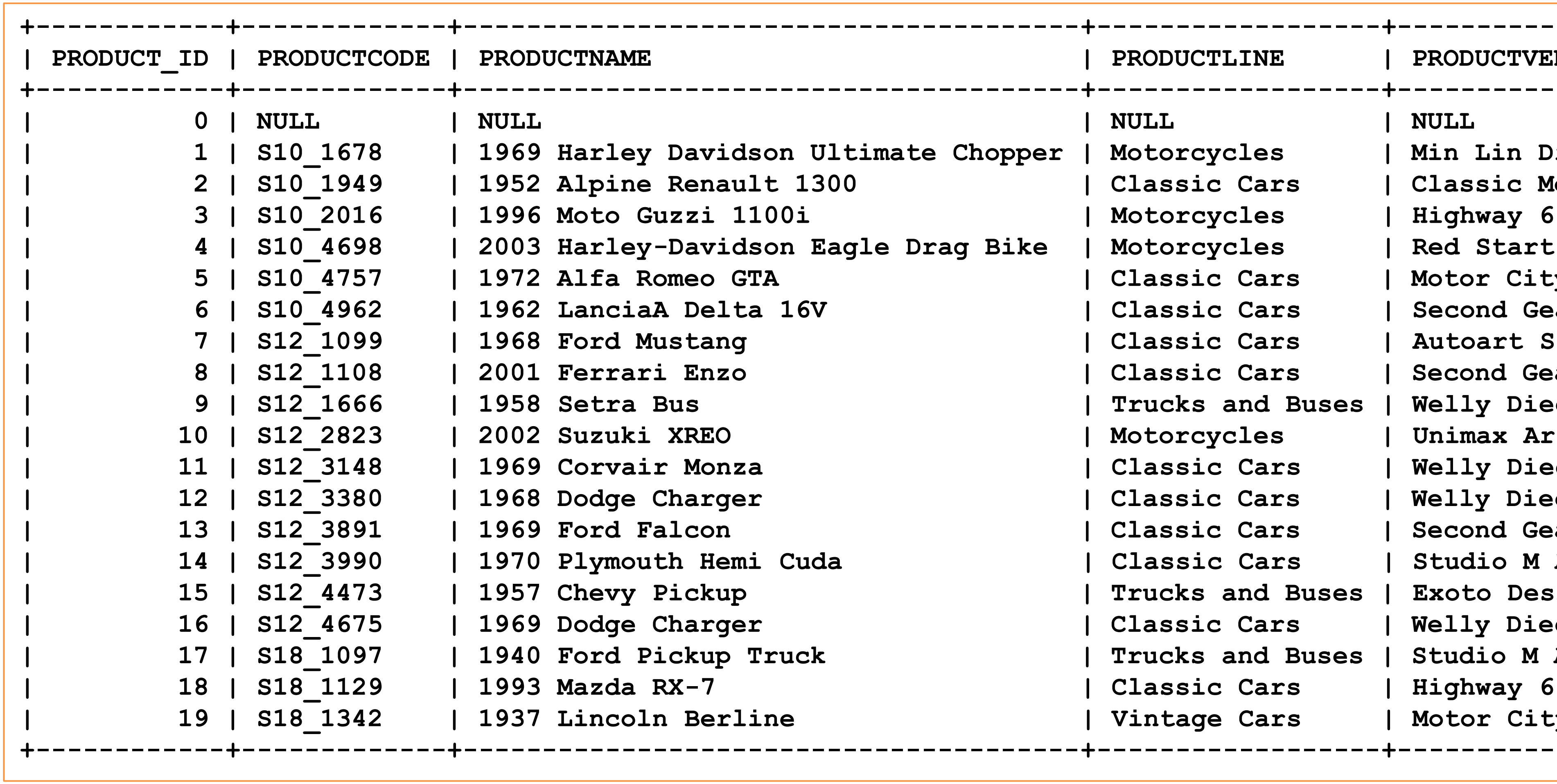




| | | | |
|---|---|---|---|
| Version field | VERSION | | |
| Stream Datefield | | | |
| Date range start field | DATE_FROM | Min. year | 1900 |
| Use an alternative start date? ☐ | <Select Option> | | |
| Table date range end | DATE_TO | Max. year | 2199 |

# Dimension tables

- The product dimension



```
+------------+-------------+---------------------------------------+------------------+----------
| PRODUCT_ID | PRODUCTCODE | PRODUCTNAME                           | PRODUCTLINE      | PRODUCTVE
+------------+-------------+---------------------------------------+------------------+----------
|          0 | NULL        | NULL                                  | NULL             | NULL
|          1 | S10_1678    | 1969 Harley Davidson Ultimate Chopper | Motorcycles      | Min Lin D
|          2 | S10_1949    | 1952 Alpine Renault 1300              | Classic Cars     | Classic M
|          3 | S10_2016    | 1996 Moto Guzzi 1100i                 | Motorcycles      | Highway 6
|          4 | S10_4698    | 2003 Harley-Davidson Eagle Drag Bike  | Motorcycles      | Red Start
|          5 | S10_4757    | 1972 Alfa Romeo GTA                   | Classic Cars     | Motor Cit
|          6 | S10_4962    | 1962 LanciaA Delta 16V                | Classic Cars     | Second Ge
|          7 | S12_1099    | 1968 Ford Mustang                     | Classic Cars     | Autoart S
|          8 | S12_1108    | 2001 Ferrari Enzo                     | Classic Cars     | Second Ge
|          9 | S12_1666    | 1958 Setra Bus                        | Trucks and Buses | Welly Die
|         10 | S12_2823    | 2002 Suzuki XREO                      | Motorcycles      | Unimax Ar
|         11 | S12_3148    | 1969 Corvair Monza                    | Classic Cars     | Welly Die
|         12 | S12_3380    | 1968 Dodge Charger                    | Classic Cars     | Welly Die
|         13 | S12_3891    | 1969 Ford Falcon                      | Classic Cars     | Second Ge
|         14 | S12_3990    | 1970 Plymouth Hemi Cuda               | Classic Cars     | Studio M
|         15 | S12_4473    | 1957 Chevy Pickup                     | Trucks and Buses | Exoto Des
|         16 | S12_4675    | 1969 Dodge Charger                    | Classic Cars     | Welly Die
|         17 | S18_1097    | 1940 Ford Pickup Truck                | Trucks and Buses | Studio M
|         18 | S18_1129    | 1993 Mazda RX-7                       | Classic Cars     | Highway 6
|         19 | S18_1342    | 1937 Lincoln Berline                  | Vintage Cars     | Motor Cit
+------------+-------------+---------------------------------------+------------------+----------
```

# Dimension tables

- The product dimension

```
-+---------------------------+---------+---------------------+---------------------+
 | PRODUCTVENDOR             | VERSION | DATE_FROM           | DATE_TO             |
-+---------------------------+---------+---------------------+---------------------+
 | NULL                      |       1 | NULL                | NULL                |
 | Min Lin Diecast           |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Classic Metal Creations   |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Highway 66 Mini Classics  |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Red Start Diecast         |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Motor City Art Classics   |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Second Gear Diecast       |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Autoart Studio Design     |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Second Gear Diecast       |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Welly Diecast Productions |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Unimax Art Galleries      |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Welly Diecast Productions |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Welly Diecast Productions |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Second Gear Diecast       |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Studio M Art Models       |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Exoto Designs             |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Welly Diecast Productions |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Studio M Art Models       |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Highway 66 Mini Classics  |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
 | Motor City Art Classics   |       1 | 1900-01-01 00:00:00 | 2200-01-01 00:00:00 |
-+---------------------------+---------+---------------------+---------------------+
```

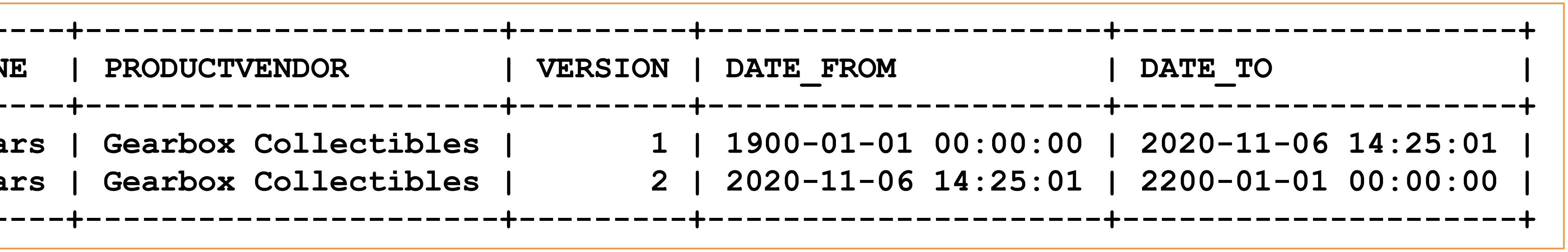
# Dimension tables

- The product dimension
  - testing the slowly changing dimension
    - change product line in the original database
    - run transformation again
    - there should be now two rows for the same product

```
+------------+-------------+------------------------------+--------------+-----
| PRODUCT_ID | PRODUCTCODE | PRODUCTNAME                  | PRODUCTLINE  | PROD
+------------+-------------+------------------------------+--------------+-----
|         24 | S18_1889    | 1948 Porsche 356-A Roadster | Classic Cars | Gear
|        111 | S18_1889    | 1948 Porsche 356-A Roadster | Vintage Cars | Gear
+------------+-------------+------------------------------+--------------+-----
```

# Dimension tables

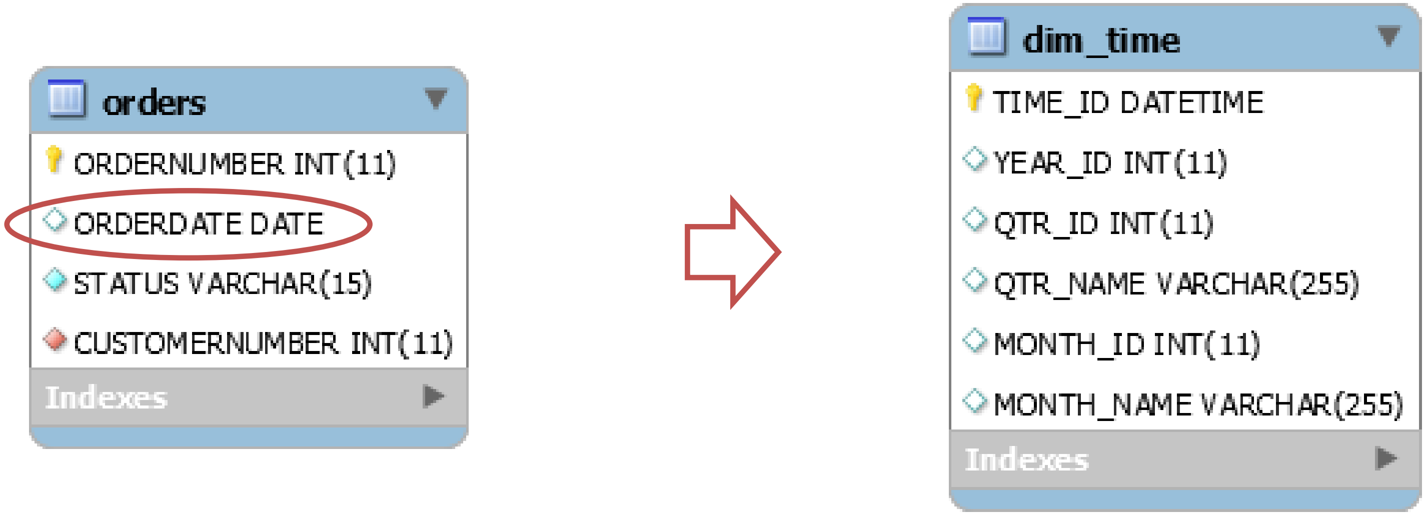
- The product dimension
  - testing the slowly changing dimension
    - change product line in the original database
    - run transformation again
    - there should be now two rows for the same product



```
----+----------------------+---------+---------------------+---------------------+
NE  | PRODUCTVENDOR        | VERSION | DATE_FROM           | DATE_TO             |
----+----------------------+---------+---------------------+---------------------+
ars | Gearbox Collectibles |       1 | 1900-01-01 00:00:00 | 2020-11-06 14:25:01 |
ars | Gearbox Collectibles |       2 | 2020-11-06 14:25:01 | 2200-01-01 00:00:00 |
----+----------------------+---------+---------------------+---------------------+
```

# Dimension tables

- The time dimension
  - year, quarter, month (id and name for quarter and month)
  - data comes from order date alone
  - key is time id

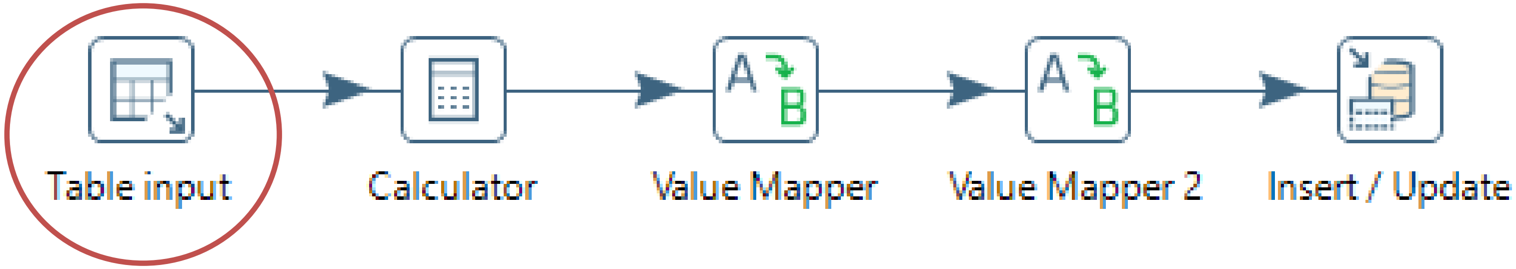


orders
ORDERNUMBER INT(11)
ORDERDATE DATE
STATUS VARCHAR(15)
CUSTOMERNUMBER INT(11)
Indexes

dim_time
TIME_ID DATETIME
YEAR_ID INT(11)
QTR_ID INT(11)
QTR_NAME VARCHAR(255)
MONTH_ID INT(11)
MONTH_NAME VARCHAR(255)
Indexes

# Dimension tables

- The time dimension



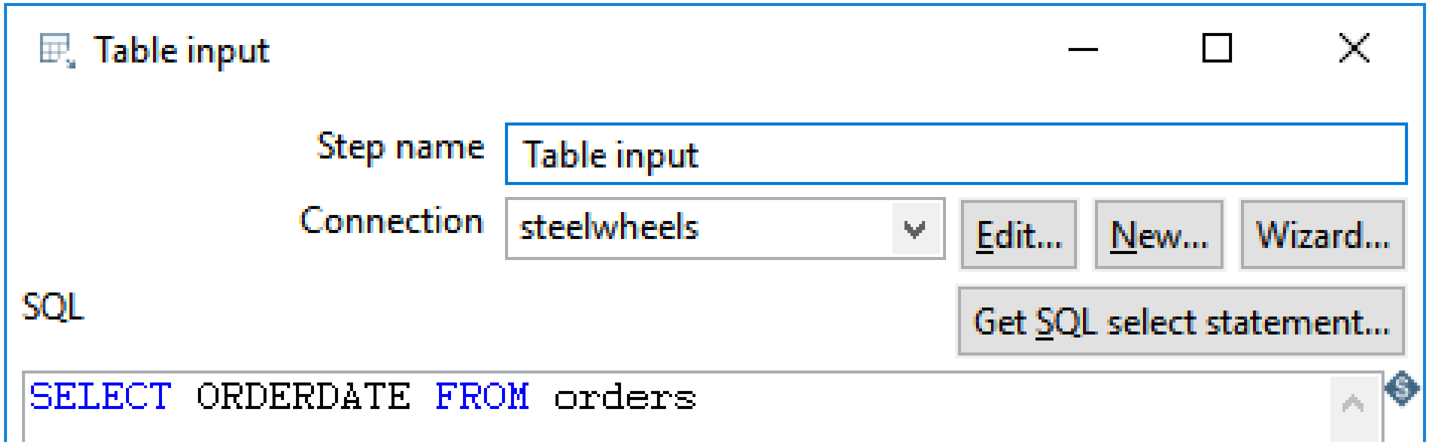


Table input

Step name: Table input

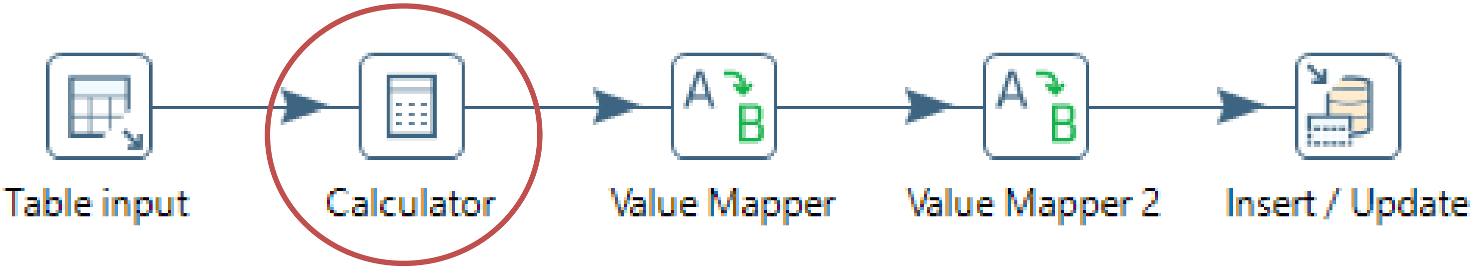
Connection: steelwheels

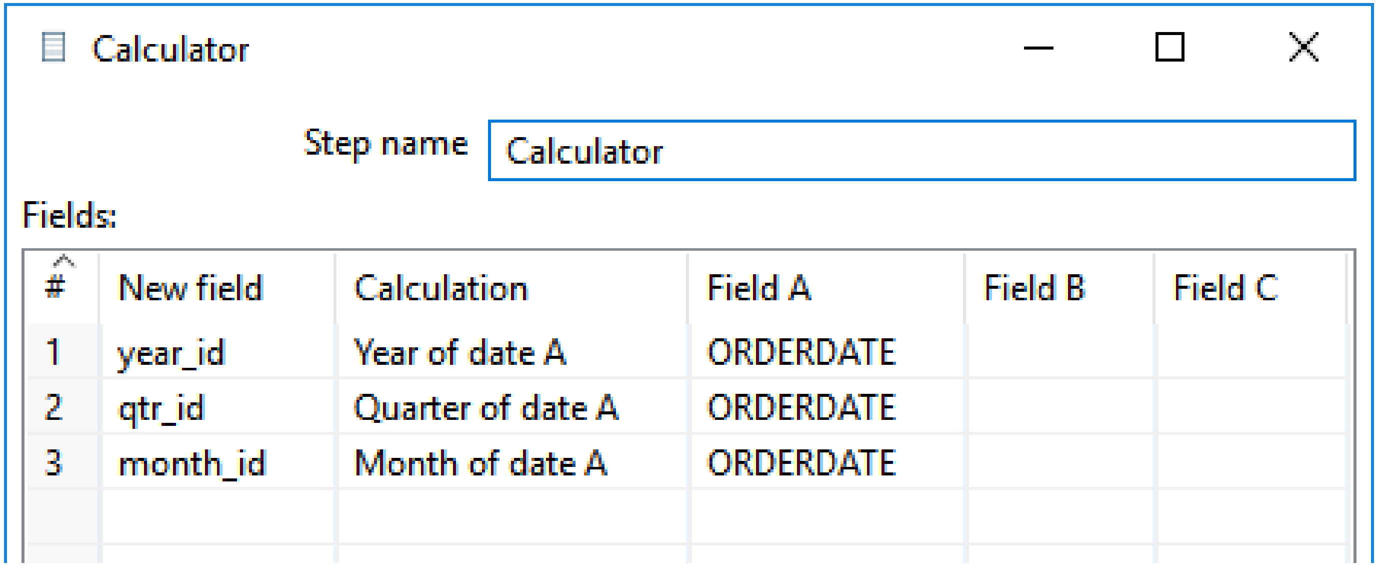
SQL

```
SELECT ORDERDATE FROM orders
```

# Dimension tables

- The time dimension





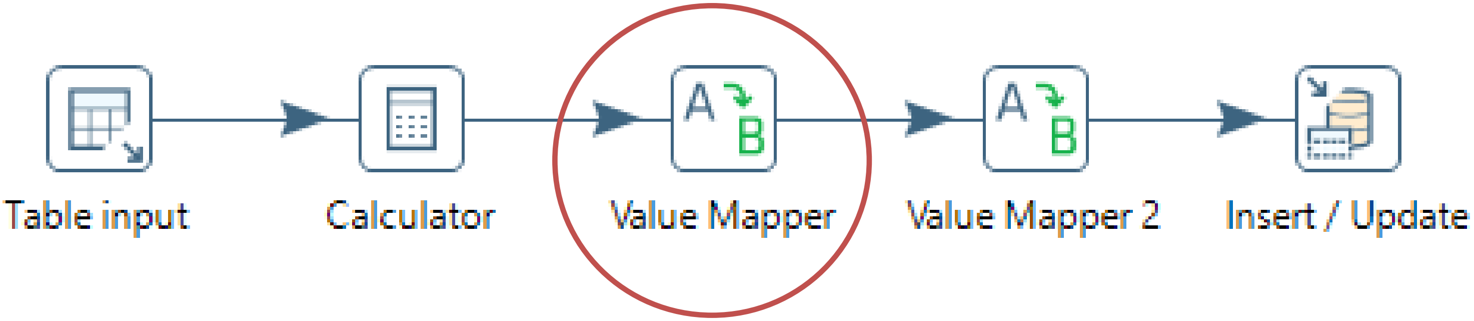
Step name: Calculator

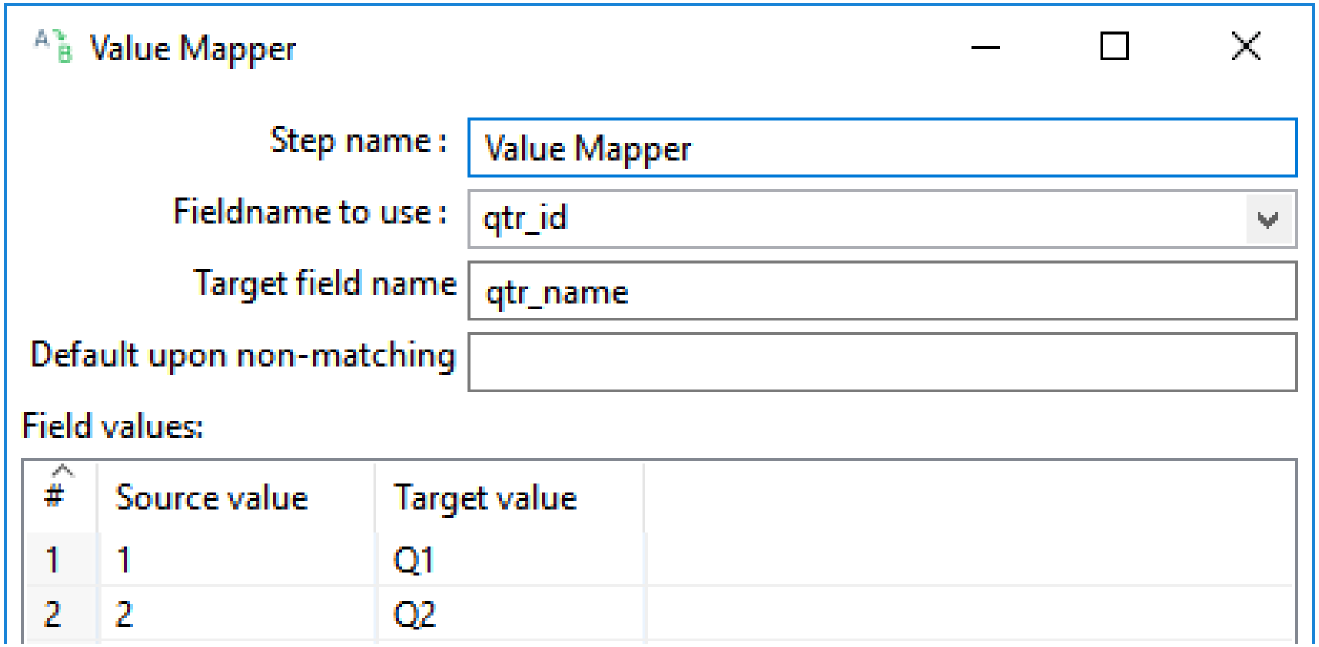
Fields:

| # | New field | Calculation | Field A | Field B | Field C |
|---|---|---|---|---|---|
| 1 | year_id | Year of date A | ORDERDATE | | |
| 2 | qtr_id | Quarter of date A | ORDERDATE | | |
| 3 | month_id | Month of date A | ORDERDATE | | |

# Dimension tables

- The time dimension





Step name : Value Mapper

Fieldname to use : qtr_id

Target field name qtr_name

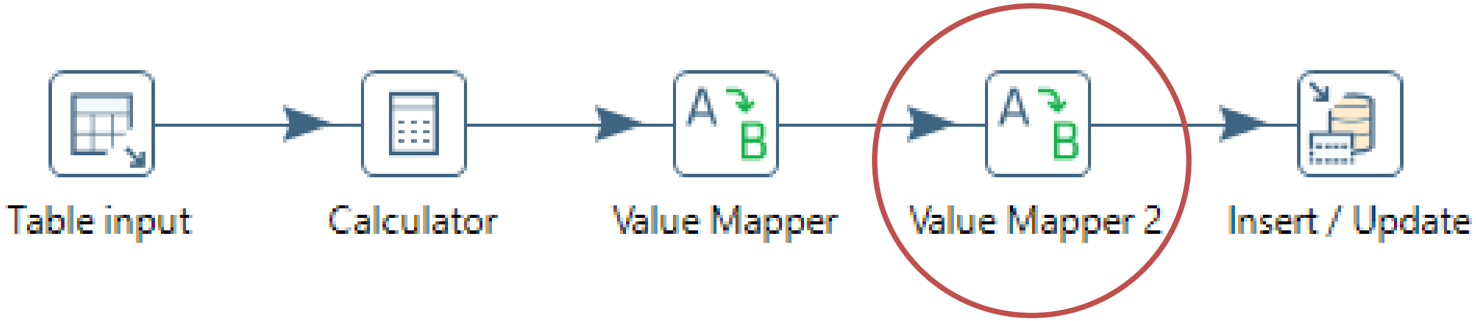
Default upon non-matching

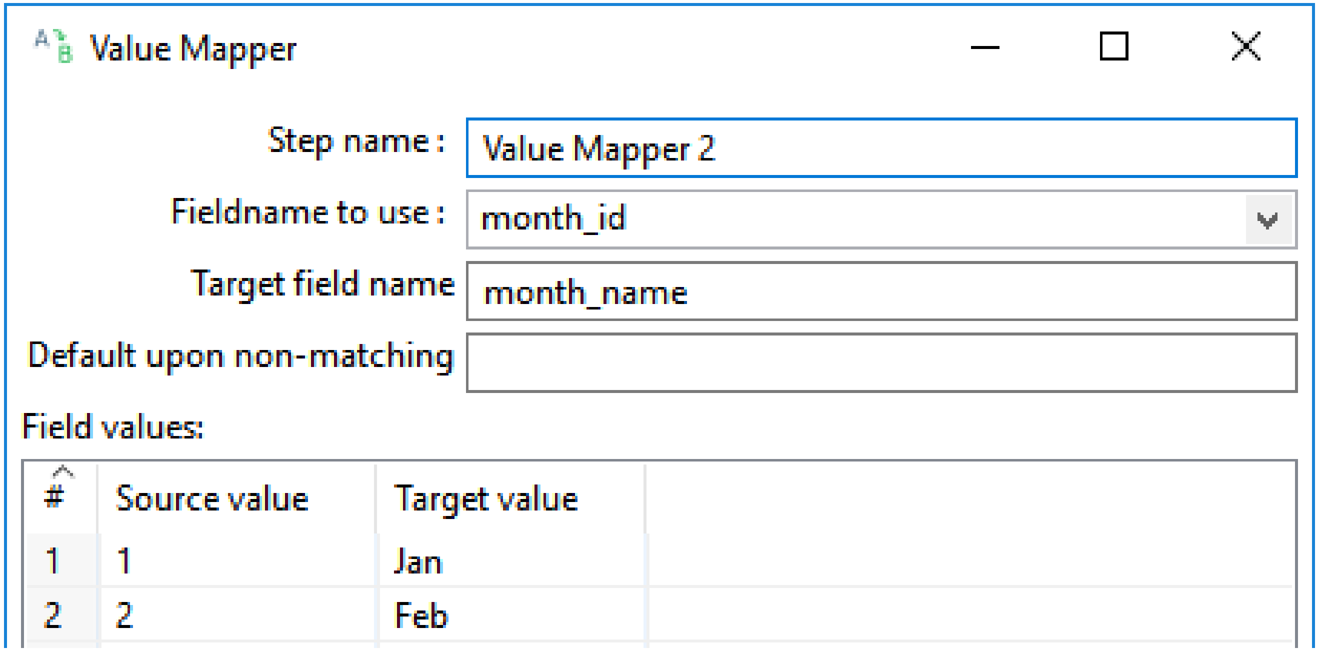
Field values:

| # | Source value | Target value |
|---|---|---|
| 1 | 1 | Q1 |
| 2 | 2 | Q2 |

# Dimension tables

- The time dimension




Value Mapper

Step name : Value Mapper 2

Fieldname to use : month_id

Target field name month_name

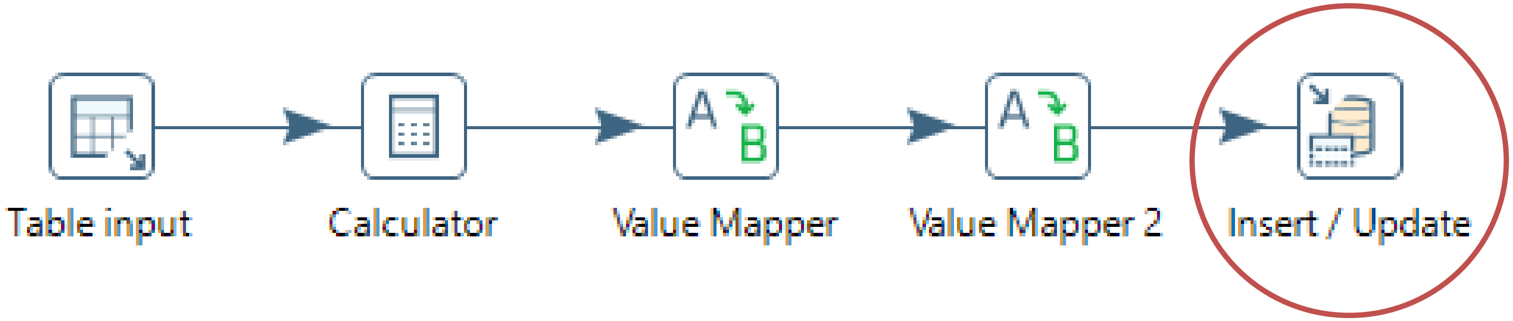
Default upon non-matching

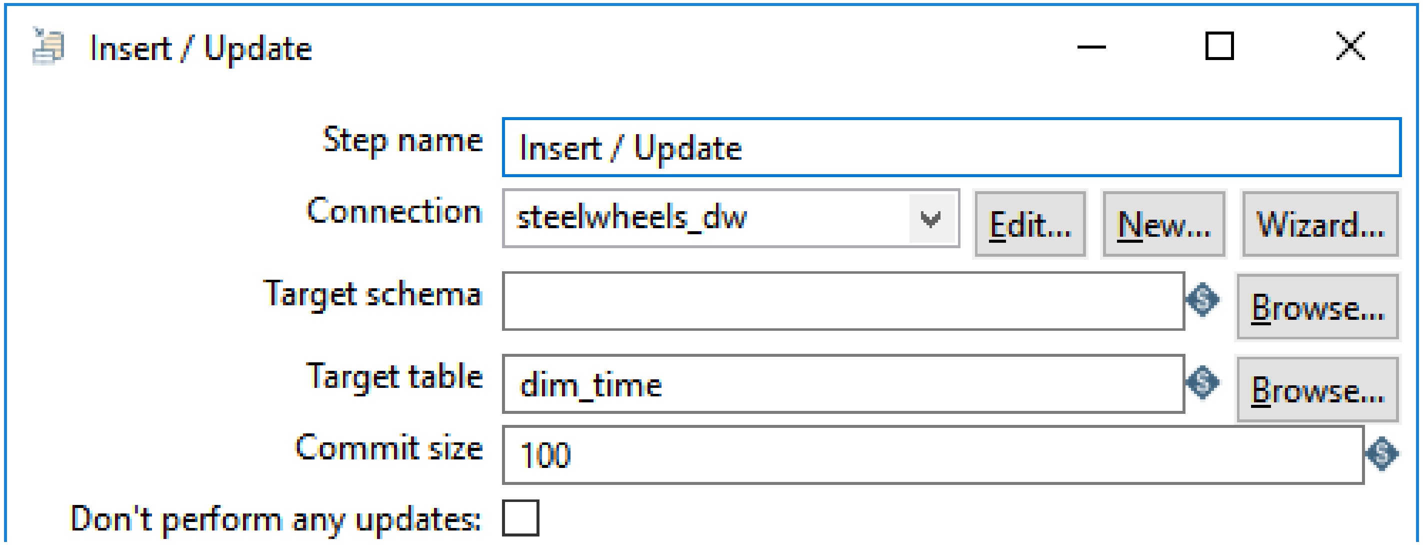
Field values:

| # | Source value | Target value |
|---|---|---|
| 1 | 1 | Jan |
| 2 | 2 | Feb |

# Dimension tables

- The time dimension

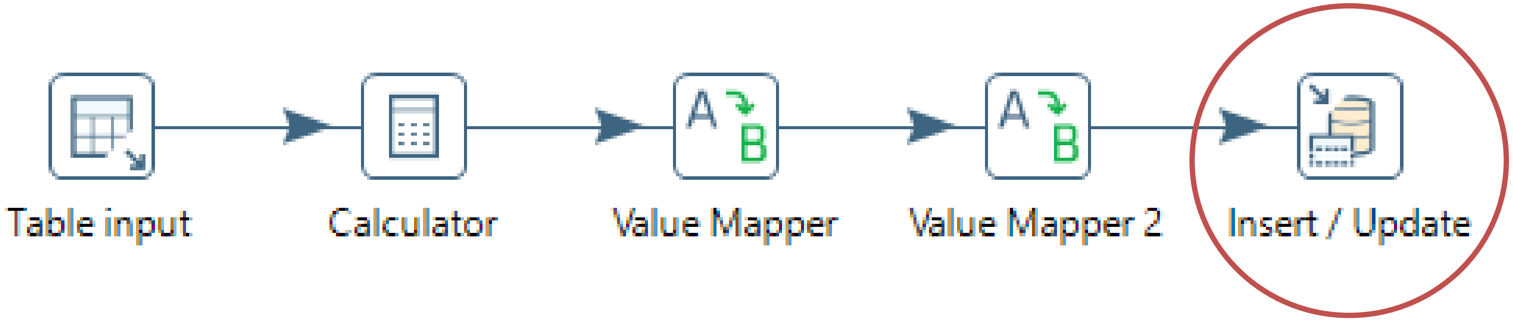


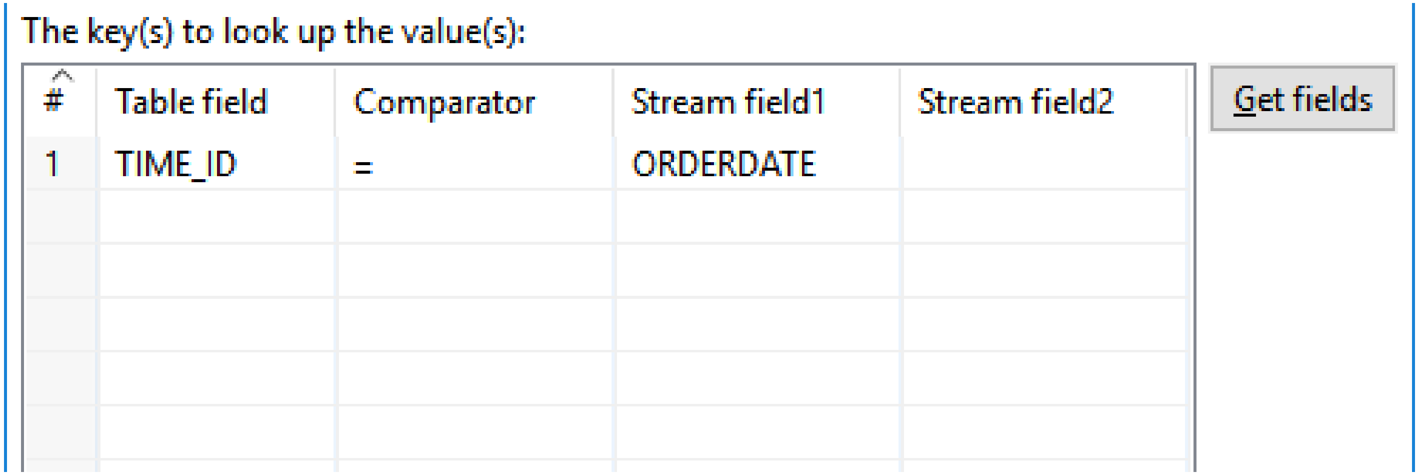


|  |  |
|---|---|
| Step name | Insert / Update |
| Connection | steelwheels_dw |
| Target schema |  |
| Target table | dim_time |
| Commit size | 100 |
| Don't perform any updates: | □ |

# Dimension tables

- The time dimension



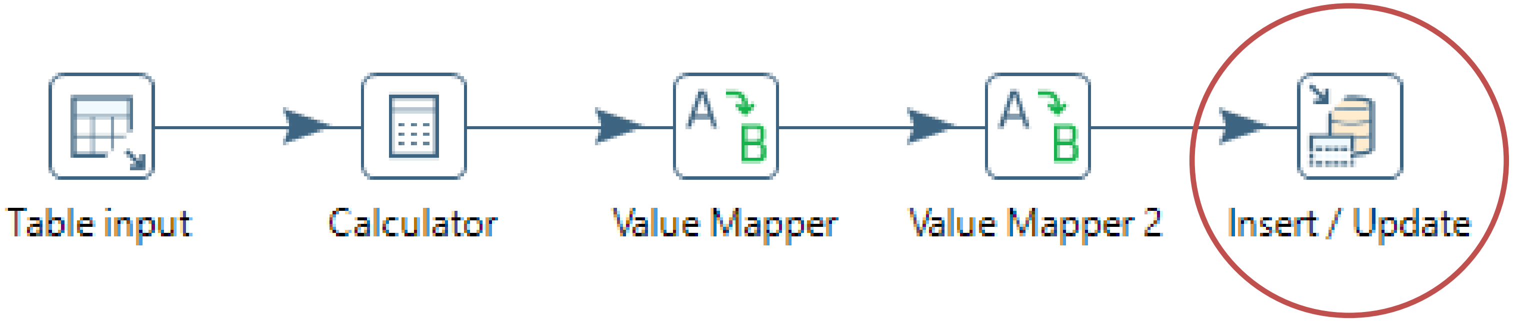


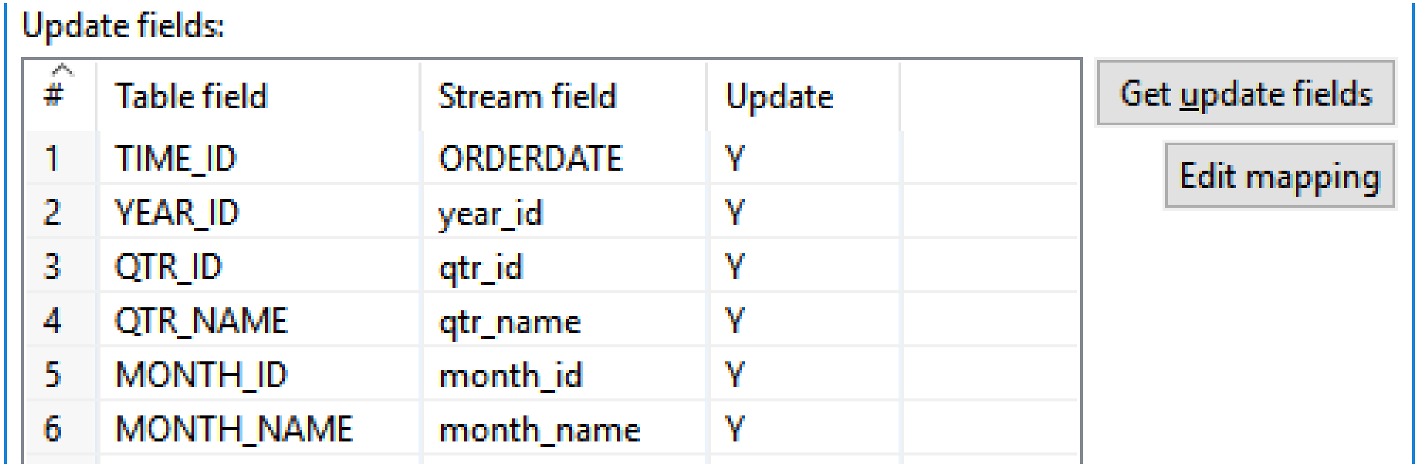
The key(s) to look up the value(s):

| # | Table field | Comparator | Stream field1 | Stream field2 |
|---|---|---|---|---|
| 1 | TIME_ID | = | ORDERDATE | |

# Dimension tables

- The time dimension





Update fields:

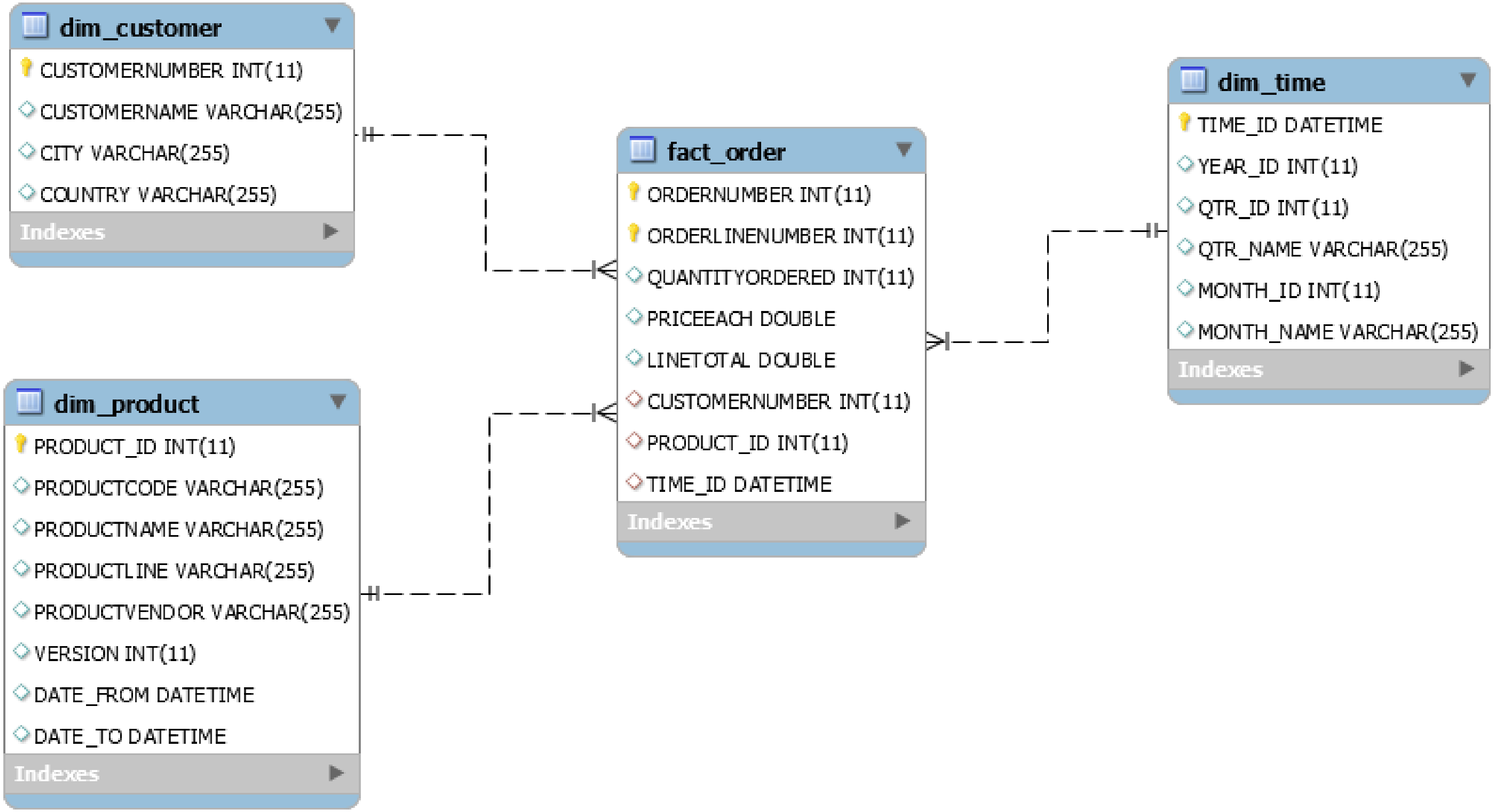
| # | Table field | Stream field | Update |
|---|---|---|---|
| 1 | TIME_ID | ORDERDATE | Y |
| 2 | YEAR_ID | year_id | Y |
| 3 | QTR_ID | qtr_id | Y |
| 4 | QTR_NAME | qtr_name | Y |
| 5 | MONTH_ID | month_id | Y |
| 6 | MONTH_NAME | month_name | Y |

# Dimension tables

- The time dimension

```
+---------------------+---------+--------+----------+----------+------------+
| TIME_ID             | YEAR_ID | QTR_ID | QTR_NAME | MONTH_ID | MONTH_NAME |
+---------------------+---------+--------+----------+----------+------------+
| 2003-01-06 00:00:00 |    2003 |      1 | Q1       |        1 | Jan        |
| 2003-01-09 00:00:00 |    2003 |      1 | Q1       |        1 | Jan        |
| 2003-01-10 00:00:00 |    2003 |      1 | Q1       |        1 | Jan        |
| 2003-01-29 00:00:00 |    2003 |      1 | Q1       |        1 | Jan        |
| 2003-01-31 00:00:00 |    2003 |      1 | Q1       |        1 | Jan        |
| 2003-02-11 00:00:00 |    2003 |      1 | Q1       |        2 | Feb        |
| 2003-02-17 00:00:00 |    2003 |      1 | Q1       |        2 | Feb        |
| 2003-02-24 00:00:00 |    2003 |      1 | Q1       |        2 | Feb        |
| 2003-03-03 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-03-10 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-03-18 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-03-24 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-03-25 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-03-26 00:00:00 |    2003 |      1 | Q1       |        3 | Mar        |
| 2003-04-01 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
| 2003-04-04 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
| 2003-04-11 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
| 2003-04-16 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
| 2003-04-21 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
| 2003-04-28 00:00:00 |    2003 |      2 | Q2       |        4 | Apr        |
+---------------------+---------+--------+----------+----------+------------+
```

# Data warehouse



**dim_customer**

CUSTOMERNUMBER INT(11)
CUSTOMERNAME VARCHAR(255)
CITY VARCHAR(255)
COUNTRY VARCHAR(255)
Indexes

**dim_product**

PRODUCT_ID INT(11)
PRODUCTCODE VARCHAR(255)
PRODUCTNAME VARCHAR(255)
PRODUCTLINE VARCHAR(255)
PRODUCTVENDOR VARCHAR(255)
VERSION INT(11)
DATE_FROM DATETIME
DATE_TO DATETIME
Indexes

**fact_order**

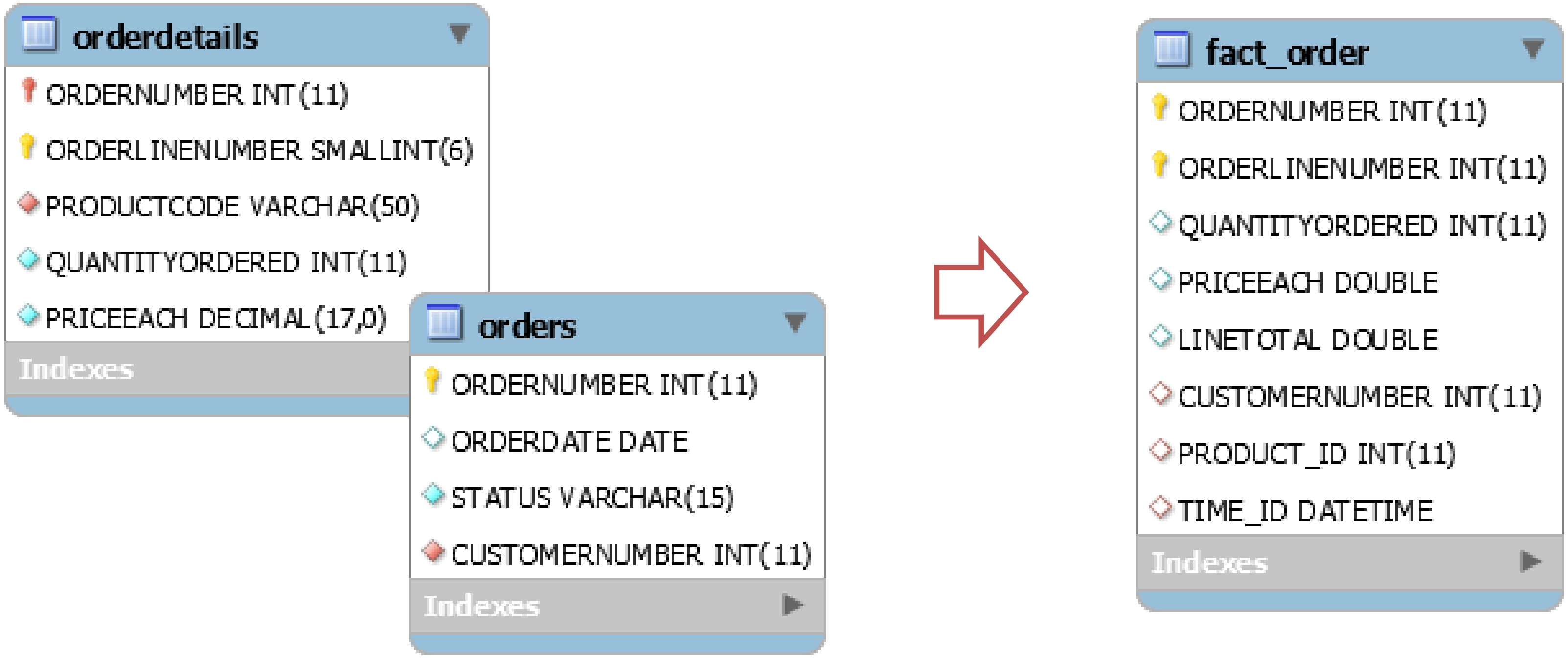
ORDERNUMBER INT(11)
ORDERLINENUMBER INT(11)
QUANTITYORDERED INT(11)
PRICEEACH DOUBLE
LINETOTAL DOUBLE
CUSTOMERNUMBER INT(11)
PRODUCT_ID INT(11)
TIME_ID DATETIME
Indexes

**dim_time**

TIME_ID DATETIME
YEAR_ID INT(11)
QTR_ID INT(11)
QTR_NAME VARCHAR(255)
MONTH_ID INT(11)
MONTH_NAME VARCHAR(255)
Indexes

# Fact table

- The fact table
  - quantity, unit price, and line total (must be calculated)
  - data comes from orderdetails and orders
    - but product id must come from product dimension (!)



**orderdetails**

ORDERNUMBER INT(11)
ORDERLINENUMBER SMALLINT(6)
PRODUCTCODE VARCHAR(50)
QUANTITYORDERED INT(11)
PRICEEACH DECIMAL(17,0)

**orders**

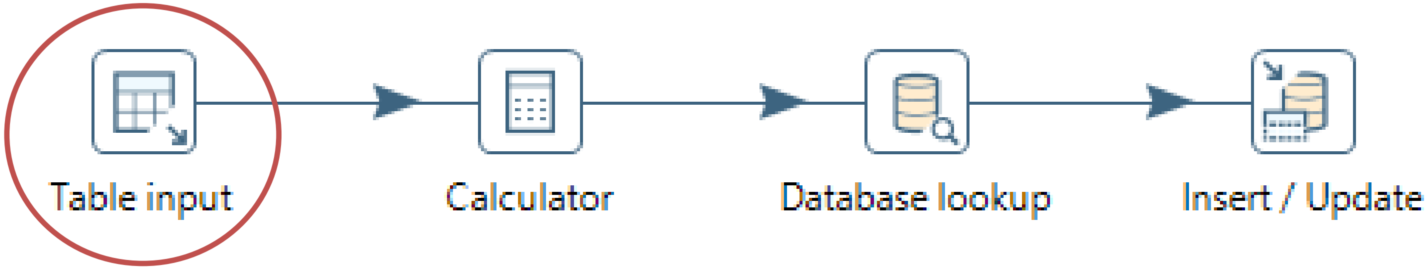
ORDERNUMBER INT(11)
ORDERDATE DATE
STATUS VARCHAR(15)
CUSTOMERNUMBER INT(11)

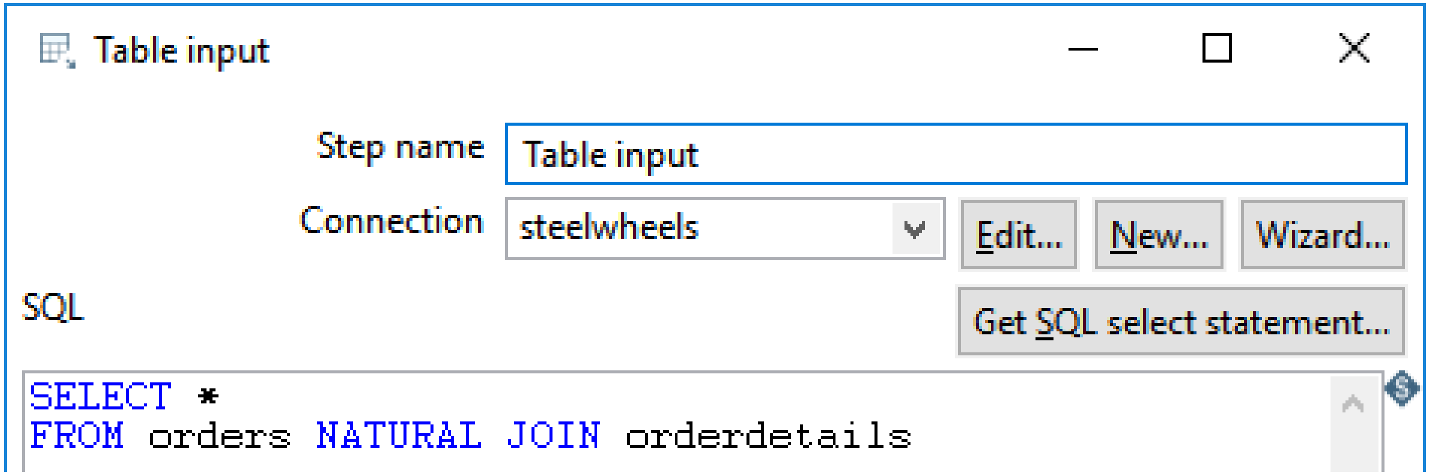
**fact_order**

ORDERNUMBER INT(11)
ORDERLINENUMBER INT(11)
QUANTITYORDERED INT(11)
PRICEEACH DOUBLE
LINETOTAL DOUBLE
CUSTOMERNUMBER INT(11)
PRODUCT_ID INT(11)
TIME_ID DATETIME

# Fact table

- The fact table





Step name: Table input

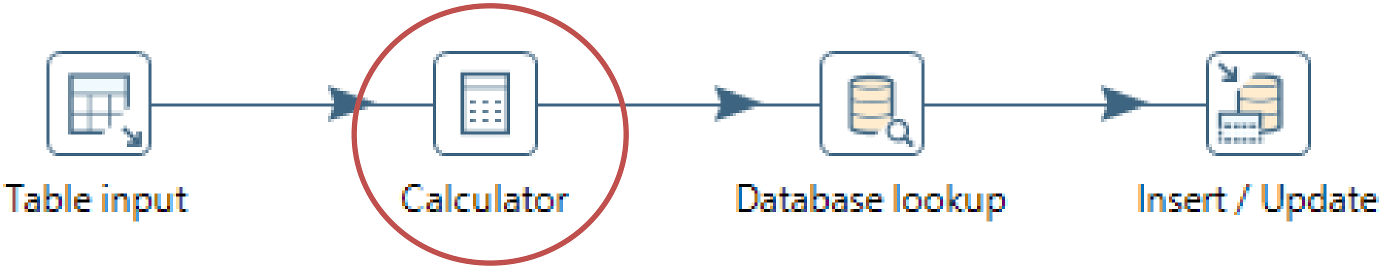
Connection: steelwheels

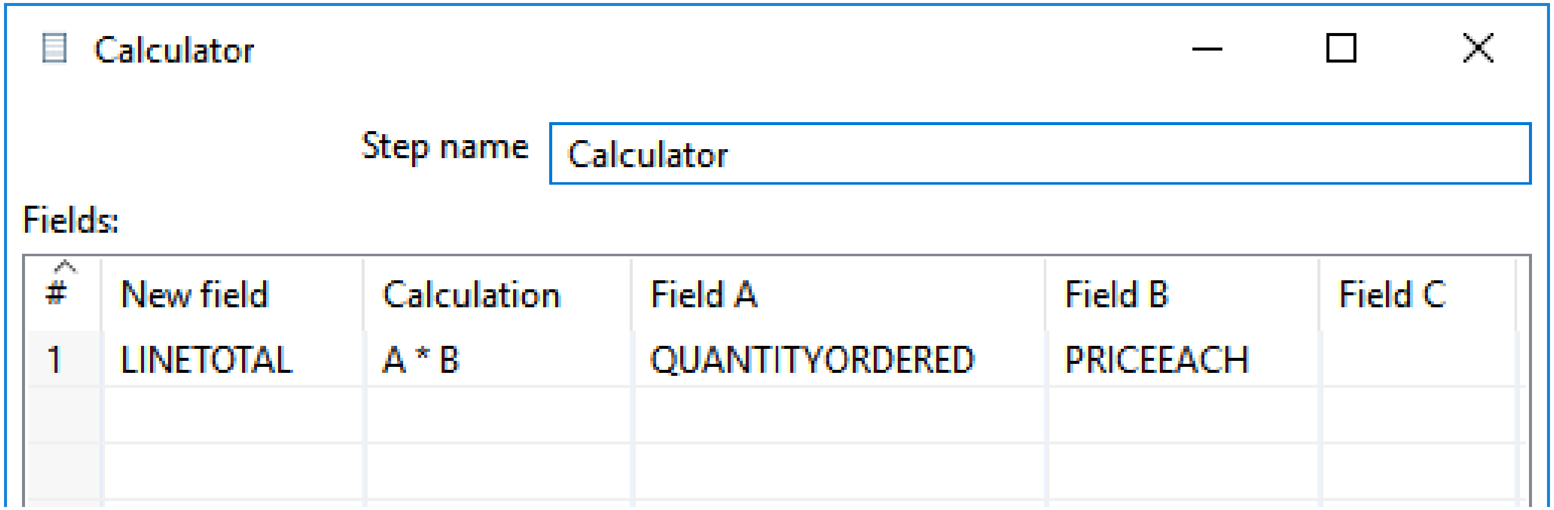
SQL

```
SELECT *
FROM orders NATURAL JOIN orderdetails
```

# Fact table

- The fact table





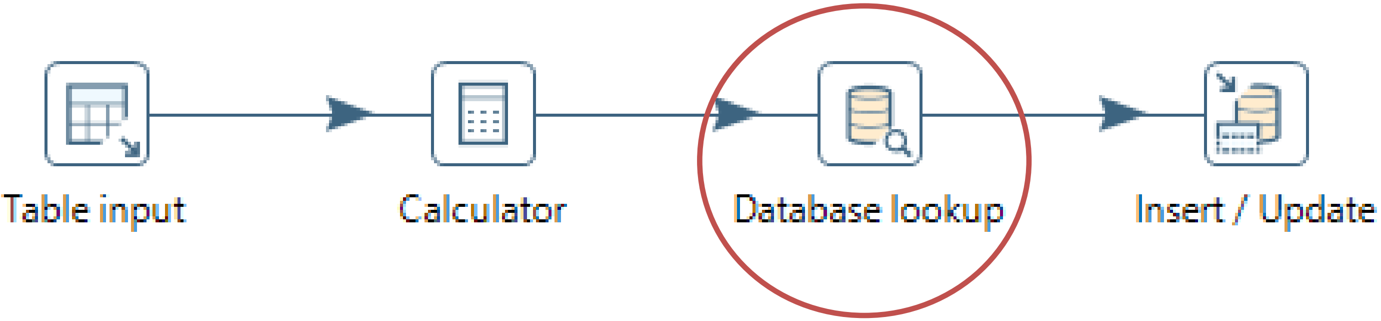
Step name: Calculator

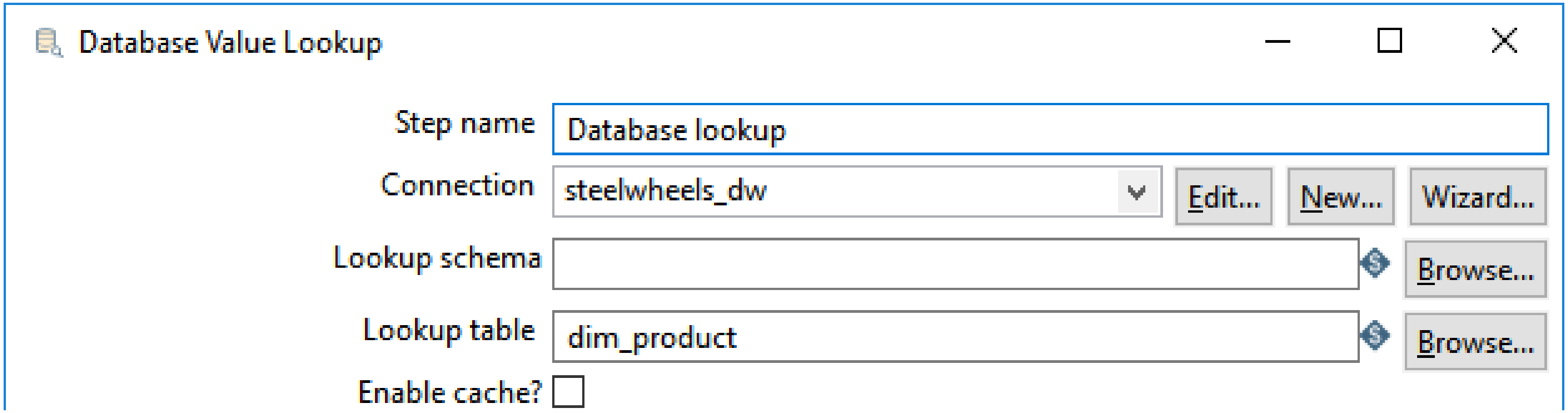
Fields:

| # | New field | Calculation | Field A | Field B | Field C |
|---|---|---|---|---|---|
| 1 | LINETOTAL | A * B | QUANTITYORDERED | PRICEEACH | |

# Fact table

- The fact table





Step name: Database lookup

Connection: steelwheels_dw

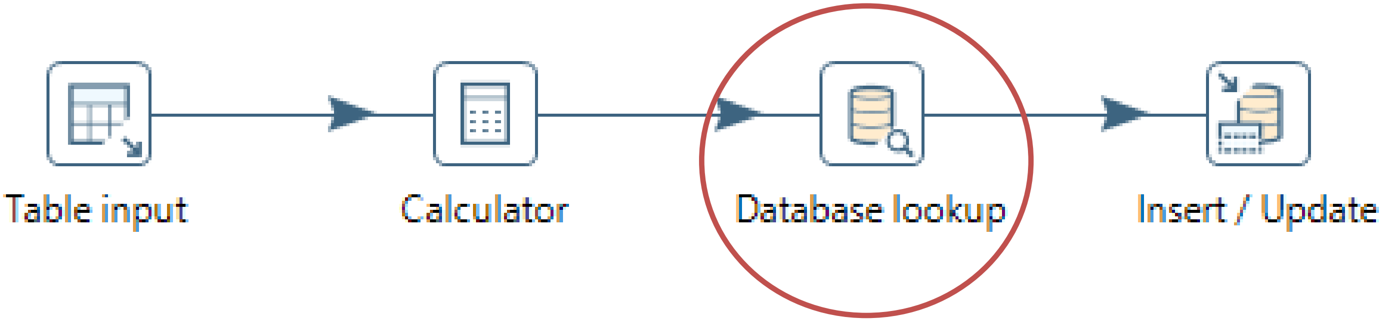
Lookup schema:

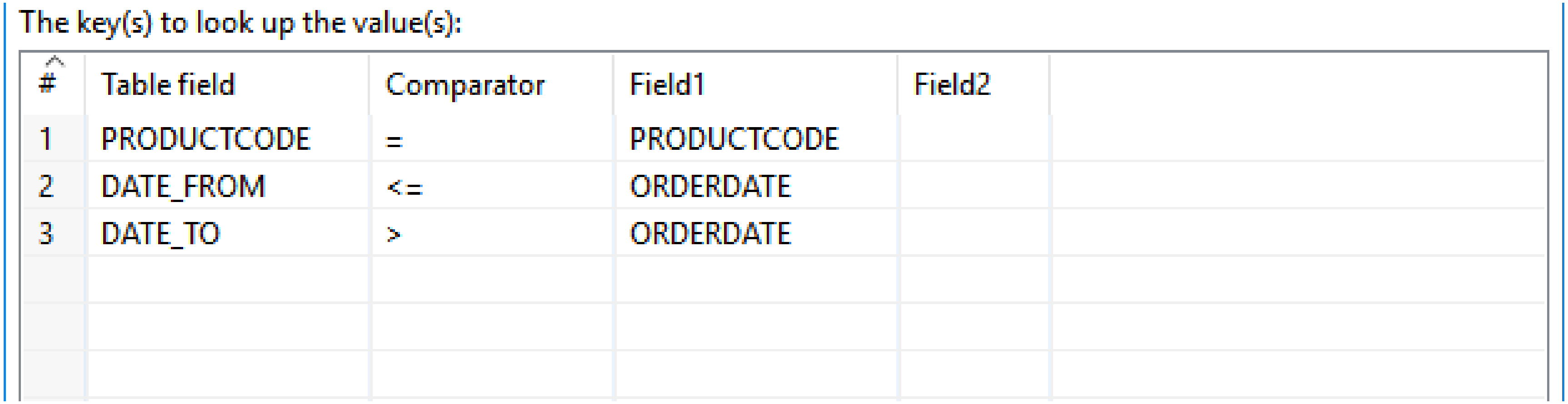
Lookup table: dim_product

Enable cache? □

# Fact table

- The fact table



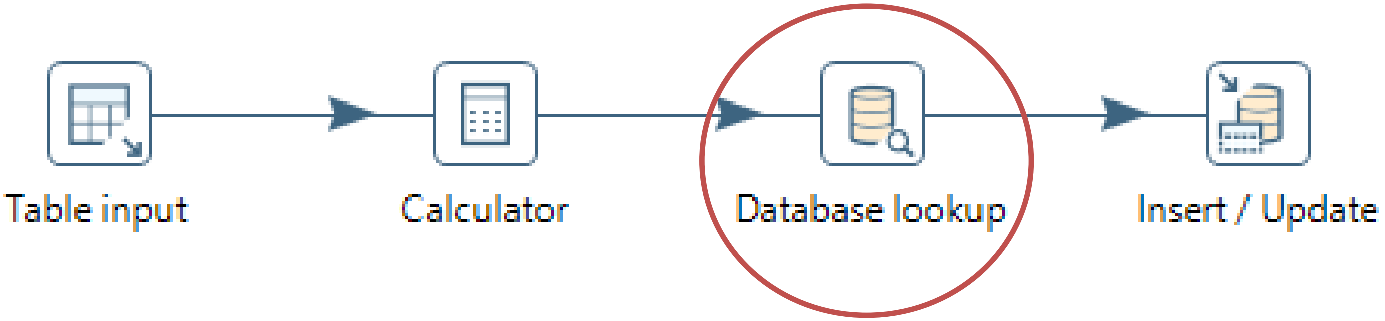


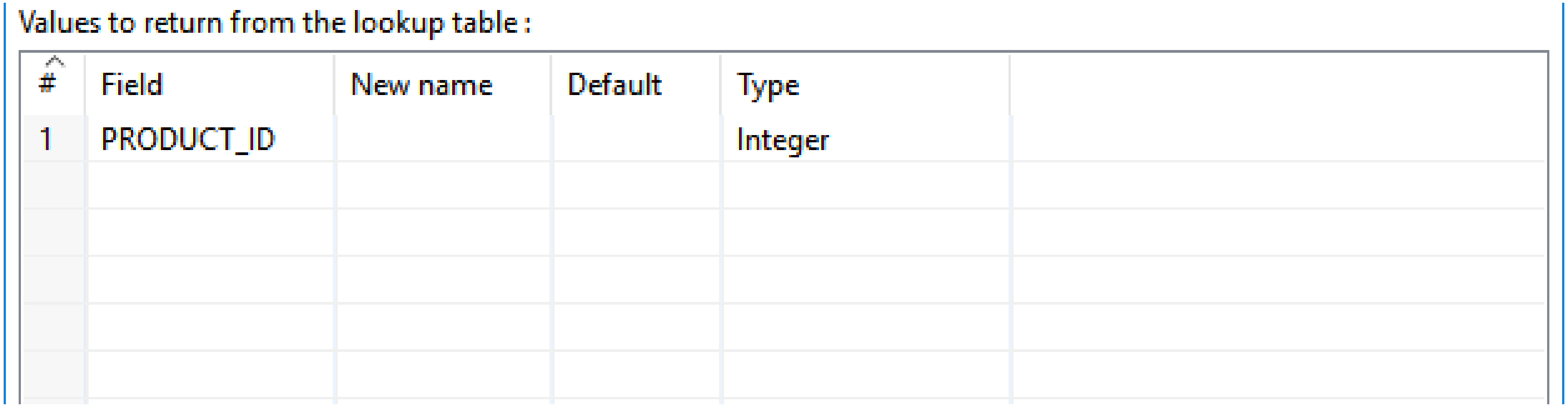
The key(s) to look up the value(s):

| # | Table field | Comparator | Field1 | Field2 |
|---|---|---|---|---|
| 1 | PRODUCTCODE | = | PRODUCTCODE | |
| 2 | DATE_FROM | <= | ORDERDATE | |
| 3 | DATE_TO | > | ORDERDATE | |

# Fact table

- The fact table

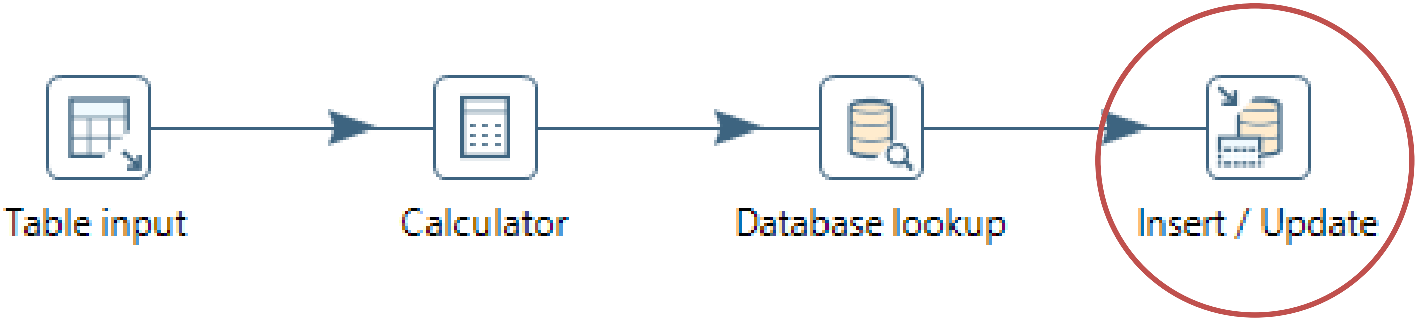


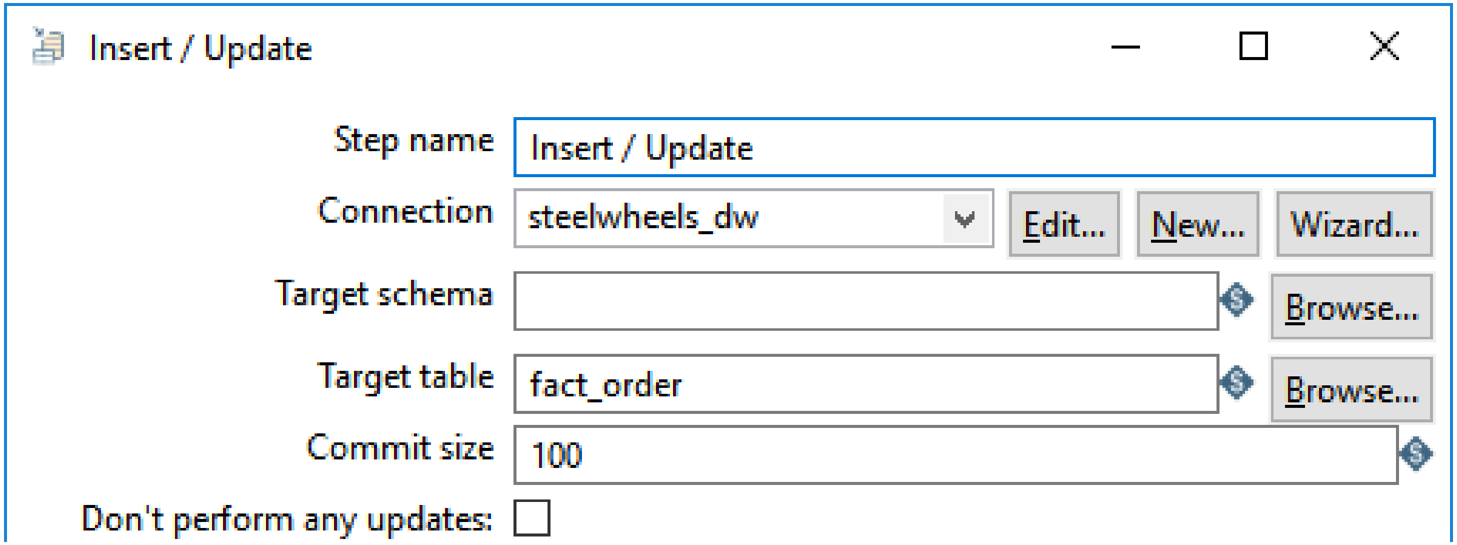

Values to return from the lookup table :

| # | Field | New name | Default | Type |
|---|---|---|---|---|
| 1 | PRODUCT_ID | | | Integer |

# Fact table

- The fact table

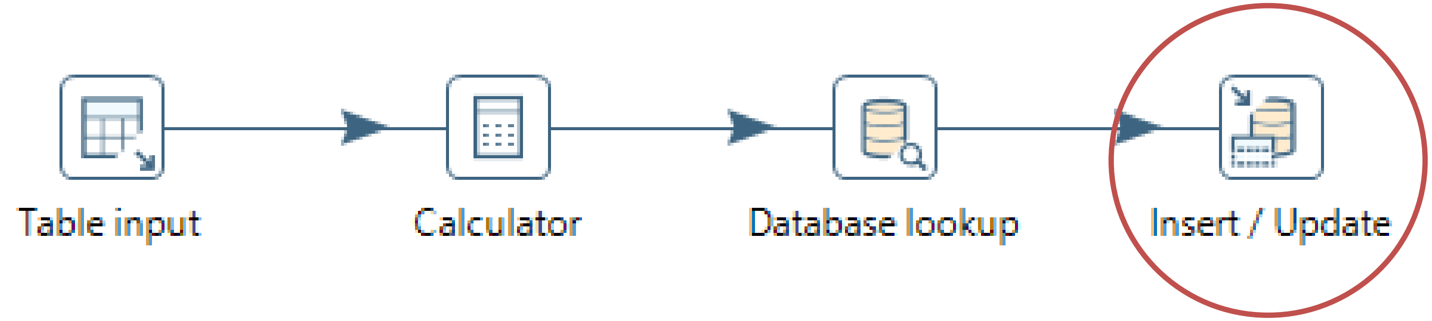


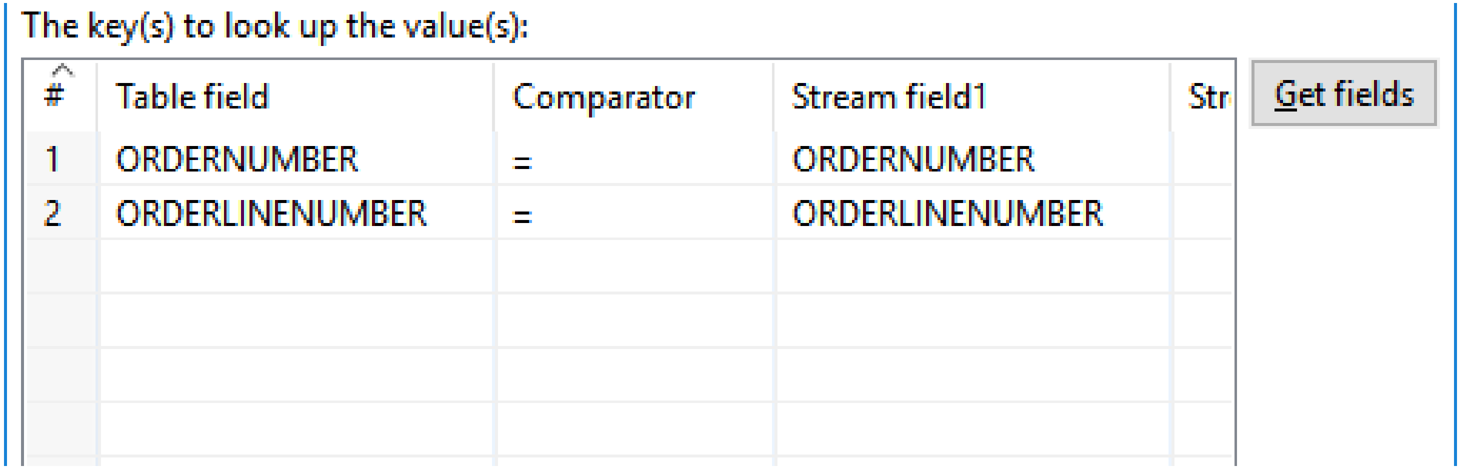


|  |  |
|---|---|
| Step name | Insert / Update |
| Connection | steelwheels_dw |
| Target schema |  |
| Target table | fact_order |
| Commit size | 100 |
| Don't perform any updates: | □ |

# Fact table

- The fact table

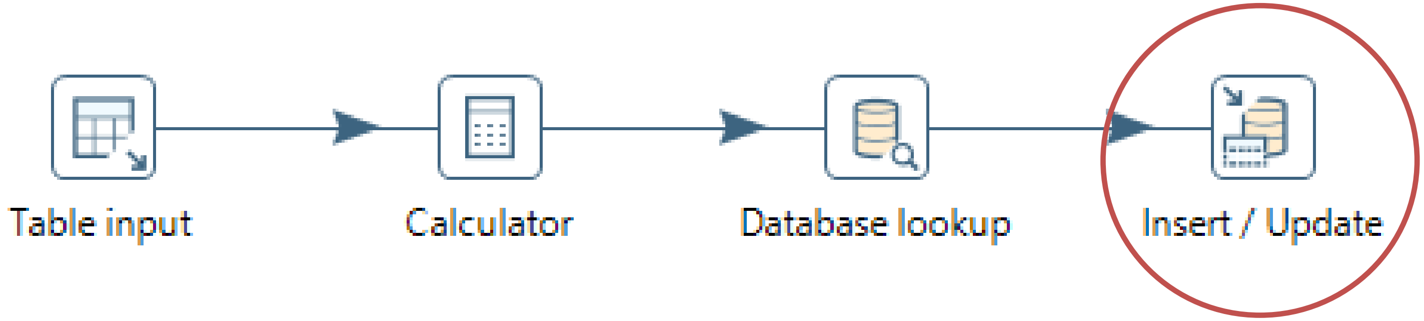


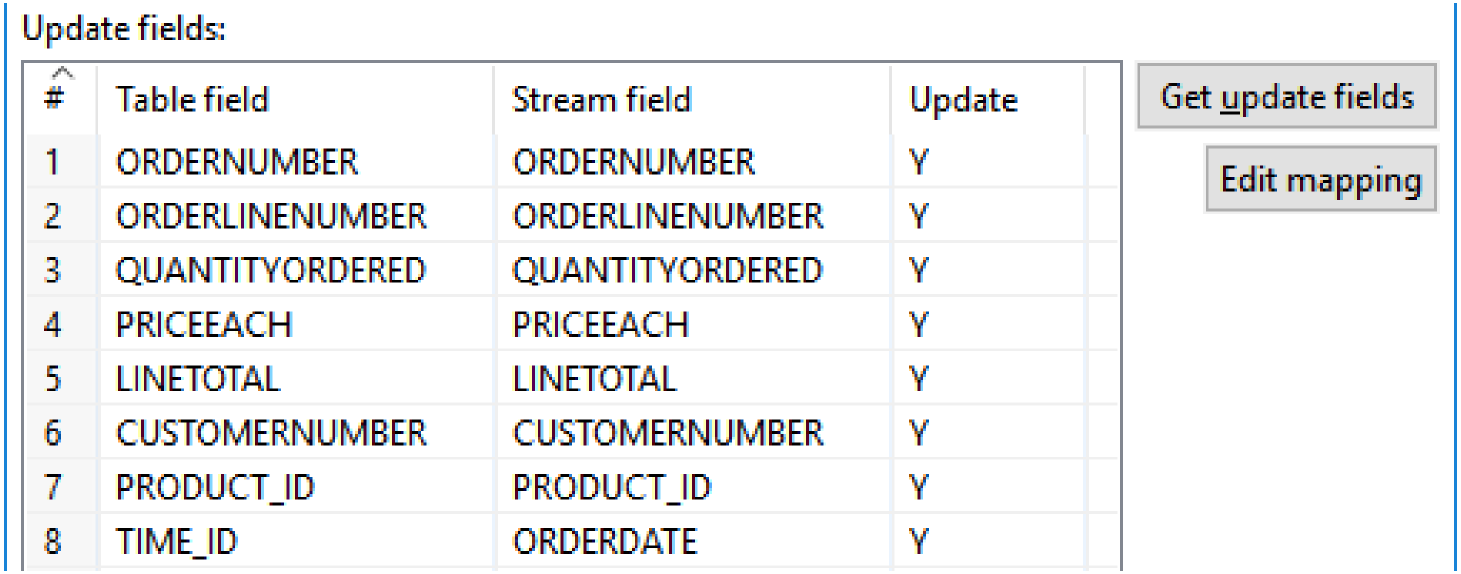

The key(s) to look up the value(s):

| # | Table field | Comparator | Stream field1 | Str |
|---|---|---|---|---|
| 1 | ORDERNUMBER | = | ORDERNUMBER | |
| 2 | ORDERLINENUMBER | = | ORDERLINENUMBER | |

# Fact table

- The fact table




Update fields:

| # | Table field | Stream field | Update |
|---|---|---|---|
| 1 | ORDERNUMBER | ORDERNUMBER | Y |
| 2 | ORDERLINENUMBER | ORDERLINENUMBER | Y |
| 3 | QUANTITYORDERED | QUANTITYORDERED | Y |
| 4 | PRICEEACH | PRICEEACH | Y |
| 5 | LINETOTAL | LINETOTAL | Y |
| 6 | CUSTOMERNUMBER | CUSTOMERNUMBER | Y |
| 7 | PRODUCT_ID | PRODUCT_ID | Y |
| 8 | TIME_ID | ORDERDATE | Y |

# Fact table

- The fact table

```
+-------------+-----------------+-----------------+-----------+-----------+----------------+
| ORDERNUMBER | ORDERLINENUMBER | QUANTITYORDERED | PRICEEACH | LINETOTAL | CUSTOMERNUMBER |
+-------------+-----------------+-----------------+-----------+-----------+----------------+
|       10100 |               1 |              49 |        34 |      1666 |            363 |
|       10100 |               2 |              50 |        68 |      3400 |            363 |
|       10100 |               3 |              30 |       172 |      5160 |            363 |
|       10100 |               4 |              22 |        87 |      1914 |            363 |
|       10101 |               1 |              26 |       145 |      3770 |            128 |
|       10101 |               2 |              46 |        54 |      2484 |            128 |
|       10101 |               3 |              45 |        31 |      1395 |            128 |
|       10101 |               4 |              25 |       151 |      3775 |            128 |
|       10102 |               1 |              41 |        50 |      2050 |            181 |
|       10102 |               2 |              39 |       123 |      4797 |            181 |
|       10103 |               1 |              36 |       102 |      3672 |            121 |
|       10103 |               2 |              22 |        54 |      1188 |            121 |
|       10103 |               3 |              31 |       104 |      3224 |            121 |
|       10103 |               4 |              42 |       129 |      5418 |            121 |
|       10103 |               5 |              36 |       117 |      4212 |            121 |
|       10103 |               6 |              42 |       106 |      4452 |            121 |
|       10103 |               7 |              45 |        76 |      3420 |            121 |
|       10103 |               8 |              27 |       126 |      3402 |            121 |
|       10103 |               9 |              41 |        47 |      1927 |            121 |
|       10103 |              10 |              35 |       112 |      3920 |            121 |
+-------------+-----------------+-----------------+-----------+-----------+----------------+
```

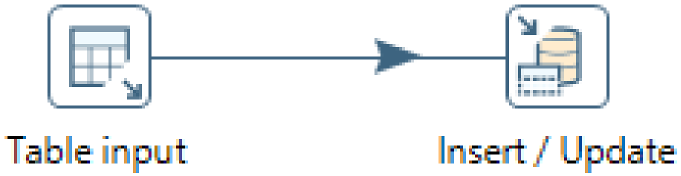
# Fact table

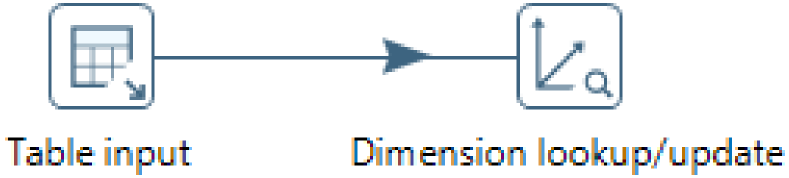
- The fact table

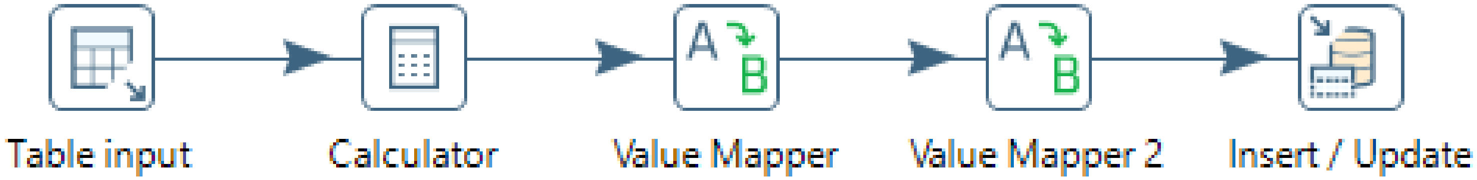
```
+-----------------+-----------+-----------+----------------+------------+---------------------+
| QUANTITYORDERED | PRICEEACH | LINETOTAL | CUSTOMERNUMBER | PRODUCT_ID | TIME_ID             |
+-----------------+-----------+-----------+----------------+------------+---------------------+
|              49 |        34 |      1666 |            363 |         80 | 2003-01-06 00:00:00 |
|              50 |        68 |      3400 |            363 |         27 | 2003-01-06 00:00:00 |
|              30 |       172 |      5160 |            363 |         23 | 2003-01-06 00:00:00 |
|              22 |        87 |      1914 |            363 |         50 | 2003-01-06 00:00:00 |
|              26 |       145 |      3770 |            128 |         33 | 2003-01-09 00:00:00 |
|              46 |        54 |      2484 |            128 |         64 | 2003-01-09 00:00:00 |
|              45 |        31 |      1395 |            128 |         61 | 2003-01-09 00:00:00 |
|              25 |       151 |      3775 |            128 |         29 | 2003-01-09 00:00:00 |
|              41 |        50 |      2050 |            181 |         20 | 2003-01-10 00:00:00 |
|              39 |       123 |      4797 |            181 |         19 | 2003-01-10 00:00:00 |
|              36 |       102 |      3672 |            121 |         65 | 2003-01-29 00:00:00 |
|              22 |        54 |      1188 |            121 |         30 | 2003-01-29 00:00:00 |
|              31 |       104 |      3224 |            121 |         85 | 2003-01-29 00:00:00 |
|              42 |       129 |      5418 |            121 |          6 | 2003-01-29 00:00:00 |
|              36 |       117 |      4212 |            121 |         52 | 2003-01-29 00:00:00 |
|              42 |       106 |      4452 |            121 |        103 | 2003-01-29 00:00:00 |
|              45 |        76 |      3420 |            121 |         90 | 2003-01-29 00:00:00 |
|              27 |       126 |      3402 |            121 |          9 | 2003-01-29 00:00:00 |
|              41 |        47 |      1927 |            121 |         53 | 2003-01-29 00:00:00 |
|              35 |       112 |      3920 |            121 |         17 | 2003-01-29 00:00:00 |
+-----------------+-----------+-----------+----------------+------------+---------------------+
```

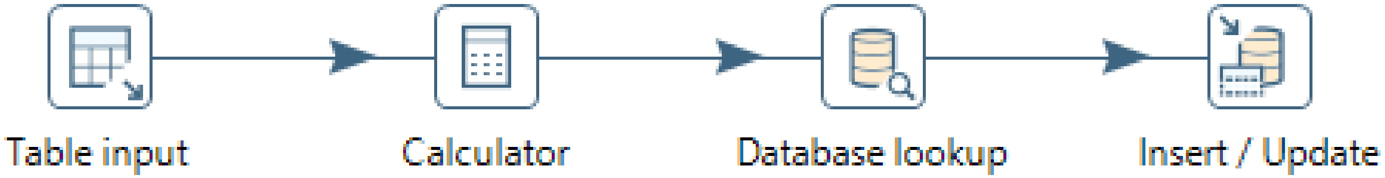
# Complete ETL process

- Transformations
  - the customer dimension
  - the product dimension
  - the time dimension
  - the fact table



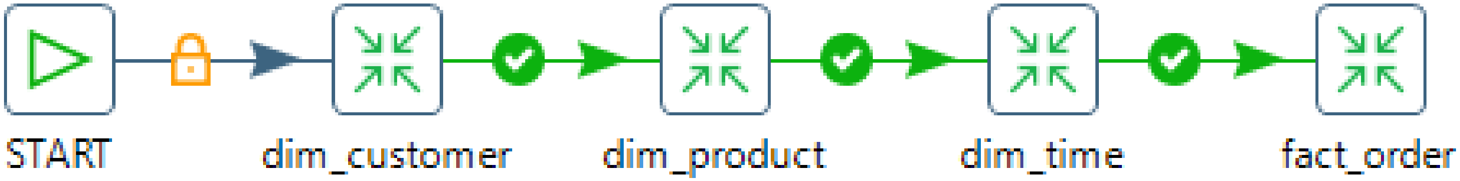






# Complete ETL process

- Defining a job
  - a job is a sequence of transformations
    - each transformation runs only upon successful completion of the previous one
  - is the complete ETL process for the data warehouse
    - can be run multiple times to update the data warehouse


START
dim_customer
dim_product
dim_time
fact_order