

ISO/IEC 9075-2:2008-07 (E)

Information technology_ - Database languages_ - SQL_ - Part_2: Foundation (SQL/Foundation)

Contents	Page
Foreword.....	xix
Introduction.....	xx
1 Scope.....	1
2 Normative references.....	3
2.1 ISO and IEC standards.....	3
2.2 Other international standards.....	4
3 Definitions, notations, and conventions.....	5
3.1 Definitions.....	5
3.1.1 Definitions taken from [ISO10646].....	5
3.1.2 Definitions taken from [ISO14651].....	5
3.1.3 Definitions taken from [Unicode].....	5
3.1.4 Definitions taken from [ISO8601].....	6
3.1.5 Definitions taken from [ISO9075-1].....	6
3.1.6 Definitions provided in Part 2.....	7
3.2 Notation.....	11
3.3 Conventions.....	11
3.3.1 Use of terms.....	11
3.3.1.1 Other terms.....	11
4 Concepts.....	13
4.1 Data types.....	13
4.1.1 General introduction to data types.....	13
4.1.2 Naming of predefined types.....	14
4.1.3 Host language data types.....	15
4.1.4 Data type terminology.....	15
4.1.5 Properties of distinct.....	17
4.2 Character strings.....	18
4.2.1 Introduction to character strings.....	18
4.2.2 Comparison of character strings.....	19
4.2.3 Operations involving character strings.....	19
4.2.3.1 Regular expression syntaxes.....	19
4.2.3.2 Operators that operate on character strings and return character strings.....	20
4.2.3.3 Other operators involving character strings.....	22
4.2.3.4 Operations involving large object character strings.....	23
4.2.4 Character repertoires.....	24
4.2.5 Character encoding forms.....	24

4.2.6	Collations.....	25
4.2.7	Character sets.....	26
4.2.8	Universal character sets.....	28
4.3	Binary strings.....	28
4.3.1	Introduction to binary strings.....	28
4.3.2	Binary string comparison.....	28
4.3.3	Operations involving binary strings.....	29
4.3.3.1	Operators that operate on binary strings and return binary strings.....	29
4.3.3.2	Other operators involving binary strings.....	29
4.4	Numbers.....	30
4.4.1	Introduction to numbers.....	30
4.4.2	Characteristics of numbers.....	30
4.4.3	Operations involving numbers.....	31
4.5	Boolean types.....	33
4.5.1	Introduction to Boolean types.....	33
4.5.2	Comparison and assignment of booleans.....	33
4.5.3	Operations involving booleans.....	33
4.5.3.1	Operations on booleans that return booleans.....	33
4.5.3.2	Other operators involving booleans.....	33
4.6	Datetimes and intervals.....	34
4.6.1	Introduction to datetimes and intervals.....	34
4.6.2	Datetimes.....	34
4.6.3	Intervals.....	37
4.6.4	Operations involving datetimes and intervals.....	39
4.7	User-defined types.....	40
4.7.1	Introduction to user-defined types.....	40
4.7.2	User-defined type descriptor.....	41
4.7.3	Observer functions and mutator functions.....	42
4.7.4	Constructors.....	43
4.7.5	Subtypes and supertypes.....	43
4.7.6	User-defined type comparison and assignment.....	44
4.7.7	Transforms for user-defined types.....	45
4.8	Row types.....	46
4.9	Reference types.....	46
4.9.1	Introduction to reference types.....	46
4.9.2	Operations involving references.....	47
4.10	Collection types.....	47
4.10.1	Introduction to collection types.....	47
4.10.2	Arrays.....	48
4.10.3	Multisets.....	48
4.10.4	Collection comparison and assignment.....	49
4.10.5	Operations involving arrays.....	49
4.10.5.1	Operators that operate on array values and return array elements.....	49
4.10.5.2	Operators that operate on array values and return array values.....	49

4.10.5.3	Operators that operate on array values and return numbers.	49
4.10.6	Operations involving multisets.	50
4.10.6.1	Operators that operate on multisets and return multiset elements.	50
4.10.6.2	Operators that operate on multisets and return multisets.	50
4.10.6.3	Operators that operate on multiset values and return numbers.	50
4.11	Data conversions.	50
4.12	Domains.	51
4.13	Columns, fields, and attributes.	52
4.14	Tables.	53
4.14.1	Introduction to tables.	53
4.14.2	Types of tables.	54
4.14.3	Table descriptors.	56
4.14.4	Relationships between tables.	57
4.14.5	Referenceable tables, subtables, and supertables.	58
4.14.6	Operations involving tables.	59
4.14.7	Identity columns.	60
4.14.8	Base columns and generated columns.	61
4.14.9	Windowed tables.	61
4.15	Data analysis operations (involving tables).	62
4.15.1	Introduction to data analysis operations.	62
4.15.2	Group functions.	63
4.15.3	Window functions.	63
4.15.4	Aggregate functions.	64
4.16	Determinism.	66
4.17	Integrity constraints.	67
4.17.1	Overview of integrity constraints.	67
4.17.2	Checking of constraints.	67
4.17.3	Table constraints.	68
4.17.4	Domain constraints.	70
4.17.5	Assertions.	71
4.18	Functional dependencies.	71
4.18.1	Overview of functional dependency rules and notations.	71
4.18.2	General rules and definitions.	72
4.18.3	Known functional dependencies in a base table.	73
4.18.4	Known functional dependencies in a transition table.	74
4.18.5	Known functional dependencies in a <table value constructor>.	74
4.18.6	Known functional dependencies in a <joined table>.	74
4.18.7	Known functional dependencies in a <table primary>.	76
4.18.8	Known functional dependencies in a <table factor>.	76
4.18.9	Known functional dependencies in a <table reference>.	77
4.18.10	Known functional dependencies in the result of a <from clause>.	77
4.18.11	Known functional dependencies in the result of a <where clause>.	77
4.18.12	Known functional dependencies in the result of a <group by clause>.	78
4.18.13	Known functional dependencies in the result of a <having clause>.	78

4.18.14	Known functional dependencies in a <query specification>.....	78
4.18.15	Known functional dependencies in a <query expression>.....	79
4.19	Candidate keys.....	80
4.20	SQL-schemas.....	81
4.21	Sequence generators.....	82
4.21.1	General description of sequence generators.....	82
4.21.2	Operations involving sequence generators.....	83
4.22	SQL-client modules.....	83
4.23	Embedded syntax.....	84
4.24	Dynamic SQL concepts.....	85
4.24.1	Overview of dynamic SQL.....	85
4.24.2	Dynamic SQL statements and descriptor areas.....	86
4.25	Direct invocation of SQL.....	87
4.26	Externally-invoked procedures.....	87
4.27	SQL-invoked routines.....	88
4.27.1	Overview of SQL-invoked routines.....	88
4.27.2	Characteristics of SQL-invoked routines.....	89
4.27.3	Execution of SQL-invoked routines.....	91
4.27.4	Routine descriptors.....	91
4.27.5	Result sets returned by SQL-invoked procedures.....	93
4.28	SQL-paths.....	94
4.29	Host parameters.....	95
4.29.1	Overview of host parameters.....	95
4.29.2	Status parameters.....	95
4.29.3	Data parameters.....	96
4.29.4	Indicator parameters.....	96
4.29.5	Locators.....	96
4.30	Diagnostics area.....	97
4.31	Host languages.....	98
4.32	Cursors.....	99
4.32.1	General description of cursors.....	99
4.32.2	Operations on and using cursors.....	102
4.33	SQL-statements.....	104
4.33.1	Classes of SQL-statements.....	104
4.33.2	SQL-statements classified by function.....	105
4.33.2.1	SQL-schema statements.....	105
4.33.2.2	SQL-data statements.....	106
4.33.2.3	SQL-data change statements.....	107
4.33.2.4	SQL-transaction statements.....	107
4.33.2.5	SQL-connection statements.....	108
4.33.2.6	SQL-control statements.....	108
4.33.2.7	SQL-session statements.....	108
4.33.2.8	SQL-diagnostics statements.....	109
4.33.2.9	SQL-dynamic statements.....	109

4.33.2.10	SQL embedded exception declaration.	109
4.33.3	SQL-statements and SQL-data access indication.	110
4.33.4	SQL-statements and transaction states.	110
4.33.5	SQL-statement atomicity and statement execution contexts.	112
4.33.6	Embeddable SQL-statements.	113
4.33.7	Preparable and immediately executable SQL-statements.	115
4.33.8	Directly executable SQL-statements.	116
4.34	Basic security model.	118
4.34.1	Authorization identifiers.	118
4.34.1.1	SQL-session authorization identifiers.	118
4.34.1.2	SQL-client module authorization identifiers.	119
4.34.1.3	SQL-schema authorization identifiers.	119
4.34.2	Privileges.	119
4.34.3	Roles.	121
4.34.4	Security model definitions.	122
4.35	SQL-transactions.	122
4.35.1	General description of SQL-transactions.	122
4.35.2	Savepoints.	123
4.35.3	Properties of SQL-transactions.	124
4.35.4	Isolation levels of SQL-transactions.	124
4.35.5	Implicit rollbacks.	126
4.35.6	Effects of SQL-statements in an SQL-transaction.	126
4.35.7	Encompassing transactions.	126
4.36	SQL-connections.	127
4.37	SQL-sessions.	128
4.37.1	General description of SQL-sessions.	128
4.37.2	SQL-session identification.	129
4.37.3	SQL-session properties.	130
4.37.4	Execution contexts.	132
4.37.5	Routine execution context.	132
4.38	Triggers.	133
4.38.1	General description of triggers.	133
4.38.2	Trigger execution.	135
4.39	Client-server operation.	137
5	Lexical elements.	139
5.1	<SQL terminal character>.	139
5.2	<token> and <separator>.	143
5.3	<literal>.	152
5.4	Names and identifiers.	161
6	Scalar expressions.	173
6.1	<data type>.	173
6.2	<field definition>.	186
6.3	<value expression primary>.	188

6.4	<value specification> and <target specification>.....	190
6.5	<contextually typed value specification>.....	196
6.6	<identifier chain>.....	198
6.7	<column reference>.....	202
6.8	<SQL parameter reference>.....	204
6.9	<set function specification>.....	205
6.10	<window function>.....	207
6.11	<case expression>.....	211
6.12	<cast specification>.....	215
6.13	<next value expression>.....	230
6.14	<field reference>.....	232
6.15	<subtype treatment>.....	233
6.16	<method invocation>.....	235
6.17	<static method invocation>.....	237
6.18	<new specification>.....	239
6.19	<attribute or method reference>.....	241
6.20	<dereference operation>.....	243
6.21	<method reference>.....	244
6.22	<reference resolution>.....	246
6.23	<array element reference>.....	248
6.24	<multiset element reference>.....	249
6.25	<value expression>.....	250
6.26	<numeric value expression>.....	254
6.27	<numeric value function>.....	256
6.28	<string value expression>.....	268
6.29	<string value function>.....	273
6.30	<datetime value expression>.....	288
6.31	<datetime value function>.....	291
6.32	<interval value expression>.....	293
6.33	<interval value function>.....	298
6.34	<boolean value expression>.....	299
6.35	<array value expression>.....	304
6.36	<array value constructor>.....	306
6.37	<multiset value expression>.....	308
6.38	<multiset value function>.....	311
6.39	<multiset value constructor>.....	312
7	Query expressions.....	315
7.1	<row value constructor>.....	315
7.2	<row value expression>.....	318
7.3	<table value constructor>.....	320
7.4	<table expression>.....	322
7.5	<from clause>.....	323
7.6	<table reference>.....	325

7.7	<joined table>.....	335
7.8	<where clause>.....	344
7.9	<group by clause>.....	345
7.10	<having clause>.....	354
7.11	<window clause>.....	356
7.12	<query specification>.....	366
7.13	<query expression>.....	376
7.14	<search or cycle clause>.....	393
7.15	<subquery>.....	398
8	Predicates.....	401
8.1	<predicate>.....	401
8.2	<comparison predicate>.....	403
8.3	<between predicate>.....	411
8.4	<in predicate>.....	412
8.5	<like predicate>.....	414
8.6	<similar predicate>.....	420
8.7	<regex like predicate>.....	426
8.8	<null predicate>.....	428
8.9	<quantified comparison predicate>.....	430
8.10	<exists predicate>.....	432
8.11	<unique predicate>.....	433
8.12	<normalized predicate>.....	434
8.13	<match predicate>.....	436
8.14	<overlaps predicate>.....	439
8.15	<distinct predicate>.....	441
8.16	<member predicate>.....	444
8.17	<submultiset predicate>.....	446
8.18	<set predicate>.....	448
8.19	<type predicate>.....	449
8.20	<search condition>.....	451
9	Additional common rules.....	453
9.1	Retrieval assignment.....	453
9.2	Store assignment.....	458
9.3	Result of data type combinations.....	463
9.4	Subject routine determination.....	466
9.5	Type precedence list determination.....	468
9.6	Host parameter mode determination.....	472
9.7	Type name determination.....	474
9.8	Determination of identical values.....	476
9.9	Equality operations.....	478
9.10	Grouping operations.....	481
9.11	Multiset element grouping operations.....	483
9.12	Ordering operations.....	485

9.13	Collation determination.	487
9.14	Execution of array-returning functions.	489
9.15	Execution of multiset-returning functions.	492
9.16	XQuery regular expression matching.	493
9.17	XQuery regular expression replacement.	496
9.18	Data type identity.	498
9.19	Determination of a from-sql function.	500
9.20	Determination of a from-sql function for an overriding method.	501
9.21	Determination of a to-sql function.	502
9.22	Determination of a to-sql function for an overriding method.	503
9.23	Generation of the next value of a sequence generator.	504
9.24	Creation of a sequence generator.	505
9.25	Altering a sequence generator.	507
10	Additional common elements.	509
10.1	<interval qualifier>.	509
10.2	<language clause>.	513
10.3	<path specification>.	515
10.4	<routine invocation>.	516
10.5	<character set specification>.	539
10.6	<specific routine designator>.	541
10.7	<collate clause>.	544
10.8	<constraint name definition> and <constraint characteristics>.	545
10.9	<aggregate function>.	547
10.10	<sort specification list>.	559
10.11	Determination of view privileges.	561
10.12	Determination of view component privileges.	563
11	Schema definition and manipulation.	567
11.1	<schema definition>.	567
11.2	<drop schema statement>.	570
11.3	<table definition>.	573
11.4	<column definition>.	584
11.5	<default clause>.	589
11.6	<table constraint definition>.	593
11.7	<unique constraint definition>.	595
11.8	<referential constraint definition>.	597
11.9	<check constraint definition>.	601
11.10	<alter table statement>.	603
11.11	<add column definition>.	604
11.12	<alter column definition>.	606
11.13	<set column default clause>.	607
11.14	<drop column default clause>.	608
11.15	<add column scope clause>.	609
11.16	<drop column scope clause>.	610

11.17	<alter column data type clause>.....	612
11.18	<alter identity column specification>.....	615
11.19	<drop column definition>.....	616
11.20	<add table constraint definition>.....	618
11.21	<drop table constraint definition>.....	619
11.22	<drop table statement>.....	622
11.23	<view definition>.....	625
11.24	<drop view statement>.....	635
11.25	<domain definition>.....	638
11.26	<alter domain statement>.....	641
11.27	<set domain default clause>.....	642
11.28	<drop domain default clause>.....	643
11.29	<add domain constraint definition>.....	644
11.30	<drop domain constraint definition>.....	645
11.31	<drop domain statement>.....	646
11.32	<character set definition>.....	648
11.33	<drop character set statement>.....	650
11.34	<collation definition>.....	652
11.35	<drop collation statement>.....	654
11.36	<transliteration definition>.....	656
11.37	<drop transliteration statement>.....	659
11.38	<assertion definition>.....	661
11.39	<drop assertion statement>.....	663
11.40	<trigger definition>.....	666
11.41	<drop trigger statement>.....	671
11.42	<user-defined type definition>.....	674
11.43	<attribute definition>.....	690
11.44	<alter type statement>.....	692
11.45	<add attribute definition>.....	693
11.46	<drop attribute definition>.....	695
11.47	<add original method specification>.....	697
11.48	<add overriding method specification>.....	703
11.49	<drop method specification>.....	708
11.50	<drop data type statement>.....	712
11.51	<SQL-invoked routine>.....	715
11.52	<alter routine statement>.....	740
11.53	<drop routine statement>.....	743
11.54	<user-defined cast definition>.....	745
11.55	<drop user-defined cast statement>.....	747
11.56	<user-defined ordering definition>.....	749
11.57	<drop user-defined ordering statement>.....	753
11.58	<transform definition>.....	755
11.59	<alter transform statement>.....	758
11.60	<add transform element list>.....	759

11.61	<drop transform element list>.....	761
11.62	<drop transform statement>.....	763
11.63	<sequence generator definition>.....	766
11.64	<alter sequence generator statement>.....	768
11.65	<drop sequence generator statement>.....	769
12	Access control.....	771
12.1	<grant statement>.....	771
12.2	<grant privilege statement>.....	776
12.3	<privileges>.....	779
12.4	<role definition>.....	782
12.5	<grant role statement>.....	783
12.6	<drop role statement>.....	785
12.7	<revoke statement>.....	786
12.8	Grantor determination.....	804
13	SQL-client modules.....	805
13.1	<SQL-client module definition>.....	805
13.2	<module name clause>.....	810
13.3	<externally-invoked procedure>.....	811
13.4	Calls to an <externally-invoked procedure>.....	814
13.5	<SQL procedure statement>.....	831
13.6	Data type correspondences.....	838
14	Data manipulation.....	849
14.1	<declare cursor>.....	849
14.2	<cursor properties>.....	851
14.3	<cursor specification>.....	853
14.4	<open statement>.....	856
14.5	<fetch statement>.....	857
14.6	<close statement>.....	861
14.7	<select statement: single row>.....	862
14.8	<delete statement: positioned>.....	866
14.9	<delete statement: searched>.....	868
14.10	<truncate table statement>.....	871
14.11	<insert statement>.....	873
14.12	<merge statement>.....	878
14.13	<update statement: positioned>.....	886
14.14	<update statement: searched>.....	888
14.15	<set clause list>.....	892
14.16	<temporary table declaration>.....	897
14.17	<free locator statement>.....	899
14.18	<hold locator statement>.....	900
15	Additional data manipulation rules.....	901
15.1	Effect of opening a cursor.....	901
15.2	Effect of receiving a result set.....	904

15.3	Determination of the current row of a cursor.	905
15.4	Effect of closing a cursor.	907
15.5	Effect of a positioned delete.	908
15.6	Effect of a positioned update.	910
15.7	Effect of deleting rows from base tables.	913
15.8	Effect of deleting some rows from a derived table.	915
15.9	Effect of deleting some rows from a viewed table.	917
15.10	Effect of inserting tables into base tables.	919
15.11	Effect of inserting a table into a derived table.	921
15.12	Effect of inserting a table into a viewed table.	923
15.13	Effect of replacing rows in base tables.	925
15.14	Effect of replacing some rows in a derived table.	927
15.15	Effect of replacing some rows in a viewed table.	930
15.16	Execution of BEFORE triggers.	932
15.17	Execution of referential actions.	933
15.18	Execution of AFTER triggers.	939
15.19	Execution of triggers.	940
16	Control statements.	943
16.1	<call statement>.	943
16.2	<return statement>.	944
17	Transaction management.	945
17.1	<start transaction statement>.	945
17.2	<set transaction statement>.	947
17.3	<transaction characteristics>.	949
17.4	<set constraints mode statement>.	951
17.5	<savepoint statement>.	953
17.6	<release savepoint statement>.	954
17.7	<commit statement>.	955
17.8	<rollback statement>.	957
18	Connection management.	961
18.1	<connect statement>.	961
18.2	<set connection statement>.	964
18.3	<disconnect statement>.	966
19	Session management.	969
19.1	<set session characteristics statement>.	969
19.2	<set session user identifier statement>.	971
19.3	<set role statement>.	972
19.4	<set local time zone statement>.	973
19.5	<set catalog statement>.	974
19.6	<set schema statement>.	975
19.7	<set names statement>.	977
19.8	<set path statement>.	978
19.9	<set transform group statement>.	979

19.10	<set session collation statement>.....	980
20	Dynamic SQL.....	983
20.1	Description of SQL descriptor areas.....	983
20.2	<allocate descriptor statement>.....	993
20.3	<deallocate descriptor statement>.....	995
20.4	<get descriptor statement>.....	996
20.5	<set descriptor statement>.....	999
20.6	<prepare statement>.....	1003
20.7	<cursor attributes>.....	1014
20.8	<deallocate prepared statement>.....	1015
20.9	<describe statement>.....	1017
20.10	<input using clause>.....	1023
20.11	<output using clause>.....	1027
20.12	<execute statement>.....	1032
20.13	<execute immediate statement>.....	1034
20.14	<dynamic declare cursor>.....	1035
20.15	<allocate cursor statement>.....	1036
20.16	<dynamic open statement>.....	1039
20.17	<dynamic fetch statement>.....	1041
20.18	<dynamic single row select statement>.....	1042
20.19	<dynamic close statement>.....	1043
20.20	<dynamic delete statement: positioned>.....	1044
20.21	<dynamic update statement: positioned>.....	1046
20.22	<preparable dynamic delete statement: positioned>.....	1048
20.23	<preparable dynamic cursor name>.....	1050
20.24	<preparable dynamic update statement: positioned>.....	1052
21	Embedded SQL.....	1055
21.1	<embedded SQL host program>.....	1055
21.2	<embedded exception declaration>.....	1067
21.3	<embedded SQL Ada program>.....	1071
21.4	<embedded SQL C program>.....	1078
21.5	<embedded SQL COBOL program>.....	1087
21.6	<embedded SQL Fortran program>.....	1094
21.7	<embedded SQL MUMPS program>.....	1100
21.8	<embedded SQL Pascal program>.....	1105
21.9	<embedded SQL PL/I program>.....	1111
22	Direct invocation of SQL.....	1119
22.1	<direct SQL statement>.....	1119
22.2	<direct select statement: multiple rows>.....	1123
23	Diagnostics management.....	1125
23.1	<get diagnostics statement>.....	1125
23.2	Pushing and popping the diagnostics area stack.....	1142

24	Status codes	1143
24.1	SQLSTATE.....	1143
24.2	Remote Database Access SQLSTATE Subclasses.....	1152
25	Conformance	1153
25.1	Claims of conformance to SQL/Foundation.....	1153
25.2	Additional conformance requirements for SQL/Foundation.....	1154
25.3	Implied feature relationships of SQL/Foundation.....	1154
Annex A	SQL Conformance Summary (informative).....	1159
Annex B	Implementation-defined elements (informative).....	1225
Annex C	Implementation-dependent elements (informative).....	1245
Annex D	Deprecated features (informative).....	1253
Annex E	Incompatibilities with ISO/IEC 9075:2003 (informative).....	1255
Annex F	SQL feature taxonomy (informative).....	1257
Annex G	Defect Reports not addressed in this edition of ISO/IEC 9075 (informative).....	1287
	Bibliography	1289
	Index	1291

Tables

Table	Page
1	Overview of character sets. 27
2	Fields in datetime values. 35
3	Datetime data type conversions. 36
4	Fields in year-month INTERVAL values. 37
5	Fields in day-time INTERVAL values. 38
6	Valid values for fields in INTERVAL values. 38
7	Valid operators involving datetimes and intervals. 39
8	SQL-transaction isolation levels and the three phenomena. 125
9	Valid values for datetime fields. 181
10	Valid absolute values for interval fields. 182
11	Truth table for the AND boolean operator. 302
12	Truth table for the OR boolean operator. 302
13	Truth table for the IS boolean operator. 302
14	<null predicate> semantics. 429
15	Standard programming languages. 513
16	Data type correspondences for Ada. 838
17	Data type correspondences for C. 839
18	Data type correspondences for COBOL. 841
19	Data type correspondences for Fortran. 842
20	Data type correspondences for M. 844
21	Data type correspondences for Pascal. 845
22	Data type correspondences for PL/I. 846
23	Data types of <key word>s used in the header of SQL descriptor areas. 987
24	Data types of <key word>s used in SQL item descriptor areas. 987
25	Codes used for SQL data types in Dynamic SQL. 989
26	Codes associated with datetime data types in Dynamic SQL. 990
27	Codes used for <interval qualifier>s in Dynamic SQL. 991
28	Codes used for input/output SQL parameter modes in Dynamic SQL. 992
29	Codes associated with user-defined types in Dynamic SQL. 992
30	<statement information item name>s for use with <get diagnostics statement>. 1127
31	<condition information item name>s for use with <get diagnostics statement>. 1127
32	SQL-statement codes. 1130
33	SQLSTATE class and subclass values. 1144
34	SQLSTATE class codes for RDA. 1152
35	Implied feature relationships of SQL/Foundation. 1154
36	Feature taxonomy and definition for mandatory features. 1257
37	Feature taxonomy for optional features. 1274

Figures

Figure		Page
1	Operation of <regular expression substring function>.....	21
2	Illustration of WIDTH_BUCKET Semantics.....	32