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Volume V
Part 19

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INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 19 - Neutral Data Manipulation Language (NDML) Precompiler Generate Oracle Request Processor Product Specification

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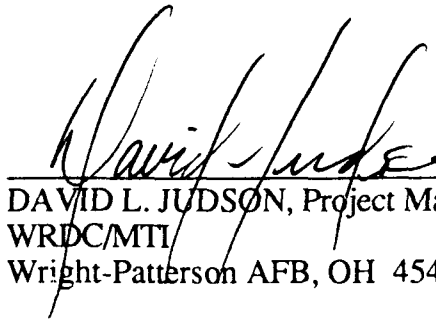

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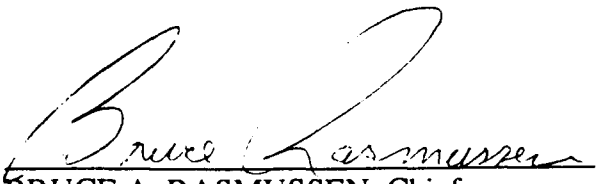

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FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

SUBCONTRACTOR	ROLE
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface,and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

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SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of Function PRE9.2, "Generate ORACLE Request Processor", one of the major functions of the Configuration Item (CI) "Precompiler" to be built and formally accepted by the ICAM Program office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to generate a COBOL, C, or FORTRAN program that will satisfy a retrieval or update NDML or SQL subtransaction against an ORACLE database.

The following functions will be performed by this CPCI:

1. Generate the Data Division section of the Request Processor:

   a) Generate file description and record layout if the NDML or SQL request resulted in a retrieval subtransaction.

2. Generate the Working Storage Section of the Request Processor. These working storage variables will be used for:

   a) Conceptual/internal transformation of retrieval search parameters or update values.

   b) Internal/Conceptual transformation of retrieved data fields

   c) DBMS status checks

   d) Retrieved qualification variables

   e) ORACLE SQL statements to access the database.

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Justification
By
Distribution/
Availability Codes
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A-1

3. Generate the Procedure Division section of the Request Processor. It will include all the code to access a particular ORACLE database in order to satisfy the NDML or SQL request. This code will consist of:

   a) Interface code to the Request Processor Main program at runtime

   b) Code to transform the retrieval search parameters or update values from conceptual to internal format.

   c) Code using DBMS specific calls to access the database to retrieve data or update data.

   d) Code to transform the retrieved data from internal to conceptual format.

   e) Code to save the retrieved data on a sequential file.

   f) Code to check DBMS status and report errors during runtime execution.

SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.

2. D. Appleton Co., CDM Administrator's Manual; UM620141000, March 1984.

3. D. Appleton Co., CDM1-IDEF Model of the Common Data Model; CCS620141000, 15 May 1985.

4. D. Appleton Co., Computer Program Development Specification (DS) ICAM Integrated Support System (IISS) Configuration Item: NDML Precompiler; DS620141200, October 1984.

5. D. Appleton Co., Embedded NDML Programmer's Reference Manual; PRM 620141200, March 1985.

6. Softech, Inc., NTM Programmer's Guide; UM620140001, July 1984.

7. Control Data Corp., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc, of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer references data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routines available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System: (IISS) A test computing environment used to investigate, demonstrate and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

Mapping: The correspondence of independent objects in two schemas: ES to CS or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp, Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing section source code of the input application program.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3

REQUIREMENTS

3.1 Structural Description

A graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationships of each module making up this CPCI.

This CPCI uses a number of lower level modules to handle specific operations such as:

1. Generate conceptual schema data definitions for retrieved data fields (CDRFT).

2. Generate internal schema data definitions for runtime search parameters (CDPRM).

3. Generate internal schema data definitions for retrieved data fields (CDRDF).

4. Generate conceptual schema data definitions for runtime search parameters or update values (CDMSG).

5. Generate working storage and procedure division code for the conceptual schema to internal schema transformation of runtime search parameters or update values (CDCI).

6. Generate working storage and procedure division code for the internal schema to conceptual schema transformation of retrieved data fields (CDIC).

7. Generate internal schema data definitions for qualified data fields (CDQDF).

8. Combine two work files into one file containing the Request Processor program (CDCWF).

9. Generate macros with the proper substitution parameters (CDMACR).

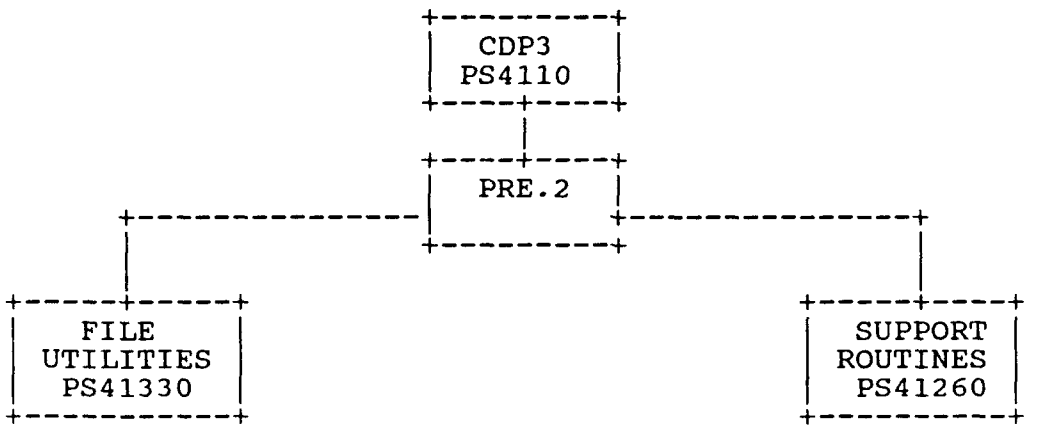
3.2 Functional Flow

This CPCI implements the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are to be found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, use of the Network Transaction Manager. It must use the ORACLE DBMS installed on a DEC VAX computer.

3.3 Interfaces

The following diagram depicts the interface of PRE9.2 with other CPCI's in the system.



3.3.1 Inputs/Outputs

The following table depicts the inputs and outputs of this CPCI. A detailed description for each item can be found in the DS for this CPCI.

FUNCTION: PRE9.2

INPUT	OUTPUT
DBMS Name	
Database Identification Number	Source code file name
Current Host	Function Status
RPS RPID	
RPS RPID Modify	
RPS RPID Insdel	
Request Processor Name	
Current Subtransaction	
Internal Schema Action List	
Internal Schema Qualify List	
Conceptual Schema Action list	
Conceptual Schema Qualify list	
Result Field table	
Subtrans Boolean List	
Subtrans Process ID Table	
Complex Mapping Alg Table	
Character Null	
Numeric Null	
Boolean List	
Source Languages	

3.4 Program Interrupts

Not applicable to this CPCI.

3.5 Timing and Sequencing Description

This CPCI is called upon by the Request Processor Control Module CDP13, for every ORACLE subtransaction identified by the current NDML or SQL request being precompiled.

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. This model is defined by the CDM1, the IDEF1 model of the CDM, Reference Number 3. The database was constructed using ORACLE.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It uses temporary scratch files for the generated program source code.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.7.1.3 Item Description

Not applicable to this CPCI.

3.8 Object Code Creation

The object code for this CPCI will be created by the system integration test team by using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL language compiler.

3.9 Adaptation Data

This CPCI has been coded using ANSI COBOL.
The intents was to provide a transportable system. Any system environment supporting these languages, a virtual memory management scheme, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been made to localize and identify any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Where Include File Used List

The following lists each include file in the documentation group and all the modules documented in this specification which include them. The purpose of each module is listed as well.

DOCGROUP PS41254 Where-include-file-used List

Include File	Module Name
CHKCDM	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ERRCDM	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ERRFS	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL

DOCGROUP PS41254 Where-include-file-used List

Include File	Module Name
	CDQPS
	CDUCOC
SBSTLST	
	CDGDS
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ISAL	
	CDGDS
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ISQUAL	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
SUBBOOL	

DOCGROUP PS41254 Where-include-file-used List

Include File	Module Name
	CDGDS
	CDGENWC
	CDGUS
	CDPDEL
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
FORVAR	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ERRPRO	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
BOOLST	

DOCGROUP PS41254 Where-include-file-used List

Include File	Module Name
	CDGENIF
	CDPDEL
	CDPMOD
	CDQPS
	CDUCOC
CSQUAL	
	CDGENIF
	CDPDEL
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
CSAL	
	CDGENIF
	CDPDEL
	CDPMOD
	CDQPS
	CDUCOC
CMAT	
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
RFTABLE	
	CDPDEL
	CDPMOD
	CDPSEL
	CDQPS

DOCGROUP PS41254 Where-include-file-used List

Include File	Module Name
	CDUCOC
SUBPROC	
	CDQPS

3.10.2 Where External Routine Used List

The following lists each external function or routine in the documentation group and all the documented modules which call it. The purpose of each module is listed as well.

DOCGROUP PS41254 Where-external-routine-used List

System Module	Module Name
CDMACR	
	CDGDS
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
OUTFIL	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC
ERRPRO	
	CDGDS
	CDGENIF
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPMOD
	CDPSEL
	CDQPS
	CDUCOC

DOCGROUP PS41254 Where-external-routine-used List

System Module	Module Name
CDQPOP	
	CDGENIF
CDGETOF	
	CDGENWC
	CDGUS
	CDPDEL
	CDPIN
	CDPSEL
	CDQPS
	CDUCOC
CDIC	
	CDPSEL
	CDUCOC
GENFIL	
	CDQPS
OPNFIL	
	CDQPS
CLSFIL	
	CDQPS
CDCWF	
	CDQPS
CDMSG2	
	CDQPS
CDRFT	
	CDQPS
CDPRM	
	CDQPS
CDRDF	
	CDQPS
CDGDF	
	CDQPS

DOCGROUP PS41254 Where-external-routine-used List

System Module	Module Name
CDGNV	CDQPS
CDCMPRM	CDQPS
CDGTV	CDQPS
CDMSG	CDQPS
CDPOOL	CDQPS
CDCI	CDQPS
CDGENRT	CDQPS
CDCREFO	CDQPS
CDRPCIF	CDUCOC

3.10.3 Main Program Parts List

The following lists each Main Program in the documentation group and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more that once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external "routine". The Purpose of the Main Program module is listed as well.

DOCGROUP PS41254 Main Program Parts List

Main Pgm Name	Module Name	Module Type
CDGDS		
	CDGENWC	Well-defined module
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
CDGENIF		
	OUTFIL	External routine
	ERRPRO	External routine
	CDQPOP	External routine
CDGENWC		
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
CDGUS		
	CDGENWC	External routine
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
CDPDEL		
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
	CDGUS	External routine
	CDGDS	External routine
	CDUCOC	Well-defined module
CDPIN		
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine

DOCGROUP PS41254 Main Program Parts List

Main Pgm Name	Module Name	Module Type
	CDGETOF	External routine
CDPMCD		
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGUS	External routine
	CDUCOC	Well-defined module
CDPSEL		
	CDGENWC	External routine
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
	CDIC	External routine
CDQPS		
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
	GENFIL	External routine
	OPNFIL	External routine
	CLSFIL	External routine
	CDCWF	External routine
	CDMSG2	External routine
	CDRFT	External routine
	CDPRM	External routine
	CDRDF	External routine
	CDGDF	External routine
	CDGNV	External routine
	CDCMPRM	External routine
	CDGTV	External routine

DOCGROUP PS41254 Main Program Parts List

Main Pgm Name	Module Name	Module Type
	CDMSG	External routine
	CDPOOL	External routine
	CDCI	External routine
	CDPSEL	External routine
	CDPIN	External routine
	CDPDEL	External routine
	CDPMOD	External routine
	CDGENRT	External routine
	CDCREFO	External routine
CDUCOC		
	CDGENWC	External routine
	CDMACR	External routine
	OUTFIL	External routine
	ERRPRO	External routine
	CDGETOF	External routine
	CDGUS	External routine
	CDGDS	External routine
	CDIC	External routine
	CDRPCIF	External routine

3.10.4 Module Documentation

The following documentation describes information which is specific to each individual module in the documentation group being documented in this specification. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.
SUBDIRECTORY:	Sub-directory of that subsystem in which this file resides.
DOCUMENTATION GROUP:	Name of documentation group of which this source file is a member.
DESCRIPTION:	A description of the module as otained from the source code.
ARGUMENTS:	The arguments with which this routine is called if it is a Subroutine or a Function.
INCLUDE FILES:	A list of all the files that are included into this module as well as their purposes.
ROUTINES CALLED:	Subroutines or Functions, either documented or external, called by this module, if any.

CALLED DIRECTLY BY: The documented routines which call this module, if any.

USED IN MAIN PROGRAM(S): The documented Main Programs which contain this module in their parts list according to the list in section 3.10.3.

The Module Documentation is arranged alphabetically according to Module Name.

DOCGROUP PS41254 Module Documentation

NAME: CDGDS
PURPOSE: THIS PROGRAM GENERATES SEQUEL CODE.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDGDS
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THIS PROGRAM IS CALLED BY OTHER PROGRAMS
AND IT GENERATES A DECLARE STATEMENT, IN SEQUEL CODE.

MODIFIED 9/88 - RELEASE 2.5
GENERATED CODE IN COBOL, C, AND FORTRAN.

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
IS-ACTION-LIST	RECRD
DB-USER-ID	DSPLY[X(30)]
SUBTRANS-BOOLEAN-LIST	RECRD
IS-QUALIFY-LIST	RECRD
CHAR-NULL	DSPLY[X(30)]
NUMERIC-NULL	DSPLY[X(30)]
RPS-DBMS	DSPLY[X(30)]
EVAL-INTERN	DSPLY[X(3)]
RPS-SUBTRANS	DSPLY[9(3)]
MY-HOST	DSPLY[X(3)]
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
ISQUAL
SUBBOOL
FORVAR
ERRPRO

ROUTINES CALLED:

CDGENWC
CDMACR
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDGENIF
PURPOSE: GENERATE AN IF STMT FOR USER QUALIFICATIONS EVAL
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDGENIF
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THIS ROUTINE WILL GENERATE A COBOL IF STATEMENT
THAT WILL EVALUATE USER QUALIFICATIONS CONTAINED
IN A NDML WHERE CLAUSE AT THE CONCEPTUAL LEVEL
IN THE CS/ES TRANSFER.

-

ARGUMENTS:

BOOLEAN-LIST	RECRD
CS-QUALIFY-LIST	RECRD
CS-ACTION-LIST	RECRD
IS-QUALIFY-LIST	RECRD
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
FCB-P	DSPLY[S9(9)]
FCB-W	DSPLY[S9(9)]
TARGET-HOST	DSPLY[XXX]
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
BOOLST
CSQUAL
CSAL
ISQUAL
FORVAR
ERRPRO

ROUTINES CALLED:

CDQPOP
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDGENWC
PURPOSE: THIS PROGRAMS GENERATES THE WHERE CLAUSE.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDGENWC
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THIS PROGRAM IS CALLED BY DIFFERENT PROGRAMS TO GENERATE THE WHERE CLAUSE IN THE SEQUEL STATEMENT.

MODIFIED 9/88 - RELEASE 2.5
GENERATE CODE IN COBOL, C, AND FORTRAN.
8/89 CODE ADDED TO SUPPORT INGRES5 AND INGRES6 DBMS WHERE ALL SELECTED AND QUALIFY VARIABLES IN 'C' MUST BE NULL TERMINATED

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
SUBTRANS-BOOLEAN-LIST	RECRD
IS-QUALIFY-LIST	RECRD
DB-USER-ID	DSPLY[X(30)]
CHAR-NULL	DSPLY[X(30)]
NUMERIC-NULL	DSPLY[X(30)]
RPS-SUBTRANS	DSPLY[9(3)]
RPS-DBMS	DSPLY[X(30)]
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
ISQUAL
SUBBOOL
FORVAR
ERRPRO

ROUTINES CALLED:

CDGETOF
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDGUS
PURPOSE: THIS PROGRAM GENERATES SEQUEL CODE.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDGUS
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THIS PROGRAM IS CALLED BY OTHER PROGRAMS,
AND IT GENERATES THE UPDATE STATEMENT IN SEQUEL.

MODIFIED 9/88 - RELEASE 2.5
GENERATE CODE IN COBOL, C, OR FORTRAN.

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
NUMERIC-NULL	DSPLY[X(30)]
CHAR-NULL	DSPLY[X(30)]
DB-USER-ID	DSPLY[X(30)]
IS-ACTION-LIST	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
SUBTRANS-BOOLEAN-LIST	RECRD
IS-QUALIFY-LIST	RECRD
EVAL-INTERN	DSPLY[X(3)]
RPS-DBMS	DSPLY[X(30)]
RPS-SUBTRANS	DSPLY[9(3)]
MY-HOST	DSPLY[X(3)]
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
ISQUAL
CMAT
SUBBOOL
FORVAR
ERRPRO

ROUTINES CALLED:

CDGENWC
CDMACR
CDGETOF
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDPDEL
PURPOSE: THIS PROGRAM PROCESSES THE DELETE STATEMENT.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDPDEL
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- IF PROCESSING A DELETE(IS-ACTION EQUALS D), THIS PROGRAM IS CALLED BY CDQPS TO GENERATE THE PROPER CODE.

MODIFICATIONS:
9/88 - RELEASE 2.5: GENERATE CODE IN C, COBOL, AND FORTRAN

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
FCB2-W	DSPLY[S9(9)]
MY-HOST	DSPLY[X(3)]
IS-ACTION-LIST	RECRD
IS-QUALIFY-LIST	RECRD
CHAR-NULL	DSPLY[X(30)]
NUMERIC-NULL	DSPLY[X(30)]
RPS-SUBTRANS	DSPLY[9(3)]
DB-USER-ID	DSPLY[X(30)]
SUBTRANS-BOOLEAN-LIST	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
RPS-DBMS	DSPLY[X(30)]
CS-QUALIFY-LIST	RECRD
CS-ACTION-LIST	RECRD
BOOLEAN-LIST	RECRD
RFT	RECRD
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
ISQUAL
SUBBOOL
CMAT
CSQUAL
CSAL
BOOLST
RFTABLE
FORVAR
ERRPRO

ROUTINES CALLED:

CDGUS
CDGDS
CDUCOC
CDMACR
CDGETOF
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDPIN
PURPOSE: THIS PROGRAM PROCESSES THE INSERT STATEMENT.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDPIN
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- IF PROCESSING AN INSERT (IS-ACTION EQUALS I), THIS PROGRAM IS CALLED BY CDQPS TO GENERATE THE PROPER CODE.

MODIFIED 9/88 - RELEASE 2.5
GENERATE CODE IN COBOL, C, OR FORTRAN.
SPECIFICATION SECTION - 22 22.11
-

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
IS-ACTION-LIST	RECRD
DB-USER-ID	DSPLY[X(30)]
COMPLEX-MAPPING-ALG-TABLE	RECRD
RPS-DBMS	DSPLY[X(30)]
RPS-SUBTRANS	DSPLY[9(3)]
MY-HOST	DSPLY[X(3)]
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
CMAT
FORVAR
ERRPRO

ROUTINES CALLED:

CDGETOF
OUTFIL
CDMACR
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDPMOD
PURPOSE: PROCESS THE MODIFY COMMAND.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDPMOD
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- IF PROCESSING A MODIFY(IS-ACTION EQUALS M), THIS PROGRAM IS CALLED BY CDQPS TO GENERATE THE PROPER CODE.

MODIFIED 9/88 - RELEASE 2.5
GENERATE CODE IN COBOL, C, AND FORTRAN.

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
FCB2-W	DSPLY[S9(9)]
MY-HOST	DSPLY[X(3)]
IS-ACTION-LIST	RECRD
IS-QUALIFY-LIST	RECRD
CHAR-NULL	DSPLY[X(30)]
NUMERIC-NULL	DSPLY[X(30)]
RPS-SUBTRANS	DSPLY[9(3)]
SUBTRANS-BOOLEAN-LIST	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
RPS-DBMS	DSPLY[X(30)]
CS-QUALIFY-LIST	RECRD
DB-USER-ID	DSPLY[X(30)]
CS-ACTION-LIST	RECRD
BOOLEAN-LIST	RECRD
RFT	RECRD
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
ISQUAL
SUBBOOL
CMAT
CSQUAL
CSAL
BOOLST
RFTABLE
FORVAR
ERRPRO

ROUTINES CALLED:

CDGUS
CDUCOC
CDMACR
OUTFIL
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDPSEL
PURPOSE: THIS PROGRAM PROCESSES THE SELECT STATEMENT.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDPSEL
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- IF PROCESSING A SELECT, TYPE 1 REFERENTIAL INTEGRITY TEST, TYPE 2 REFERENTIAL INTEGRITY TEST, KEY UNIQUENESS TEST OR QUERY COMBINATION (IS-ACTION EQUALS S OR 1 OR 2 OR K OR Q), THIS PROGRAM IS CALLED BY CDQPS TO GENERATE THE PROPER CODE.

MODIFIED 9/88 - RELEASE 2.5
GENERATE CODE IN COBOL, C, AND FORTRAN.
Modified 8/89 to allow for a string-expansion-flag to be passed to cdic to see if when source language is 'c' and dbms is ingres5 or ingres6 for all actions except insert and modify
that a null terminator is put on all strings.
PECIFICATION SECTION 21-21.10

ARGUMENTS:

FCB-W	
FCB2-W	
MY-HOST	
MODIFY-SUB-NAME	
INSERT-SUB-NAME	
IS-QUALIFY-LIST	RECRD
IS-ACTION-LIST	RECRD
NUMERIC-NULL	
CHAR-NULL	
RPS-SUBTRANS	
DB-USER-ID	
SUBTRANS-BOOLEAN-LIST	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
RPS-DBMS	
CS-QUALIFY-LIST	RECRD
RFT	
SOURCE-LANGUAGE	
FORTRAN-VARIABLE-TABLE	
RET-STATUS	

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
ISAL
ISQUAL
SUBBOOL
CMAT
CSQUAL
RFTABLE
FORVAR
ERRPRO

ROUTINES CALLED:

CDGENWC
CDIC
CDGETOF
OUTFIL
CDMACR
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDQPS
PURPOSE: FUNCTION PRE9.2 GENERATE SQL REQUEST PROCESSOR
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDQPS
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THE PRE9 SQL REQUEST PROCESSOR WILL GENERATE THE COBOL CODE REQUIRED TO EXECUTE NDML SUBTRANSACTIONS AGAINST A RELATIONAL DATABASE. CURRENTLY ORACLE AND DB2 ARE SUPPORTED. THE GENERATED PROGRAM WILL USE ORACLE AS A RELATIONAL DATABASE MANAGEMENT SYSTEM TO CONTROL ALL THE TRANSACTIONS AGAINST THE DATABASE. THE PROGRAM WILL SUPPORT BOTH UPDATE AND RETRIEVAL REQUESTS AGAINST THE DATABASE. THE RESULTS OF ALL RETRIEVAL OPERATIONS WILL BE REFORMATTED INTO A SEQUENTIAL FILE AND RETURNED TO THE REQUESTING APPLICATION. THE DB2 VARCHAR DATATYPE IS NOT SUPPORTED.

MODIFIED 9/88 - RELEASE 2.5
WILL NOW GENERATE CODE IN COBOL, C, OR FORTRAN.
MODIFIED 8/89 TO ALLOW FOR EXTRA CHARACTER IN CHAR-STRINGS TO HOLD
NULL INDICATOR - NEEDED DUE TO INGRES5 AND INGRES6 CRITERIA.
MODIFIED 12/89 BY FWK TO PASS INVALID NDML-STATUS CODES TO CALLING
PROGRAM
PECIFICATION SECTION 1-20.

ARGUMENTS:

RPS-DBMS	DSPLY[X(30)]
MY-HOST	DSPLY[X(3)]
RPS-RPID	DSPLY[X(10)]
RPS-RPID-MODIFY	DSPLY[X(10)]
RPS-RPID-INSDEL	DSPLY[X(10)]
RPS-SUBTRANS	DSPLY[9(3)]
IS-ACTION-LIST	RECRD
IS-QUALIFY-LIST	RECRD
CS-ACTION-LIST	RECRD
CS-QUALIFY-LIST	RECRD
RFT	RECRD
SUBTRANS-BOOLEAN-LIST	RECRD
SUBTRANS-PROCESS-ID-TABLE	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
CHAR-NULL	DSPLY[X(30)]
NUMERIC-NULL	DSPLY[X(30)]
DB-USER-ID	DSPLY[X(30)]
BOOLEAN-LIST	RECRD
SOURCE-LANGUAGE	DSPLY[X(10)]
FILE-NAME	DSPLY[X(80)]
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
FORVAR
ISAL
ISQUAL
RFTABLE
SUBBOOL
SUBPROC
CSAL
CSQUAL
CMAT
BOOLST
ERRPRO

ROUTINES CALLED:

GENFIL
OPNFIL
CLSFIL
CDCWF
CDMSG2
CDRFT
CDPRM
CDRDF
CDGDF
CDGNV
CDCMPRM
CDGTV
CDMSG
CDPOOL
CDCI
CDPSEL
CDPIN
CDPDEL
CDPMOD
CDGENRT
CDCREFO
CDGETOF
OUTFIL
CDMACR
ERRPRO

DOCGROUP PS41254 Module Documentation

NAME: CDUCOC
PURPOSE: THIS PROGRAM GENERATES SEQUEL CODE.
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDUCOC
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

- THIS PROGRAM IS CALLED IF A USING CLAUSE HAS BEEN EMPLOYED, OR THERE IS NO USING CLAUSE AND COMPLEX MAPPING.

UPDATED 9/88 TO GENERATE CODE IN COBOL, C, AND FORTRAN

ARGUMENTS:

FCB-W	DSPLY[S9(9)]
FCB2-W	DSPLY[S9(9)]
MY-HOST	DSPLY[X(3)]
CHAR-NULL	DSPLY[X(30)]
IS-ACTION-LIST	RECRD
RPS-SUBTRANS	DSPLY[9(3)]
DB-USER-ID	DSPLY[X(30)]
IS-QUALIFY-LIST	RECRD
COMPLEX-MAPPING-ALG-TABLE	RECRD
SUBTRANS-BOOLEAN-LIST	RECRD
NUMERIC-NULL	DSPLY[X(30)]
NON-COMPLEX	DSPLY[9]
EVAL-INTERN	DSPLY[XXX]
CS-QUALIFY-LIST	RECRD
CS-ACTION-LIST	RECRD
RPS-DBMS	DSPLY[X(30)]
BOOLEAN-LIST	RECRD
RFT	RECRD
SOURCE-LANGUAGE	DSPLY[X(10)]
FORTRAN-VARIABLE-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
SBSTLST
CSAL
CSQUAL
ISAL
ISQUAL
SUBBOOL
CMAT
BOOLST
RFTABLE
FORVAR
ERRPRO

ROUTINES CALLED:

CDGENWC
CDGUS
CDGDS
CDIC
CDRPCIF
CDMACR
CDGETOF
OUTFIL
ERRPRO

3.10.5 Include File Descriptions

The following list contains a purpose and description of each include file in the documentation group as specified in the source code. The language it is written in is also given.

DOCGROUP PS41254 Include File Description

FILE NAME: BOOLST
PURPOSE: BOOLEAN LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS THE BOOLEAN OPERATORS, PARENTHESES, AND POINTERS TO THE TYPE 2 CONDITIONS FOR AN NDML TRANSACTION

DOCGROUP PS41254 Include File Description

FILE NAME: CHKCDM
PURPOSE: IISS CDMP CHECK STATUS CODES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL STATUS CODES FOR THE *
CDMP MODULES *

DOCGROUP PS41254 Include File Description

FILE NAME: CMAT
PURPOSE: COMPLEX MAPPING ALGORITHM TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS TABLE IDENTIFIES THE SOFTWARE MODULES AND PARAMETERS THAT ARE NEEDED TO PERFORM COMPLEX MAPPINGS BETWEEN CS AND IS FORMATS

DOCGROUP PS41254 Include File Description

FILE NAME: CSAL
PURPOSE: CONCEPTUAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

TABLE TO HOLD CONCEPTUAL DATA ABOUT THE REQUEST

NOTE!!!!!! This table is cloned in both cdpre5 and cdpre4 so any changes made to this structure needs to be made in these cloned versions. Clone version is CSALX for CDPRE4.
NOTE AGAIN Any changes to the CS-ACTION-ENTRY must be reflected in CDP10B in the C code generation section. The length of CS-STRING2 has been hard coded in the

DOCGROUP PS41254 Include File Description

FILE NAME: CSQUAL
PURPOSE: CONCEPTUAL SCHEMA QUALIFY LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS CONCEPTUAL SCHEMA INFORMATION FOR
THE REQUEST'S QUALIFICATION

NOTE!!!!!
This table is cloned as CSQUALX in CDPRE4. If it is changed, CSQUALX must be changed also.

THE CONCEPTUAL SCHEMA QUALIFY LIST

DOCGROUP PS41254 Include File Description

FILE NAME: ERRCDM
PURPOSE: IISS ERROR STATUS CODES FOR CDMP MODULES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL ERROR CODES USED BY CDMP *
MODULES FOR ERROR HANDLING *

DOCGROUP PS41254 Include File Description

FILE NAME: ERRFS
PURPOSE: ERRFS.INC - FILE I/O PRIMITIVES (FILE SERVICES)
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

IISS ERROR CODES

THIS FILE DEFINES THE FS STATUS
CODES IN COBOL FORMAT

DOCGROUP PS41254 Include File Description

FILE NAME: ERRPRO
PURPOSE: PROCESS ERROR INCLUDE FILE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

DOCGROUP PS41254 Include File Description

FILE NAME: FORVAR
PURPOSE: FORTRAN VARIABLE TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS TABLE HOLDS THE ORIGINAL FORTRAN VARIABLE
AND ITS GENERATED SIX-CHARACTER COUNTERPART.

DOCGROUP PS41254 Include File Description

FILE NAME: ISAL
PURPOSE: INTERNAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INTERNAL SCHEMA INFORMATION ABOUT AN
NDML REQUEST

THE INTERNAL SCHEMA ACTION LIST

DOCGROUP PS41254 Include File Description

FILE NAME: ISQUAL
PURPOSE: INTERNAL SCHEMA QUALIFY LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INTERNAL SCHEMA INFORMATION FOR AN

DOCGROUP PS41254 Include File Description

FILE NAME: RFTABLE
PURPOSE: THE RESULT FIELD TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS CONCEPTUAL SCHEMA INFORMATION ABOUT
THE RESULTS OF AN NDML REQUEST

THE RESULT FIELD TABLE

WHEN CHANGING THE STRUCTURE OF THIS TABLE
BE SURE TO CHANGE THE LAYOUT IN THE
LINKAGE SECTION OF THE DRS (CDS01)
WHICH WAS COPIED FROM THIS.

DOCGROUP PS41254 Include File Description

FILE NAME: SBSTLST
PURPOSE: WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

SUBSTITUTION-LIST REPRESENTS THE INPUT TABLE
OF SUBSTITUTION PARAMETERS FOR THE CDMACR
MACRO EXPANSION SUBROUTINE

DOCGROUP PS41254 Include File Description

FILE NAME: SUBBOOL
PURPOSE: SUBTRANS BOOLEAN LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL THE BOOLEAN OPERATORS, PARENTHESES, AND CONDITIONS WHICH CAN BE SATISFIED AT THE INTERNAL SCHEMA LEVEL, FOR EACH SUBTRANSACTION.

DOCGROUP PS41254 Include File Description

FILE NAME: SUBPROC
PURPOSE: SUBTRANSACTION PROCESSES ID TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

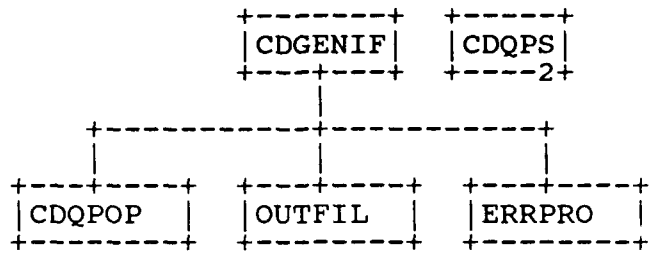
THIS TABLE MUST HAVE THE SAME NUMBER OF OCCURS AS THE RITABLE.INC AND QITABLE.INC SINCE THEY ARE PARALLEL TABLES.

DOCGROUP PS41254 Include File Description

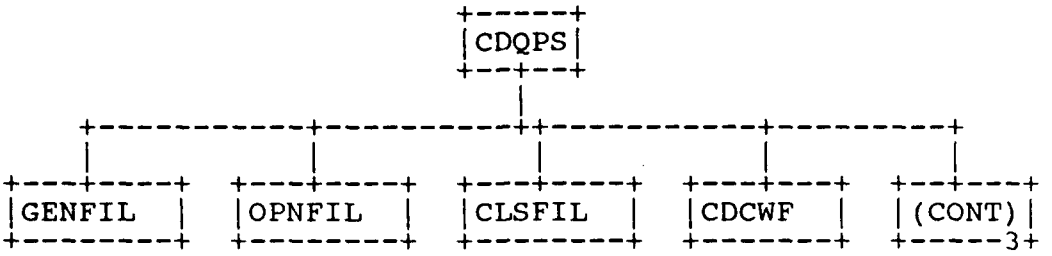
FILE NAME: THRU
PURPOSE: PROCESS ERROR INCLUDE FILE
LANGUAGE: VAX-11 COBOL

3.10.6 Hierarchy Charts

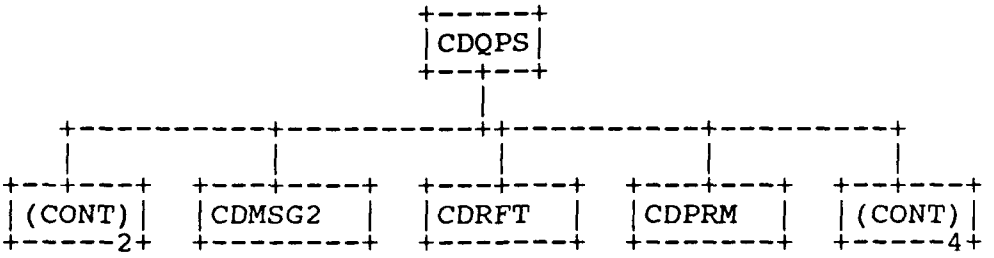
1



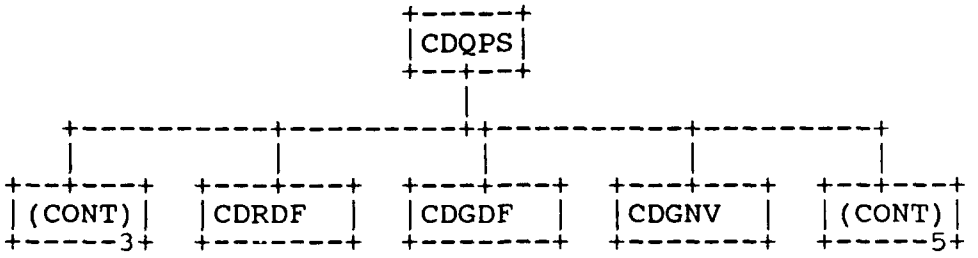
2



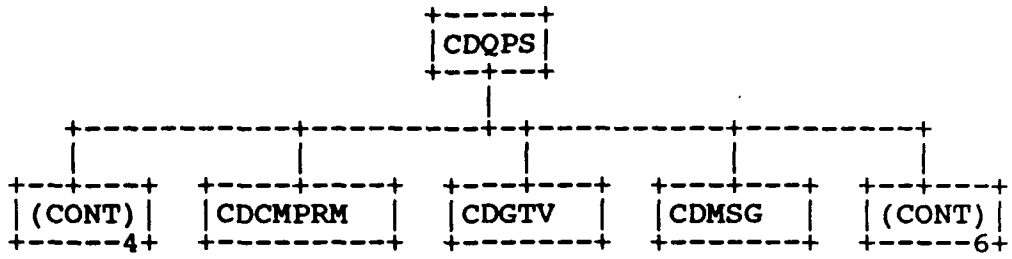
3



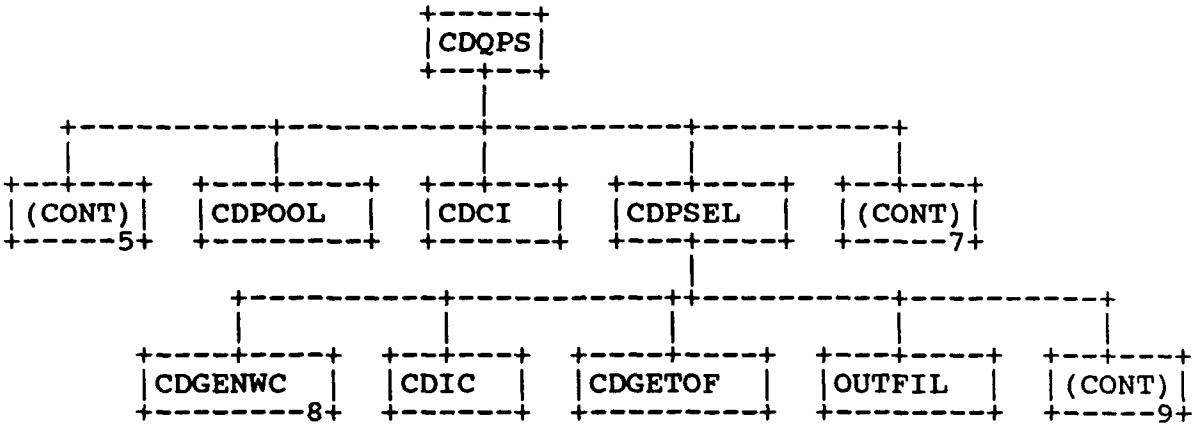
4



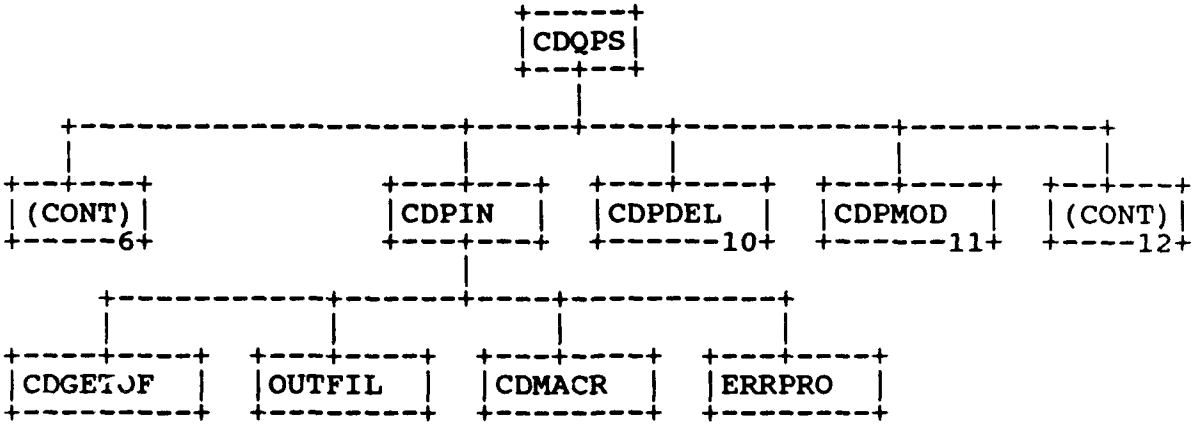
5


CDQPS
(CONT)
4
CDCMPRM
CDGTV
CDMSG
(CONT)
6

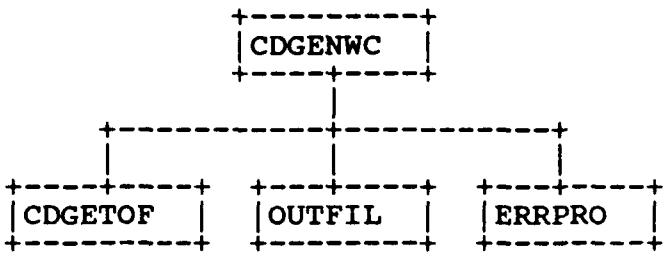
6


CDQPS
(CONT)
5
CDPOOL
CDCI
CDPSEL
(CONT)
7
CDGENWC
8
CDIC
CDGETOF
OUTFIL
(CONT)
9

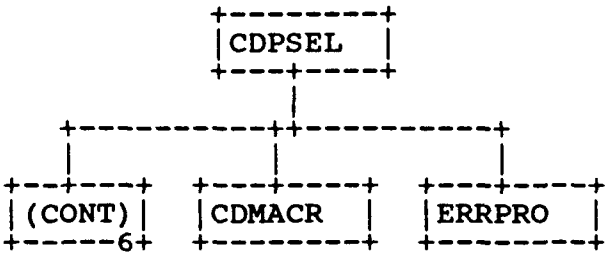
7


CDQPS
(CONT)
6
CDPIN
CDPDEL
10
CDPMOD
11
(CONT)
12
CDGETOF
OUTFIL
CDMACR
ERRPRO

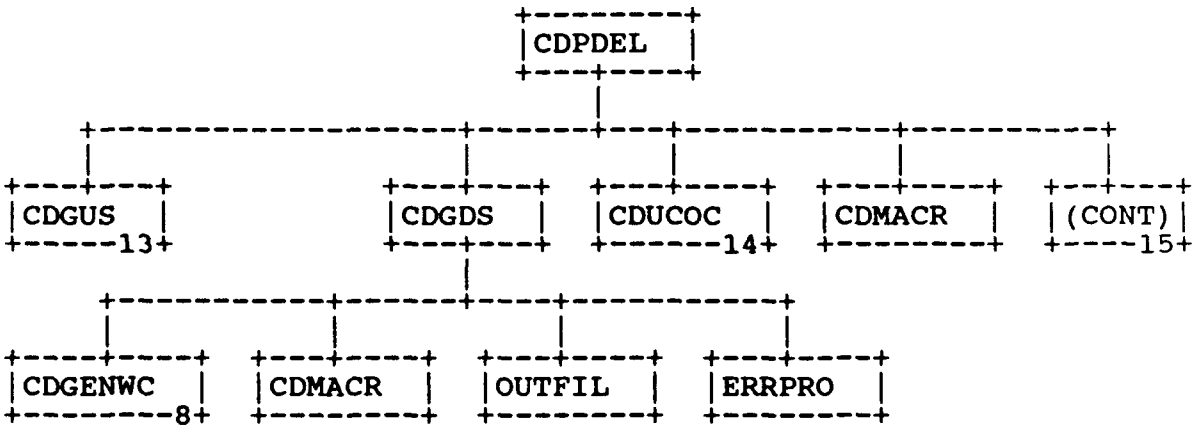
8


CDGENWC
CDGETOF
OUTFIL
ERRPRO

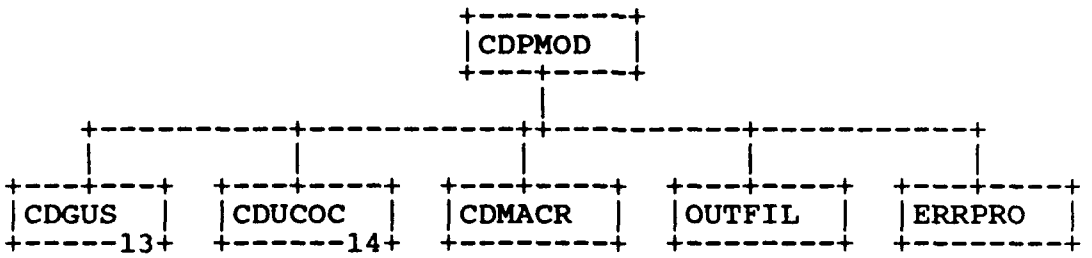
9


CDPSEL
(CONT)
6
CDMACR
ERRPRO

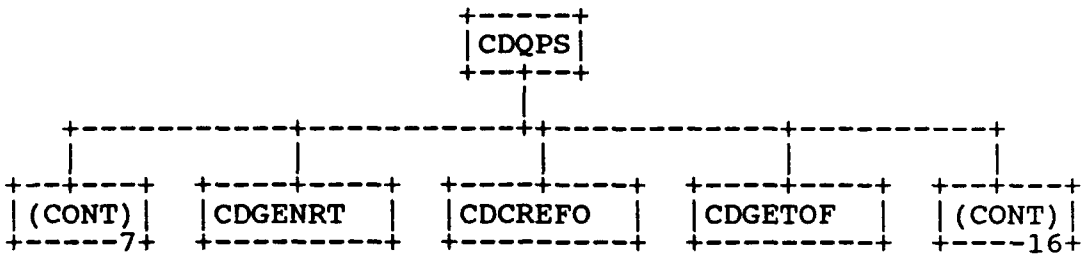
10


CDPDEL
CDGUS
13
CDGDS
CDUCOC
14
CDMACR
(CONT)
15
CDGENWC
8
CDMACR
OUTFIL
ERRPRO

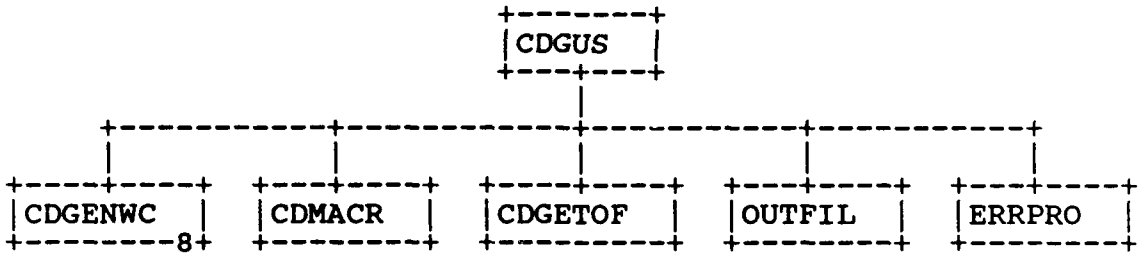
11


CDPMOD
CDGUS
13
CDUCOC
14
CDMACR
OUTFIL
ERRPRO

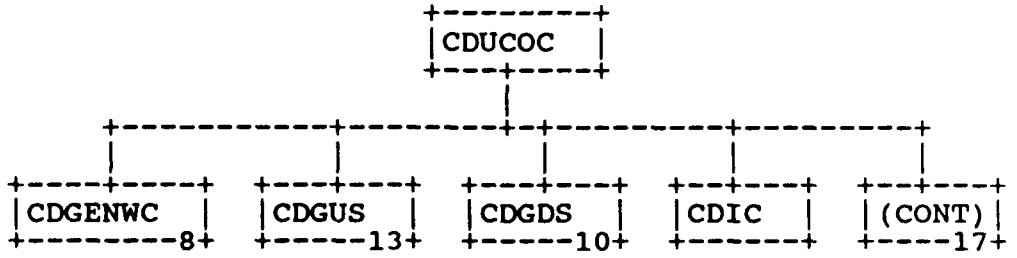
12


CDQPS
(CONT)
7
CDGENRT
CDCREFO
CDGETOF
(CONT)
16

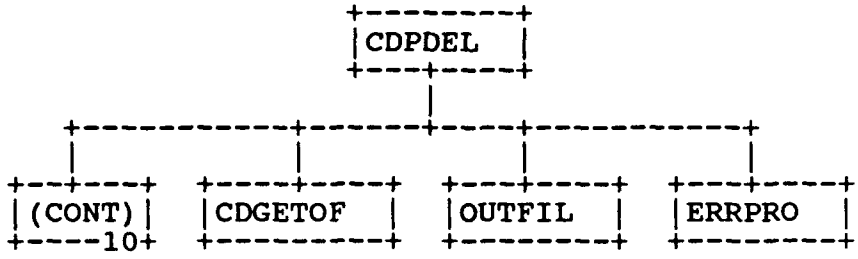
13


CDGUS
CDGENWC
8
CDMACR
CDGETOF
OUTFIL
ERRPRO

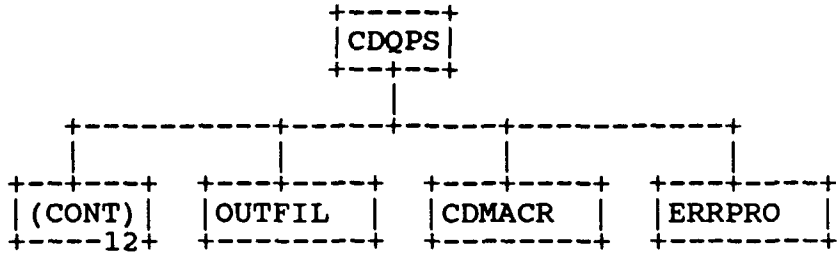
14


CDUCOC
CDGENWC
8
CDGUS
13
CDGDS
10
CDIC
(CONT)
17

15


CDPDEL
(CONT)
10
CDGETOF
OUTFIL
ERRPRO

16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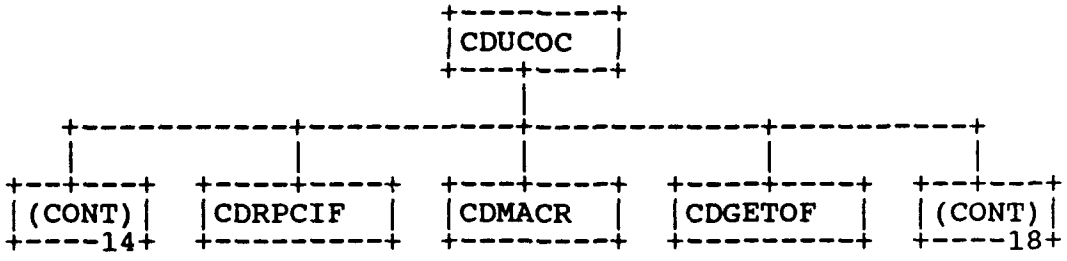
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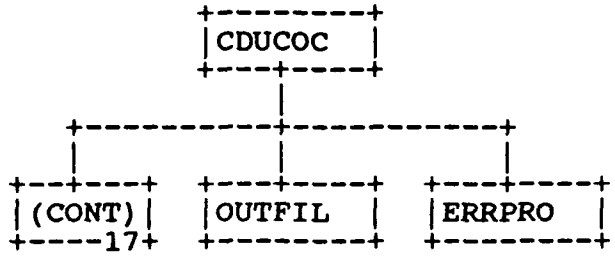
18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CDPIN 7
CDPMOD 11
CDPOOL
CDPRM
CDPSEL 6
CDQPOP
CDQPS.....2
CDRDF
CDRFT
CDRPCIF
CDUCOC 14
CLSFIL
ERRPRO
GENFIL
OPNFIL
OUTFIL

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."

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