Simba C++ SQL Engine

Reference Guide

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About This Guide

Purpose

This guide explains how to use the Simba C++ SQL Engine to document what SQL grammar the C++ engine supports.

Audience

The guide is intended for developers who have created a connector with the Simba C++ SQL Engine. This guide is also intended for end users of the Simba C++ SQL Engine.

Knowledge Prerequisites

To use the Simba C++ SQL Engine, the following knowledge is helpful:

- Familiarity with the platform on which you are using the Simba C++ SQL Engine.
- Ability to use the data store to which the Simba C++ SQL Engine is connecting.
- An understanding of the role of ODBC or JDBC technologies and driver managers in connecting to a data store.
- Experience creating and configuring ODBC or JDBC connections.

Variables Used in this Document

The following variables are used in this document:

Variable	Description
[DRIVER_NAME]	The name of your connector, as used in Windows registry keys and names of configuration files.
[INSTALL_DIR]	Installation directory for the Simba C++ SQL Engine.

Contents

Introducing the Simba C++ SQL Engine

An ODBC SQL Parsing and Execution Engine for Database Access, Simba C++ SQL Engine is a component of SimbaEngine. It provides SQL processing in data drivers and data providers for non-SQL data stores built with SimbaEngine. Simba C++ SQL Engine can also be used in custom solutions where SQL parsing or execution is required.

About

Simba C++ SQL Engine is an easy-to-use, complete, high-performance SQL parser and execution engine for building ODBC, JDBC, ADO.NET or OLE DB data access solutions for non-SQL data stores. You can use it with other SimbaEngine components to create either local or remote data driver access to non-SQL data sources – such as web service, object-oriented, network, real time (e.g. SCADA) and ISAM databases – or you can use it in a custom solution and call it from your own code. Simba SQL Engine's clean and logical interfaces make it easy to work with, and it can either parse, or parse and execute a SQL statement and retrieve the result set. Included with the SimbaEngine is the Quickstart ODBC driver that is a working example of an ODBC driver built using SQL Engine that you can modify to demonstrate reading your own data in just a few days.

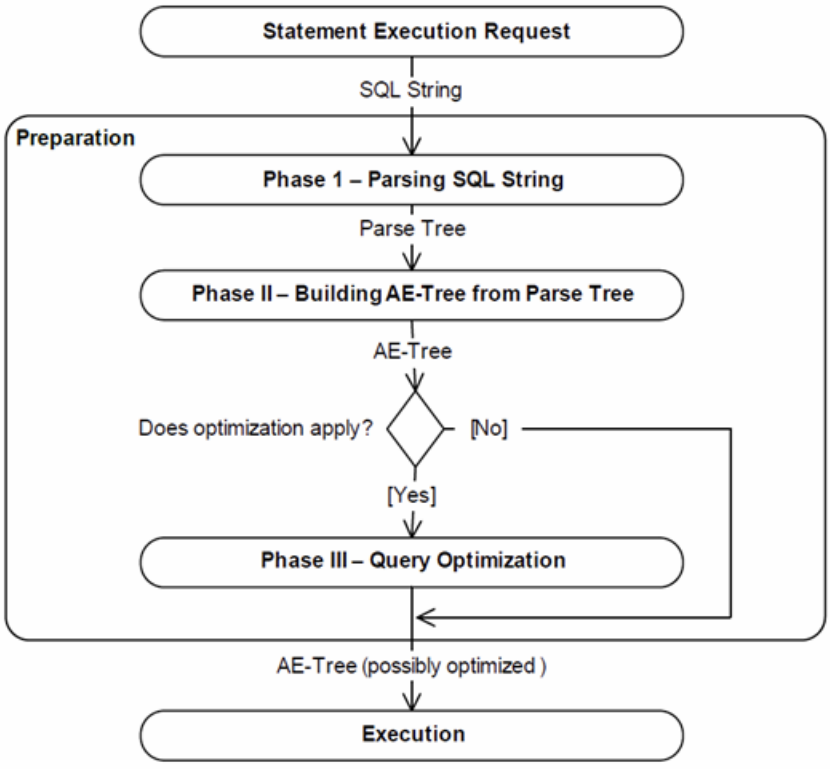
The Simba C++ SQL Engine parser conforms to the SQL-92 specification, but it can be extended to implement any SQL function or feature. When Simba C++ SQL Engine prepares a SQL statement, it validates the tables and columns referenced in the statement against the metadata from the underlying data store. Then it creates an intermediate version of the query called the Algebraic Expression Tree (AE-Tree).

The AE-Tree represents the metadata for the query, and is eventually transformed into an Execution Tree (E-Tree), which can be executed. By carefully moving or modifying nodes, the AE-Tree can be updated to change the way the query is executed without changing the result. The underlying data store can modify the AE-Tree, so that when the query is executed, Simba C++ SQL Engine delegates some or all of the processing to the underlying data store. We call this Collaborative Query Execution. The advantage is that any high-performance processing available in the data store is available for use with Simba C++ SQL Engine. If the entire query can be delegated, Simba C++ SQL Engine will only retrieve the result set. This is particularly important for analytical databases with built-in, high-performance aggregation processing that end users expect to see even through ODBC.

Simba C++ SQL Engine is a complete, compatible, high-performance and easy to use solution for SQL processing on non-SQL data stores. Everything you need to prepare and execute SQL queries is included with a clean and logical interface. With

compliance to the SQL-92 standard, it is carefully designed to support common reporting and BI tools, so end users can get on with their work. Collaborative Query Execution allows you to use the high-performance processing built into your own data store to boost the performance of Simba C++ SQL Engine. You can use Simba C++ SQL Engine with the other components of SimbaEngine to quickly deploy local or remote data access, or you can use it alone, called from your own code. However you choose to deploy it, Simba C++ SQL Engine is the easiest and most flexible SQL preparation and execution engine available today.

This flow of control is illustrated below:



Block Diagram: Simba SQL Engine Process Flow

Specifications

The following list details the specifications for the Simba C++ SQL Engine:

- SQL-92-compliant parser with comprehensive support for ODBC 3.80-compliant data types, as well as scalar and aggregate functions
- ANSI and Unicode UTF-8, -16 and -32 support for both data and metadata.
- Available in 32-bit and 64-bit versions for Windows, Linux and UNIX, OSX, and more.
- Maximum number of simultaneous connections limited only by memory.
- Maximum result set length limited only by memory and swap table space.
- Maximum 65,356 columns supported in a select list.
- Maximum 65,356 columns supported in a table.
- Maximum number of characters in a SQL statement is configurable and is only limited by memory.
- Maximum number of joined tables limited only by memory and swap table space.

SQL Engine Parser

The following is a list of commands that the SQL Engine Parser supports that the Execution component does not support. This means that a parse tree can be generated, however executing using the Execution component will fail.

- ALL PRIVILEGES
- ALTER TABLE
- CASCADE
- CREATE VIEW
- DROP VIEW
- EXCEPT
- EXCEPT ALL
- GRANT
- GRANT OPTION FOR
- INTERSECT
- INTERSECT ALL
- PUBLIC
- REFERENCES
- RESTRICT
- REVOKE
- SET CATALOG
- SET SCHEMA
- USAGE
- WITH GRANT OPTION

SQL Engine SQL Commands

This section discusses commands that are supported by both the Parser and Execution components of the SQL Engine:

- CREATE TABLE
- CREATE VIEW
- DELETE
- DROP TABLE
- DROP VIEW
- INSERT
- SELECT
- UPDATE
- UPSERT

Functions

Simba Engine SQL has many built-in functions for performing calculations on data. There are several basic types and categories of functions. The following sections list some SQL Functions supported by Simba Engine SQL.

Aggregate Functions

An aggregate function takes a set of values (like a column of data) and returns a single value result from the set of values. As of SimbaEngine 9.3, custom aggregates are supported (excluding the ETree), which means that any aggregate function can be supported.

Aggregate Functions	SimbaEngine SQL Supported
AVG	Yes
COUNT	Yes
MAX	Yes
MIN	Yes
STDDEV	Yes
STDDEV_POP	Yes
SUM	Yes
VAR	Yes
VAR_POP	Yes

Scalar Function

A scalar function takes input argument(s) and returns a single value result. Following is a list of scalar function which supported by SimbaEngine SQL. As of SimbaEngine 9.3, custom scalars are supported, which means that any scalar function can be supported.

Scalar Function	SimbaEngine SQL Supported
String Functions	
ASCII	Yes
CHAR	Yes
CONCAT	Yes
LCASE	Yes
LEFT	Yes
LENGTH	Yes
LOCATE	Yes
LTRIM	Yes
INSERT	Yes
REPEAT	Yes
REPLACE	Yes
RIGHT	Yes
RTRIM	Yes
SOUNDEX	Yes
SPACE	Yes
SUBSTRING	Yes
UCASE	Yes
BIT_LENGTH	No
CHAR_LENGTH	No
CHARACTER_LENGTH	No

Scalar Function	SimbaEngine SQL Supported
DIFFERENCE	No
OCTET_LENGTH	No
POSITION(_IN_)	No
Numeric Functions	
ABS	Yes
ACOS	Yes
ASIN	Yes
ATAN	Yes
ATAN2	Yes
CEILING	Yes
COS	Yes
COT	Yes
DEGREES	Yes
EXP	Yes
FLOOR	Yes
LOG	Yes
LOG10	Yes
MOD	Yes
PI	Yes
POWER	Yes
RADIANS	Yes

Scalar Function	SimbaEngine SQL Supported
RAND	Yes
ROUND	Yes
SIGN	Yes
SIN	Yes
SQRT	Yes
TAN	Yes
TRUNCATE	Yes
System Functions	
CAST	Yes
CONVERT	Yes
DATABASE	Yes
IFNULL	Yes
USER	Yes
SimbaEngine SQL	
COALESCE	Yes
NULL	Yes
NULLIF	Yes

Date and Time Functions

The following is a table of all important Date and Time related functions available through Simba Engine SQL.

Date and Time and Interval Functions	SimbaEngine SQL Supported
CURRENT_DATE	Yes
CURRENT_TIME	Yes
CURRENT_TIME(time-precision)	Yes
CURRENT_TIMESTAMP	Yes
CURRENT_TIMESTAMP(time-precision)	Yes
CURDATE	Yes
CURTIME	Yes
DAYNAME	Yes
DAYOFMONTH	Yes
DAYOFWEEK	Yes
DAYOFYEAR	Yes
HOUR	Yes
MINUTE	Yes
MONTH	Yes
MONTHNAME	Yes
NOW	Yes
DAYNAME	Yes
DAYOFMONTH	Yes
DAYOFWEEK	Yes
DAYOFYEAR	Yes

Date and Time and Interval Functions	SimbaEngine SQL Supported
HOUR	Yes
MINUTE	Yes
MONTH	Yes
MONTHNAME	Yes
NOW	Yes
QUARTER	Yes
SECOND	Yes
TIMESTAMPDIFF	Yes
TIMESTAMPADD	Yes
WEEK	Yes
WEEK_ISO	Yes
YEAR	Yes
EXTRACT	Yes

Joins

A SQL JOIN clause is used to combine rows from two or more tables, based on a common field between them. SimbaEngine SQL supports all the join types which show in following table:

Joins	SimbaEngine SQL Supported
CROSS JOIN	Yes
JOIN	Yes
INNER	Yes

Joins	SimbaEngine SQL Supported
LEFT OUTER	Yes
LEFT	Yes
RIGHT OUTER	Yes
RIGHT	Yes
FULL	Yes
FULL OUTER	Yes

SELECT or Subquery Key Words

A subquery is a query within a query. A subquery is usually added in the WHERE Clause of the sql statement, and is usually used when you know how to search for a value using a SELECT statement but do not know the exact value in the database. Subqueries are an alternate way of returning data from multiple tables and can be used with the comparision operators, for example “=”, “<>”, “<”, “>”, “<=” and “>=”. They map contain any of the keywords used in the SELECT statement.

The following are other keywords that can be used within a SELECT statement, in any of the associated clauses:

Subquery Key Words	SimbaEngine SQL Supported
ALL	Yes
ANY	Yes
DISTINCT	Yes
GROUP BY	Yes
HAVING	Yes
LIMIT	Yes
TOP	Yes

Subquery Key Words	SimbaEngine SQL Supported
UNION	Yes
UNION ALL	Yes
VALUES	Yes
AS	Yes
ASC	Yes
DATATYPE (one of the SQL_* types)	Yes
TSIDATATYPE (one of the SQL_TSI_* types)	Yes
DESC	Yes
DEFAULT	Yes
WHERE	Yes
OR	Yes
AND	Yes
NOT	Yes
EQ (=)	Yes
NE (<>)	Yes
LT (<)	Yes
GT (>)	Yes
LE (<=)	Yes
GE (>=)	Yes
NOT BETWEEN	Yes

Subquery Key Words	SimbaEngine SQL Supported
BETWEEN	Yes
NOT IN	Yes
IN	Yes
NOT LIKE	Yes
LIKE	Yes
ESCAPE	Yes
IS NOT NULL	Yes
IS NULL	Yes
EXISTS	Yes

Simba Engine SQL Keywords

Keywords cannot be used as identifiers (names of database objects such as columns and tables) without quoting. Simba Engine SQL reserved keywords for defining, manipulating, and accessing databases.

Key Words	SimbaEngine SQL Supported
ADD *	Yes
ALL	Yes
ALTER *	Yes
AND	Yes
ANY	Yes
AS	Yes
ASC	Yes

Key Words	SimbaEngine SQL Supported
AVG	Yes
BETWEEN	Yes
BY	Yes
CALL	Yes
CASCADE *	Yes
CASE	Yes
CAST	Yes
CATALOG *	Yes
CHECK	Yes
COALESCE	Yes
COLUMN	Yes
CONVERT	Yes
COUNT	Yes
CREATE	Yes
CROSS	Yes
DATE	Yes
DAY	Yes
DEFAULT	Yes
DELETE	Yes
DESC	Yes

Key Words	SimbaEngine SQL Supported
DISTINCT	Yes
DROP	Yes
ELSE	Yes
END	Yes
ESCAPE	Yes
EXCEPT *	Yes
EXISTS	Yes
FN	Yes
FOR	Yes
FOREIGN *	Yes
FROM	Yes
FULL	Yes
GRANT *	Yes
GROUP	Yes
HAVING	Yes
HOUR	Yes
IF	Yes
IN	Yes
INDEX	Yes
INNER	Yes

Key Words	SimbaEngine SQL Supported
INSERT	Yes
INTERVAL	Yes
INTO	Yes
IS	Yes
JOIN	Yes
KEY	Yes
LEFT	Yes
LIKE	Yes
LIMIT	Yes
MAX	Yes
MIN	Yes
MINUTE	Yes
MONTH	Yes
NOT	Yes
NULL	Yes
NULLIF	Yes
ON	Yes
OPTION *	Yes
OR	Yes
ORDER	Yes

Key Words	SimbaEngine SQL Supported
OUTER	Yes
PERCENT	Yes
PRIMARY	Yes
PRIVILEGE *	Yes
PROCEDURE	Yes
PUBLIC *	Yes
REFERENCES *	Yes
RESTRICT *	Yes
REVOKE *	Yes
RIGHT	Yes
SCHEMA *	Yes
SECOND	Yes
SELECT	Yes
SET	Yes
SOME *	Yes
STDDEV	Yes
STDDEV_POP	Yes
SUM	Yes
SVBEGIN	Yes
SVEND	Yes

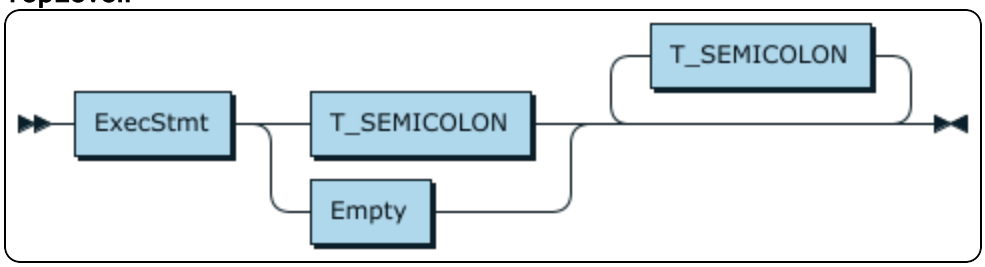
Key Words	SimbaEngine SQL Supported
TABLE *	Yes
THEN	Yes
TIME	Yes
TIMESTAMP	Yes
TIMESTAMPADD	Yes
TIMESTAMPDIFF	Yes
TO	Yes
TOP	Yes
UNION	Yes
UNIQUE	Yes
UPDATE	Yes
USAGE *	Yes
USER	Yes
VALUES	Yes
VAR	Yes
VAR_POP	Yes
VIEW *	Yes
WHEN	Yes
WHERE	Yes
WITH	Yes
YEAR	Yes

* Parser Support only. This is not supported by the AETree or ETree components.

Appendix A: BNF Grammar for C++ SQLEngine with Railroad Diagram

The following is the Rail Diagrams for the SQL BNF Grammar with their relations.

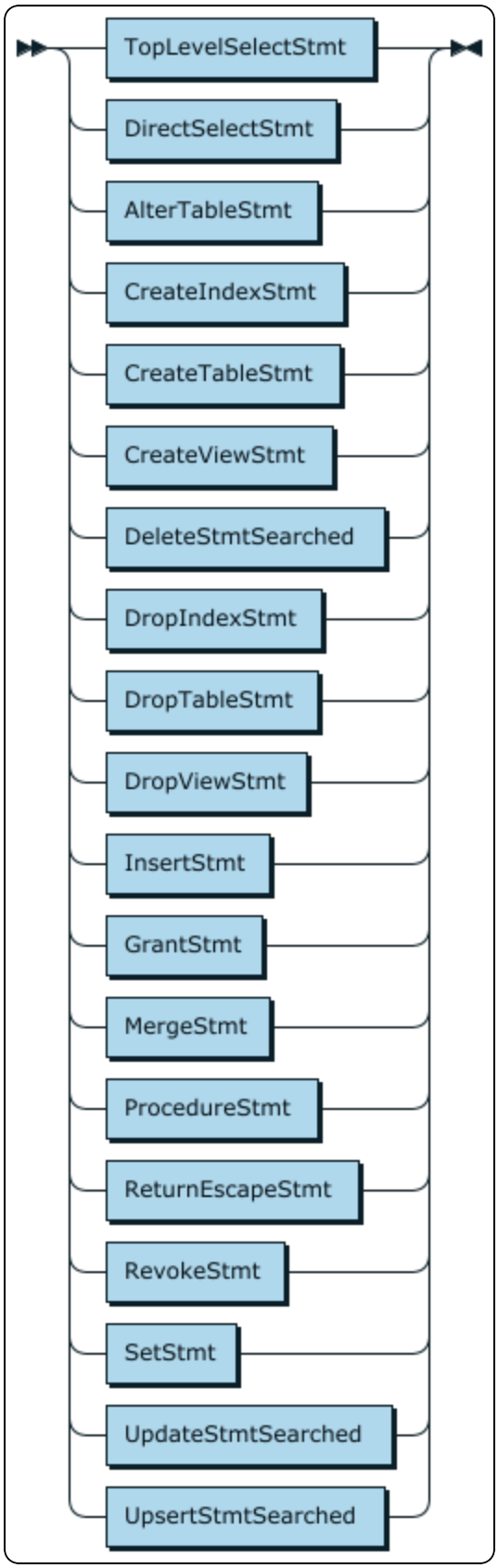
TopLevel:




```
TopLevel ::= ExecStmt ( T_SEMICOLON | Empty ) T_SEMICOLON*
```

no references

ExecStmt:



```
ExecStmt ::= TopLevelSelectStmt
           | DirectSelectStmt
           | AlterTableStmt
           | CreateIndexStmt
           | CreateTableStmt
           | CreateViewStmt
           | DeleteStmtSearched
           | DropIndexStmt
           | DropTableStmt
           | DropViewStmt
           | InsertStmt
           | GrantStmt
           | MergeStmt
           | ProcedureStmt
           | ReturnEscapeStmt
           | RevokeStmt
           | SetStmt
           | UpdateStmtSearched
           | UpsertStmtSearched
```

referenced by:

- TopLevel

Empty:

```
Empty ::=
```

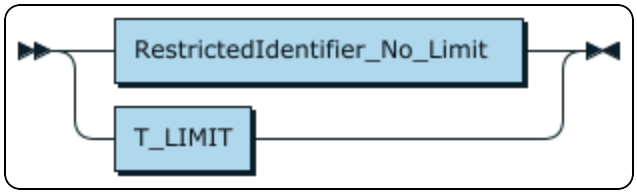
referenced by:

- AS_Clause_Opt
- AS_Opt
- CastFormat_Opt
- ColumnConstraintDefinition_Opt
- ColumnDefinitionList_Opt
- ColumnNameList_Opt

- CorrelationSpec_Opt
- CreateTableStmt
- CreateViewStmt
- DataTypeAttributeList_Opt
- DataType_Opt
- DerivedColumnList_Opt
- ElseClause_Opt
- EscapeCharacter_Opt
- GrantOptionFor_Opt
- GroupBy_Opt
- Having_Opt
- Index_Type_Opt
- IntervalFractionalSecondsPrecision_Opt
- IntervalLeadingPrecision_Opt
- IntervalSign_Opt
- Limit_Opt
- Nulls_Opt
- OrderingSpecification_Opt
- ParamList_Opt
- Params_Opt
- PassingClauseName_Opt
- PassingClause_Opt
- Percent_Opt
- Pivot_Opt
- PrivilegeColumnList_Opt
- ProcedureParams_Opt
- SelectLimit_Opt
- SetQuantifier_Opt
- ToDay_Opt
- ToHour_Opt
- ToMinute_Opt
- ToMonth_Opt
- ToSecond_Opt
- ToYear_Opt

- TopLevel
- Unique_Opt
- WhereSearchCond_Opt
- WithGrantOption_Opt

RestrictedIdentifier:

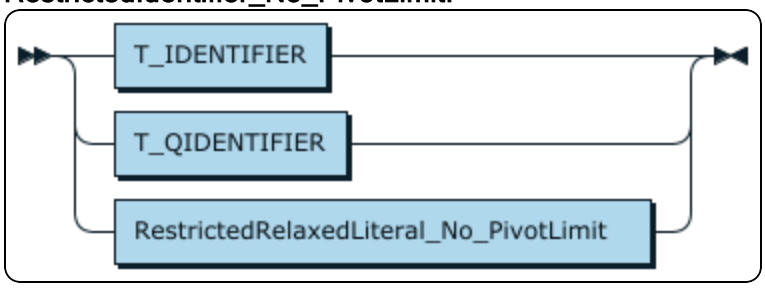



```
RestrictedIdentifier
          ::= RestrictedIdentifier_No_Limit
            | T_LIMIT
```

referenced by:

- PassingClauseName
- RestrictedColumnName

RestrictedIdentifier_No_PivotLimit:

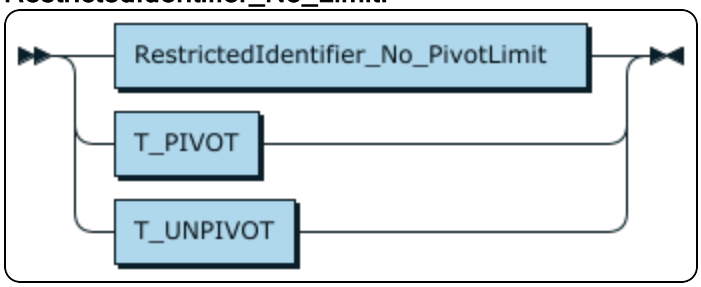



```
RestrictedIdentifier_No_PivotLimit
          ::= T_IDENTIFIER
            | T_QIDENTIFIER
            | RestrictedRelaxedLiteral_No_PivotLimit
```

referenced by:

- Identifier_No_PivotLimit
- RestrictedIdentifier_No_Limit

RestrictedIdentifier_No_Limit:

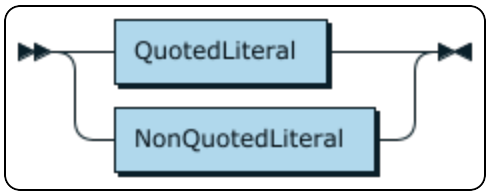



```
RestrictedIdentifier_No_Limit
          ::= RestrictedIdentifier_No_PivotLimit
            | T_PIVOT
            | T_UNPIVOT
```

referenced by:

- Identifier_No_Limit
- RestrictedIdentifier

IdentLiteral:




```
IdentLiteral
          ::= QuotedLiteral
            | NonQuotedLiteral
```

referenced by:

- DateTimeTSGuidValueVT
- OuterJoinVT

- PredVT
- ScalarOrAggrFn

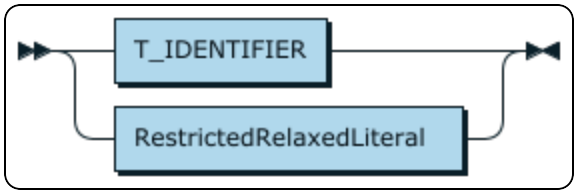
QuotedLiteral:


```
QuotedLiteral
          ::= T_QIDENTIFIER
```

referenced by:

- DataType
- IdentLiteral

NonQuotedLiteral:

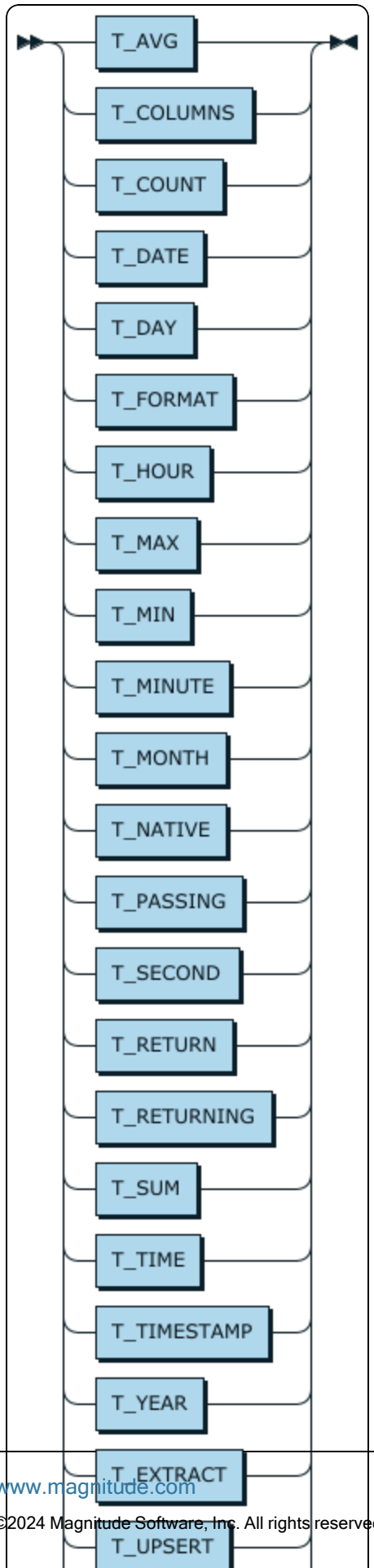



```
NonQuotedLiteral
          ::= T_IDENTIFIER
            | RestrictedRelaxedLiteral
```

referenced by:

- IdentLiteral
- NonQuotedDataTypeLiteral

RestrictedRelaxedLiteral_No_PivotLimit:

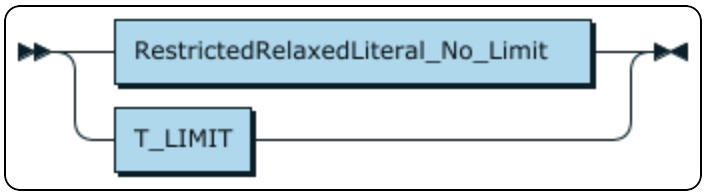


```
RestrictedRelaxedLiteral_No_PivotLimit
          ::= T_AVG
            | T_COLUMNS
            | T_COUNT
            | T_DATE
            | T_DAY
            | T_FORMAT
            | T_HOUR
            | T_MAX
            | T_MIN
            | T_MINUTE
            | T_MONTH
            | T_NATIVE
            | T_PASSING
            | T_SECOND
            | T_RETURN
            | T_RETURNING
            | T_SUM
            | T_TIME
            | T_TIMESTAMP
            | T_YEAR
            | T_EXTRACT
            | T_UPSERT
            | T_INCLUDE
            | T_EXCLUDE
            | T_NULLS
            | T_CHECK
            | T_END
            | T_PERCENT
            | T_WEEK
            | T_QUARTER
            | T_DAYOFWEEK
            | T_POSITION
```

referenced by:

- RestrictedIdentifier_No_PivotLimit
- RestrictedRelaxedLiteral_No_Limit

RestrictedRelaxedLiteral:

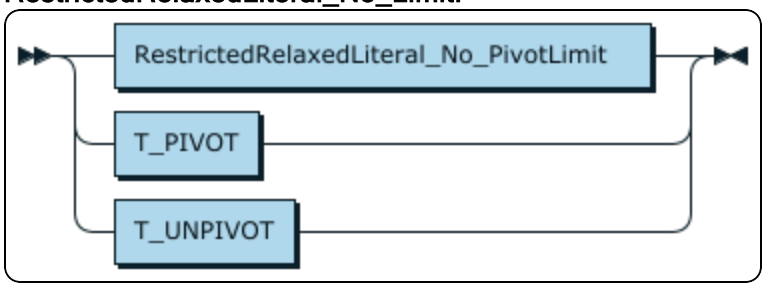



```
RestrictedRelaxedLiteral
         ::= RestrictedRelaxedLiteral_No_Limit
           | T_LIMIT
```

referenced by:

- NonQuotedLiteral

RestrictedRelaxedLiteral_No_Limit:

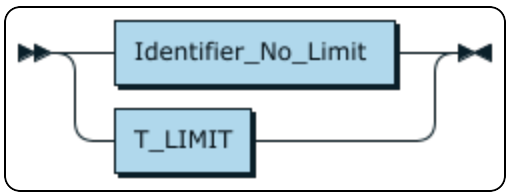



```
RestrictedRelaxedLiteral_No_Limit
         ::= RestrictedRelaxedLiteral_No_PivotLimit
           | T_PIVOT
           | T_UNPIVOT
```

referenced by:

- RestrictedRelaxedLiteral

Identifier:

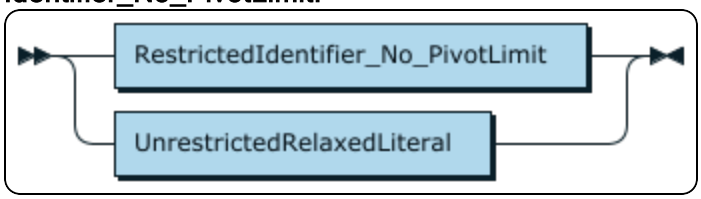


```
Identifier
         ::= Identifier_No_Limit
           | T_LIMIT
```

referenced by:

- AuthorizationIdentifier
- ColumnReference
- CreateIndexStmt
- DataTypeAttributeValue
- DropIndexStmt
- Index_Type_Opt
- MeasureColumnList
- OrderColumn
- ParameterName
- QualifiedIdentifier
- QualifiedName
- QualifiedProcedureName
- SelectSubListItem
- UnpivotColumnList

Identifier_No_PivotLimit:

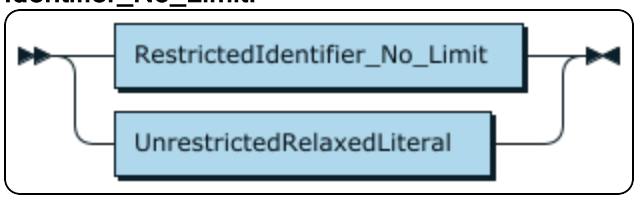



```
Identifier_No_PivotLimit
         ::= RestrictedIdentifier_No_PivotLimit
           | UnrestrictedRelaxedLiteral
```

referenced by:

- CorrelationName

Identifier_No_Limit:

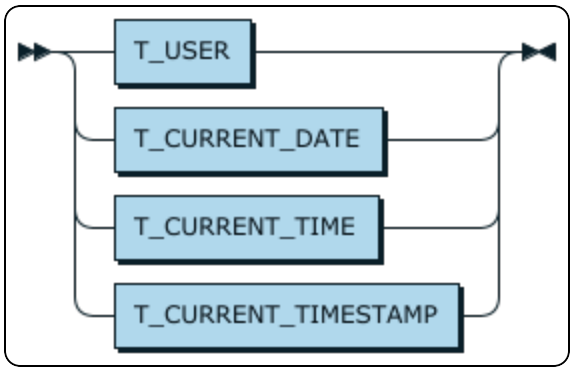



```
Identifier_No_Limit
          ::= RestrictedIdentifier_No_Limit
            | UnrestrictedRelaxedLiteral
```

referenced by:

- ColumnName_No_Limit
- Identifier

UnrestrictedRelaxedLiteral:

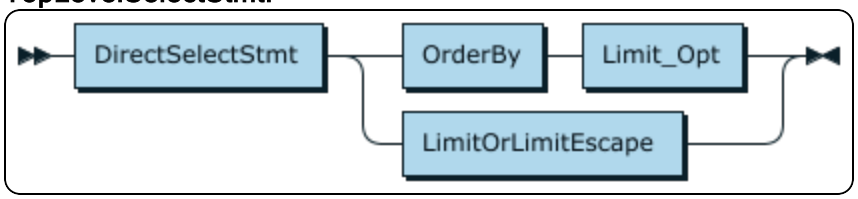



```
UnrestrictedRelaxedLiteral
          ::= T_USER
            | T_CURRENT_DATE
            | T_CURRENT_TIME
            | T_CURRENT_TIMESTAMP
```

referenced by:

- Identifier_No_Limit
- Identifier_No_PivotLimit
- NonQuotedDataTypeLiteral

TopLevelSelectStmt:

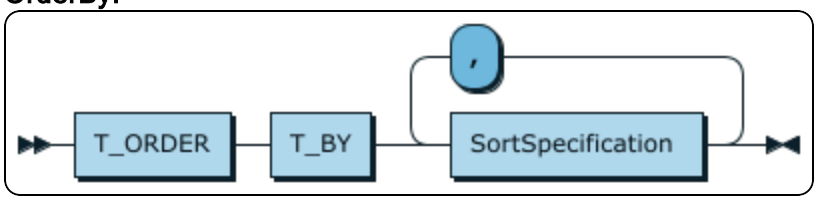



```
TopLevelSelectStmt
         ::= DirectSelectStmt ( OrderByLimit_Opt |
LimitOrLimitEscape )
```

referenced by:

- ExecStmt

OrderBy:




```
OrderBy  ::=  T_ORDER T_BY SortSpecification ( ','
SortSpecification )*
```

referenced by:

- InsertList
- SubQuery
- TopLevelSelectStmt

SortSpecification:


```
SortSpecification
         ::= SortKey OrderingSpecification_Opt
```

referenced by:

- OrderBy

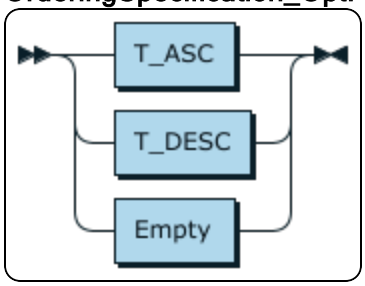
SortKey:


```
SortKey  ::= Expression
```

referenced by:

- SortSpecification

OrderingSpecification_Opt:

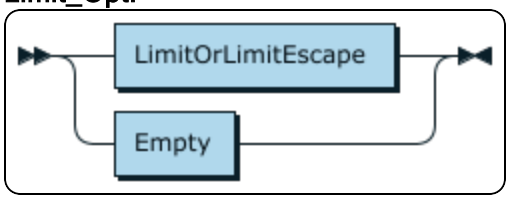



```
OrderingSpecification_Opt
         ::= T_ASC
           | T_DESC
           | Empty
```

referenced by:

- OrderColumn
- SortSpecification

Limit_Opt:

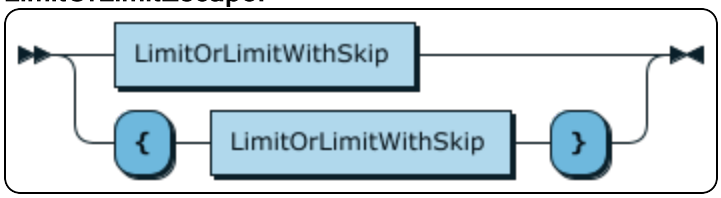



```
Limit_Opt
          ::= LimitOrLimitEscape
            | Empty
```

referenced by:

- InsertList
- NonJoinQueryExpression
- NonJoinQueryPrimaryLimitOpt
- SubQuery
- TopLevelSelectStmt

LimitOrLimitEscape:

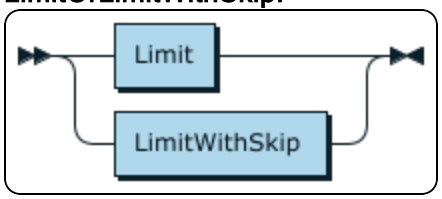



```
LimitOrLimitEscape
          ::= LimitOrLimitWithSkip
            | '{' LimitOrLimitWithSkip '}'
```

referenced by:

- Limit_Opt
- SubQuery
- TopLevelSelectStmt

LimitOrLimitWithSkip:

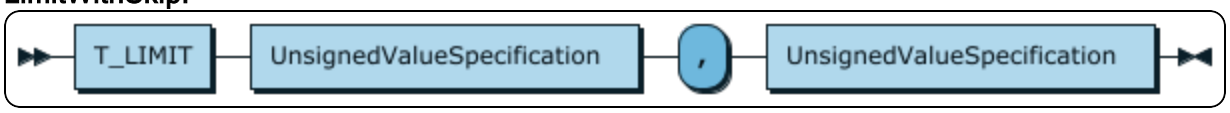



```
LimitOrLimitWithSkip
          ::= Limit
            | LimitWithSkip
```

referenced by:

- LimitOrLimitEscape

LimitWithSkip:




```
LimitWithSkip
          ::= T_LIMIT UnsignedValueSpecification ','
UnsignedValueSpecification
```

referenced by:

- LimitOrLimitWithSkip

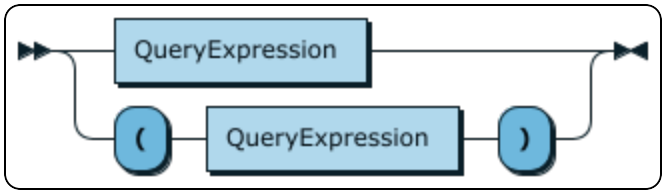
Limit:

```
Limit     ::= T_LIMIT UnsignedValueSpecification
```

referenced by:

- LimitOrLimitWithSkip

DirectSelectStmt:

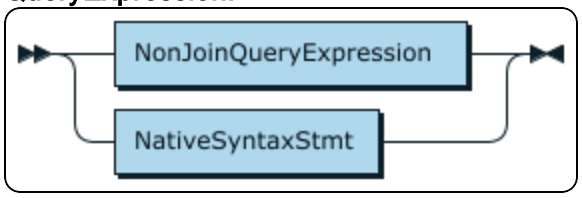



```
DirectSelectStmt
          ::= QueryExpression
            | '(' QueryExpression ')'
```

referenced by:

- CreateTableStmt
- ExecStmt
- NonJoinQueryExpression
- TopLevelSelectStmt

QueryExpression:

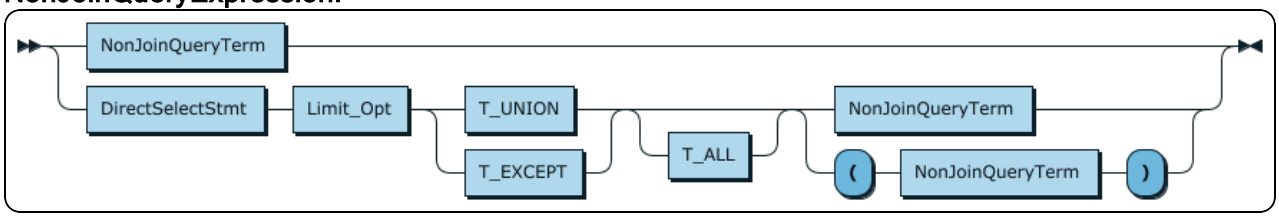



```
QueryExpression
          ::= NonJoinQueryExpression
            | NativeSyntaxStmt
```

referenced by:

- DirectSelectStmt
- InsertList
- SubQuery

NonJoinQueryExpression:

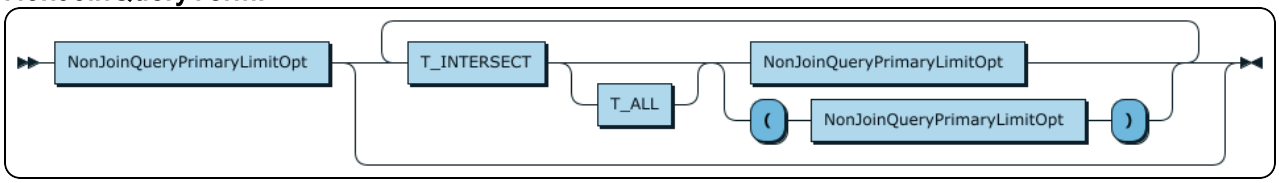



```
NonJoinQueryExpression
         ::= NonJoinQueryTerm
           | DirectSelectStmt Limit_Opt ( T_UNION | T_EXCEPT
) T_ALL? ( NonJoinQueryTerm | '(' NonJoinQueryTerm ')' )
```

referenced by:

- QueryExpression

NonJoinQueryTerm:

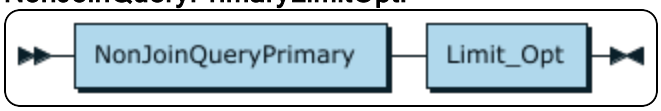



```
NonJoinQueryTerm
         ::= NonJoinQueryPrimaryLimitOpt ( T_INTERSECT T_ALL?
( NonJoinQueryPrimaryLimitOpt | '('
NonJoinQueryPrimaryLimitOpt ')' ) )*
```

referenced by:

- NonJoinQueryExpression

NonJoinQueryPrimaryLimitOpt:




```
NonJoinQueryPrimaryLimitOpt
          ::= NonJoinQueryPrimary Limit_Opt
```

referenced by:

- NonJoinQueryTerm

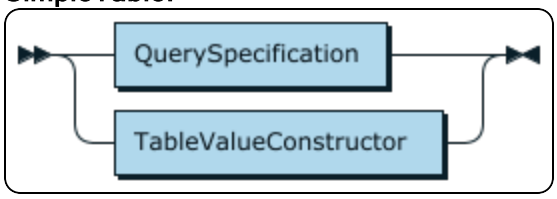
NonJoinQueryPrimary:


```
NonJoinQueryPrimary
          ::= SimpleTable
```

referenced by:

- NonJoinQueryPrimaryLimitOpt

SimpleTable:

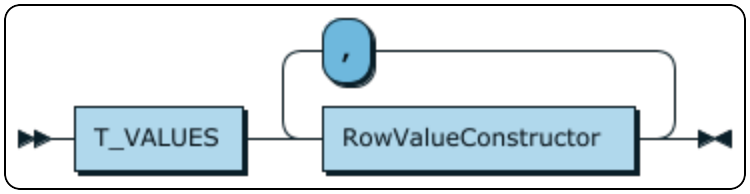



```
SimpleTable
          ::= QuerySpecification
            | TableValueConstructor
```

referenced by:

- NonJoinQueryPrimary

TableValueConstructor:

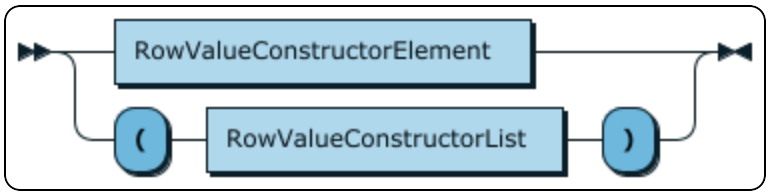



```
TableValueConstructor
         ::= T_VALUES RowValueConstructor ( ','
RowValueConstructor )*
```

referenced by:

- SimpleTable

RowValueConstructor:

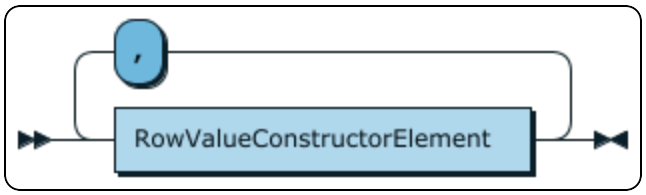



```
RowValueConstructor
         ::= RowValueConstructorElement
           | '(' RowValueConstructorList ')'
```

referenced by:

- BetweenPredicate
- ComparisonPredicate
- InPredicate
- NullPredicate
- QuantifiedComparisonPredicate
- TableValueConstructor

RowValueConstructorList:

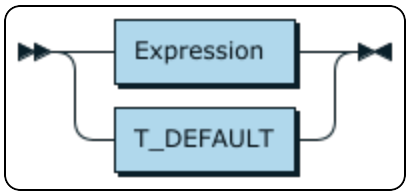



```
RowValueConstructorList
         ::= RowValueConstructorElement ( ','
RowValueConstructorElement )*
```

referenced by:

- MergeWhenNotMatchedClause
- RowValueConstructor

RowValueConstructorElement:

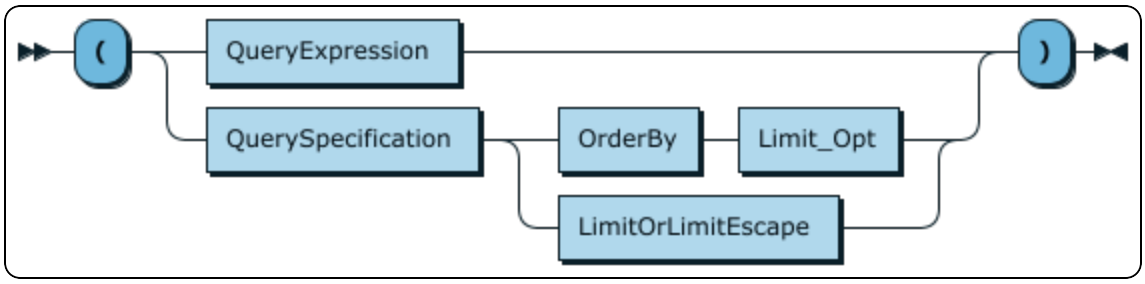



```
RowValueConstructorElement
         ::= Expression
           | T_DEFAULT
```

referenced by:

- RowValueConstructor
- RowValueConstructorList

SubQuery:

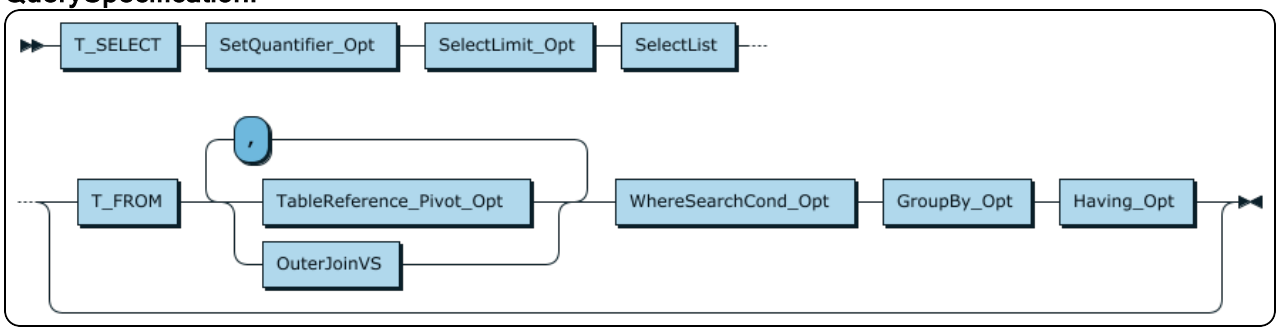



```
SubQuery ::= '(' ( QueryExpression | QuerySpecification (
OrderBy Limit_Opt | LimitOrLimitEscape ) ) ')'
```

referenced by:

- ExistsPredicate
- InPredicateValue
- QuantifiedComparisonPredicate
- TablePrimary
- ValueExpressionPrimary

QuerySpecification:

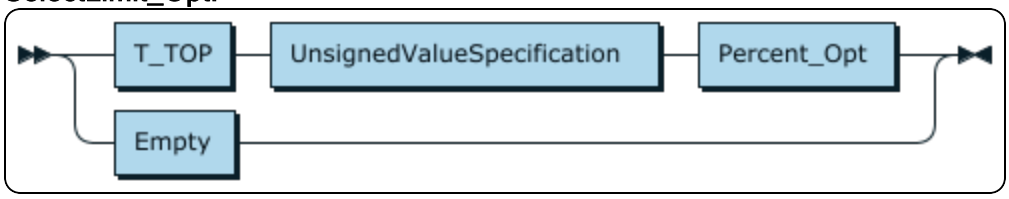



```
QuerySpecification
         ::= T_SELECT SetQuantifier_Opt SelectLimit_Opt
SelectList ( T_FROM ( TableReference_Pivot_Opt | OuterJoinVS
) ( ',' ( TableReference_Pivot_Opt | OuterJoinVS ) )*
WhereSearchCond_Opt GroupBy_Opt Having_Opt )?
```

referenced by:

- CreateViewStmt
- InsertList
- SimpleTable
- SubQuery

SelectLimit_Opt:

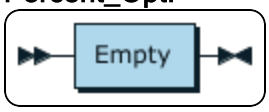



```
SelectLimit_Opt
          ::= T_TOP UnsignedValueSpecification Percent_Opt
            | Empty
```

referenced by:

- QuerySpecification

Percent_Opt:

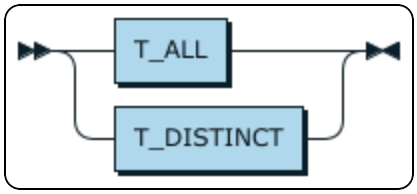



```
Percent_Opt
          ::= Empty
```

referenced by:

- SelectLimit_Opt

SetQuantifier:

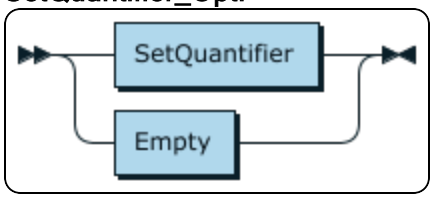


```
SetQuantifier
          ::= T_ALL
            | T_DISTINCT
```

referenced by:

- ScalarOrAggrFn
- SetQuantifier_Opt

SetQuantifier_Opt:

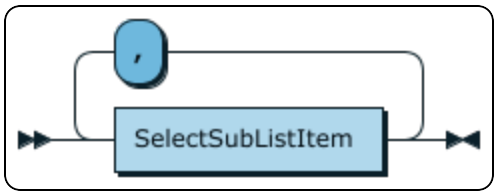



```
SetQuantifier_Opt
          ::= SetQuantifier
            | Empty
```

referenced by:

- QuerySpecification
- SetFunction

SelectList:

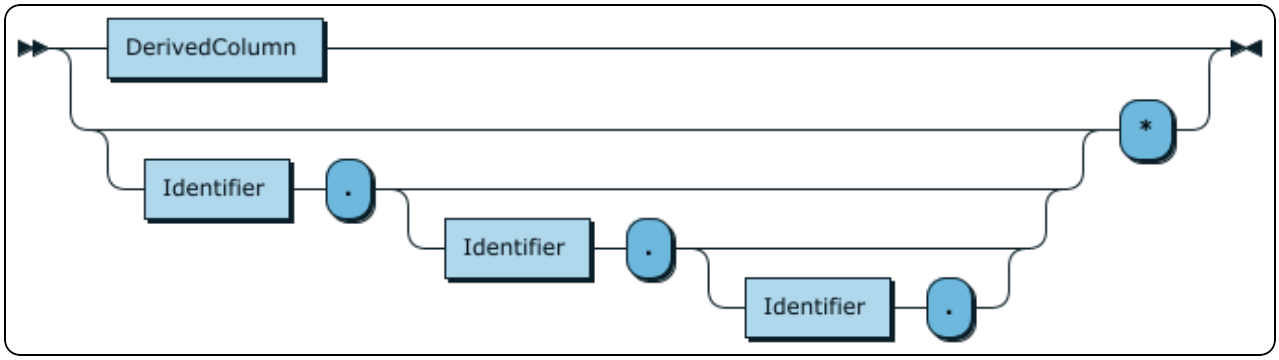



```
SelectList
          ::= SelectSubListItem ( ',' SelectSubListItem )*
```

referenced by:

- QuerySpecification

SelectSubListItem:

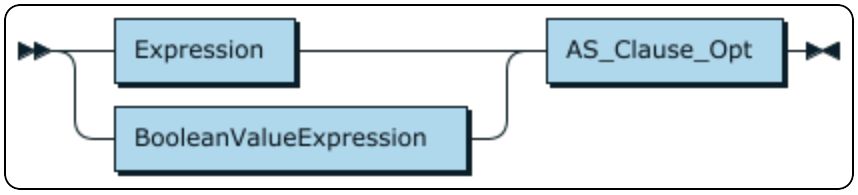



```
SelectSubListItem
          ::= DerivedColumn
            | ( Identifier '.' ( Identifier '.' ( Identifier
'.' )? )? )? '*'
```

referenced by:

- SelectList

DerivedColumn:

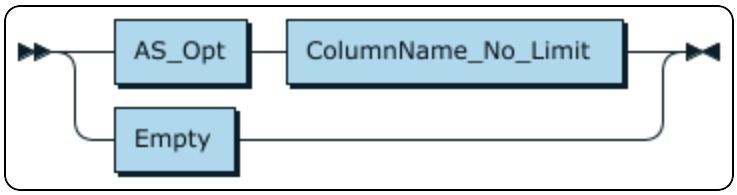



```
DerivedColumn
          ::= ( Expression | BooleanValueExpression ) AS_
Clause_Opt
```

referenced by:

- SelectSubListItem

AS_Clause_Opt:

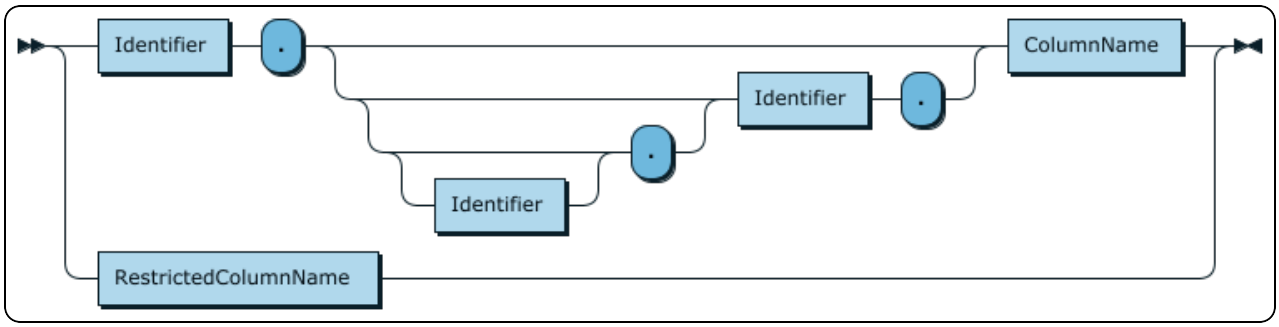



```
AS_Clause_Opt
          ::= AS_Opt ColumnName_No_Limit
            | Empty
```

referenced by:

- DerivedColumn

ColumnReference:

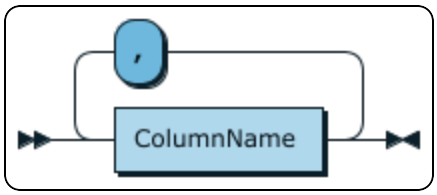



```
ColumnReference
          ::= Identifier '.' ( ( Identifier? '.' )? Identifier
'.' )? ColumnName
            | RestrictedColumnName
```

referenced by:

- ColumnReferenceList
- ColumnReferences
- GroupColumnList
- ValueExpressionPrimary

ColumnNameList:

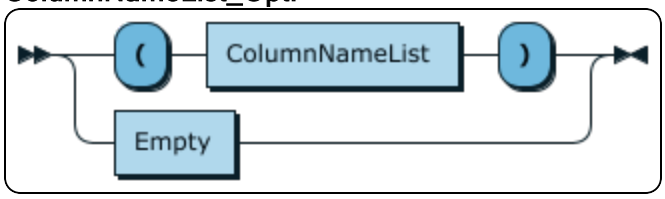



```
ColumnNameList
          ::= ColumnName  (  ',' ColumnName  )*
```

referenced by:

- ColumnNameList_Opt
- CreateViewStmt
- DerivedColumnList_Opt
- InsertList
- PrivilegeColumnList_Opt
- ReturnEscapeStmt
- TableConstraintDefinition

ColumnNameList_Opt:

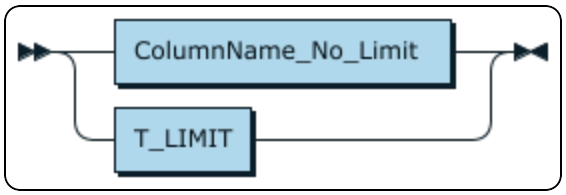



```
ColumnNameList_Opt
          ::= '(' ColumnNameList ')'
            | Empty
```

referenced by:

- CreateTableStmt

ColumnName:

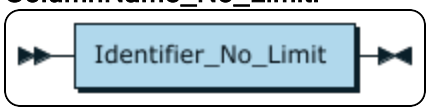



```
ColumnName
          ::= ColumnName_No_Limit
            | T_LIMIT
```

referenced by:

- ColumnDefinition
- ColumnNameList
- ColumnReference
- SetClause

ColumnName_No_Limit:




```
ColumnName_No_Limit
          ::= Identifier_No_Limit
```

referenced by:

- AS_Clause_Opt
- ColumnName

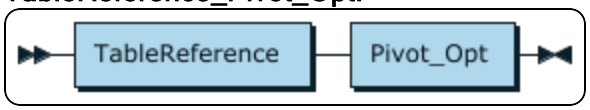
RestrictedColumnName:


```
RestrictedColumnName
          ::= RestrictedIdentifier
```

referenced by:

- ColumnReference

TableReference_Pivot_Opt:

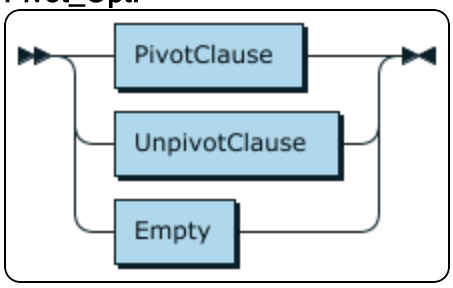



```
TableReference_Pivot_Opt
         ::= TableReference Pivot_Opt
```

referenced by:

- JoinedTable
- QualifiedJoin
- QuerySpecification

Pivot_Opt:

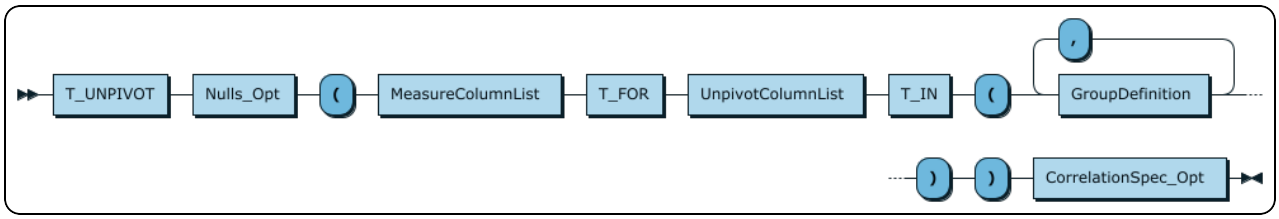



```
Pivot_Opt
          ::= PivotClause
            | UnpivotClause
            | Empty
```

referenced by:

- TableReference_Pivot_Opt

UnpivotClause:

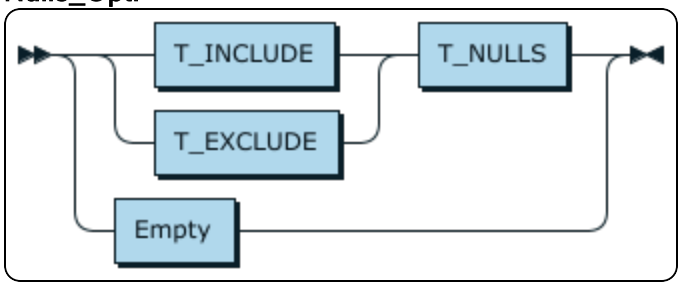



```
UnpivotClause
         ::= T_UNPIVOT Nulls_Opt '(' MeasureColumnList T_FOR
UnpivotColumnList T_IN '(' GroupDefinition ( ','
GroupDefinition )* ')' ')' CorrelationSpec_Opt
```

referenced by:

- Pivot_Opt

Nulls_Opt:

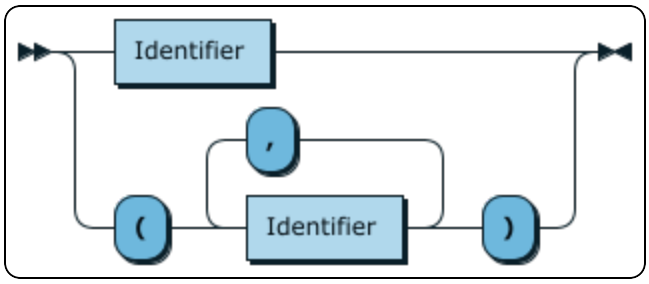



```
Nulls_Opt
          ::= ( T_INCLUDE | T_EXCLUDE ) T_NULLS
            | Empty
```

referenced by:

- UnpivotClause

MeasureColumnList:

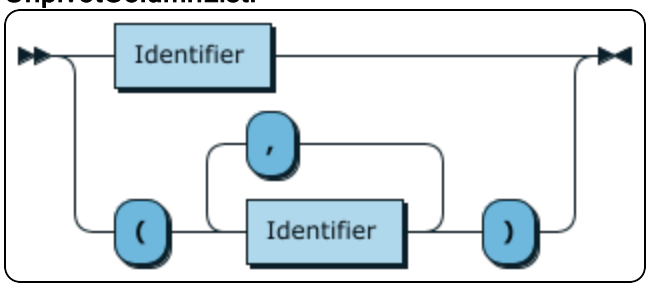



```
MeasureColumnList
         ::= Identifier
           | '(' Identifier ( ',' Identifier )* ')'
```

referenced by:

- UnpivotClause

UnpivotColumnList:

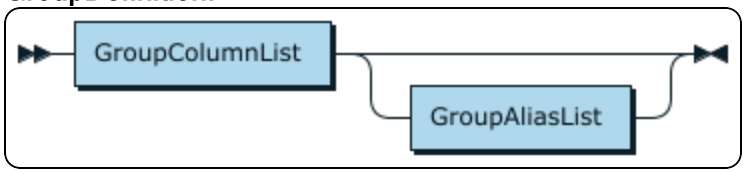



```
UnpivotColumnList
         ::= Identifier
           | '(' Identifier ( ',' Identifier )* ')'
```

referenced by:

- UnpivotClause

GroupDefinition:

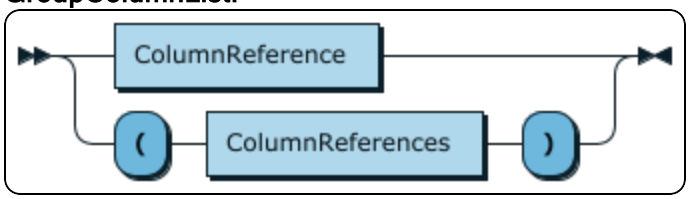


```
GroupDefinition
         ::= GroupColumnList GroupAliasList?
```

referenced by:

- UnpivotClause

GroupColumnList:

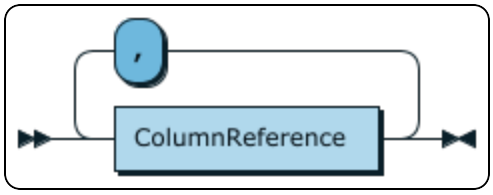



```
GroupColumnList
         ::= ColumnReference
           | '(' ColumnReferences ')'
```

referenced by:

- GroupDefinition

ColumnReferences:

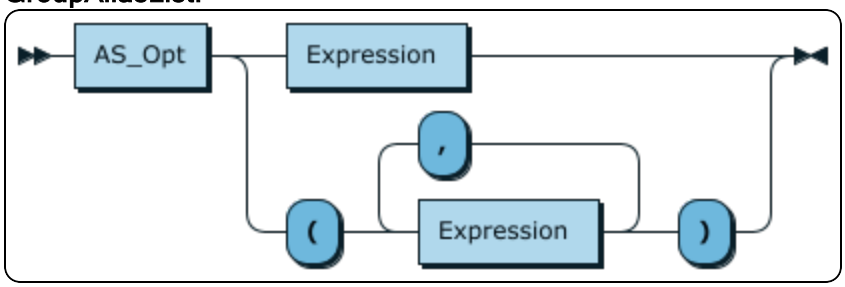



```
ColumnReferences
         ::= ColumnReference ( ',' ColumnReference )*
```

referenced by:

- ColumnReferenceList
- GroupColumnList

GroupAliasList:

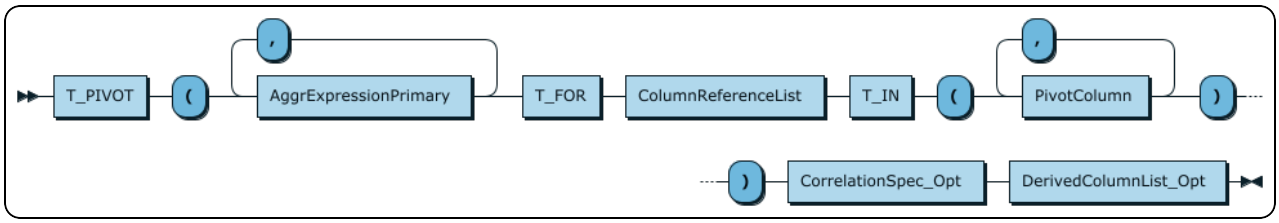



```
GroupAliasList
         ::= AS_Opt ( Expression | '(' Expression ( ',' 
Expression )* ')' )
```

referenced by:

- GroupDefinition

PivotClause:

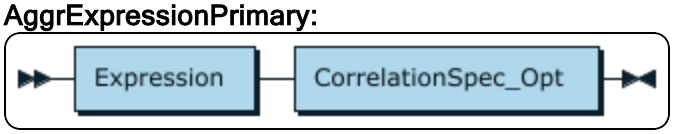



```
PivotClause
         ::= T_PIVOT '(' AggrExpressionPrimary ( ',' 
AggrExpressionPrimary )* T_FOR ColumnReferenceList T_IN '(' 
PivotColumn ( ',' PivotColumn )* ')' ')' CorrelationSpec_Opt 
DerivedColumnList_Opt
```

referenced by:

- Pivot_Opt

AggrExpressionPrimary:

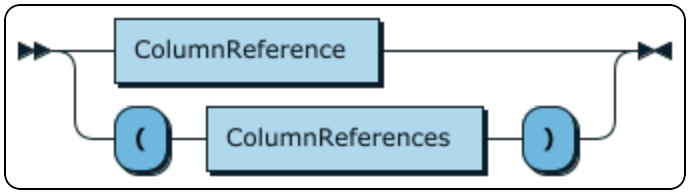


```
AggrExpressionPrimary
         ::= Expression CorrelationSpec_Opt
```

referenced by:

- PivotClause

ColumnReferenceList:

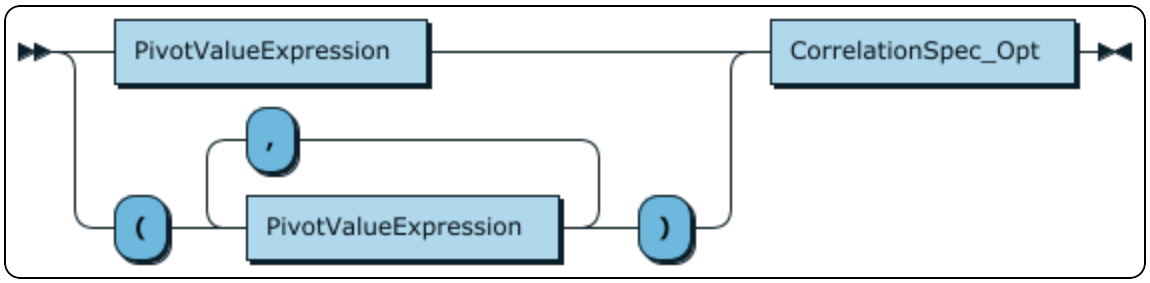



```
ColumnReferenceList
         ::= ColumnReference
           | '(' ColumnReferences ')'
```

referenced by:

- PivotClause

PivotColumn:




```
PivotColumn
         ::= ( PivotValueExpression | '('
PivotValueExpression ( ',' PivotValueExpression )* ')' )
CorrelationSpec_Opt
```

referenced by:

- PivotClause

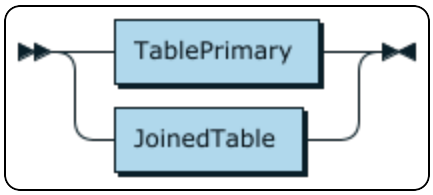
PivotValueExpression:


```
PivotValueExpression
         ::= Expression
```

referenced by:

- PivotColumn

TableReference:

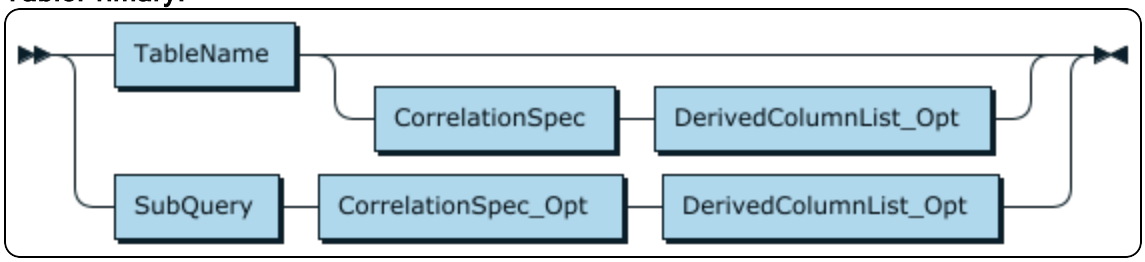



```
TableReference
         ::= TablePrimary
           | JoinedTable
```

referenced by:

- TableReference_Pivot_Opt

TablePrimary:

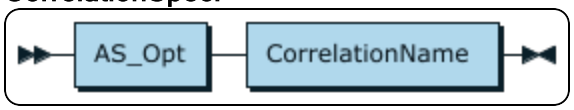


```
TablePrimary
         ::= TableName ( CorrelationSpec DerivedColumnList_
Opt )?
           | SubQuery CorrelationSpec_Opt DerivedColumnList_
Opt
```

referenced by:

- MergeStmt
- TableReference

CorrelationSpec:

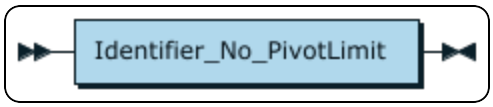



```
CorrelationSpec
         ::= AS_Opt CorrelationName
```

referenced by:

- CorrelationSpec_Opt
- TablePrimary

CorrelationName:

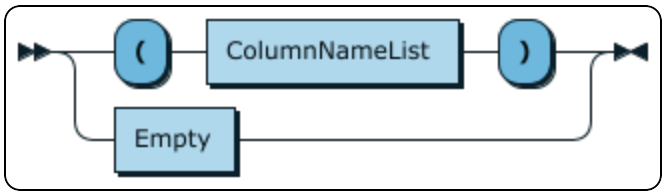



```
CorrelationName
         ::= Identifier_No_PivotLimit
```

referenced by:

- CorrelationSpec

DerivedColumnList_Opt:

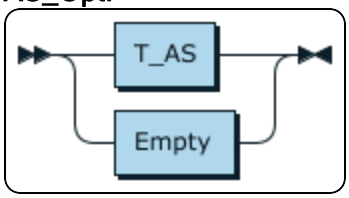



```
DerivedColumnList_Opt
          ::= '(' ColumnNameList ')'
            | Empty
```

referenced by:

- MergeWhenNotMatchedClause
- PivotClause
- TablePrimary

AS_Opt:

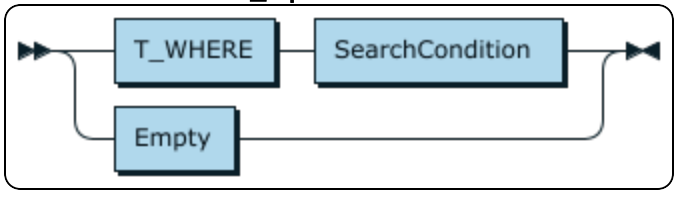



```
AS_Opt    ::= T_AS
            | Empty
```

referenced by:

- AS_Clause_Opt
- CorrelationSpec
- GroupAliasList

WhereSearchCond_Opt:



```
WhereSearchCond_Opt
         ::= T_WHERE SearchCondition
           | Empty
```

referenced by:

- DeleteStmtSearched
- QuerySpecification
- UpdateStmtSearched
- UpsertStmtSearched

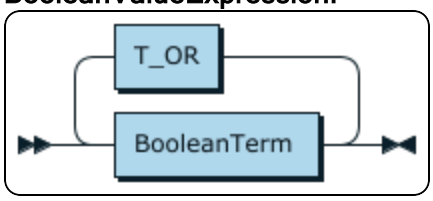
SearchCondition:


```
SearchCondition
         ::= BooleanValueExpression
```

referenced by:

- BooleanPrimary
- Having_Opt
- MergeStmt
- QualifiedJoin
- SearchedWhenClause
- WhereSearchCond_Opt

BooleanValueExpression:

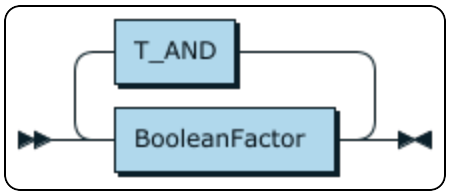


```
BooleanValueExpression
         ::= BooleanTerm ( T_OR BooleanTerm )*
```

referenced by:

- CaseAbbreviation
- DerivedColumn
- GroupBy_Opt
- SearchCondition

BooleanTerm:

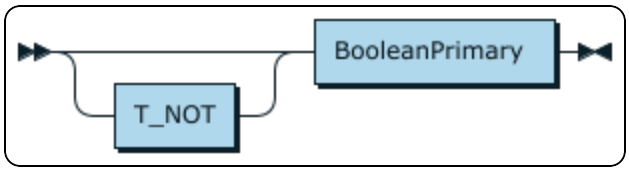



```
BooleanTerm
         ::= BooleanFactor ( T_AND BooleanFactor )*
```

referenced by:

- BooleanValueExpression
- Result

BooleanFactor:

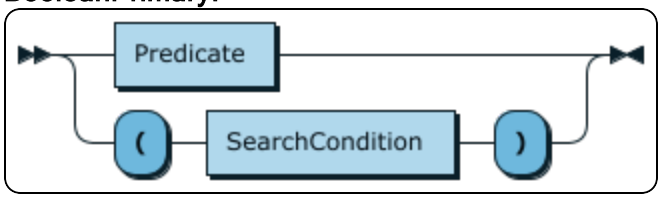



```
BooleanFactor
         ::= T_NOT? BooleanPrimary
```

referenced by:

- BooleanTerm

BooleanPrimary:

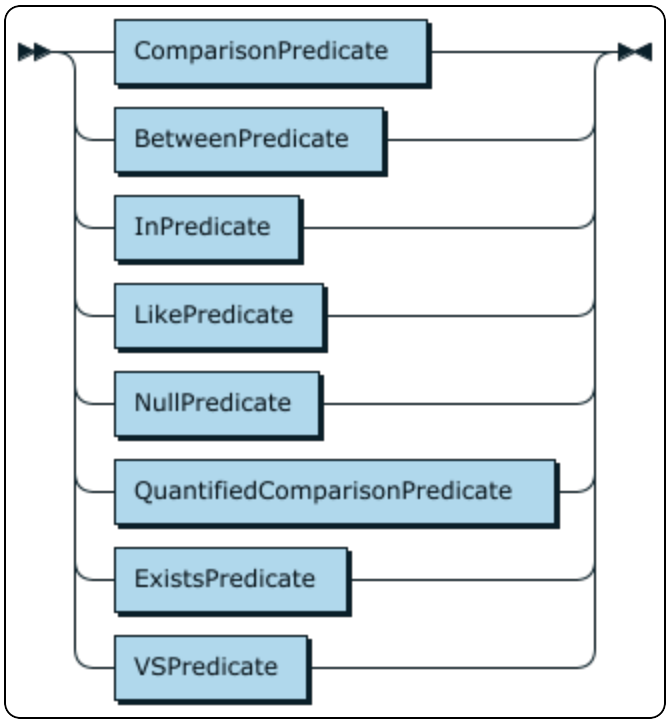



```
BooleanPrimary
          ::= Predicate
            | '(' SearchCondition ')'
```

referenced by:

- BooleanFactor

Predicate:




```
Predicate
```

```
          ::= ComparisonPredicate
            | BetweenPredicate
            | InPredicate
            | LikePredicate
            | NullPredicate
            | QuantifiedComparisonPredicate
            | ExistsPredicate
            | VSPredicate
```

referenced by:

- BooleanPrimary

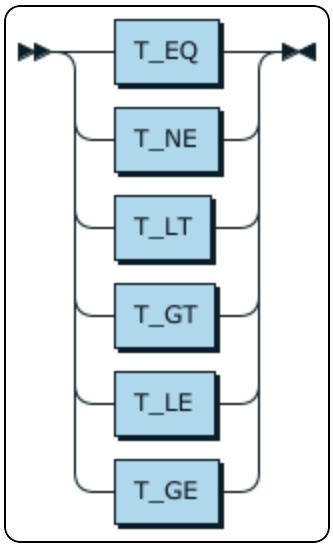
ComparisonPredicate:


```
ComparisonPredicate
          ::= RowValueConstructor ComparisonOp
RowValueConstructor
```

referenced by:

- Predicate

ComparisonOp:

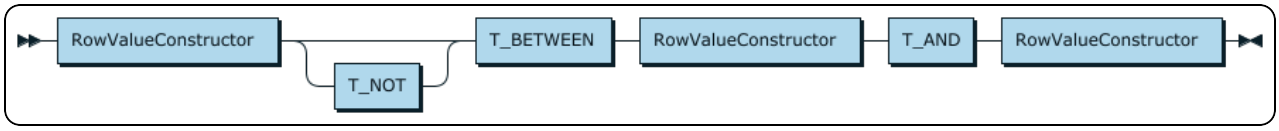



```
ComparisonOp
          ::= T_EQ
            | T_NE
            | T_LT
            | T_GT
            | T_LE
            | T_GE
```

referenced by:

- ComparisonPredicate
- QuantifiedComparisonPredicate

BetweenPredicate:

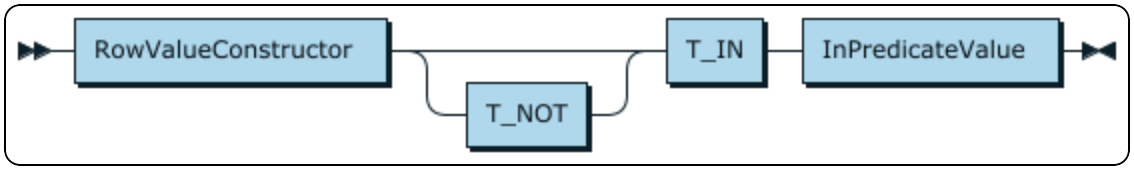



```
BetweenPredicate
          ::= RowValueConstructor T_NOT? T_BETWEEN
RowValueConstructor T_AND RowValueConstructor
```

referenced by:

- Predicate

InPredicate:

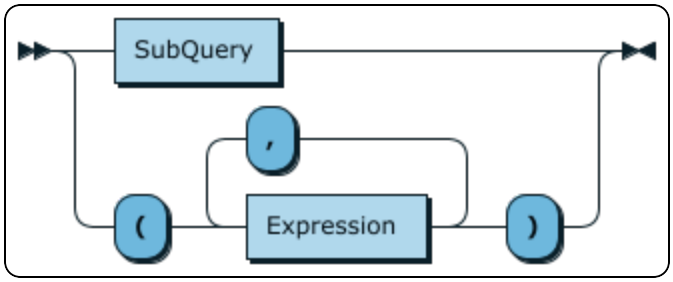



```
InPredicate
         ::= RowValueConstructor T_NOT? T_IN InPredicateValue
```

referenced by:

- Predicate

InPredicateValue:

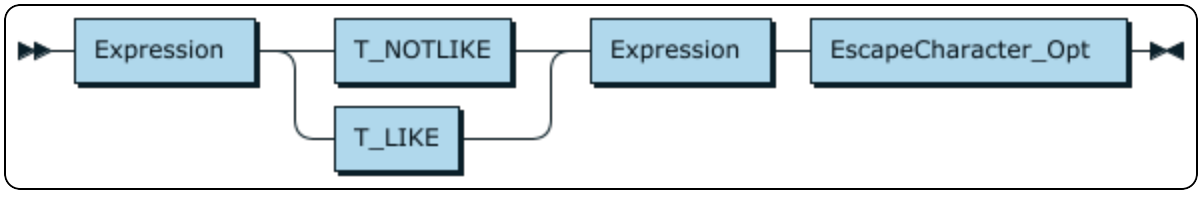



```
InPredicateValue
         ::= SubQuery
           | '(' Expression ( ',' Expression )* ')'
```

referenced by:

- InPredicate

LikePredicate:

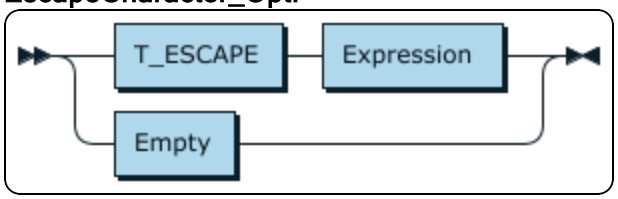


```
LikePredicate
         ::= Expression ( T_NOTLIKE | T_LIKE ) Expression
EscapeCharacter_Opt
```

referenced by:

- Predicate

EscapeCharacter_Opt:

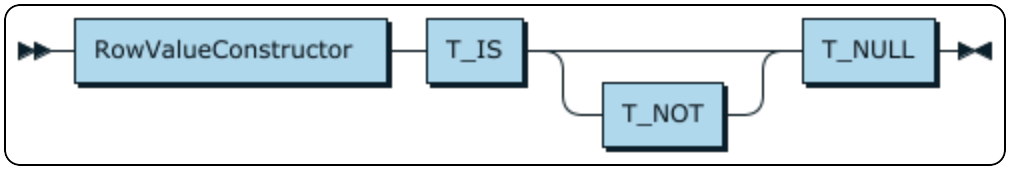



```
EscapeCharacter_Opt
         ::= T_ESCAPE Expression
           | Empty
```

referenced by:

- LikePredicate

NullPredicate:




```
NullPredicate
         ::= RowValueConstructor T_IS T_NOT? T_NULL
```

referenced by:

- Predicate

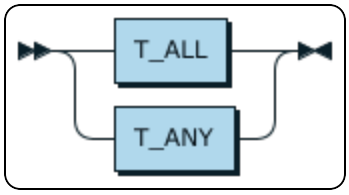
QuantifiedComparisonPredicate:


```
QuantifiedComparisonPredicate
          ::= RowValueConstructor ComparisonOp Quantifier
SubQuery
```

referenced by:

- Predicate

Quantifier:

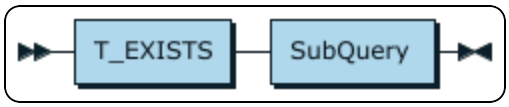



```
Quantifier
          ::= T_ALL
            | T_ANY
```

referenced by:

- QuantifiedComparisonPredicate

ExistsPredicate:




```
ExistsPredicate
          ::= T_EXISTS SubQuery
```

referenced by:

- Predicate

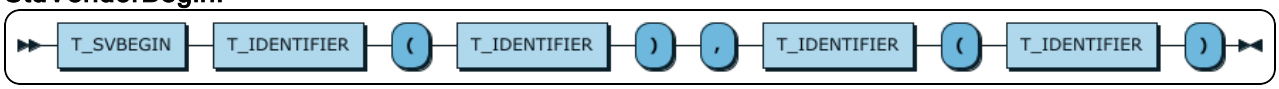
VSPredicate:


```
VSPredicate
         ::= StdVendorBegin PredVT StdVendorEnd
```

referenced by:

- Predicate

StdVendorBegin:




```
StdVendorBegin
         ::= T_SVBEGIN T_IDENTIFIER '(' T_IDENTIFIER ')' ','
T_IDENTIFIER '(' T_IDENTIFIER ')'
```

referenced by:

- OuterJoinVS
- ProcedureStmt
- VSPredicate
- ValueVS

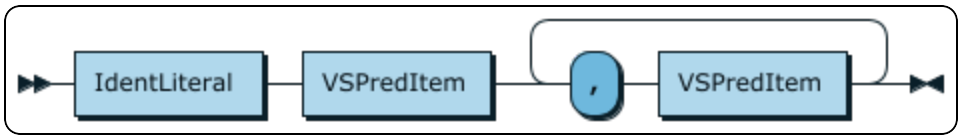
StdVendorEnd:


```
StdVendorEnd
         ::= T_SVEND
```

referenced by:

- OuterJoinVS
- ProcedureStmt
- VSPredicate
- ValueVS

PredVT:

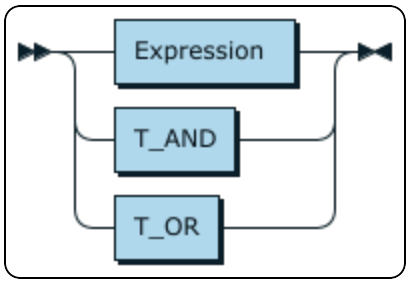



```
PredVT    ::= IdentLiteral VSPredItem ( ',' VSPredItem )+
```

referenced by:

- VSPredicate

VSPredItem:

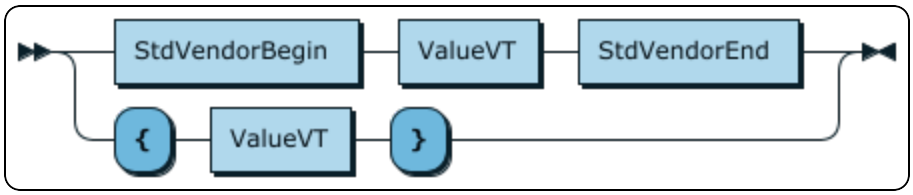



```
VSPredItem
          ::= Expression
            | T_AND
            | T_OR
```

referenced by:

- PredVT

ValueVS:

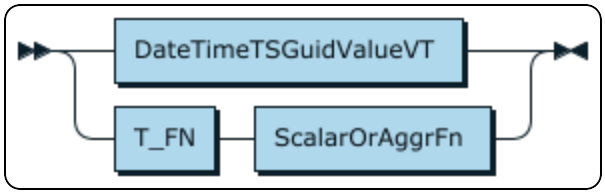



```
ValueVS  ::= StdVendorBegin ValueVT StdVendorEnd
           | '{' ValueVT '}'
```

referenced by:

- ValueExpressionPrimary

ValueVT:

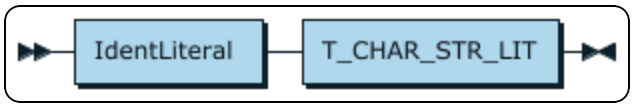



```
ValueVT  ::= DateTimeTSGuidValueVT
           | T_FN ScalarOrAggrFn
```

referenced by:

- ValueVS

DateTimeTSGuidValueVT:

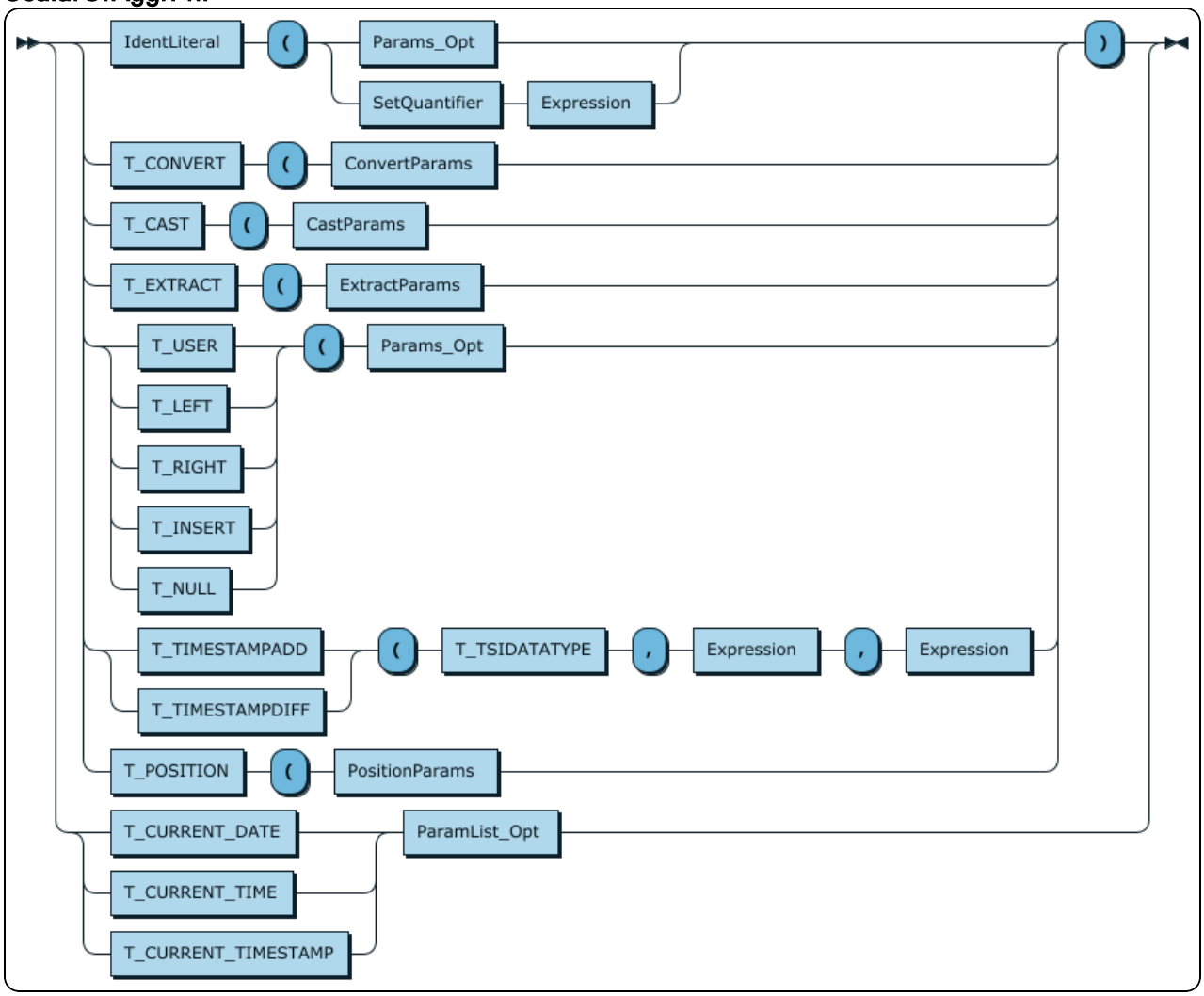



```
DateTimeTSGuidValueVT
         ::= IdentLiteral T_CHAR_STR_LIT
```

referenced by:

- ValueVT

ScalarOrAggrFn:

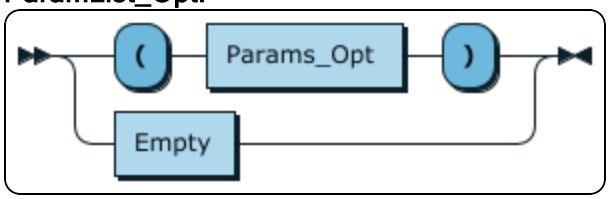



```
ScalarOrAggrFn
        ::= ( IdentLiteral '(' ( Params_Opt |
SetQuantifierExpression ) | T_CONVERT '(' ConvertParams | T_
CAST '(' CastParams | T_EXTRACT '(' ExtractParams | ( T_USER
| T_LEFT | T_RIGHT | T_INSERT | T_NULL ) '(' Params_Opt | (
T_TIMESTAMPADD | T_TIMESTAMPDIFF ) '(' T_TSIDATATYPE ','
Expression ',' Expression | T_POSITION '(' PositionParams )
')'
          | ( T_CURRENT_DATE | T_CURRENT_TIME | T_CURRENT_
TIMESTAMP ) ParamList_Opt
```

referenced by:

- ValueExpressionPrimary
- ValueVT

ParamList_Opt:

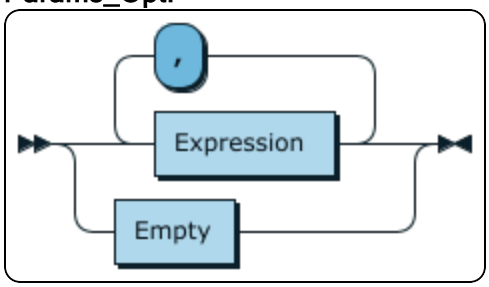



```
ParamList_Opt
          ::= '(' Params_Opt ')'
            | Empty
```

referenced by:

- ScalarOrAggrFn

Params_Opt:




```
Params_Opt
          ::= Expression ( ',' Expression )*
            | Empty
```

referenced by:

- ParamList_Opt
- ScalarOrAggrFn

ConvertParams:


```
ConvertParams
         ::= Expression ',' DataType
```

referenced by:

- ScalarOrAggrFn

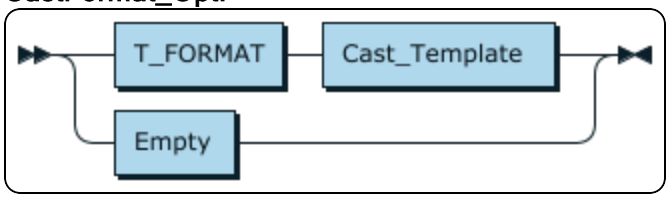
CastParams:


```
CastParams
         ::= Expression T_AS DataType CastFormat_Opt
```

referenced by:

- ScalarOrAggrFn

CastFormat_Opt:




```
CastFormat_Opt
         ::= T_FORMAT Cast_Template
           | Empty
```

referenced by:

- CastParams

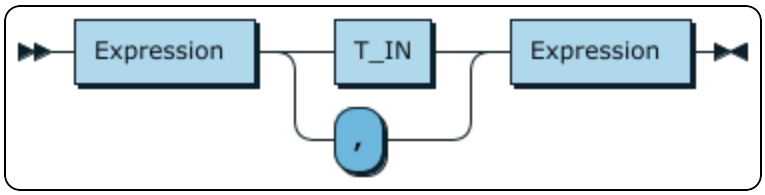
Cast_Template:


```
Cast_Template
        ::= T_CHAR_STR_LIT
```

referenced by:

- CastFormat_Opt

PositionParams:

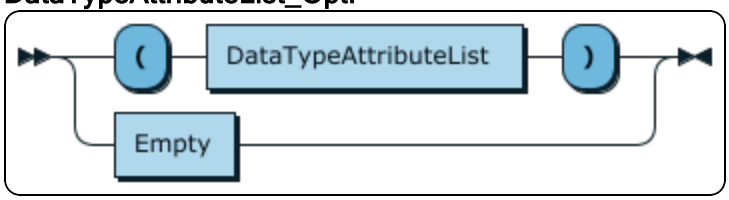



```
PositionParams
        ::= Expression ( T_IN | ',' ) Expression
```

referenced by:

- ScalarOrAggrFn

DataTypeAttributeList_Opt:

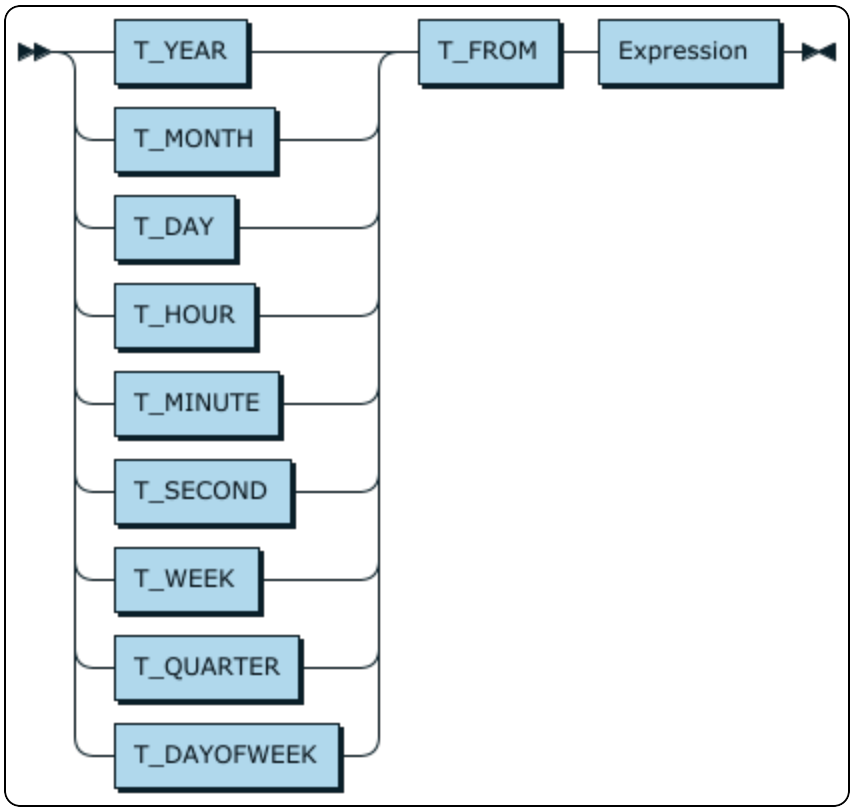



```
DataTypeAttributeList_Opt
        ::= '(' DataTypeAttributeList ')'
```

```
            | Empty
```

no references

ExtractParams:

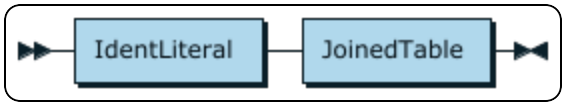



```
ExtractParams
          ::= ( T_YEAR | T_MONTH | T_DAY | T_HOUR | T_MINUTE |
T_SECOND | T_WEEK | T_QUARTER | T_DAYOFWEEK ) T_FROM
Expression
```

referenced by:

- ScalarOrAggrFn

OuterJoinVT:

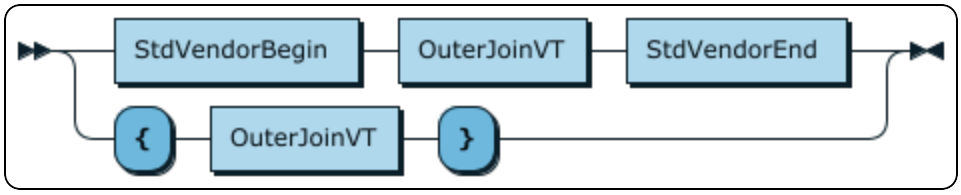


```
OuterJoinVT
         ::= IdentLiteral JoinedTable
```

referenced by:

- OuterJoinVS

OuterJoinVS:

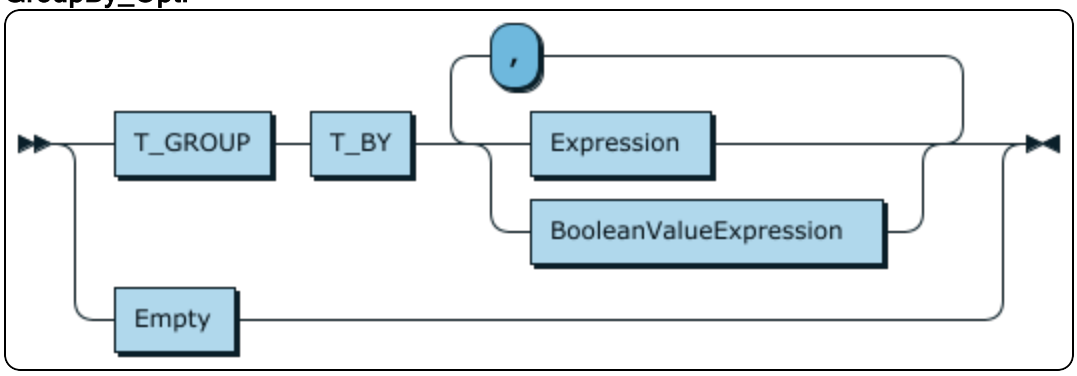



```
OuterJoinVS
         ::= StdVendorBegin OuterJoinVT StdVendorEnd
           | '{' OuterJoinVT '}'
```

referenced by:

- QuerySpecification

GroupBy_Opt:



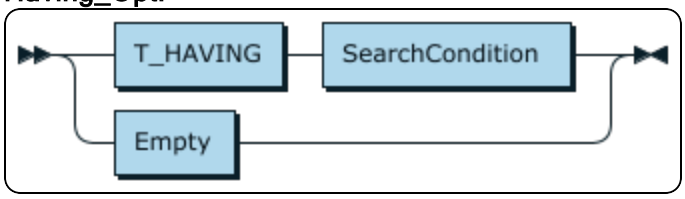

```
GroupBy_Opt
         ::= T_GROUP T_BY ( Expression |
BooleanValueExpression ) ( ',' ( Expression |
BooleanValueExpression ) )*
```

```
            | Empty
```

referenced by:

- QuerySpecification

Having_Opt:

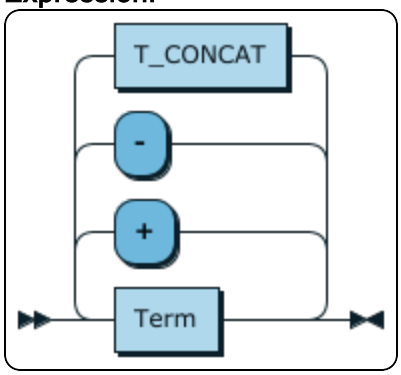



```
Having_Opt
          ::= T_HAVING SearchCondition
            | Empty
```

referenced by:

- QuerySpecification

Expression:

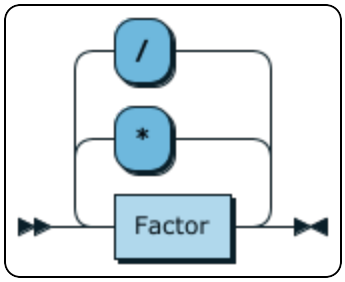



```
Expression
          ::= Term ( ( '+' | '-' | T_CONCAT ) Term )*
```

referenced by:

- AggrExpressionPrimary
- CaseAbbreviation
- CastParams
- CoalesceListExpression
- ConvertParams
- DerivedColumn
- EscapeCharacter_Opt
- ExtractParams
- GroupAliasList
- GroupBy_Opt
- InPredicateValue
- LikePredicate
- Params_Opt
- PassingClauseValue
- PivotValueExpression
- PositionParams
- ProcedureParams_Opt
- Result
- RowValueConstructorElement
- ScalarOrAggrFn
- SetFunction
- SimpleCase
- SimpleWhenClause
- SortKey
- UpdateSource
- VSPredItem
- ValueExpressionPrimary

Term:

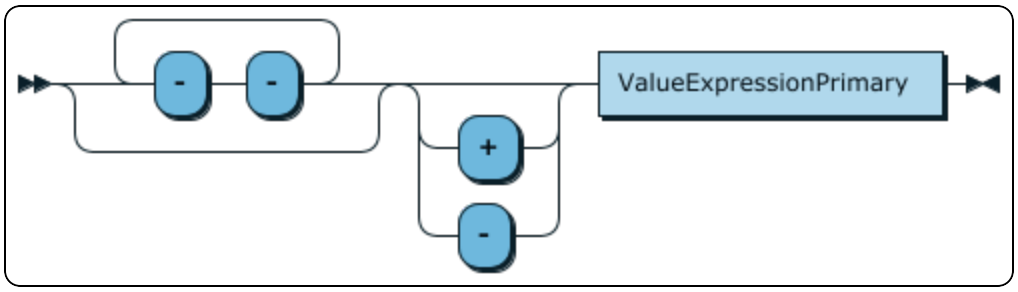


```
Term      ::= Factor ( ( '*' | '/' ) Factor )*
```

referenced by:

- Expression

Factor:

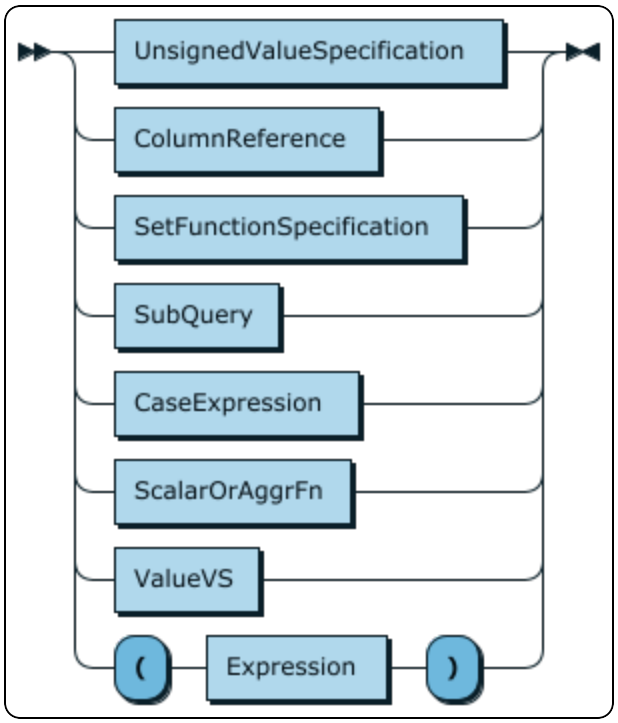



```
Factor    ::= ( '-' '-' )* ( '+' | '-' )?
ValueExpressionPrimary
```

referenced by:

- Term

ValueExpressionPrimary:

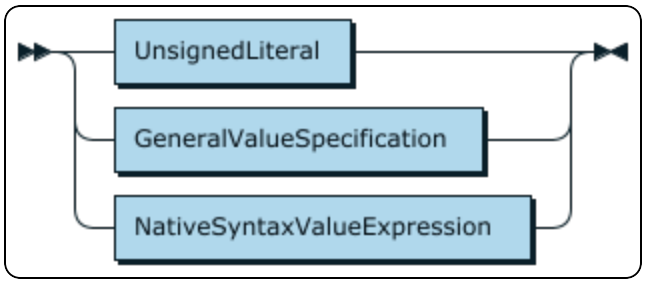



```
ValueExpressionPrimary
         ::= UnsignedValueSpecification
           | ColumnReference
           | SetFunctionSpecification
           | SubQuery
           | CaseExpression
           | ScalarOrAggrFn
           | ValueVS
           | '(' Expression ')'
```

referenced by:

- Factor

UnsignedValueSpecification:

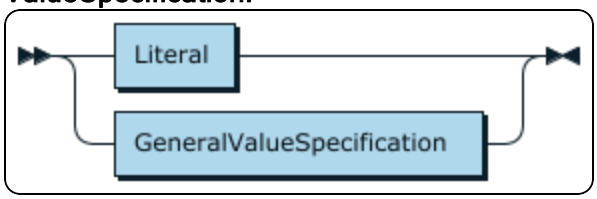



```
UnsignedValueSpecification
          ::= UnsignedLiteral
            | GeneralValueSpecification
            | NativeSyntaxValueExpression
```

referenced by:

- Limit
- LimitWithSkip
- SelectLimit_Opt
- ValueExpressionPrimary

ValueSpecification:

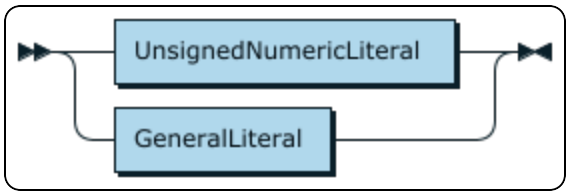



```
ValueSpecification
          ::= Literal
            | GeneralValueSpecification
```

referenced by:

- SetStmt

UnsignedLiteral:

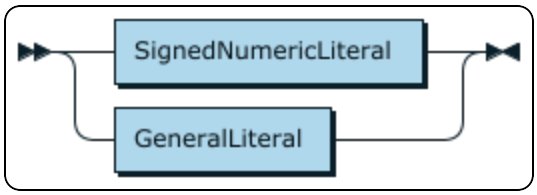



```
UnsignedLiteral
          ::= UnsignedNumericLiteral
            | GeneralLiteral
```

referenced by:

- UnsignedValueSpecification

Literal:

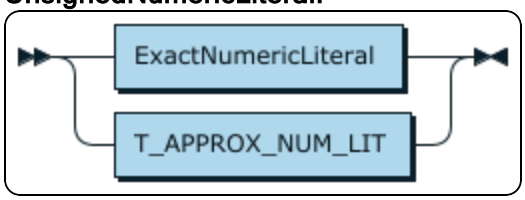



```
Literal   ::= SignedNumericLiteral
            | GeneralLiteral
```

referenced by:

- DataTypeAttributeValue
- ValueSpecification

UnsignedNumericLiteral:



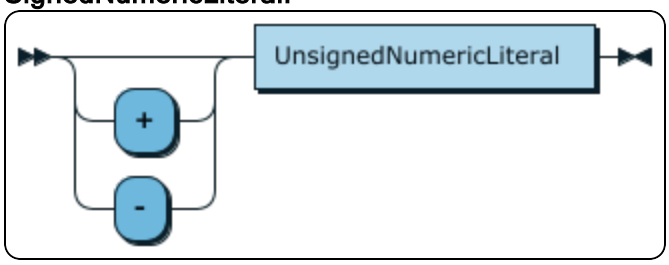

```
UnsignedNumericLiteral
```

```
          ::= ExactNumericLiteral
            | T_APPROX_NUM_LIT
```

referenced by:

- SignedNumericLiteral
- UnsignedLiteral

SignedNumericLiteral:

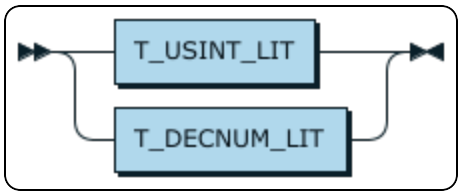



```
SignedNumericLiteral
          ::= ( '+' | '-' )? UnsignedNumericLiteral
```

referenced by:

- Literal

ExactNumericLiteral:

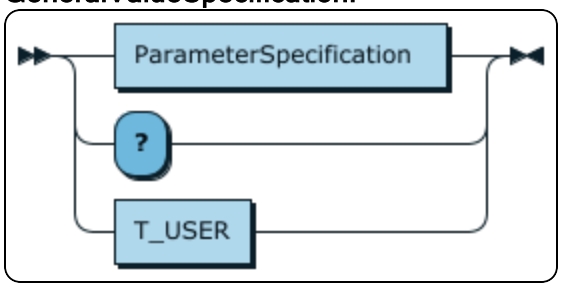



```
ExactNumericLiteral
          ::= T_USINT_LIT
            | T_DECNUM_LIT
```

referenced by:

- UnsignedNumericLiteral

GeneralValueSpecification:

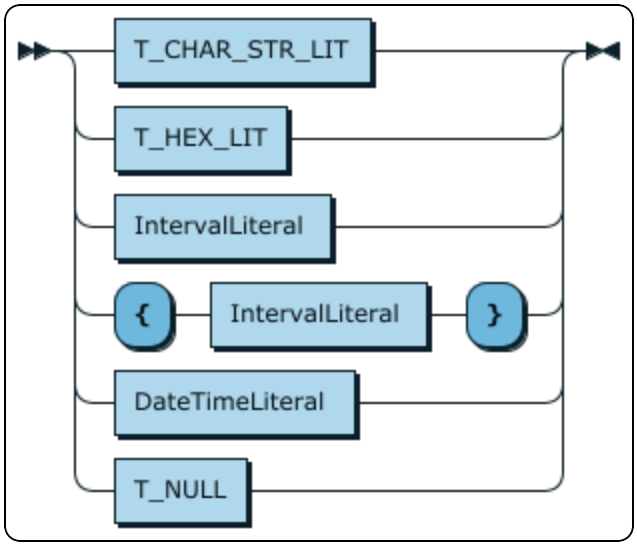



```
GeneralValueSpecification
         ::= ParameterSpecification
           | '?'
           | T_USER
```

referenced by:

- UnsignedValueSpecification
- ValueSpecification

GeneralLiteral:



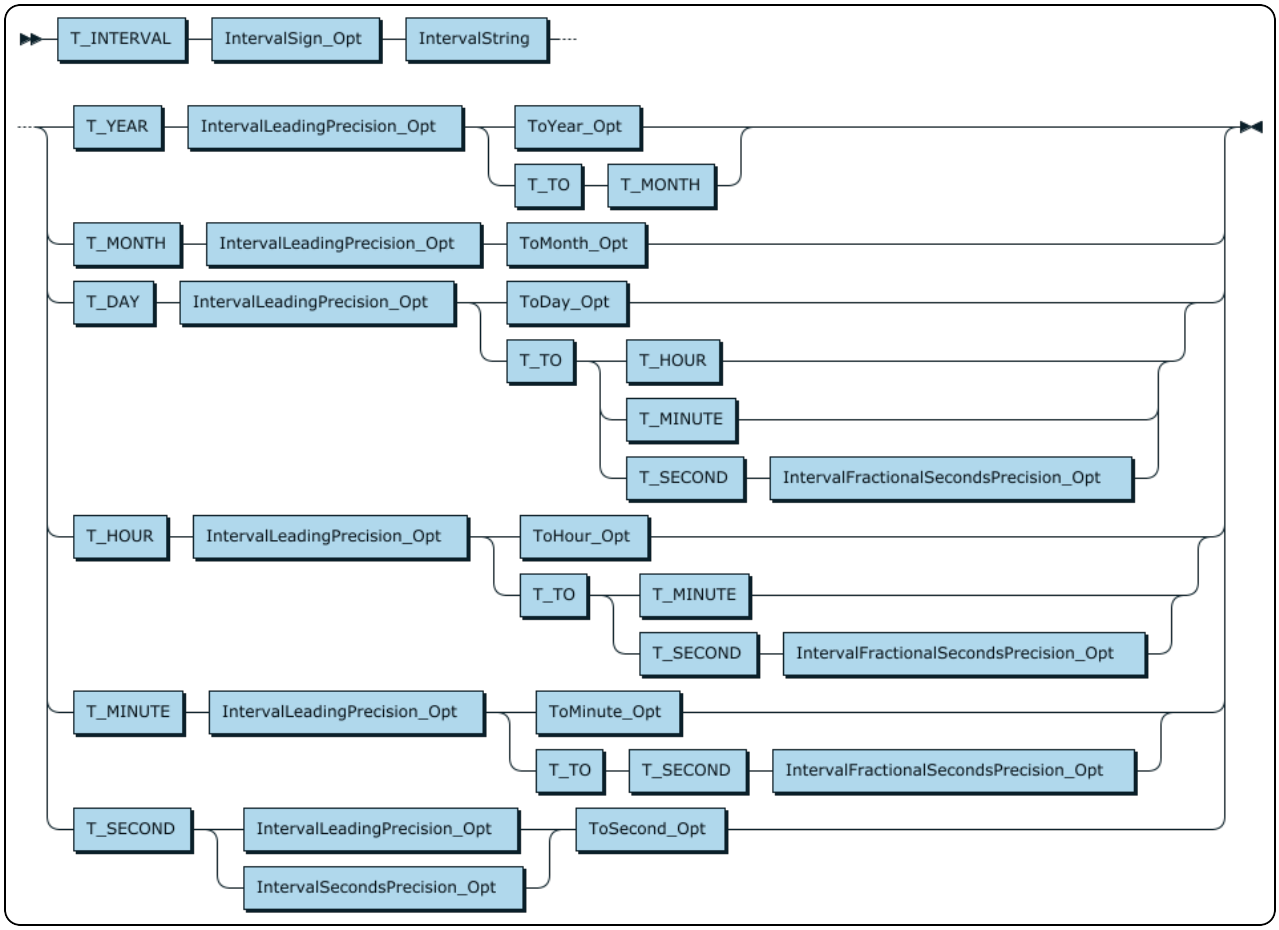

```
GeneralLiteral
         ::= T_CHAR_STR_LIT
           | T_HEX_LIT
           | IntervalLiteral
```

```
            | '{' IntervalLiteral '}'
            | DateTimeLiteral
            | T_NULL
```

referenced by:

- Literal
- UnsignedLiteral

IntervalLiteral:




```
IntervalLiteral
        ::= T_INTERVAL IntervalSign_Opt IntervalString ( T_
YEAR IntervalLeadingPrecision_Opt ( ToYear_Opt | T_TO T_MONTH
) | T_MONTH IntervalLeadingPrecision_Opt ToMonth_Opt | T_DAY
IntervalLeadingPrecision_Opt ( ToDay_Opt | T_TO ( T_HOUR | T_
MINUTE | T_SECOND IntervalFractionalSecondsPrecision_Opt ) )
```

```
| T_HOUR IntervalLeadingPrecision_Opt ( ToHour_Opt | T_TO (
T_MINUTE | T_SECOND IntervalFractionalSecondsPrecision_Opt )
) | T_MINUTE IntervalLeadingPrecision_Opt ( ToMinute_Opt | T_
TOT_SECOND IntervalFractionalSecondsPrecision_Opt ) | T_
SECOND ( IntervalLeadingPrecision_Opt |
IntervalSecondsPrecision_Opt ) ToSecond_Opt )
```

referenced by:

- GeneralLiteral

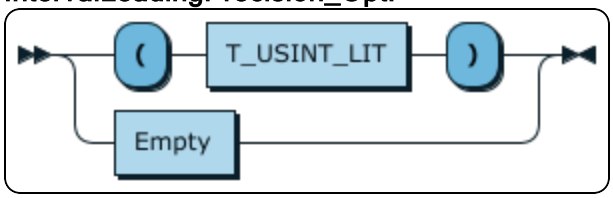
IntervalString:


```
IntervalString
         ::= T_CHAR_STR_LIT
```

referenced by:

- IntervalLiteral

IntervalLeadingPrecision_Opt:

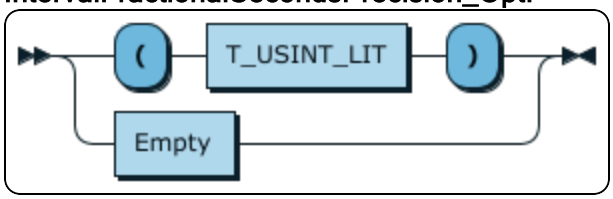



```
IntervalLeadingPrecision_Opt
         ::= '(' T_USINT_LIT ')'
           | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

IntervalFractionalSecondsPrecision_Opt:

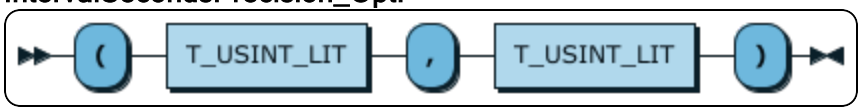



```
IntervalFractionalSecondsPrecision_Opt
         ::= '(' T_USINT_LIT ')'
           | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

IntervalSecondsPrecision_Opt:

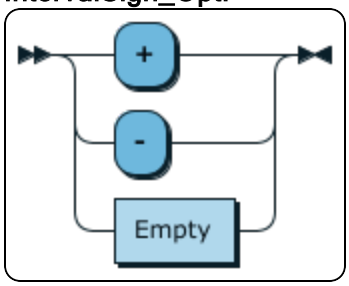



```
IntervalSecondsPrecision_Opt
         ::= '(' T_USINT_LIT ',' T_USINT_LIT ')'
```

referenced by:

- IntervalLiteral
- IntervalType

IntervalSign_Opt:

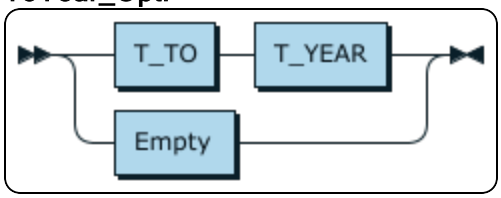


```
IntervalSign_Opt
          ::= '+'
            | '-'
            | Empty
```

referenced by:

- IntervalLiteral

ToYear_Opt:

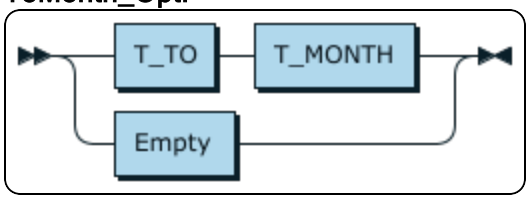



```
ToYear_Opt
          ::= T_TO T_YEAR
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

ToMonth_Opt:

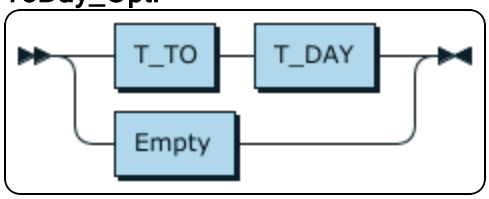



```
ToMonth_Opt
          ::= T_TO T_MONTH
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

ToDay_Opt:

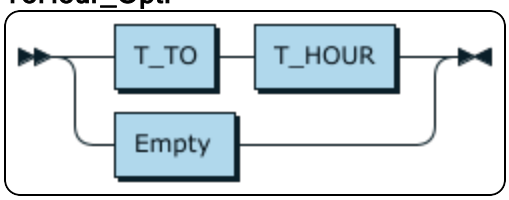



```
ToDay_Opt
          ::= T_TO T_DAY
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

ToHour_Opt:

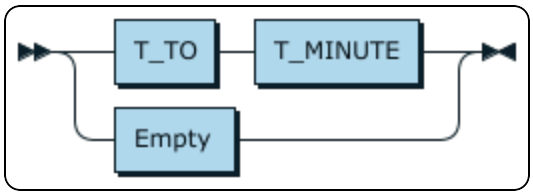



```
ToHour_Opt
          ::= T_TO T_HOUR
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

ToMinute_Opt:

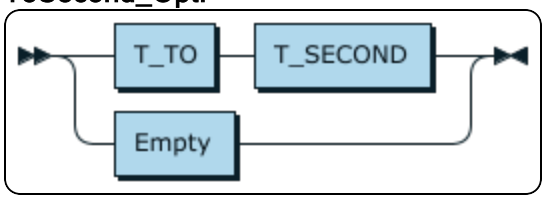



```
ToMinute_Opt
          ::= T_TO T_MINUTE
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

ToSecond_Opt:

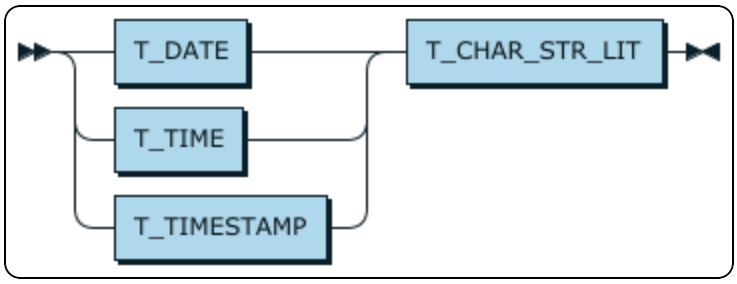



```
ToSecond_Opt
          ::= T_TO T_SECOND
            | Empty
```

referenced by:

- IntervalLiteral
- IntervalType

DateTimeLiteral:




```
DateTimeLiteral
         ::= ( T_DATE | T_TIME | T_TIMESTAMP ) T_CHAR_STR_LIT
```

referenced by:

- GeneralLiteral

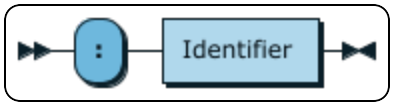
ParameterSpecification:


```
ParameterSpecification
         ::= ParameterName
```

referenced by:

- GeneralValueSpecification

ParameterName:

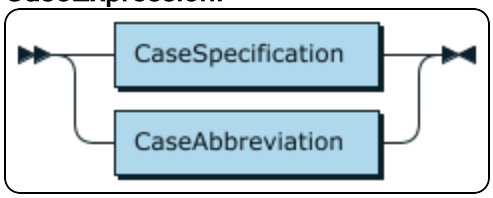



```
ParameterName
         ::= ':' Identifier
```

referenced by:

- ParameterSpecification

CaseExpression:

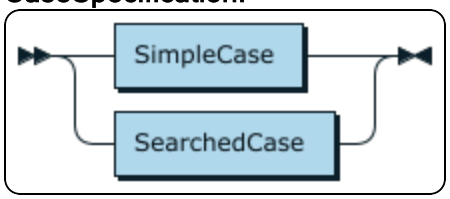



```
CaseExpression
          ::= CaseSpecification
            | CaseAbbreviation
```

referenced by:

- ValueExpressionPrimary

CaseSpecification:

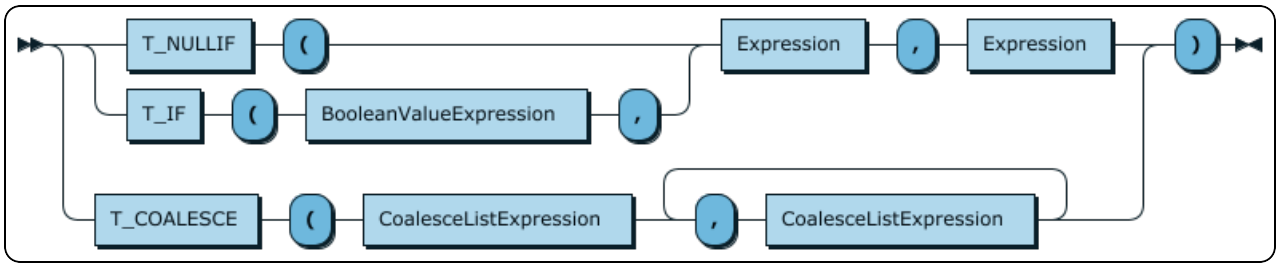



```
CaseSpecification
          ::= SimpleCase
            | SearchedCase
```

referenced by:

- CaseExpression

CaseAbbreviation:




```
CaseAbbreviation
         ::= ( ( T_NULLIF '(' | T_IF '('
BooleanValueExpression ',' ) Expression ',' Expression | T_
COALESCE '(' CoalesceListExpression ( ','
CoalesceListExpression )+ ) ')'
```

referenced by:

- CaseExpression

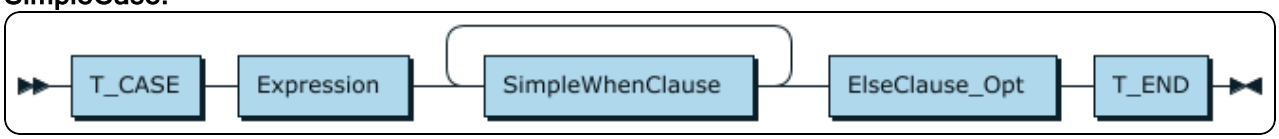
CoalesceListExpression:


```
CoalesceListExpression
         ::= Expression
```

referenced by:

- CaseAbbreviation

SimpleCase:

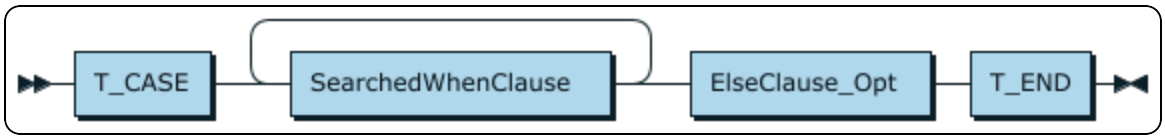



```
SimpleCase
         ::= T_CASE Expression SimpleWhenClause+ ElseClause_
Opt T_END
```

referenced by:

- CaseSpecification

SearchedCase:

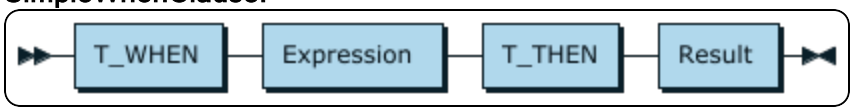



```
SearchedCase
         ::= T_CASE SearchedWhenClause+ ElseClause_Opt T_END
```

referenced by:

- CaseSpecification

SimpleWhenClause:




```
SimpleWhenClause
         ::= T_WHEN Expression T_THEN Result
```

referenced by:

- SimpleCase

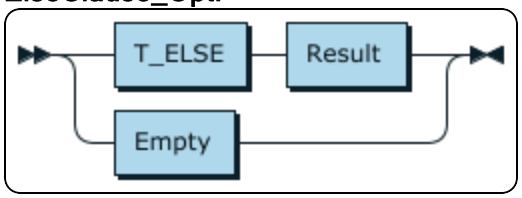
SearchedWhenClause:


```
SearchedWhenClause
         ::= T_WHEN SearchCondition T_THEN Result
```

referenced by:

- SearchedCase

ElseClause_Opt:

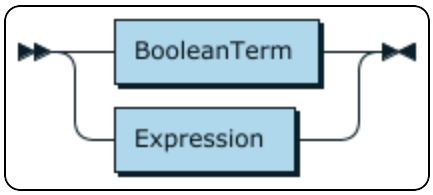



```
ElseClause_Opt
          ::= T_ELSE Result
            | Empty
```

referenced by:

- SearchedCase
- SimpleCase

Result:

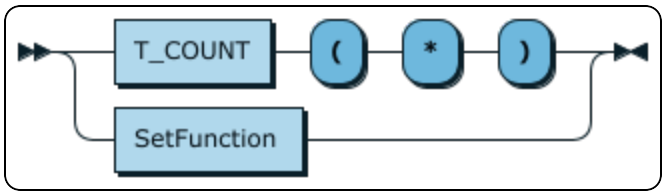



```
Result    ::= BooleanTerm
            | Expression
```

referenced by:

- ElseClause_Opt
- SearchedWhenClause
- SimpleWhenClause

SetFunctionSpecification:

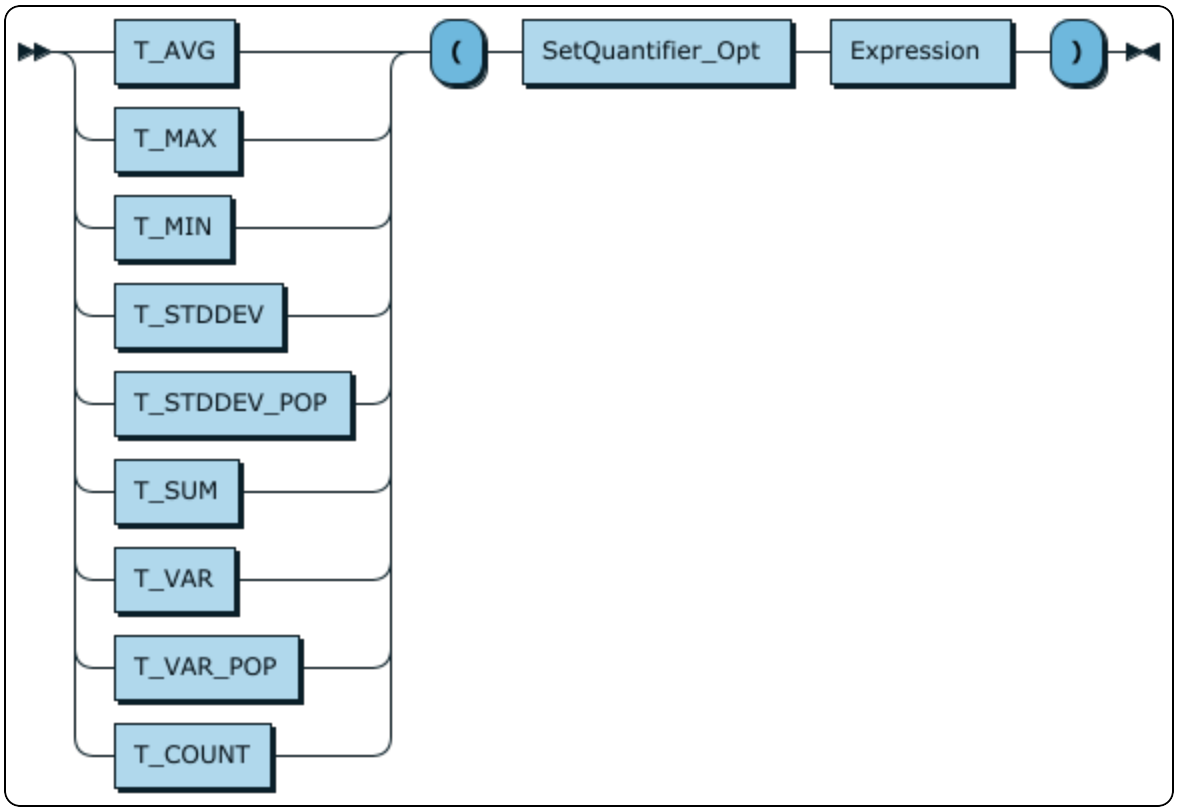



```
SetFunctionSpecification
         ::= T_COUNT '(' '*' ')'
           | SetFunction
```

referenced by:

- ValueExpressionPrimary

SetFunction:



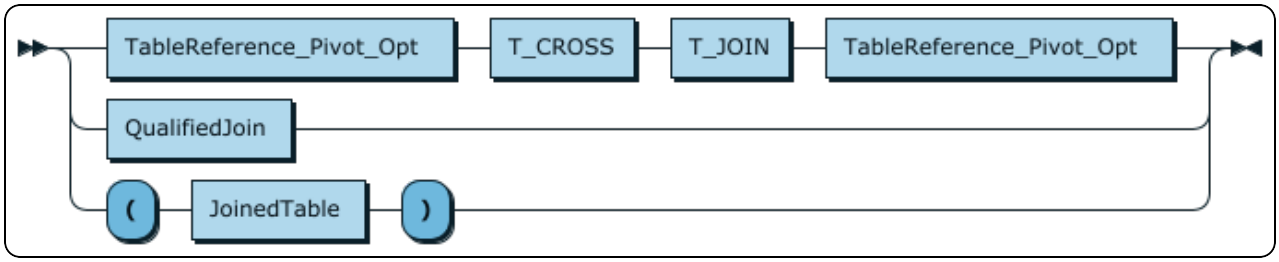

```
SetFunction
```

```
          ::= ( T_AVG | T_MAX | T_MIN | T_STDDEV | T_STDDEV_
POP | T_SUM | T_VAR | T_VAR_POP | T_COUNT ) '('
SetQuantifier_Opt Expression ')'
```

referenced by:

- SetFunctionSpecification

JoinedTable:

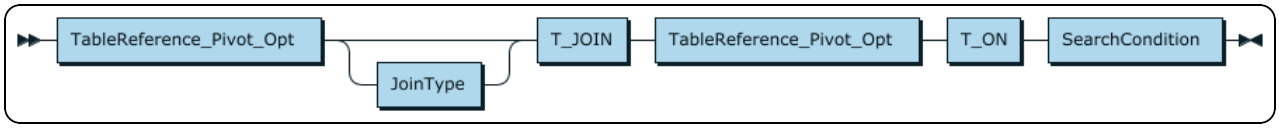



```
JoinedTable
          ::= TableReference_Pivot_Opt T_CROSS T_JOIN
TableReference_Pivot_Opt
            | QualifiedJoin
            | '(' JoinedTable ')'
```

referenced by:

- JoinedTable
- OuterJoinVT
- TableReference

QualifiedJoin:

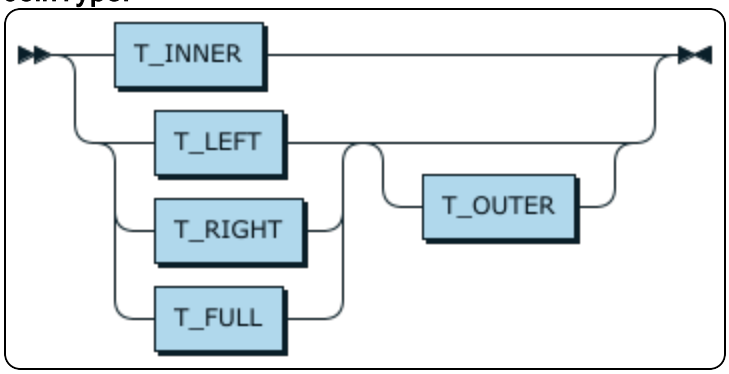



```
QualifiedJoin
          ::= TableReference_Pivot_Opt JoinType? T_JOIN
TableReference_Pivot_Opt T_ON SearchCondition
```

referenced by:

- JoinedTable

JoinType:

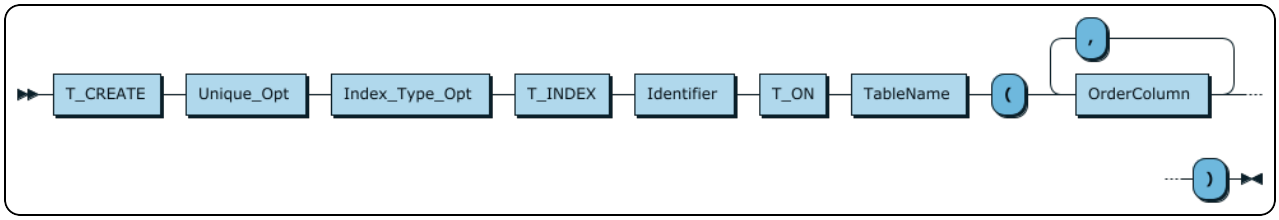



```
JoinType ::= T_INNER
           | ( T_LEFT | T_RIGHT | T_FULL ) T_OUTER?
```

referenced by:

- QualifiedJoin

CreateIndexStmt:

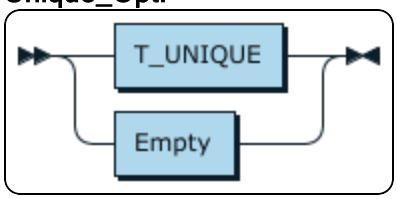



```
CreateIndexStmt
         ::= T_CREATE Unique_Opt Index_Type_Opt T_INDEX
Identifier T_ON TableName '(' OrderColumn ( ',' OrderColumn
)* ')'
```

referenced by:

- ExecStmt

Unique_Opt:

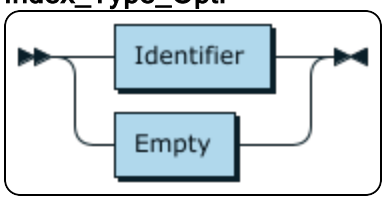



```
Unique_Opt
          ::= T_UNIQUE
            | Empty
```

referenced by:

- CreateIndexStmt

Index_Type_Opt:




```
Index_Type_Opt
          ::= Identifier
            | Empty
```

referenced by:

- CreateIndexStmt

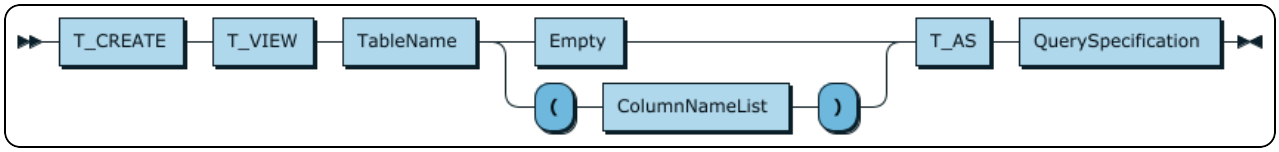
OrderColumn:


```
OrderColumn
          ::= Identifier OrderingSpecification_Opt
```

referenced by:

- CreateIndexStmt

CreateViewStmt:

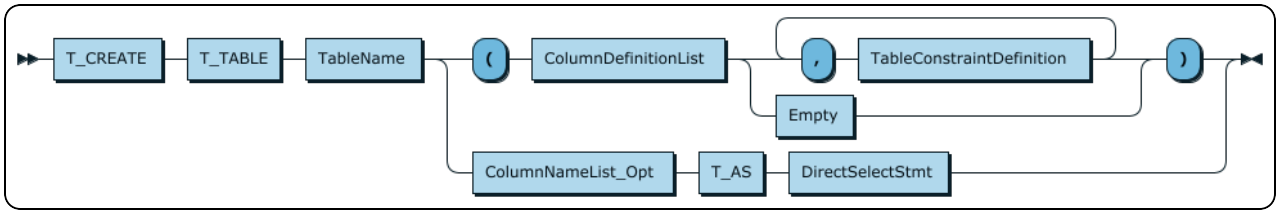



```
CreateViewStmt
         ::= T_CREATE T_VIEW TableName ( Empty | '('
ColumnNameList ')' ) T_AS QuerySpecification
```

referenced by:

- ExecStmt

CreateTableStmt:

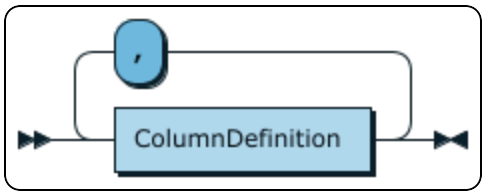



```
CreateTableStmt
         ::= T_CREATE T_TABLE TableName ( '('
ColumnDefinitionList ( ( ',' TableConstraintDefinition )+ |
Empty ) ')' | ColumnNameList_Opt T_AS DirectSelectStmt )
```

referenced by:

- ExecStmt

ColumnDefinitionList:

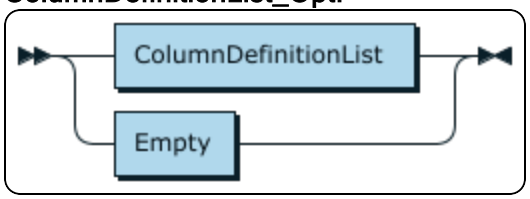



```
ColumnDefinitionList
         ::= ColumnDefinition ( ',' ColumnDefinition )*
```

referenced by:

- ColumnDefinitionList_Opt
- CreateTableStmt

ColumnDefinitionList_Opt:

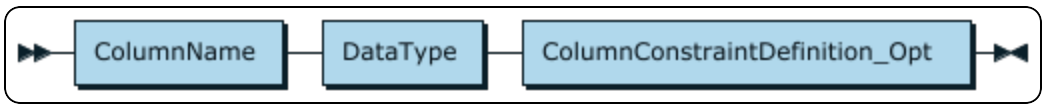



```
ColumnDefinitionList_Opt
         ::= ColumnDefinitionList
           | Empty
```

referenced by:

- ColumnsClause

ColumnDefinition:

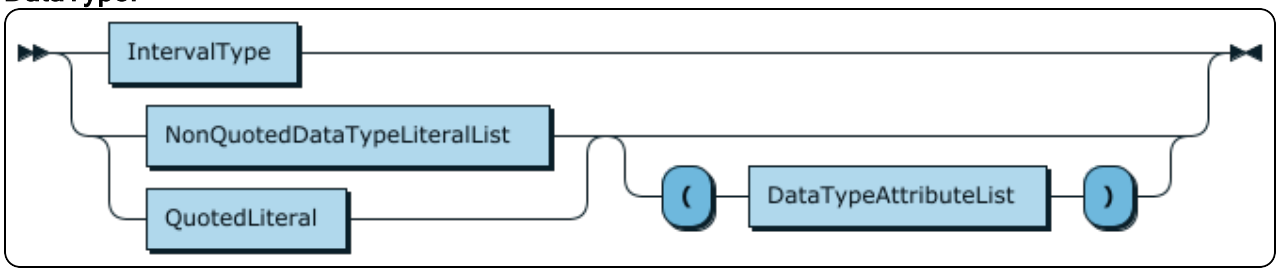



```
ColumnDefinition
         ::= ColumnName DataType ColumnConstraintDefinition_
Opt
```

referenced by:

- AddColumnDefinition
- ColumnDefinitionList

DataType:

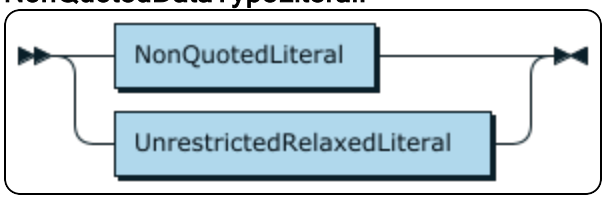



```
DataType ::= IntervalType
           | ( NonQuotedDataTypeLiteralList | QuotedLiteral )
( '(' DataTypeAttributeList ')' )?
```

referenced by:

- CastParams
- ColumnDefinition
- ConvertParams
- DataType_Opt
- ReturningClause

NonQuotedDataTypeLiteral:

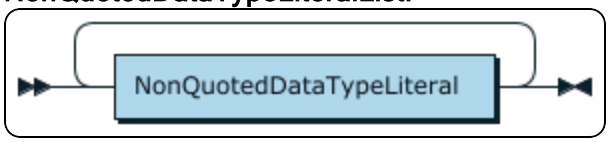



```
NonQuotedDataTypeLiteral
         ::= NonQuotedLiteral
           | UnrestrictedRelaxedLiteral
```

referenced by:

- NonQuotedDataTypeLiteralList

NonQuotedDataTypeLiteralList:

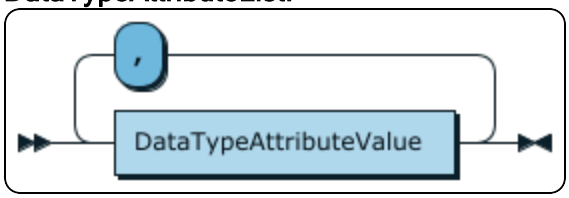



```
NonQuotedDataTypeLiteralList
         ::= NonQuotedDataTypeLiteral+
```

referenced by:

- DataType

DataTypeAttributeList:

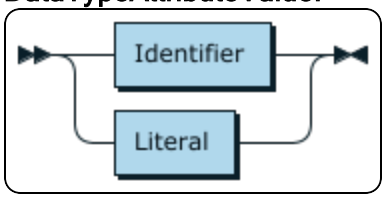



```
DataTypeAttributeList
         ::= DataTypeAttributeValue ( ','
DataTypeAttributeValue )*
```

referenced by:

- DataType
- DataTypeAttributeList_Opt

DataTypeAttributeValue:

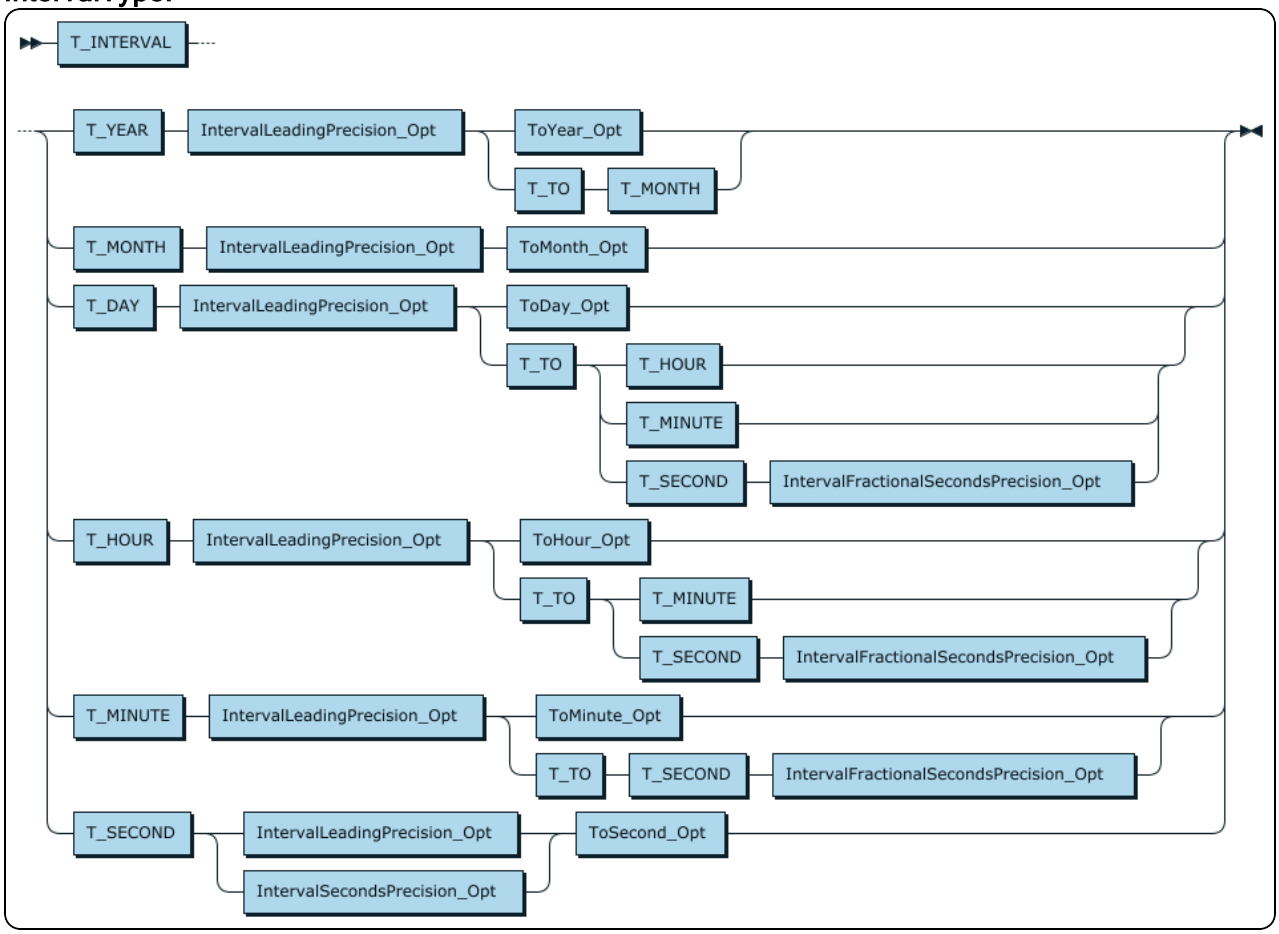


```
DataTypeAttributeValue
         ::= Identifier
           | Literal
```

referenced by:

- DataTypeAttributeList

IntervalType:



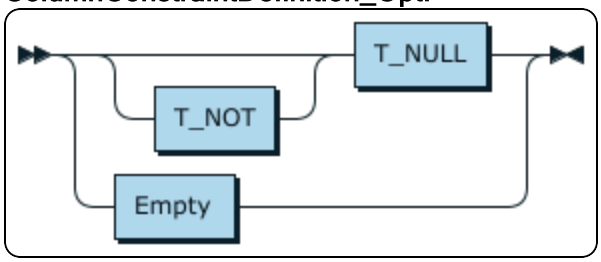

```
IntervalType
         ::= T_INTERVAL ( T_YEAR IntervalLeadingPrecision_Opt
( ToYear_Opt | T_TO T_MONTH ) | T_MONTH
IntervalLeadingPrecision_Opt ToMonth_Opt | T_DAY
IntervalLeadingPrecision_Opt ( ToDay_Opt | T_TO ( T_HOUR | T_
MINUTE | T_SECOND IntervalFractionalSecondsPrecision_Opt ) )
| T_HOUR IntervalLeadingPrecision_Opt ( ToHour_Opt | T_TO (
```

```
T_MINUTE | T_SECONDIntervalFractionalSecondsPrecision_Opt ) )
| T_MINUTE IntervalLeadingPrecision_Opt ( ToMinute_Opt | T_TO
T_SECONDIntervalFractionalSecondsPrecision_Opt ) | T_SECOND (
IntervalLeadingPrecision_Opt | IntervalSecondsPrecision_Opt )
ToSecond_Opt )
```

referenced by:

- DataType

ColumnConstraintDefinition_Opt:

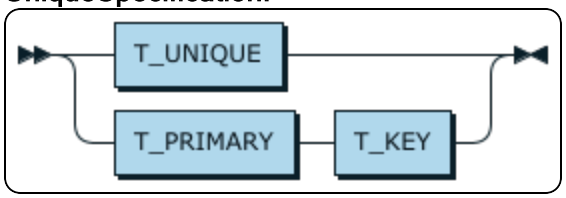



```
ColumnConstraintDefinition_Opt
          ::= T_NOT? T_NULL
            | Empty
```

referenced by:

- ColumnDefinition

UniqueSpecification:

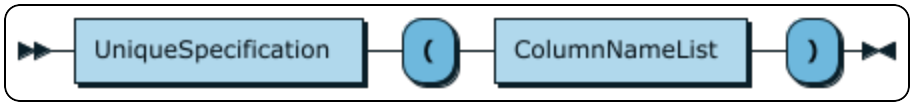



```
UniqueSpecification
          ::= T_UNIQUE
            | T_PRIMARY T_KEY
```

referenced by:

- TableConstraintDefinition

TableConstraintDefinition:

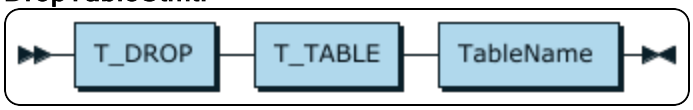



```
TableConstraintDefinition
         ::= UniqueSpecification '(' ColumnNameList ')'
```

referenced by:

- CreateTableStmt

DropTableStmt:

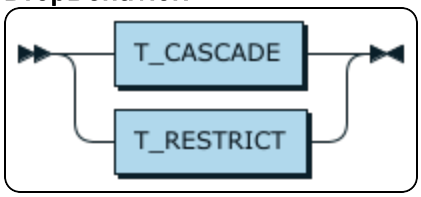



```
DropTableStmt
         ::= T_DROP T_TABLE TableName
```

referenced by:

- ExecStmt

DropBehavior:

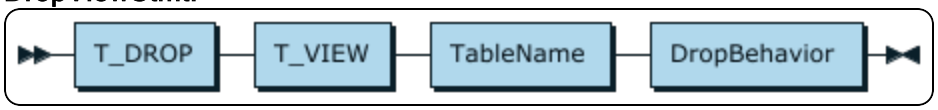



```
DropBehavior
         ::= T_CASCADE
           | T_RESTRICT
```

referenced by:

- DropViewStmt
- RevokeStmt

DropViewStmt:

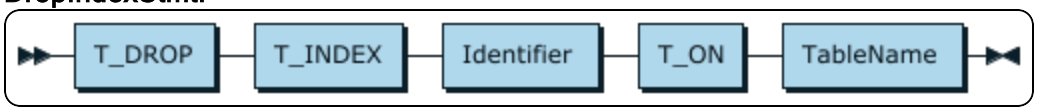



```
DropViewStmt
         ::= T_DROP T_VIEW TableName DropBehavior
```

referenced by:

- ExecStmt

DropIndexStmt:




```
DropIndexStmt
         ::= T_DROP T_INDEX Identifier T_ON TableName
```

referenced by:

- ExecStmt

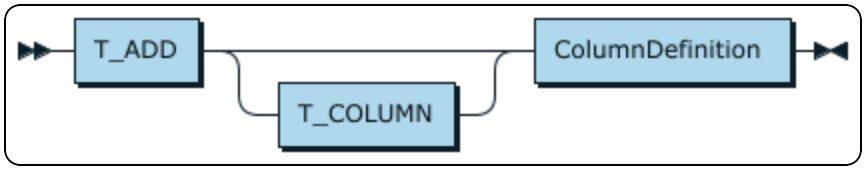
AlterTableStmt:


```
AlterTableStmt
         ::= T_ALTER T_TABLE TableName Add ColumnDefinition
```

referenced by:

- ExecStmt

AddColumnDefinition:




```
AddColumnDefinition
         ::= T_ADD T_COLUMN? ColumnDefinition
```

referenced by:

- AlterTableStmt

DeleteStmtSearched:


```
DeleteStmtSearched
         ::= T_DELETE T_FROM TableName WhereSearchCond_Opt
```

referenced by:

- ExecStmt

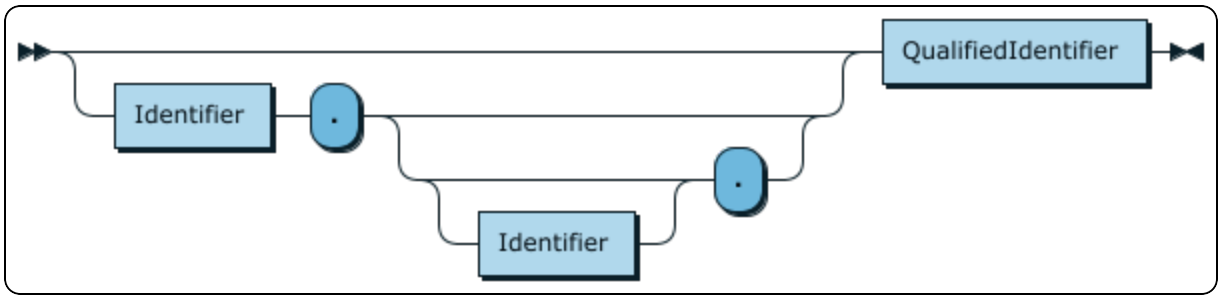
TableName:


```
TableName
         ::= QualifiedName
```

referenced by:

- AlterTableStmt
- CreateIndexStmt
- CreateTableStmt
- CreateViewStmt
- DeleteStmtSearched
- DropIndexStmt
- DropTableStmt
- DropViewStmt
- InsertStmt
- MergeStmt
- ObjectName
- TablePrimary
- UpdateStmtSearched
- UpsertStmtSearched

QualifiedName:




```
QualifiedName
          ::= ( Identifier '.' ( Identifier? '.' )? )?
QualifiedIdentifier
```

referenced by:

- TableName

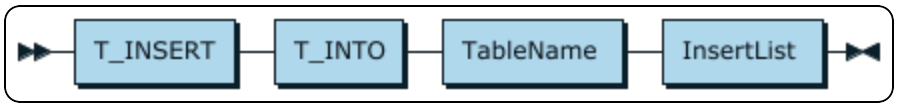
QualifiedIdentifier:

```
QualifiedIdentifier
         ::= Identifier
```

referenced by:

- QualifiedName

InsertStmt:

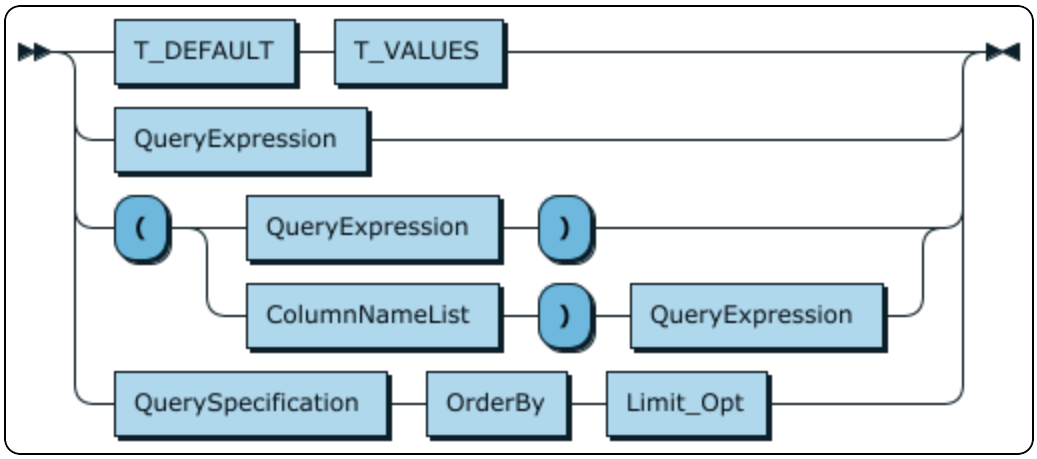



```
InsertStmt
         ::= T_INSERT T_INTO TableName InsertList
```

referenced by:

- ExecStmt

InsertList:



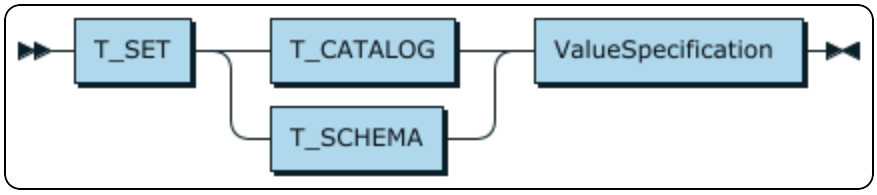

```
InsertList
         ::= T_DEFAULT T_VALUES
           | QueryExpression
           | '(' ( QueryExpression ')' | ColumnNameList ')'
QueryExpression )
```

```
            | QuerySpecification OrderBy Limit_Opt
```

referenced by:

- InsertStmt

SetStmt:

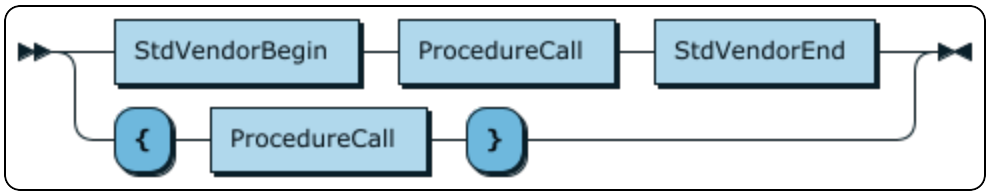



```
SetStmt  ::= T_SET ( T_CATALOG | T_SCHEMA )
ValueSpecification
```

referenced by:

- ExecStmt

ProcedureStmt:

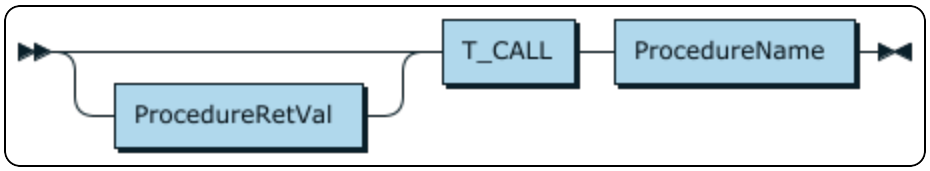



```
ProcedureStmt
         ::= StdVendorBegin ProcedureCall StdVendorEnd
           | '{' ProcedureCall '}'
```

referenced by:

- ExecStmt

ProcedureCall:

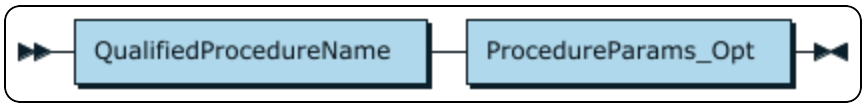



```
ProcedureCall
         ::= ProcedureRetVal? T_CALL ProcedureName
```

referenced by:

- ProcedureStmt

ProcedureName:

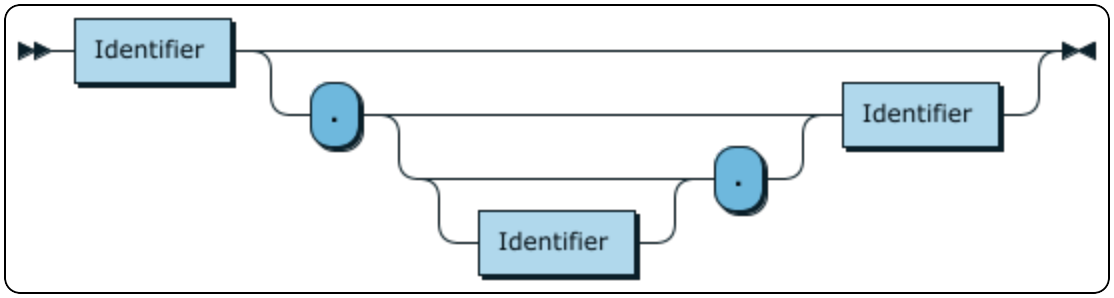



```
ProcedureName
         ::= QualifiedProcedureName ProcedureParams_Opt
```

referenced by:

- ProcedureCall

QualifiedProcedureName:

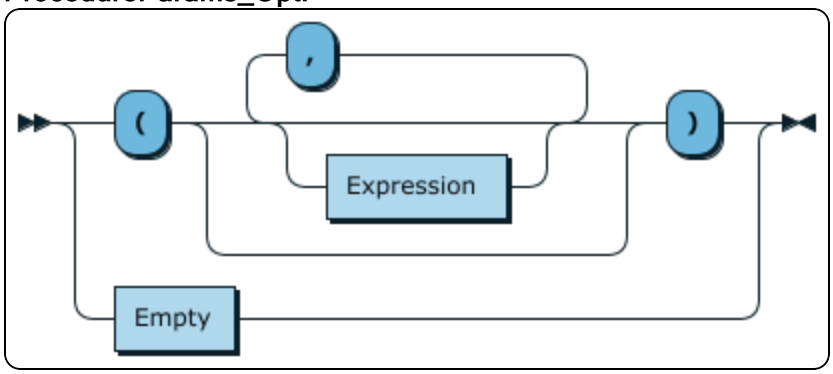



```
QualifiedProcedureName
         ::= Identifier ( '.' ( Identifier? '.' )? Identifier
)?
```

referenced by:

- ProcedureName

ProcedureParams_Opt:

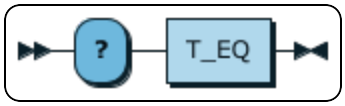



```
ProcedureParams_Opt
         ::= '(' ( Expression? ( ',' Expression? )* )? ')'
           | Empty
```

referenced by:

- ProcedureName

ProcedureRetVal:

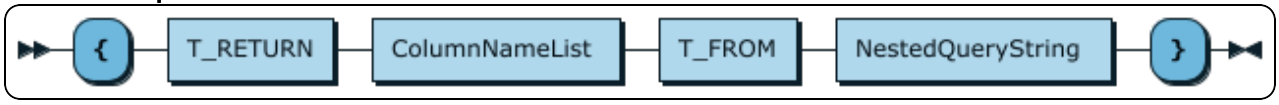



```
ProcedureRetVal
         ::= '?' T_EQ
```

referenced by:

- ProcedureCall

ReturnEscapeStmt:

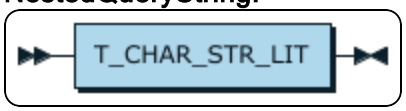


```
ReturnEscapeStmt
          ::= '{' T_RETURN ColumnNameList T_FROM
NestedQueryString '}'
```

referenced by:

- ExecStmt

NestedQueryString:

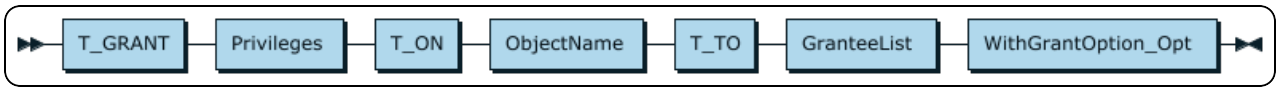



```
NestedQueryString
          ::= T_CHAR_STR_LIT
```

referenced by:

- ReturnEscapeStmt

GrantStmt:

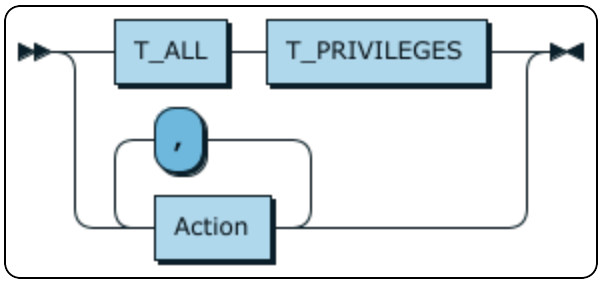



```
GrantStmt
          ::= T_GRANT Privileges T_ON ObjectName T_TO
GranteeList WithGrantOption_Opt
```

referenced by:

- ExecStmt

Privileges:

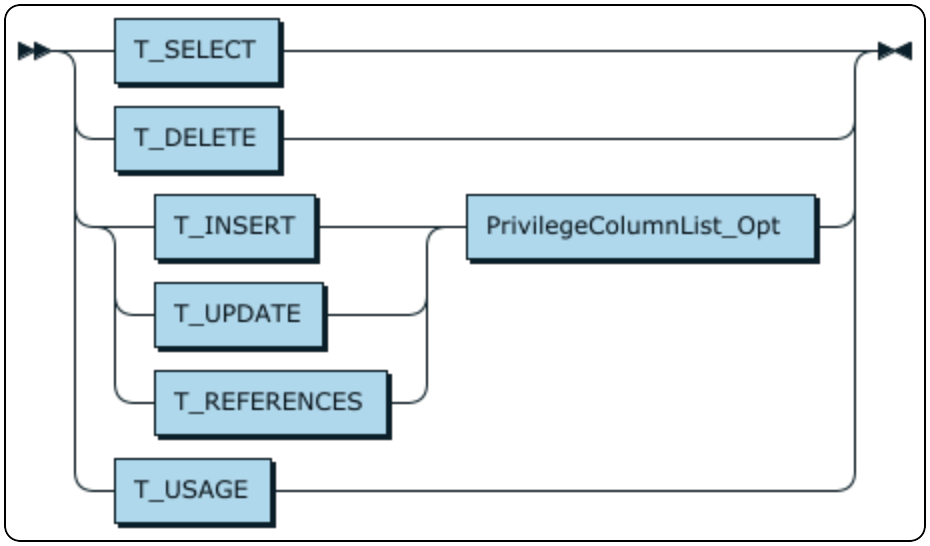



```
Privileges
          ::= T_ALL T_PRIVILEGES
            | Action ( ',' Action )*
```

referenced by:

- GrantStmt
- RevokeStmt

Action:

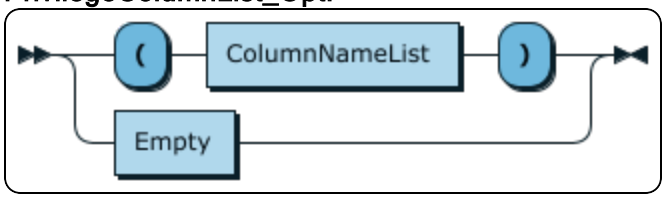



```
Action    ::= T_SELECT
            | T_DELETE
            | ( T_INSERT | T_UPDATE | T_REFERENCES )
PrivilegeColumnList_Opt
            | T_USAGE
```

referenced by:

- Privileges

PrivilegeColumnList_Opt:

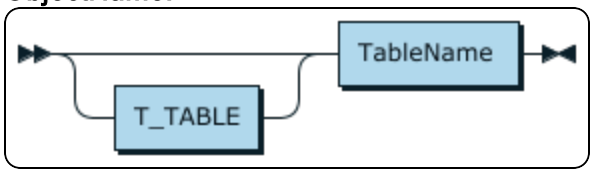



```
PrivilegeColumnList_Opt
          ::= '(' ColumnNameList ')'
            | Empty
```

referenced by:

- Action

ObjectName:

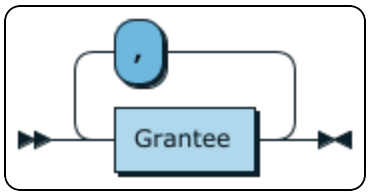



```
ObjectName
          ::= T_TABLE? TableName
```

referenced by:

- GrantStmt
- RevokeStmt

GranteeList:

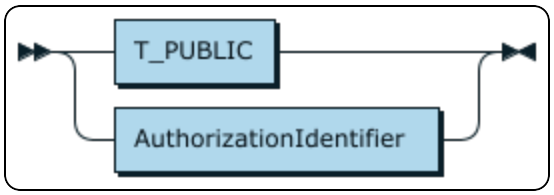



```
GranteeList
         ::= Grantee ( ',' Grantee )*
```

referenced by:

- GrantStmt
- RevokeStmt

Grantee:




```
Grantee  ::= T_PUBLIC
           | AuthorizationIdentifier
```

referenced by:

- GranteeList

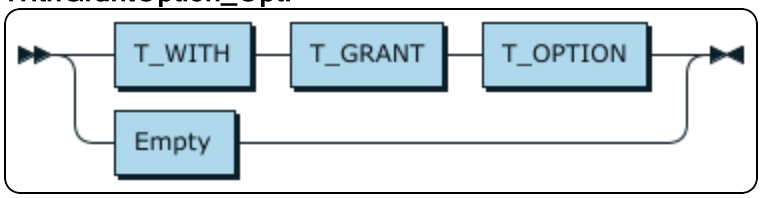
AuthorizationIdentifier:


```
AuthorizationIdentifier
         ::= Identifier
```

referenced by:

- Grantee

WithGrantOption_Opt:

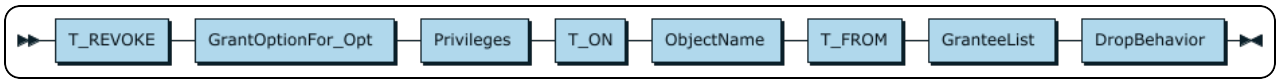



```
WithGrantOption_Opt
          ::= T_WITH T_GRANT T_OPTION
            | Empty
```

referenced by:

- GrantStmt

RevokeStmt:

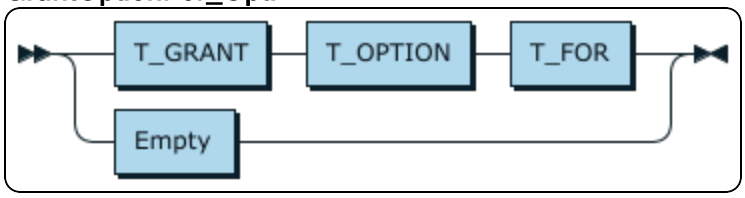



```
RevokeStmt
          ::= T_REVOKE GrantOptionFor_Opt Privileges T_ON
ObjectName T_FROM GranteeList DropBehavior
```

referenced by:

- ExecStmt

GrantOptionFor_Opt:



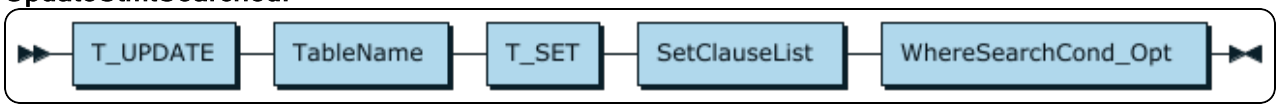

```
GrantOptionFor_Opt
```

```
          ::= T_GRANT T_OPTION T_FOR
            | Empty
```

referenced by:

- RevokeStmt

UpdateStmtSearched:

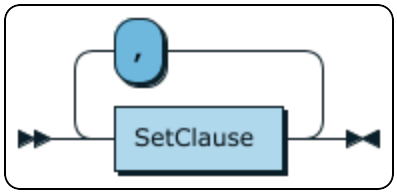



```
UpdateStmtSearched
          ::= T_UPDATE TableName T_SET SetClauseList
WhereSearchCond_Opt
```

referenced by:

- ExecStmt

SetClauseList:

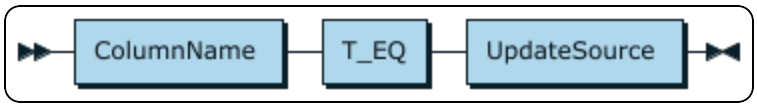



```
SetClauseList
          ::= SetClause ( ',' SetClause )*
```

referenced by:

- MergeWhenMatchedClause
- UpdateStmtSearched
- UpsertStmtSearched

SetClause:

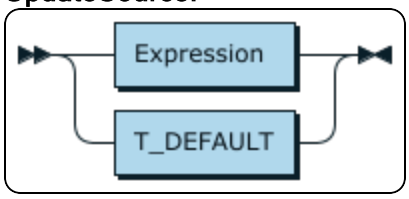



```
SetClause
         ::= ColumnName T_EQ UpdateSource
```

referenced by:

- SetClauseList

UpdateSource:

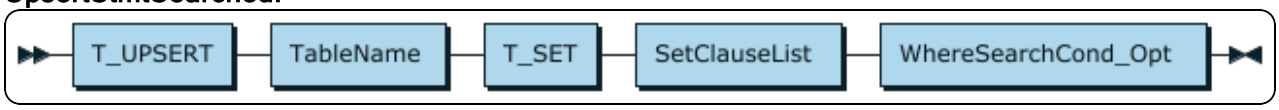



```
UpdateSource
         ::= Expression
           | T_DEFAULT
```

referenced by:

- SetClause

UpsertStmtSearched:

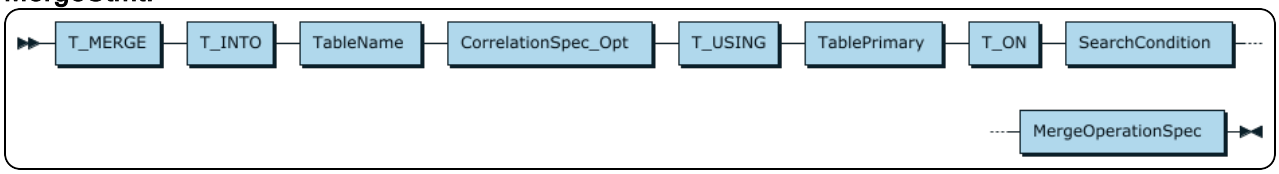



```
UpsertStmtSearched
         ::= T_UPSERT TableName T_SET SetClauseList
WhereSearchCond_Opt
```

referenced by:

- ExecStmt

MergeStmt:

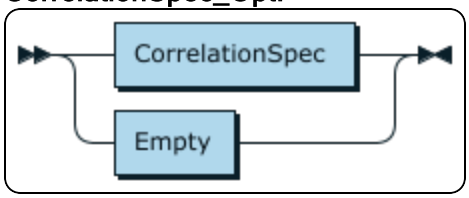



```
MergeStmt
         ::= T_MERGE T_INTO TableNameCorrelationSpec_Opt T_
USING TablePrimary T_ON SearchCondition MergeOperationSpec
```

referenced by:

- ExecStmt

CorrelationSpec_Opt:

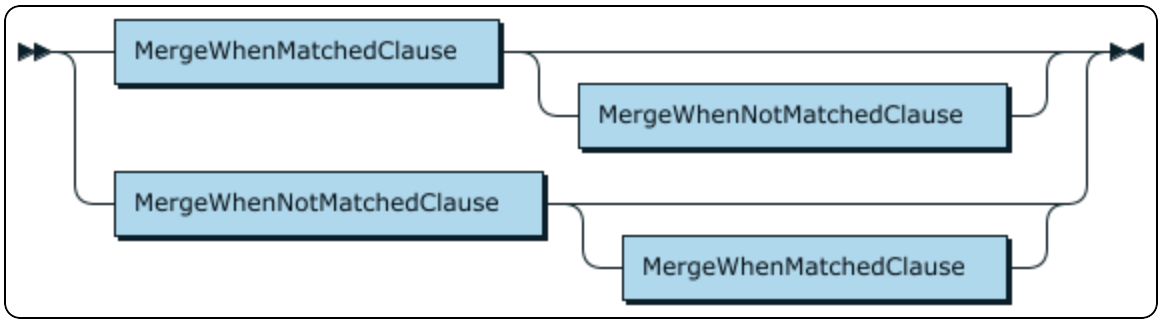



```
CorrelationSpec_Opt
         ::= CorrelationSpec
           | Empty
```

referenced by:

- AggrExpressionPrimary
- MergeStmt
- PivotClause
- PivotColumn
- TablePrimary
- UnpivotClause

MergeOperationSpec:

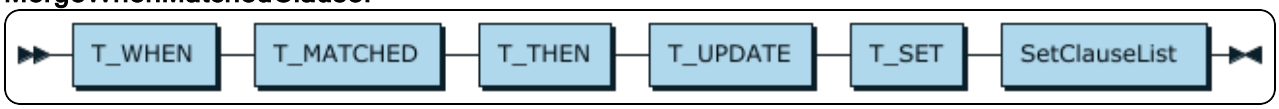



```
MergeOperationSpec
         ::= MergeWhenMatchedClause
MergeWhenNotMatchedClause?
           | MergeWhenNotMatchedClause
MergeWhenMatchedClause?
```

referenced by:

- MergeStmt

MergeWhenMatchedClause:

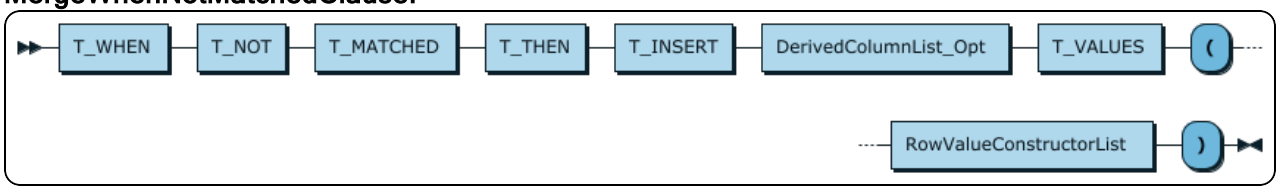



```
MergeWhenMatchedClause
         ::= T_WHEN T_MATCHED T_THEN T_UPDATE T_SET
SetClauseList
```

referenced by:

- MergeOperationSpec

MergeWhenNotMatchedClause:



```
MergeWhenNotMatchedClause
         ::= T_WHEN T_NOT T_MATCHED T_THEN T_INSERT
DerivedColumnList_Opt T_VALUES '(' RowValueConstructorList
')'
```

referenced by:

- MergeOperationSpec

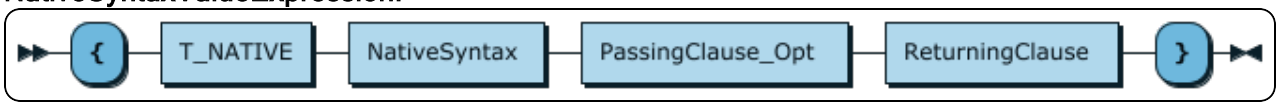
NativeSyntaxStmt:


```
NativeSyntaxStmt
         ::= '{' T_NATIVE NativeSyntax PassingClause_Opt
ColumnsClause '}'
```

referenced by:

- QueryExpression

NativeSyntaxValueExpression:




```
NativeSyntaxValueExpression
         ::= '{' T_NATIVE NativeSyntax PassingClause_Opt
ReturningClause '}'
```

referenced by:

- UnsignedValueSpecification

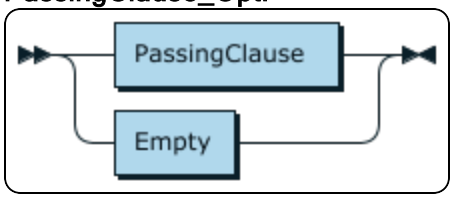
NativeSyntax:


```
NativeSyntax
         ::= T_CHAR_STR_LIT
```

referenced by:

- NativeSyntaxStmt
- NativeSyntaxValueExpression

PassingClause_Opt:

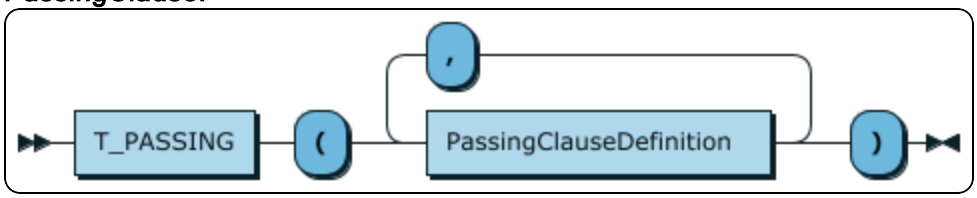



```
PassingClause_Opt
         ::= PassingClause
           | Empty
```

referenced by:

- NativeSyntaxStmt
- NativeSyntaxValueExpression

PassingClause:




```
PassingClause
         ::= T_PASSING '(' PassingClauseDefinition ( ','
PassingClauseDefinition )* ')'
```

referenced by:

- PassingClause_Opt

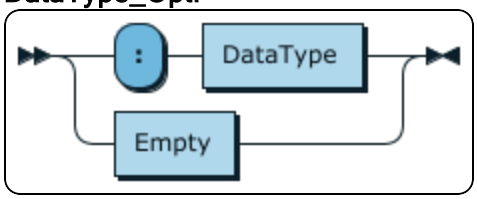
PassingClauseDefinition:


```
PassingClauseDefinition
          ::= PassingClauseValue DataType_Opt
PassingClauseName_Opt
```

referenced by:

- PassingClause

DataType_Opt:

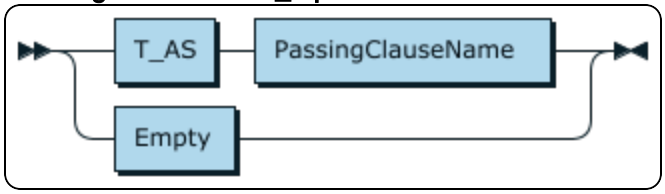



```
DataType_Opt
          ::= ':' DataType
            | Empty
```

referenced by:

- PassingClauseDefinition

PassingClauseName_Opt:

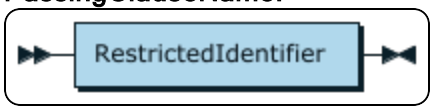


```
PassingClauseName_Opt
         ::= T_AS PassingClauseName
           | Empty
```

referenced by:

- PassingClauseDefinition

PassingClauseName:




```
PassingClauseName
         ::= RestrictedIdentifier
```

referenced by:

- PassingClauseName_Opt

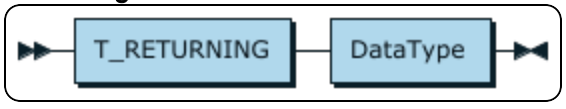
PassingClauseValue:


```
PassingClauseValue
         ::= Expression
```

referenced by:

- PassingClauseDefinition

ReturningClause:



```
ReturningClause
         ::= T_RETURNING DataType
```

referenced by:

- NativeSyntaxValueExpression

ColumnsClause:


```
ColumnsClause
         ::= T_COLUMNS '(' ColumnDefinitionList_Opt ')'
```

referenced by:

- NativeSyntaxStmt

Appendix 2: Token Definitions

This section defines the tokens for the C++ SQL BNF Grammar described in Appendix 1.

The following token matches the pattern:

T_APPROX_NUM_LIT

```
({DecNumLit}|{USInt})("E"|"e")("+"|"-")?{USInt}
```

T_CALL

```
(c|C)(a|A)(l|L)(l|L)
```

T_CHAR_STR_LIT

```
({Chars}|"''"|"\"")*
```

T_DECNUM_LIT

```
(({USInt}"."{USInt})|({USInt}".")|("."{USInt}))
```

T_FN

```
(f|F)(n|N)
```

T_HEX_LIT

```
0(x|X)[a-fA-F0-9]*
```

T_IDENTIFIER

```
({letter}|"_")({letter}|{digit}|"_")*
```

If an identifier matches one of the following strings (case-insensitive), it's mapped to the associated token in the following table:

Identifier	Token
"ADD"	T_ADD
"AND"	T_AND
"ANY"	T_ANY
"ALL"	T_ALL
"ALTER"	T_ALTER
"AS"	T_AS
"ASC"	T_ASC
"AVG"	T_AVG
"BETWEEN"	T_BETWEEN
"BY"	T_BY
"CASCADE"	T_CASCADE
"CAST"	T_CAST
"CATALOG"	T_CATALOG
"CHECK"	T_CHECK
"COALESCE"	T_COALESCE
"COLUMN"	T_COLUMN
"COLUMNS"	T_COLUMNS
"CONVERT"	T_CONVERT
"COUNT"	T_COUNT
"CREATE"	T_CREATE

Identifier	Token
"CROSS"	T_CROSS
"CURRENT_DATE"	T_CURRENT_DATE
"CURRENT_TIME"	T_CURRENT_TIME
"CURRENT_TIMESTAMP"	T_CURRENT_TIMESTAMP
"DATE"	T_DATE
"DAY"	T_DAY
"DAYOFWEEK"	T_DAYOFWEEK
"DEFAULT"	T_DEFAULT
"DELETE"	T_DELETE
"DESC"	T_DESC
"DISTINCT"	T_DISTINCT
"DROP"	T_DROP
"ELSE"	T_ELSE
"END"	T_END
"ESCAPE"	T_ESCAPE
"EXCEPT"	T_EXCEPT
"EXCLUDE"	T_EXCLUDE
"EXISTS"	T_EXISTS
"EXTRACT"	T_EXTRACT
"FOR"	T_FOR

Identifier	Token
"FORMAT"	T_FORMAT
"FROM"	T_FROM
"GRANT"	T_GRANT
"GROUP"	T_GROUP
"HAVING"	T_HAVING
"HOUR"	T_HOUR
"IN"	T_IN
"INCLUDE"	T_INCLUDE
"INDEX"	T_INDEX
"INNER"	T_INNER
"INSERT"	T_INSERT
"INTERSECT"	T_INTERSECT
"INTERVAL"	T_INTERVAL
"INTO"	T_INTO
"IS"	T_IS
"JOIN"	T_JOIN
"KEY"	T_KEY
"LEFT"	T_LEFT
"LIMIT"	T_LIMIT
"MATCHED"	T_MATCHED

Identifier	Token
"MAX"	T_MAX
"MERGE"	T_MERGE
"MIN"	T_MIN
"MINUTE"	T_MINUTE
"MONTH"	T_MONTH
"NATIVE"	T_NATIVE
"NULL"	T_NULL
"NULLIF"	T_NULLIF
"NULLS"	T_NULLS
"ON"	T_ON
"OPTION"	T_OPTION
"OR"	T_OR
"ORDER"	T_ORDER
"OUTER"	T_OUTER
"PASSING"	T_PASSING
"PERCENT"	T_PERCENT
"PIVOT"	T_PIVOT
"POSITION"	T_POSITION
"PRIMARY"	T_PRIMARY
"PRIVILEGES"	T_PRIVILEGES

Identifier	Token
"PUBLIC"	T_PUBLIC
"QUARTER"	T_QUARTER
"REFERENCES"	T_REFERENCES
"RESTRICT"	T_RESTRICT
"RETURN"	T_RETURN
"RETURNING"	T_RETURNING
"REVOKE"	T_REVOKE
"RIGHT"	T_RIGHT
"SCHEMA"	T_SCHEMA
"SECOND"	T_SECOND
"SELECT"	T_SELECT
"SET"	T_SET
"STDDEV"	T_STDDEV
"STDDEV_POP"	T_STDDEV_POP
"SUM"	T_SUM
"SVEBEGIN"	T_SVBEGIN
"SVEND"	T_SVEND
"TABLE"	T_TABLE
"THEN"	T_THEN
"TIME"	T_TIME

Identifier	Token
"TIMESTAMP"	T_TIMESTAMP
"TIMESTAMPADD"	T_TIMESTAMPADD
"TIMESTAMPDIFF"	T_TIMESTAMPDIFF
"TO"	T_TO
"TOP"	T_TOP
"UNION"	T_UNION
"UNIQUE"	T_UNIQUE
"UNPIVOT"	T_UNPIVOT
"UPDATE"	T_UPDATE
"UPSERT"	T_UPSERT
"USAGE"	T_USAGE
"USER"	T_USER
"USING"	T_USING
"VALUES"	T_VALUES
"VAR"	T_VAR
"VAR_POP"	T_VAR_POP
"VIEW"	T_VIEW
"WEEK"	T_WEEK
"WHEN"	T_WHEN
"WHERE"	T_WHERE
"WITH"	T_WITH

Identifier	Token
"YEAR"	T_YEAR
{"||"}	T_CONCAT
"="	T_EQ
">="	T_GE
">"	T_GT
"<"	T_LT
"<="	T_LE
"<>" | "!="	T_NE

T_LIKE

```
(l|L)(i|I)(k|K)(e|E)
```

T_NOT

```
(n|N)(o|O)(t|T)
```

T_NOTLIKE

```
{Not}{white}+{Like}
```

T_TSIDATATYPE

```
(S|s)(Q|q)(L|l)"_"(T|t)(S|s)(I|i)"_"({letter}|"_")*
```

T_USINT_LIT

```
{digit}+
```

Reference

1. BNF for SQL-92: http://savage.net.au/SQL/sql-92.bnf.html#subquery
2. Credit to Syntax diagrams for BNF generate tool: http://bottlecaps.de/rr/ui

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