

{ REQUIRE file for I/O Statement Block (ISB)
 { File: OTSISB.SDL Edit: SBL2005

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{ Author: T.Hastings
{ [Previous edit history removed. SBL 19-Aug-1982]
{ ***** - VMS Version V2.0
{ 1-057 - Force length calculation of block after allocation. HJ 22-Aug-1980
{ 1-058 - Add statement types for FORTRAN NAMELIST. Fix some typos in
{ comments. SBL 27-August-1980
{ 1-059 - Add flags ISBSV_SNGL_ELEM and ISBSV_NEED_INIT to support
{ Fortran single-element lists. JAW T1-May-1981
{ 1-060 - Restore names for input format flags, and add output format
{ flag ISBSV_ERR_OFLO. JAW 13-Aug-1981
{ 1-061 - Remove date from Edit: line for uniformity. JAW 15-Aug-1981
{ ***** - VMS Version V3.0
{ 1-062 - Add new statement types for Basic V2. PLL 1-Jun-1982
{ 2-001 - Convert to SDL. SBL 19-Aug-1982
{ 2-002 - Don't depend on names for unions/structures. SBL 29-Sep-1982
{ 2-003 - Change aggregate name to ISB for better fieldset name. SBL 26-Oct-1982
{ 2-004 - Add A_PREVIOUS_LUB. SBL 2-Dec-1982
{ 2-005 - Add A_SAVE_PTR and A_SAVE_END, and statement types for list-directed
{ internal files. SBL 21-Apr-1983
{ --
    
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{+
{ The ISB contains OTS OWN data associated with a particular
{ logical unit which is needed only for the set of calls which
{ implement a single I/O statement. The ISB locations are grouped by
{ level of abstraction:
{ 1. User Program Interface (UPI)
{ 2. User Data Formatter (UDF)
{ 3. Record Formatter and processor (REC)
{
    
```

```
{ In principle, ISB could be dynamically allocated at the beginning of every
{ READ, WRITE, DECODE, and ENCODE and deallocated at the end
{ (in FOR$IO END). However, for runtime efficiency it is not.
{ OWN data which is needed to be retained for more than
{ one I/O Statement is allocated in the Logical Unit Block (LUB).
{ Data which is needed during a single call is always LOCAL.
```

```
{
{
{ ISB definition (-11 OTS equivalents are indicated in parens)
{ All are unsigned, except ISB$W_FMT_REP.
{ Symbols have form: ISB$t_symbol where t is A,B,W,L,T, or V.
{-
```

```
MODULE $ISBDEF:
AGGREGATE ISB STRUCTURE PREFIX ISB$ ORIGIN end_of_lub;
```

```
{+
{ I/O statement type codes
{ Used to index into routine dispatch tables to call
{ the appropriate User-program data formatter level
{ of abstraction (UDF = level 2) and Record processing level
{ of abstraction (REC = level 3).
{ Codes assigned so that a TRUE value means WRITE and a
{ false value means READ. The distinction between
{ formatted and object-time formatted disappears at level 1
{ and so does not have a separate statement type code.
{-
```

```
{ the 0 entry is no longer used because it reports an error. It is
{ designed to catch a recursive CLOSE among other things.
```

CONSTANT ST_TY_WSF	EQUALS 1:	{ FORTRAN WRITE sequential formatted
CONSTANT FORSTTYLO	EQUALS 1:	{ Lowest FORTRAN statement type
CONSTANT ST_TY_RSF	EQUALS 2:	{ FORTRAN READ sequential formatted
CONSTANT ST_TY_WSU	EQUALS 3:	{ FORTRAN WRITE sequential unformatted
CONSTANT ST_TY_RSU	EQUALS 4:	{ FORTRAN READ sequential unformatted
CONSTANT ST_TY_WDF	EQUALS 5:	{ FORTRAN WRITE direct formatted
CONSTANT ST_TY_RDF	EQUALS 6:	{ FORTRAN READ direct formatted
CONSTANT ST_TY_WDU	EQUALS 7:	{ FORTRAN WRITE direct unformatted
CONSTANT ST_TY_RDU	EQUALS 8:	{ FORTRAN READ direct unformatted
CONSTANT ST_TY_WSL	EQUALS 9:	{ FORTRAN WRITE sequential list-directed
CONSTANT ST_TY_RSL	EQUALS 10:	{ FORTRAN READ sequential list-directed
CONSTANT ST_TY_WMF	EQUALS 11:	{ FORTRAN WRITE memory formatted (ENCODE)
CONSTANT MIN_DE_EN	EQUALS 11:	{ FORTRAN Minimum
		{ DECODE/ENCODE code
CONSTANT ST_TY_RMF	EQUALS 12:	{ FORTRAN READ memory formatted (DECODE)
CONSTANT MAX_DE_EN	EQUALS 12:	{ FORTRAN Maximum
		{ DECODE/ENCODE code
CONSTANT ST_TY_WXF	EQUALS 13:	{ FORTRAN REWRITE indexed formatted
CONSTANT ST_TY_RKF	EQUALS 14:	{ FORTRAN READ keyed formatted
CONSTANT ST_TY_WXU	EQUALS 15:	{ FORTRAN REWRITE indexed unformatted
CONSTANT ST_TY_RKU	EQUALS 16:	{ FORTRAN READ keyed unformatted
CONSTANT ST_TY_WIF	EQUALS 17:	{ FORTRAN WRITE internal formatted
CONSTANT ST_TY_RIF	EQUALS 18:	{ FORTRAN READ internal formatted
CONSTANT ST_TY_WSN	EQUALS 19:	{ FORTRAN WRITE sequential NAMELIST
CONSTANT ST_TY_RSN	EQUALS 20:	{ FORTRAN READ sequential NAMELIST

```

CONSTANT ST_TY_WIL      EQUALS 21:  { FORTRAN WRITE internal list-directed
CONSTANT ST_TY_RIL      EQUALS 22:  { FORTRAN READ internal list-directed
CONSTANT FORSTTYHI      EQUALS 22:  { Highest FORTRAN statement type
                                { Leave a little room for FORTRAN expansion
CONSTANT ST_TY_PRI      EQUALS 27:  { BASIC PRINT
CONSTANT BASSTYLO       EQUALS 27:  { Lowest BASIC statement type
CONSTANT ST_TY_LIN      EQUALS 28:  { Basic LINPUT
CONSTANT ST_TY_PSE      EQUALS 29:  { Basic PUT sequential
CONSTANT ST_TY_INP      EQUALS 30:  { Basic INPUT
CONSTANT ST_TY_PRU      EQUALS 31:  { Basic PRINT USING
CONSTANT ST_TY_INL      EQUALS 32:  { Basic INPUT LINE
CONSTANT ST_TY_DEL      EQUALS 33:  { Basic DELETE
CONSTANT ST_TY_REA      EQUALS 34:  { Basic READ memory
CONSTANT ST_TY_UPD      EQUALS 35:  { Basic UPDATE
CONSTANT ST_TY_GSE      EQUALS 36:  { Basic GET sequential
CONSTANT ST_TY_RES      EQUALS 37:  { Basic RESTORE
CONSTANT ST_TY_SCR      EQUALS 38:  { Basic SCRATCH
CONSTANT ST_TY_PRE      EQUALS 39:  { Basic PUT relative
CONSTANT ST_TY_GRE      EQUALS 40:  { Basic GET relative
CONSTANT ST_TY_FRE      EQUALS 41:  { Basic FIND relative
CONSTANT ST_TY_UNL      EQUALS 42:  { Basic UNLOCK
CONSTANT ST_TY_FEE      EQUALS 43:  { Basic FREE (strange name to avoid conflict
                                { with FIND relative)
CONSTANT ST_TY_GIN      EQUALS 44:  { Basic GET indexed
CONSTANT ST_TY_PIN      EQUALS 45:  { Basic Put indexed
CONSTANT ST_TY_MOV      EQUALS 46:  { BASIC MOVE FROM/MOVE TO
CONSTANT ST_TY_FIN      EQUALS 47:  { Basic FIND indexed
CONSTANT ST_TY_MIN      EQUALS 48:  { Basic MAT INPUT
CONSTANT ST_TY_RIN      EQUALS 49:  { Basic RESTORE indexed
CONSTANT ST_TY_MLI      EQUALS 50:  { Basic MAT LINPUT
CONSTANT ST_TY_FSE      EQUALS 51:  { Basic FIND sequential
CONSTANT ST_TY_MPR      EQUALS 53:  { Basic MAT PRINT
CONSTANT ST_TY_MRE      EQUALS 54:  { Basic MAT READ
CONSTANT ST_TY_GRFA     EQUALS 55:  { Basic GET by RFA
CONSTANT ST_TY_FRFA     EQUALS 56:  { Basic FIND by RFA
CONSTANT BASSTTYHI     EQUALS 56:  { Highest BASIC statement type

```

{ end of statement type definitions

{ Begin data structure definition

```

union 1 UNION:
  RESTARTPC ADDRESS:      { Address of start of I/O list, for
                          { restarting BASIC I/O statements.
  USR_HANDL ADDRESS:     { Address of user's handler (FORTRAN)
  END union_1;

union 1A UNION:
  MAJ_F_PTR ADDRESS:     { Holds pointer to last Basic major frame.
  PREVIOUS_LUB ADDRESS:  { Back pointer to previous LUB (FORTRAN)
  END union_1A;

USER_FP ADDRESS:         { User's FP.
union 1B UNION:
  FMT_STKP WORD UNSIGNED DIMENSION 8; { 8 entry pushdown stack containing relative

```

{ byte offset in format statement for beginning
 { of a repeat group. ISB\$B_FMT_DEP is index
 { into stack (-1 = empty, 0 = 1 item, 1 = 2 items,...)

{ The following two items are used by FOR\$\$UDF_RL to save the buffer
 { pointer and end when processing a repeated complex value.

```
structure 1B STRUCTURE;
  SAVE_PTR ADDRESS;      { Saved LUB$A_BUF_PTR
  SAVE_END ADDRESS;     { Saved LUB$A_BUF_END
end structure_1B;
end union_1B;
```

```
union 2 UNION;
  FMT_STKR WORD UNSIGNED DIMENSION 8; { 8 entry pushdown stack containing group repeat
                                       { count (as a word) remaining. ISB$B_FMT_DEP is
                                       { index into stack (-1=empty, 0=1 item, 1=2
                                       { items, ...).
  SCA_FAC_D BYTE UNSIGNED DIMENSION 8; { Double precision scale factor for BASIC
END union_2;
```

{+
 { Locations initialized for all I/O statements
 {-

```
union 3 UNION;
  ERR_NO BYTE UNSIGNED;      { FORTRAN error number occurring during
                              { current I/O statement and continued until
                              { end of statement where it will be SIGNALed.
                              { 0 means no such continuable error has occurred in this
                              { I/O statement.
  SCALE_FAC BYTE;           { BASIC scale factor in the range of -6 -> 0.
END union_3;
```

{+
 { ISB Locations set at the beginning of every I/O statement in Procedures
 { at the User Program Interface (FOR-UPI) level of abstraction, which is:
 { FOR\$(READ,WRITE)_{SF,SO,SU,DF,DO,DU} or FOR\$(DECODE,ENCODE)_{MF,MO}
 {-

```
STTM_TYPE BYTE UNSIGNED;    { (FOR-RECIO,W.EXJ) Record I/O statement
                              { type code. Used as an index into
                              { dispatch table structures for calling
                              { procedures in the User Data Formatter (FOR-UDF)
                              { and Record processing (FOR-REC) levels
                              { of abstraction. See FOR$IO_BEG Modlue.
  FMT_LEN WORD UNSIGNED;    { (FORFMTBUF) No. of characters
                              { allocated to contain compiled format of
                              { object-time format. 0 means not
                              { object-time format. Space is deallocated
                              { at end of I/O statement (FORFOR$IO_END).
  ERR_EQUAL ADDRESS;        { (FOR-ERREX) Adr of ERR= transfer or 0 if none.
  END_EQUAL ADDRESS;        { (FOR-ENDEX) Adr of END= transfer or 0 if none.
  FMT_BEG ADDRESS;          { Address of the beginning of the FORTRAN format.
                              { This is set in FOR$$IO_BEG and can either point
                              { to a precompiled format or a run-time compiled
                              { format. In the latter case, FMT_LEN is non-zero.
                              { This is also where the NAMELIST description
```

{ block address is stored.

```
{+
{ ISB locations used by the I/O independent format interpreter
{ FOR$$FMT_INTRP and occasionally updated by the input or output
{ dependent Formatted User Data Formatter (FOR$$UDF_RF or FOR$$UDF_WF)
{ for Hollerith (FOR-nH) format code only.
{-
```

```
union 3A UNION;
  FMT_PTR ADDRESS;          { (FORFMTAD) Adr. of next byte to be read
                           { from the compiled format statement byte array
  LIS_HEAP_LEN LONGWORD UNSIGNED; { Length of storage allocated in LIS_STR
                           { Used by FOR$$UDF_RL
  END union_3A;
```

```
{+
{ ISB locations used as own storage solely by FOR$$UDF_RL,
{ the list-directed input processor. More storage is defined
{ further down where it is convenient.
{-
```

```
LIS_STR ADDRESS;          { Address of repeated string constant
                           { saved in FOR$$UDF_RL1.
```

```
{+
{ ISB Locations returned as parameters from FOR$$FMT_INTRP to the input
{ or output dependent Formatted User Data Formatter (FORFOR$$UDF_RF
{ or FOR$$UDF_WF) which do not modify them. These parameters are
{ stored in the ISB because they are needed by FOR$$FMT_INTRP for more than
{ one call if the format code is repeated.
{-
```

```
FMT_P BYTE;              { (FOR-PSCALE) Signed P scale factor
FMT_W WORD UNSIGNED;     { (FOR-W) Width of field in characters
FMT_D BYTE UNSIGNED;     { (FOR-D) Number of fraction digits
FMT_E BYTE UNSIGNED;     { (FOR-E) Number of exponent characters
```

```
{+
{ ISB Locations used solely by the I/O independent format interpreter
{ FOR$$FMT_INTRP(0,1)
{-
```

```
union 4 UNION;
  FMT_REP WORD;          { (FOR-REPCNT) signed Format repeat count for current
                           { format code.
  LIS_REP WORD UNSIGNED; { (FOR-REPCT) unsigned repeat count for List-
                           { directed input
  LEN_REM WORD UNSIGNED; { (BAS-new) length of format string remaining.
  END union_4;
```

```
union 5 UNION;
  FMT_CODE UNION UNION;
  -FMT_CODE BYTE UNSIGNED; { Format type code
```

```

FMT_CODE_STRUCT STRUCTURE;
  fill_3 BITFIELD LENGTH 7 FILL TAG $$; { first 7 bits are format code
  FMT_REPRE BITFIELD; { representation byte follows if 1
END_FMT_CODE_STRUCT;
END_FMT_CODE_UNION;
LIS_CTYPE_BYTE UNSIGNED; { type of constant scanned by list-directed input
END_union_5;

FMT_REVER_WORD UNSIGNED; { (FORFMTAD) Relative position of current format reversion
{ point to revert to when end of format
{ statement is encountered with more data
{ elements to be transmitted.
FMT_DEP_BYTE UNSIGNED; { (FORFSTKP) Adr. of current top of format
{ pushdown stack.

FMT_FLAGS_UNION UNION;
  FMT_FLAGS_WORD UNSIGNED; { Flags for FORTRAN-77
  FMT_FLAGS_STRUCT STRUCTURE;
  INP_FLAGS_UNION UNION;
    INP_FLAGS_BYTE UNSIGNED; { Input conversion flags
    INP_FLAGS_STRUCT STRUCTURE;
      BN BITFIELD; { Blanks are nulls if set
      ONLY_E BITFIELD; { Only allow E, e if set
      ERR_OFLO BITFIELD; { Underflow is an error if set
      DONTROUND BITFIELD; { Don't round result if set
      SKIPTABS BITFIELD; { Ignore tabs if set
      EXP_LETTER BITFIELD; { Exponent letter is required if set
      FORCESCALE BITFIELD; { Scale even if exponent present if set
      fill_4 BITFIELD FILL TAG $$; { Expansion
    END_INP_FLAGS_STRUCT;
  END_INP_FLAGS_UNION;
  OUT_FLAGS_UNION UNION;
    OUT_FLAGS_BYTE UNSIGNED; { Output conversion flags
    OUT_FLAGS_STRUCT STRUCTURE;
      SP BITFIELD; { Force optional +
      ERR_OFLO BITFIELD; { Exponent field width overflow is an
      { error if set
      fill_5 BITFIELD LENGTH 6 FILL TAG $$; { Expansion
    END_OUT_FLAGS_STRUCT;
  END_OUT_FLAGS_UNION;
END_FMT_FLAGS_STRUCT;
END_FMT_FLAGS_UNION;

fill_6 BYTE UNSIGNED FILL TAG $$; { 1 spare byte for future (FOR-keep longword aligned)

{+
{ Status bits used at any of the levels of abstraction
{-

STTM_STAT_UNION UNION;
  STTM_STAT_WORD UNSIGNED; { status lasting only for a single
  { I/O statement, but needed
  { across several calls which
  { implement that single I/O statement.

  STTM_STAT_STRUCTURE STRUCTURE;

```

```

P_FORM_CH BITFIELD LENGTH 2: { (BAS) Store the format character that follows
                               { Prompt. This is set in BAS$$UDF_RL1 and read
                               { in BAS$IO_END.
DOLLAR BITFIELD:              { (FOR-DOLFLG) Dollar format encountered in
                               { format processing
USER_ELEM BITFIELD:          { (FORFMTLP) User-program data encountered
                               { in format for current records. Used to
                               { group with no data element format code
                               { thereby causing an infinite loop
SLASH BITFIELD:              { (FOR-W.NULL) Slash seen during formatted input.
                               { *** also: Slash seen in List-directed input.
LAST_REC BITFIELD:           { (FOR-UNFLGS) Last record in segmented record
                               { being processing if 1, 0=not last record
DE_ENCODE BITFIELD:          { (FOR-DV.FAK) DECODE/ENCODE being done
                               { so RAB and unit number have
                               { no meaning (FOR-used during error handling).
                               { Also set for internal files.
LIS_HEAP BITFIELD:           { List directed input currently has heap
                               { storage allocated.
RECURSIVE BITFIELD:          { Used by OTSCCB for recursive I/O.
                               { Set when there is I/O in progress for
                               { this LUN in addition to the current I/O.
MAT_CONT BITFIELD:           { (BAS) MAT INPUT continuation - '&' was last
                               { character of record. Read and written at the
                               { REC level of matrix processing.
MAT_PRINT BITFIELD:          { (BAS) MAT PRINT has more than one array for an
                               { element transmitter. Set and checked in UPI
                               { level of MAT INPUT element transmitter.
                               { Cleared by IO_END.
PRINT_INI BITFIELD:          { (BAS) A print statement has been initialized.
                               { set in BASIOBEG. cleared in element transmitter
                               { checked and cleared in BASIOEND. Used to indicate
                               { that there has been a PRINT with no element
                               { transmitter.
SNGL_ELEM BITFIELD:          { (FOR) There is only one element in the
                               { current I/O list. Indicates that an
                               { unbuffered transfer is possible if
                               { record type and record size permit.
NEED_INIT BITFIELD:          { (FOR) REC-level initialization has not
                               { yet been done. Set on an unformatted
                               { READ, other than a keyed READ.

```

```

END STTM_STAT_STRUCTURE;
END STTM_STAT_UNION;

```

```

INTFILEND ADDRESS;           { End of internal file buffer (FORTRAN)

```

```

CONSTANT NEG_LUB EQUALS .;   { Negative length of LUB (which follows)

```

```

{+
{ The following filler occupies the space where the LUB is allocated.
{ If the length of the LUB is changed the size of this filler must be
{ changed accordingly.
{-

```

```

lub_filler BYTE UNSIGNED DIMENSION 100 FILL TAG $$;

```

OTSISB.SDL:1

16-SEP-1984 16:41:38.57^{M 13} Page 8

CONSTANT ISB_LEN EQUALS ::

end_of_lub BYTE FILL TAG \$\$;
END ISB;

END_MODULE \$ISBDEF;

{ End of file OTSISB.SDL

**

