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SDL/UPL COMPILER

PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
C	1/11/82	R Shoda	Changes for MARK 11.0 Release 5-1 Deleted the rest of the document.

8 pages

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B1700 SDL/UPL COMPILER

2212 5389

PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
A	4/4/75		ORIGINAL ISSUE
B	4/21/77		CHANGES FOR THE VI.1 RELEASE OF SDL/UPL COMPILER

Page	Change
Gen. Ref.	Underscore replaces dot, where appropriate, as break character.
1-1	Reworded General description.
2-1	Changed section name from GENERAL to COMPILATION PROCEDURE.
5-2	Added CONVERTDOTS, USEDOTS, and UNDERSCORES_IN_FILE_NAMES to CONTROL OPTION WORD BNF.
5-4	Added CONVERTDOTS description to list of Semantics
5-6	Added USEDOTS description to list of Semantics. Added UNDERSCORES_IN_FILE_ NAMES description to list of Semantics.
5-7	Listing Control added to XREF & XMAP.

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GENERAL

This product specification discusses the SDL and UPL Compilers. They are both three-pass compilers which accept source language input and produce executable S-language output. The passes are the pre-pass, the first pass, and the second pass. Another, the third pass, is a binder which is used only in connection with partial compilation.

The SDL and UPL compilers are virtually identical in logic, structure, and operation; consequently, the discussion of the SDL compiler in this product specification applies equally to the UPL compiler. The user must note, however, the following conditions in which the two compilers differ:

1. The table of reserved words for UPL contains a subset of the table of reserved words for SDL.

2. The table of "special" words for UPL contains a subset of the table of special words for SDL.

3. There is a check in UPL to disallow the SDL indexing construct.

RELATED PUBLICATIONS

Name	Number
SDL S-language	P.S. 2201 2389
B1800/B1700 SDL (BNF Version)	P.S. 2212 5405
B1800/B1700 SDL Manual (BNF Version)	5000847

COMPILATION PROCEDURE

SDL compilation can be executed in one of the following three modes:

(A) "Regular" mode of compilation, i.e., the entire source program (with patches) is processed to produce a code file.

(B) "Create-Master" mode of compilation. It is the same as (A) except that pertinent intermediate files are saved in preparation for partial recompilation (C).

(C) "Partial Recompile" mode of compilation. This mode uses the saved intermediate data files from (B) in order to recompile one (or more) lexic level zero procedures and bind the emitted results with previously compiled global and lexic level zero procedures.

The Pre-pass merges patches with a source file, expands macros (DEFINEs), handles file declarations, and writes the results of its analysis (in the form of modified source) to an intermediate file known as the PFILE. The PFILE is then read by the First Pass. The First Pass parses data declarations, forward declarations, switch file declarations, and procedure declarations (including formal parameter declarations). The results are conveyed via a second intermediate file, the IFILE, to the Second Pass. The Second Pass parses executable statements and generates code for all statements. This code is bound into a final code file, if the partial compilation facility has not been invoked. if a Create-Master or Recompile is being performed, then execution passes to the Third Pass, which is not a true pass in that it does not scan (modified) source text, but rather binds intermediate code file information into the final code file.

An SDL program consists of three parts: a declaration section, a procedure section, and an executable section. An SDL procedure is a microcosm of an SDL program: following the procedure head is a declaration section, a procedure section, and an executable section. This organization is reflected in the organization of each of the passes of the SDL compiler.

Each of the three main passes consists of a procedure which handles declarations, a procedure which handles procedure declarations (This procedure, in turn, handles declarations, procedures, and executable statements, using recursion.), and a procedure which handles executable statements. At the beginning of each pass is a call on an initialization procedure; and at the end of each pass is a call on a termination procedure. The Third Pass consists of four parts: A combine phase (if Create-Master) or a merge phase (if Recompile), an address-fixup phase, and a create-final-code-file phase.

CREATE MASTER OR RECOMPILE

If a Create-Master is being performed, then the termination part of each of the three passes and of the bind pass causes tables to be dumped to files. If Recompile is being performed, then the initialization part of each of the three passes and of the bind pass causes tables to be pre-loaded with the information that was dumped during a previous Create-Master. See the SDL Reference Manual (BNF Version), 5000847, for further details on Create-Master/Recompilation.

SDL/UPL SOURCE LANGUAGE

The SDL language is an ALGOL-like language. It is based on the XPL language of McKeeman, Horning, and Wortman. Allowable data types in SDL are bit strings, character strings, and fixed (integer) numbers, as well as single-dimensional arrays of these and structures of mixed data types. There is no GO-TO statement in SDL. Control is handled with IF-THEN and IF-THEN-ELSE statements, CASE statements, procedure invocations and returns, DO and DO-FOREVER statements, and block-exit (UNDO) statements. Procedures in SDL are automatically recursive with up-level addressing. Run-time routines are needed only to handle "paged arrays", which is a dynamic array allocation feature that may be used to augment the MCP's virtual memory capability.

SDL/UPL S-MACHINE

The ALGOL-like structure of SDL dictates a stack-oriented machine as a best fit of the S-machine to the source language. However, the traditional usage of one stack to handle data, data descriptions, and control information imposes unnecessary restrictions on the S-machine structure. Consequently, the different functions which a stack performs were identified, and a stack was assigned to each of these functions, thus removing unnatural relationships imposed upon the stacks by their intermixture.

A B1800/B1700 program consists of code segments scattered in memory, one block of data bounded by a Base Register and a Limit Register, and a contiguous, read-only block (the Run Structure Nucleus) containing program attributes. Also scattered throughout memory, in addition to code segments, are file attribute blocks and segment dictionaries. The area inside Base-Limit is divided into two parts: the static area contains the S-machine stacks and the dynamic area contains paged array page tables and paged array pages.

A complete description of the stacks and their inter-relationships and the S-instructions which operate on or through the stacks is given in the SDL S-Language Product Specifications, P.S. 2201 2389.

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