

DEREMER for Rev 19.0

DATE: December 2, 1981
TO: DEREMER Users
SUBJECT: DEREMER for Rev 19.0

ABSTRACT

This memo describes the changes to DEREMER for Rev. 19.0.

1. New functionality

Described below.

2. User visible bug fixes

The combination of command line options -PL1G and -DEBUG now generates the correct suffix .DEBUG.PL1G, instead of .DEBUG.PL1.

3. Internal bug fixes

None.

4. Outstanding problems

None.

Generated parsers now have appropriate language suffix

A previous rev of DEREMER introduced the flags -PLP, -PL1G, -PL1, and -SPL. These flags now control the suffix of the generated parser. For example, the command line:

```
deremer foo.deremer -plp
```

will create the parser 'foo.plp', instead of 'foo.deremer.parser'.

If no language flag appears on the command line, DEREMER will default to -PLP. If more than one appears, DEREMER will announce an error.

The -DEBUG option will generate a parser name with the component '.debug', for example:

```
deremer foo.deremer -pl1g -debug
```

will create the parser 'foo.debug.plg', instead of 'foo.deremer.debug'.

Other output files change name

Other output files no longer contain the '.DEREMER' component. For example, the DEREMER source file 'foo.deremer' will generate (with appropriate command line options) the following output files:

```
foo.symbol.table
foo.tables
foo.externals
foo.fsa
foo.grammar
```

Note on the 'syntax error' facility

In order to prevent an infinite loop in the error recovery algorithm, you should have a production in your DEREMER source file as follows:

```
<start_symbol> ::= syntax_error end_of_file_;
```

This production ensures that there will always be at least one production pending on the stack which contains the token 'syntax_error'. This particular production means that in the worst case, recovery from a syntax error will read tokens till the end of the input, and then stop.

New clause to control the parsing stack

The '%stack' clause allows you to redefine the length of the state and symbol stacks in the generated parser, and allows the option of making the stacks external rather than internal. The syntax for this clause is:

```
%stack <integer> [external];
```

The integer must be greater than 0, and will be used as the length of both the state and the symbol stacks. The keyword 'external' is optional. If used, then the stacks are declared with storage class 'external static'. The actual declaration looks like this:

```
dcl 1 dp$ stacks external static,
    2 dp$_state_stack(...) bin,
    2 dp$_state_stack_ptr bin,
    2 dp$_symbol_stack(...) ptr,
    2 dp$_symbol_stack_ptr bin;
```

Output files generated in current ufd

DEREMER now generates all output files in your current ufd. Previous versions generated output files in the same ufd as specified for the input file.

EXAMPLE:

```
a <trans6>vrpgtst
so.deremer <trans4>schwartz>rpg>compiler>parse_input_stmt.deremer
```

This used to leave the generated files in <trans4>schwartz>rpg>compiler. Now, it leaves the generated files in <trans6>vrpgtst.

New internal subroutine - dp\$ recover

The internal mechanism for recovering from syntax errors has now been encapsulated into a callable subroutine named 'dp\$ recover'. This subroutine may be called from inside %action clauses.

This routine will not normally return - it will do a non-local goto to the label 'dp\$ next', in the main parser loop. The exception is if the entire rest of the input is swallowed without having recovered. In this case, dp\$ recover will return.

Note - This is only available if you have specified 'syntax_error' in your productions.

Only -PLP now gets options(shortcall)

Internal parser routines will only be given the attribute 'options(shortcall)' when the -PLP flag is present. This is to avoid warnings on this clause now given by SPL.

PIELIB is a 'qualified' library available for PRIME internal use in product building.

At 19.0 PIELIB is used in creating the DBMS preprocessors CDML and FDML.

05/21/81 NEW FEATURES: 1) The number of arguments in a procedure call has been
19.0 increased to 60. 2) a -SIL option has been added to suppress sev 0
error messages.

02/25/81 BUGS FIXED: Initialization of unaligned character variables.
18.2

11/06/80 BUGS FIXED: 1) DO UNTIL register tracking. 2) A = -A*10
18.1 3) Use of XB

05/16/80 BUGS FIXED: 1) Comparison of a left justified BIT with a longer
18.0 bit constant. 2) FB15 = -FB31 works again.
NEW FEATURES: The number of arguments in a procedure call has been
increased to 50.

04/28/80 BUGS FIXED: 1) CSTORE(P->FB31,P->FB31,P->FB31 + 1) now loads the
17.4.1 old value. 2) MOD does not cause multiple indirects.

04/24/80 BUGS FIXED: 1) CSTORE(FB31, X, Y) now returns the correct value.
17.04 2) INHIBIT and ENABLE now generate INHM and ENBM.
3) FB31 = - FB15 now works. 4) MOD will now JMP around ADD, not SKP.
5) MOD(FB31, FB15) will now work. 6) DIVIDE(FB31,FB15,15) will work.
7) CSTORE now evaluates its arguments in the correct order.
8) BIT assignments from unaligned BITS to aligned BITS now work.
8) Using -32768 ('8000'b4) in a WHEN expression is now allowed.
NEW FEATURES: PLP now supports the interim error reporting protocol.

01/04/80 BUGS FIXED: 1) STATIC INIT of BIT values in a structure were being
06.08 ignored. 2) the third argument to CSTORE may now be an expression.
3) external shortcalled functions will now work in expressions.
4) the MOD function returned incorrect values with BIN(31) args.
5) one may now use a simple GOTO in an OTHERWISE clause.

10/25/79 ***** INCOMPATIBLE VERSION *****
06.07 BUGS FIXED: 1) CSTORE causing a STAC with indexing 2) X-register
tracking. 3) ENTRY statements causing problems when loading.
NEW FEATURES: 1) The token buffer is now 10,000 tokens for the
DEREFER hackers. 2) The sense of CSTORE has been reversed from the
documentation: a return value of '1'b indicates success.
3) There is a new option on the procedure statement called SHORTSTACK
It causes the size of the minimum stack to be reduced to 10 words.
NOTE: This restricts the PLP operations allowed within the PROC.

03/22/79 BUGS FIXED: 1) char array size allocation 2) char array constant index
06.06 calculation 3) TRIM(CHAR_ARRAY(I),'1'b) 4) Alternate entry DBG groups
5)

03/12/79 BUGS FIXED: 1) Entry variables. 2) Illegal segno errors within the
06.05 the compiler. 3) DO I= 1 TO 10, 20 TO 30; not incrementing I.
4) Register tracking over optimized char moves. 5) ARRAY(FB31 - FB15)

ABSTRACT

This document describes the new Systems Programming Language SPL for release at PRIMOS rev 19.0.

For rev 19.0, SPL is a derivative of PL1G. SPL follows all of the language constructs of PL1-subset G with the following exceptions:

1 PL1 I/O

Because SPL is a systems programming language, PL1G and full PL1 I/O statements, I/O on conditions, and declaration attributes are NOT supported, and any attempt to use them will result in compile errors. This list includes the statements: CLOSE, DELETE, FORMAT, GET, OPEN, PUT, READ, REWRITE, and WRITE. The following I/O on conditions are illegal unless redefined by the user: ENDFILE, ENDPAGE, KEY, UNDEFINEDFILE, and UNDF. The following declaration attributes are illegal: BACKWARDS, BUFFERED, BUF, DIRECT, ENVIRONMENT, FILE, KEYED, LINE SIZE, OUTPUT, PAGE SIZE, PRINT, RECORD, SEQUENTIAL, SEQL, STREAM, TITLE, UNBUFFERED, and UNBUF. Also, the following options are illegal: DATA, EDIT, FILE, FROM, INTO, KEY, KEYFROM, KEYTO, LINE, LIST, PAGE, SKIP, and STRING.

2 Select Statements

SPL Supports the select statement. The format of a Select block is:

```
Select;
  When (<if expression>) <statement>;
  .
  .
  .
  [Otherwise <statement>;]
End;
```

Or a Select block looks like:

```
Select (<value>);
  When (<value list>) <statement>;
  .
  .
  .
  [Otherwise <statement>;]
End;
```

Where <statement> is defined to be any simple statement not including DECLARE, END, ENTRY, or PROCEDURE. <statement> may include a DO block or a BEGIN block of statements, or be an IF statement. <if expression> is an expression that evaluates to a BIT(1) result as in an IF statement. <value> is any expression and <value list> is either <value> or a list of <value>s separated by commas. A select block is traversed by executing each WHEN clause until a TRUE condition is found. A TRUE condition happens when the <if expression> part evaluates to '1'B or (a <value> in the When clause) = (<value> in the Select statement). If a <value> in the When clause is not of the same data type as the <value> in the Select statement, it is converted to the data type of the latter before the comparison is done. After

either a When clause or the Otherwise clause is executed, control passes to the first executable statement following the Select Block. If none of the When clauses are satisfied and an Otherwise clause exists, then the otherwise clause is executed, else ERROR is signalled. NOTE: PLP does not signal an error and SPL does for a missing otherwise clause. Only one clause of a Select block will be executed per invocation.

3 UNTIL

SPL supports the Until option of a DO statement. Until is the opposite of the While option. It has the form UNTIL(<if expression>), Where <if expression> is an expression that evaluates to a BIT(1) result as in an IF statement. The result of an Until option is to execute the Do group, and then test the Until part to see if it is false. The Do group will continue to be executed WHILE the until part is false and UNTIL it is true. Until differs from the While option in that the Do group is only executed when the While is true. When the While part becomes false, execution continues after the Do group. While and Until can be used together to form a double exit from the Do group as in: DO Until(exp1) While(exp2). In this case the Do is executed when While is true. After the first execution, we check the Until part. If it is false, we repeat the While test and continue. If it is true, we leave the Do group and continue. Until can appear anywhere in a Do statement that While can appear.

4 LEAVE

Leave is a statement for leaving loops without using a GOTO statement. It is intended as a more structured approach for leaving a loop, since when executed, execution continues with the first statement after the corresponding Do group containing the Leave. Leave has the following form: LEAVE [<label>]; where <label> is optional and if present is the label of the Do group that we want to leave. For example:

acts like:

```
DO WHILE('1'B);
  IF ready to leave
    THEN LEAVE;
    ELSE continue;
END;
```

```
DO WHILE('1'B);
  IF ready to leave
    THEN GO TO EXIT;
    ELSE continue;
END;
EXIT;;
```

and

acts like:

```
LOOP1: DO WHILE('1'B);
  IF loop 2
    THEN DO UNTIL(done);
    IF end of list
      THEN LEAVE LOOP1;
      ELSE continue;
    END;
  ELSE continue;
```

```
DO WHILE('1'B);
  IF loop 2
    THEN DO UNTIL(done);
    IF end of list
      THEN GOTO EXIT1;
      ELSE continue;
    END /* Do Until */;
  ELSE continue;
```

```
END LOOP1;
```

```
END /* Do While */;
EXIT1;;
```

NOTE: If the LEAVE statement is used inside of a non-iterative usage of the DO statement, that it will still leave THAT DO, not an iterative DO that might contain the non-iterative DO. All DO's are created equal!

5 LIKE

Like is an option of a structure declaration in a DECLARE statement. It has the form: LIKE <structure reference>, where <structure reference> is the name of a structure declared earlier in the program and known to the block containing the LIKE declaration; it need not be a level-1 structure. Like has the effect as if the all of the members of <structure reference> had been copied directly following the variable with the like attribute, except that the level numbers are adjusted upward or downward as necessary to be compatible with there position in the new structure. For example:

```
Declare 1 structure 1,
      2 length Fixed;
      2 string Char(80);
Declare 1 structure 2,
      2 char_var_1 like structure_1,
      2 size Fixed,
      2 char_var_2 like structure_1;
```

is the same as:

```
Declare 1 structure 1,
      2 length Fixed;
      2 string Char(80);
Declare 1 structure 2,
      2 char_var_1,
      3 length Fixed,
      3 string Char(80),
      2 size Fixed,
      2 char_var_2,
      3 length Fixed,
      3 string Char(80);
```

6 OPTIONS(VARIABLE)

SPL contains a declaration attribute for specifying that an entry point can be called without checking its arguments for the correct type of parameters. The attribute is called OPTIONS(VARIABLE), and is used as in: DECLARE VARY ENTRY OPTIONS(VARIABLE);. This means that VARY can be called from the user's program with different arguments without causing errors, for example:

```
CALL VARY(12345E3);  
CALL VARY('This ia a string', 23, '1'B);  
CALL VARY(VARY);
```

would then all be valid uses of the entrypoint VARY; The first will call VARY with one argument, the floating point number $12345 * 10^{**3}$. The second will call VARY with three arguments, a Character nonvarying string, a Fixed Decimal constant 23, and a Bit string of '1'. The third will call VARY with the entry VARY as its one argument. NOTE: OPTIONS(VARIABLE) is intended for use with non-builtin subroutine that will except a variable number of arguments in its calling sequence like the PRIMOS entry point IOA\$, in which the number of arguments and the format of them after the second is wholly dependent upon the format control items appearing in the first argument. It will however work in the global case as well. NOTE: beware of Machine restrictions apply to the case of NO arguments versus ANY arguments as the called subroutine may not execute properly under such circumstances.

7 Programmer Named Conditions

SPL allows the programmer to Create his own Condition names for use in an SPL program. The manners in which to do this is as follows: DECLARE <name> CONDITION; Then when the programmer wishes to reference that condition he uses the CONDITION builtin function as in: ON CONDITION(<name>) handle condition;; or as in: SIGNAL CONDITION(<name>);. These conditions are just as real as the PL1 and PRIMOS conditions are, and act in the same fashion.

8 -COPY, -QUICK, -MAP

SPL has three command line options to the compiler that may be of use to the programmer: -COPY/-NO COPY, -QUICK/-NO QUICK, and -MAP/-NO MAP. SPL uses -COPY, -NO QUICK, and -MAP as its defaults.

8.1 COPY/NO_COPY

The COPY/NO_COPY flag allows the programmer to suppress the copying of constants into temporary variables for subroutine calls. This feature must be coded properly in the called subroutine, for if it changes the value of one of its parameters which was passed as a constant, then the value of that constant in the calling program will be changed, causing subsequent use of that constant to use the wrong value. NO COPY suppresses the copying of constants, COPY copies constants before calling subroutines. Use of the NO COPY option can save on the amount of executable code generated by the SPL compiler.

8.2 QUICK/NO_QUICK

The QUICK/NO_QUICK flag allows SPL to call internal subroutines to the compiled program via a JSX instruction wherever possible. Internal subroutines that are recursive or are called from two different subroutines who are not a part of the same parents, cannot be Quick called and must be invoked via a PCL. If NO_QUICK is specified, or the DEBUG option is specified, all internal subroutines are invoked via the PCL instruction. Local variables for subroutines invoked via the Quick mechanism are stored with the local variables of the first non-quick parent of the called subroutine. The -QUICK command line option is the SPL replacement for the PLP procedure statement option: OPTIONS(SHORTCALL). The PLP option can be specified PER PROCEDURE. The SPL option encompasses all of the internal procedures of a compilation module. NOTE: the external procedures of a compilation module can NOT be Quick-called and must be PCLed.

8.3 MAP/-NO_MAP

The MAP option controls whether or not an identifier cross-reference map will appear in the listing file after the program listing. When a listing is specified, the MAP is the default. Use of -NO_MAP will compress the listing file to contain only the program listing. -XREF will force both the LISTING and MAP options on.

9 PLP features not supported

At rev 19.0, SPL does not support the following PLP BIFs: STACKPTR, LINKPTR, STACKBASE, ADDR_EL, BASE_REL, BASEPTR, PTR, SEGNO, REL, RING, CSTORE nor does it support the PV REGFILE. SPL does not support the following procedure options: GATE, STACKROOT, or NOCOPY. These will all be implemented at a later rev. SPL does not support the use of the SHORTCALL option at 19.0. The functionality can be gotten through the use of the -QUICK command line option on the SPL command line. This feature can be overridden by the use of the option NONQUICK. Under the -QUICK flag, SPL will call via JSX only those routines which can be shortcalled, all others will be called via PCL. Use OPTIONS(NONQUICK) to ensure that all calls to the marked procedure are made through PCLs.

10 Bugs Fixed

The following bugs/problems were fixed for SPL rev 19.0.M2.

1. Use of '1'B or '0'B as constants in logical expressions of IF statements will no longer cause the OPTIMIZER to fail with ACCESS_VIOLATION\$.
2. -Quick will no longer cause a random symbol table entry to be trashed causing other random errors to be generated.

3. Use of BIFs in SELECT statements will now work correctly instead of trying to do illegal conversions.
4. ENTRY OPTIONS(VARIABLE) will now work when the argument is a function call.
5. SPL will now tell you the correct number of errors if it has trouble with

11 Other changes to 19.0.M2

Here are the other changes to SPL for 19.0.M2

1. SPL will now generate 32 character external names. SEG will truncate these names to 8 characters for its own usage. BIND will accept all 32 characters.
2. -FIND_NODE command line option is now obsolete and unrecognized. The code generator has a better FIND_NODE routine that no longer requires the use of the command line option.
3. OPTIONS(CONSTANT) has been added as a means of placing constant static data into the PROCEDURE frame instead of the LINKAGE frame of a program. This will allow the constants to be shared among many users if the program is shared. NOTE: Variables or arrays using this option should NOT be modified during the course of program execution. Attempts to do so will cause runtime errors from both shared programs and EPFs.
4. -32I command line option has been removed. SPL does not support generation of 32I mode code.
5. SPL will not allocate space for DATA ITEMS that are not used by the current program module. This includes the suppression of IPs to externals not referenced. It will however always generate COMMON BLOCK DEFINITION groups for all EXTERNAL STATIC defined in the program. The use of the -DEBUG command line option will force allocation of all declared names and IPs. Any external that is initialized by this program can be considered to be referenced.