```
--- ODA-5.4.1.md        2023-11-23 15:08:34.777933962 +0100
+++ ODA-5.4.2-libredwg.md       2023-12-04 11:37:34.263842004 +0100
@@ -8,20 +8,20 @@

 # 2 BIT CODES AND DATA DEFINITIONS

 NOTE: Unless otherwise stated, all data in this manual is in little-endian order, with the
 least significant byte first.

-Much of the data in the DWG file format versions 13/14/2000/2004/2007/2010 must be read at
 the bit level. Various parts of the drawing use data in compressed forms, which are explai
ned below. Here are the abbreviations used in this document for the various compressed form
s:
+Much of the data in the DWG file format versions 13/14/2000/2004/2007/2010/2013/2018 must
be read at the bit level. Various parts of the drawing use data in compressed forms, which
are explained below. Here are the abbreviations used in this document for the various compr
essed forms:

 ----

       B : bit (1 or 0)
      BB : special 2 bit code (entmode in entities, for instance)
-     3B : bit triplet (1-3 bits) (R24)
+     3B : bit triplet (1-3 bits) (R2010)
      BS : bitshort (16 bits)
      BL : bitlong (32 bits)
-    BLL : bitlonglong (64 bits) (R24)
+    BLL : bitlonglong (64 bits) (R2010)
       BD : bitdouble
     2BD : 2D point (2 bitdoubles)
     3BD : 3D point (3 bitdoubles)
      RC : raw char (not compressed)
      RS : raw short (not compressed)
@@ -34,11 +34,11 @@
       H : handle reference (see the HANDLE REFERENCES section)
       T : text (bitshort length, followed by the string).
      TU : Unicode text (bitshort character length, followed by Unicode string, 2 bytes per
           character). Unicode text is read from the â\200\234string streamâ\200\235 within
 the object data,
           see the main Object description section for details.
-     TV : Variable text, T for 2004 and earlier files, TU for 2007+ files.
+     TV : Variable text, T for R2004 and earlier files, TU for R2007+ files.
       X : special form
       U : unknown
      SN : 16 byte sentinel
      BE : BitExtrusion
      DD : BitDouble With Default
@@ -303,11 +303,11 @@

 For R13-R14, this is a BD. For R2000+, this is a single bit followed optionally by a BD. I
f the bit is one, the thickness value is assumed to be 0.0. If the bit is 0, then a BD that
 represents the thickness follows.

 ## 2.11 CmColor

-R15 and earlier: BS color index
+R2000 and earlier: BS color index

 R2004+: There are two types of color definitions, below named as CMC and ENC:

 CMC:

@@ -453,11 +453,11 @@

 This function takes as its input an initial CRC value, a pointer to the data to be CRC'd,
and the number of bytes of data. The return value is the new CRC. This function can be used
 to accumulate a CRC by running the first set of bytes with an initial value of 0 (or the "
starting value" for this type of object), and subsequent calls with the initial value equal
 to the last returned CRC.
```

2.14.2 32-bit CRC

-From R18 onwards a 32-bit CRC is used. The algorithm is similar to the 8-bit version, but uses a CRC lookup table containing 256 32-bit values.
+From R18/R2004 onwards a 32-bit CRC is used. The algorithm is similar to the 8-bit version, but uses a CRC lookup table containing 256 32-bit values.

```c

OdUInt32 crc32Table[] =
{
@@ -517,17 +517,17 @@
  return ~invertedCrc;
}

```

-# 3 R13-R15 DWG FILE FORMAT ORGANIZATION
+# 3 R13-R2000 DWG FILE FORMAT ORGANIZATION

3.1 FILE STRUCTURE

The structure of the DWG file format changed between R13 C2 and R13 C3. Notations regarding C3 below indicate the differences.

-The general arrangement of data in an R13/R14/R15 file is as follows:
+The general arrangement of data in an R13/R14/R2000 file is as follows:

    HEADER
      FILE HEADER
      DWG HEADER VARIABLES
      CRC
@@ -537,26 +537,42 @@
    PADDING (R13C3 AND LATER, 200 bytes, minutes the template section above if present)
    IMAGE DATA (PRE-R13C3)
    OBJECT DATA
      All entities, table entries, dictionary entries, etc. go in this section.
    OBJECT MAP
-   OBJECT FREE SPACE (optional)
-   TEMPLATE (R14-R15, optional)
+   OBJECT FREE SPACE (R14-R2000, optional)
    SECOND HEADER
+   TEMPLATE (R14-R2000, optional)
    IMAGE DATA (R13C3 AND LATER)

3.2 FILE HEADER

3.2.1 VERSION ID:

The first 6 bytes are:

Bytes (ascii encoded)	Version
MC0.0	MicroCAD R1.1
AC1.2	R1.2
AC1.3	R1.3
AC1.40	R1.4
AC1.50	R2.0
AC2.10	R2.10
AC2.21	R2.21
AC2.22	R2.22
AC1001	R2.4
AC1002	R2.5
AC1003	R2.6
AC1004	R9
AC1006	R10
AC1009	R11
AC1012	R13

+| AC1013 | R13C3 |
| AC1014 | R14 |
| AC1015 | R2000 |
+| AC1016 | R2000i |
AC1018	R2004
AC1021	R2007
AC1024	R2010
AC1027	R2013
AC1032	R2018

@@ -567,20 +583,68 @@

At 0x0D is a seeker (4 byte long absolute address) for the beginning sentinel of the image data.

3.2.3 OBJECT FREE SPACE

-**TODO.**
+See chapter 21.

3.2.4 TEMPLATE

This section is optional, see chapter 22.

3.2.5 DWGCODEPAGE:

Bytes at 0x13 and 0x14 are a raw short indicating the value of the code page for this drawing file.

Codepage	Name
0	UTF8 (Unused)
1	US_ASCII
2	ISO-8859-1
3	ISO-8859-2
4	ISO-8859-3
5	ISO-8859-4
6	ISO-8859-5
7	ISO-8859-6
8	ISO-8859-7
9	ISO-8859-8
10	ISO-8859-9
11	CP437 (DOS English)
12	CP850 (DOS Latin-1)
13	CP852 (DOS Central European)
14	CP855 (DOS Cyrillic)
15	CP857 (DOS Turkish)
16	CP860 (DOS Portoguese)
17	CP861 (DOS Icelandic)
18	CP863 (DOS Hebrew)
19	CP864 (DOS Arabic IBM)
20	CP865 (DOS Nordic)
21	CP869 (DOS Greek)
22	CP932 (DOS Japanese, shiftjis)
23	MACINTOSH
24	BIG5
25	CP949 (Korean, Wansung + Johab)
26	JOHAB
27	CP866 (Russian)
28	ANSI-1250 (Windows Central + Eastern European)
29	ANSI-1251 (Windows Cyrillic)
30	ANSI-1252 (Windows Western European)
31	GB2312 (Windows EUC-CN Chinese)
32	ANSI-1253 (Windows Greek)
33	ANSI-1254 (Windows Turkish)
34	ANSI-1255 (Windows Hebrew)
35	ANSI-1256 (Windows Arabic)
36	ANSI-1257 (Windows Baltic)
37	ANSI-874 (Windows Thai)
38	ANSI-932 (Windows Japanese, extended shiftjis, windows-31j)

```
+|  39       | ANSI-936   (Windows Simplified Chinese)
+|  40       | ANSI-949   (Windows Korean Wansung)
+|  41       | ANSI-950   (Windows Trad Chinese)
+|  42       | ANSI-1361  (Windows Korean Wansung)
+|  43       | UTF16 (Default since R2007)
+|  44       | ANSI-1258  (Windows Vietnamese)
+
```

3.2.6 SECTION-LOCATOR RECORDS:

At 0x15 is a long that tells how many sets of recno/seeker/length records follow. Each rec
ord has the following format:

```
     Record number (raw byte) | Seeker (raw long) | Size (raw long)
@@ -590,26 +654,18 @@
 ----

     0 : Header variables (covers beginning and ending sentinels).
     1 : Class section.
     2 : Object map.
-    3 : (C3 and later.) A special table (no sentinels). See unknown section (R13 C3 and
-        later). The presence of the 4th record (3) indicates that the C3 file format
-        applies. Just look at the long at 21; if it's 4 or greater, it's the C3-and-later
-        format.
-    4 : In R13-R15, points to a location where there may be data stored. Currently we
-        have seen only the MEASUREMENT variable stored here. See chapter 22.
+    3 : R13 and later: OBJECT FREE SPACE (optional, without sentinels),
+        followed by the SECOND HEADER (with sentinels).
+    4 : In R13-R2000, TEMPLATE with the MEASUREMENT variable. See chapter 22.
         This section is optional.

 Remarks: We have seen files with up to 6 sets in this section; the meaning of the sixth on
e is unknown. The Open Design Toolkit emits files with the first 5 sets only.

-    RS : CRC for BOF to this point. Use 0 for the initial value, and depending on the
-         number of sets of section-locators, XOR the result with one of the following:
-     3 : 0xA598
-     4 : 0x8101
-     5 : 0x3CC4
-     6 : 0x8461
+    RS : CRC from 0 to to this point, with the standard seed 0xC0C1

 ----

 The following 16 byte sentinel appears after the CRC:

@@ -966,11 +1022,11 @@

 # 5 R2007 DWG FILE FORMAT ORGANIZATION

 ## 5.1 Sections and pages overview

-Like the R18 format the R21 format has sections and pages. There are system sections and d
ata sections.
+Like the R18/R2004 format the R21/R2007 format has sections and pages. There are system se
ctions and data sections.

 The system sections contain information about where the data sections and their pages are
in the stream.

 A system section only has a single page, while a data section can have multiple pages. The
 page map contains information about where each data page is in the file stream. The sectio
n map has information about which pages belong to which section. The file header, which is
at the beginning of the file, just after the meta data, contains the stream locations of th
e page map and section map.

@@ -1192,11 +1248,11 @@

 By default data/properties are not encrypted. Encryption still needs to be described.
```

5.2.1 File header creation

-**Creating the R21 file header is very complex:**
+**Creating the R2007 file header is very complex:**

Compute and set all the file header fields. In this process also compute CRCâ\200\231s and generate check data, derived from a CRC seed value (paragraph 5.2.1.1).

Write the file header data to a buffer and calculate/write the 64-bit CRC (paragraph 5.2.1.2).

@@ -1557,15 +1613,15 @@

We read sets of these until we exhaust the data.

5.9 AcDb:Header Section

-**This section contains the "DWG Header Variables" data in a similar format as R15 files (see details in the DWG HEADER VARIABLES section of this document), except that string data is separated out into a string stream. See the Objects Section for details about string stream location within an object. Also, the handles are separated out into a separate stream at the end of the header, in the same manner as is done for Objects.**
+**This section contains the "DWG Header Variables" data in a similar format as R2000 files (see details in the DWG HEADER VARIABLES section of this document), except that string data is separated out into a string stream. See the Objects Section for details about string stream location within an object. Also, the handles are separated out into a separate stream at the end of the header, in the same manner as is done for Objects.**

5.10 Decompression

-**The compression uses another variant of the LZ77 algorithm, different from the one used in R18. Like the R18 compression, the compressed stream (source buffer) contains opcodes, offsets and lengths of byte chunks to be copied from either compressed or decompressed buffer.**
+**The compression uses another variant of the LZ77 algorithm, different from the one used in R18/R2004. Like the R18/R2004 compression, the compressed stream (source buffer) contains opcodes, offsets and lengths of byte chunks to be copied from either compressed or decompressed buffer.**

An opcode consists of a single byte. The first byte contains the first opcode. If the first opcodeâ\200\231s high nibble equals a 2, then:

* the source buffer pointer is advanced 2 bytes, and a length is read from the next byte, bitwise and-ed with 0x07

@@ -1993,15 +2049,15 @@
0xa6df411fbfb21ca3, 0xdc0731d78f8795da, 0x536fa08fdfd90e51, 0x29b7d047efec8728
```

## 5.13 Reed-Solomon encoding

-**R21 uses Reed-Solomon (RS) encoding to add error correction. Error correction codes are typically used in telecommunication to correct errors during transmittion or on media to correct e.g. errors caused by a scratch on a CD. RS coding takes considerably study to master, and books on the subject require at least some mathematical base knowledge on academic level. For this reason itâ\200\231s recommended to use an existing RS implementation, rather than to build one from scratch. When choosing to learn about the subject, a good book on the subject is â\200\234Error Control Coding, Second Editionâ\200\235, by Shu Lin and Daniel J. Costello, Jr. This book is taught over two semesters, to give an idea of the depth of the subject. RS coding is treated in Chapter 7 out of 22, to have a full understanding of the subject chapters 1-7 should be read.**
+**R2007 uses Reed-Solomon (RS) encoding to add error correction. Error correction codes are typically used in telecommunication to correct errors during transmittion or on media to correct e.g. errors caused by a scratch on a CD. RS coding takes considerably study to master, and books on the subject require at least some mathematical base knowledge on academic level. For this reason itâ\200\231s recommended to use an existing RS implementation, rather than to build one from scratch. When choosing to learn about the subject, a good book on the subject is â\200\234Error Control Coding, Second Editionâ\200\235, by Shu Lin and Daniel J. Costello, Jr. This book is taught over two semesters, to give an idea of the depth of the subject. RS coding is treated in Chapter 7 out of 22, to have a full understanding of the**
```

```
 subject chapters 1-7 should be read.

 An open source RS implementation is available from <http://www.eccpage.com/>, item â\200
\234Reed-Solomon (RS) codesâ\200\235, by Simon Rockliff, 1989. This implementation uses Ber
lekamp-Masssey for decoding. Note that there are many ways to encode and decode, the implem
entation above is just one example. Though only 404 lines of code, the math involved is ver
y sophisticated.

-DWG file format version R21 uses two configurations of RS coding:
+DWG file format version R2007 uses two configurations of RS coding:

 * Data pages: use a (n, k) of (255, 251), the primitive polynomial coefficients being (1,
0, 1, 1, 1, 0, 0, 0). This configuration can correct (255 â\200\223 251) / 2 = 2 error byte
s per block of 255 bytes. For each 251 data bytes (k), 4 parity bytes are added to form a 2
55 byte (code word) block.

 * System pages: use a (n, k) of (255, 239), the primitive polynomial coefficients being (1
, 0, 0, 1, 0, 1, 1, 0). This configuration can correct (255 â\200\223 239) / 2 = 8 error by
tes per block of 255 bytes. For each 239 data bytes (k), 16 parity bytes are added to form
a 255 byte (code word) block.

@@ -2082,11 +2138,11 @@
     ----------------------

     R2007 Only:
         RL : Size in bits
     R2013+:
-       BLL : Variabele REQUIREDVERSIONS, default value 0, read only.
+       BLL : Variable REQUIREDVERSIONS, default value 0, read only.
     Common:
         BD : Unknown, default value 412148564080.0
         BD : Unknown, default value 1.0
         BD : Unknown, default value 1.0
         BD : Unknown, default value 1.0
@@ -2111,20 +2167,20 @@
          B : REGENMODE
          B : FILLMODE
          B : QTEXTMODE
          B : PSLTSCALE
          B : LIMCHECK
-    R13-R14 Only (stored in registry from R15 onwards):
+    R13-R14 Only (stored in registry from R2000 onwards):
          B : BLIPMODE
     R2004+:
          B : Undocumented
     Common:
          B : USRTIMER (User timer on/off).
          B : SKPOLY
          B : ANGDIR
          B : SPLFRAME
-    R13-R14 Only (stored in registry from R15 onwards):
+    R13-R14 Only (stored in registry from R2000 onwards):
          B : ATTREQ
          B : ATTDIA
     Common:
          B : MIRRTEXT
          B : WORLDVIEW
@@ -2132,33 +2188,33 @@
          B : WIREFRAME Undocumented.
     Common:
          B : TILEMODE
          B : PLIMCHECK
          B : VISRETAIN
-    R13-R14 Only (stored in registry from R15 onwards):
+    R13-R14 Only (stored in registry from R2000 onwards):
          B : DELOBJ
     Common:
          B : DISPSILH
          B : PELLIPSE (not present in DXF)
```

```
         BS : PROXYGRAPHICS
-    R13-R14 Only (stored in registry from R15 onwards):
+    R13-R14 Only (stored in registry from R2000 onwards):
         BS : DRAGMODE
     Common:
         BS : TREEDEPTH
         BS : LUNITS
         BS : LUPREC
         BS : AUNITS
         BS : AUPREC
-    R13-R14 Only Only (stored in registry from R15 onwards):
+    R13-R14 Only Only (stored in registry from R2000 onwards):
         BS : OSMODE
     Common:
         BS : ATTMODE
-    R13-R14 Only Only (stored in registry from R15 onwards):
+    R13-R14 Only Only (stored in registry from R2000 onwards):
         BS : COORDS
     Common:
         BS : PDMODE
-    R13-R14 Only Only (stored in registry from R15 onwards):
+    R13-R14 Only Only (stored in registry from R2000 onwards):
         BS : PICKSTYLE
     R2004+:
         BL : Unknown
         BL : Unknown
         BL : Unknown
@@ -2201,11 +2257,11 @@
         BD : CHAMFERC
         BD : CHAMFERD
         BD : FACETRES
         BD : CMLSCALE
         BD : CELTSCALE
-    R13-R18:
+    R13-R2004:
         TV : MENUNAME
     Common:
         BL : TDCREATE (Julian day)
         BL : TDCREATE (Milliseconds into the day)
         BL : TDUPDATE (Julian day)
@@ -2220,11 +2276,11 @@
         BL : TDUSRTIMER (Days)
         BL : TDUSRTIMER (Milliseconds into the day)
       CMC : CECOLOR
         H : HANDSEED The next handle, with an 8-bit length specifier preceding the handle
            bytes (standard hex handle form) (code 0). The HANDSEED is not part of the han
dle
-           stream, but of the normal data stream (relevant for R21 and later).
+           stream, but of the normal data stream (relevant for R2007 and later).
         H : CLAYER (hard pointer)
         H : TEXTSTYLE (hard pointer)
         H : CELTYPE (hard pointer)
     R2007+ Only:
         H : CMATERIAL (hard pointer)
@@ -2410,11 +2466,11 @@
          H : LINETYPE CONTROL OBJECT (hard owner)
          H : VIEW CONTROL OBJECT (hard owner)
          H : UCS CONTROL OBJECT (hard owner)
          H : VPORT CONTROL OBJECT (hard owner)
          H : APPID CONTROL OBJECT (hard owner)
-         H : DIMSTYLE CONTROL OBJECT (hard owner) R13-R15 Only:
+         H : DIMSTYLE CONTROL OBJECT (hard owner) R13-R2000 Only:
          H : VIEWPORT ENTITY HEADER CONTROL OBJECT (hard owner) Common:
          H : DICTIONARY (ACAD_GROUP) (hard pointer)
          H : DICTIONARY (ACAD_MLINESTYLE) (hard pointer)
          H : DICTIONARY (NAMED OBJECTS) (hard owner)
       R2000+ Only:
@@ -2603,11 +2659,11 @@
 00240 47 B1 92 CC A0           G.... 0100 0111 1011 0001 1001 0010 1100 1100 1010 0000
```

```

# 10 Data section AcDb:Classes

-## 10.1 R13-R15
+## 10.1 R13-R2000

This section contains the defined classes for the drawing.

    SN : 0x8D 0xA1 0xC4 0xB8 0xC4 0xA9 0xF8 0xC5 0xC0 0xDC 0xF4 0x5F 0xE7 0xCF 0xB6 0x8A.
    RL : size of class data area.
@@ -2630,13 +2686,13 @@

This following 16-byte sentinel appears after the CRC:

    0x72,0x5E,0x3B,0x47,0x3B,0x56,0x07,0x3A,0x3F,0x23,0x0B,0xA0,0x18,0x30,0x49,0x75

-For R18 and later 8 unknown bytes follow. The ODA writes 0 bytes.
+For R18/R2004 and later 8 unknown bytes follow. The ODA writes 0 bytes.

-## 10.2 R18+
+## 10.2 R2004+

This section is compressed and contains the standard 32 byte section header.

This section contains the defined classes for the drawing.

@@ -2688,15 +2744,15 @@

# 11 PADDING (R13C3 AND LATER)

0x200 bytes of padding. Can be ignored. When writing, the Open Design Toolkit writes all 0
s.

-Occasionally AutoCAD will use the first 4 bytes of this area to store the value of the "me
asurement" variable. This padding was evidently required to allow pre-R13C3 versions of Aut
oCAD to read files produced by R13C3 and later.
+Occasionally AutoCAD will use the first 4 bytes of this area to store the value of the "me
asurement" variable, i.e the TEMPLATE section. This padding was evidently required to allow
 pre-R13C3 versions of AutoCAD to read files produced by R13C3 and later.

# 12 Data section: ""

-The empty data section was introduced in R18. This section contains no data.
+The empty data section was introduced in R18/R2004. This section contains no data.

| Section property | Value
|------------------|------
| Name             | â\200\234â\200\235
| Section ID       | Always 0
@@ -2807,43 +2863,42 @@
| Name             | AcDb:AppInfo
| Compressed       | 1
| Encrypted        | 0
| Page size        | 0x80

-The AppInfo format depends on the application version (Acad version that wrote the file) i
n the file header. So a R18 .dwg file might have an R21 AppInfo section.
+The AppInfo format depends on the application version (Acad version that wrote the file) i
n the file header. So a R2004 .dwg file might have an R2007 AppInfo section.

-## 16.1 R18
+## 16.1 R2004

-In R18 the app info section consists of the following fields. Strings are encoded as a 16-
bit length, followed by the character bytes (0-terminated).
+In R2004 the app info section consists of the following fields. Strings are encoded as a 1
6-bit length, followed by the single-character bytes (0-terminated).
```

```
  | Type     | Length  | Description
  |----------|---------|------------
-| String   | 2 + n   | App info name, ODA writes â\200\234AppInfoDataListâ\200\235
-| UInt32   | 4       | Unknown, ODA writes 2
-| String   | 2 + n   | Unknown, ODA writes â\200\2344001â\200\235
-| String   | 2 + n   | App info product XML element, e.g. ODA writes
-|          |         | â\200\234<ProductInformation name=â\200\235Teighaâ\200\235 build_versi
on=â\200\2350.0â\200\235
-|          |         | registry_version=â\200\2353.3â\200\235 install_id_string=â\200\235ODAâ
\200\235
-|          |         | registry_localeID=â\200\2351033â\200\235/>â\200\234
-| String   | 2 + n   | App info version, e.g. ODA writes â\200\2342.7.2.0â\200\235.
+| String   | 2 + n   | App info name, ACAD writes "AppInfoData", ODA writes "AppInfoDataList"
+| RL       | 4       | num strings (default: 0)
+| String   | 2 + n   | Comment, e.g. "5004", ODA writes "4001"
+| String   | 2 + n   | App info product string, e.g. "Autodesk Architectural Desktop 2007"
+| String   | 2 + n   | App info version, e.g. "5.0.318.0", ODA writes "2.7.2.0".

-### 16.2 R21-27
+### 16.2 R2007+ or class_version == 3

-In R21 (and also R24, R27) the app info section consists of the following fields. Strings
are encoded as a 16-bit length, followed by the character bytes (0-terminated), using unico
de encoding (2 bytes per character).
+Since R2007 or class_version 3 the app info section consists of the following fields. Stri
ngs are encoded as a 16-bit length, followed by 0-terminated unicode wide-chars (2 bytes pe
r character).

  | Type     | Length  | Description
  |----------|---------|------------
-| UInt32   | 4       | Unknown (ODA writes 2)
+| RL       | 4       | class_version (default: 3)
  | String   | 2 + 2 * n + 2 | App info name, ODA writes â\200\234AppInfoDataListâ\200\235
-| UInt32   | 4       | Unknown (ODA writes 3)
-| Byte[]   | 16      | Version data (checksum, ODA writes zeroes)
-| String   | 2 + 2 * n + 2 | Version
-| Byte[]   | 16      | Comment data (checksum, ODA writes zeroes)
-| String   | 2 + 2 * n + 2 | Comment
-| Byte[]   | 16      | Product data (checksum, ODA writes zeroes)
-| String   | 2 + 2 * n + 2 | Product
-| String   | 2 + n   | App info version, e.g. ODA writes "2.7.2.0".
+| RL       | 4       | num strings (default: 3)
+| Byte[]   | 16      | Version checksum (ODA and LibreDWG write zeroes)
+| String   | 2 + 2 * n + 2 | Version. Eg "Teigha(R) 4.3.2.0" or AutoCAD: "19.0.55.0.0"
+| Byte[]   | 16      | Comment checksum (ODA and LibreDWG write zeroes)
+| String   | 2 + 2 * n + 2 | Comment. Eg "Autodesk DWG.  This file is a Trusted DWG last sav
ed by an
+|          |         | Autodesk application or Autodesk licensed application.", or "This file
 was last saved by an
+|          |         | Open Design Alliance (ODA) application or an ODA licensed application.
" or
+|          |         | "This file was last saved by LibreDWG."
+| Byte[]   | 16      | Product checksum (ODA and LibreDWG write zeroes)
+| String   | 2 + 2 * n + 2 | ProductInformation as XML

 # 17 Data section AcDb:FileDepList

 Contains file dependencies (e.g. IMAGE files, or fonts used by STYLE).

@@ -2852,11 +2907,11 @@
  | Name             | AcDb:FileDepList
  | Compressed       | 1
  | Encrypted        | 2 (meaning unknown)
  | Page size        | 0x80 if number of entries is 0 or 1. If more than 1, then 0x80 x numb
er of entries.

-In R18 the app info section consists of the following fields. Strings are encoded as a 32-
bit length, followed by the character bytes (without trailing 0).
+In R2004 the app info section consists of the following fields. Strings are encoded as a 3
```

2-bit length, followed by the character bytes (without trailing 0).

```
 | Type    | Length | Description
 |---------|--------|------------
 | Int32   | 4      | Feature count (ftc)
 | String32 | ftc * ( 4 + n) | Feature name list. A feature name is one of the following:
@@ -2889,21 +2944,21 @@
 | Encrypted        | 0
 | Page size        | 0x7400
```

The contents of this section are unknown. In the following paragraphs is described what th
e ODA writes in this section.

```
-## 18.1 R18
+## 18.1 R2004

 | Type    | Length | Description
 |---------|--------|------------
 | UInt32  | 4      | Unknown (ODA writes 0)
 | UInt32  | 4      | Unknown (ODA writes 0)
 | UInt32  | 4      | Unknown (ODA writes 0)
```

More unknown bytes may follow.

```
-## 18.2 R21
+## 18.2 R2007

 | Type    | Length | Description
 |---------|--------|------------
 | UInt32  | 4      | Unknown (ODA writes 0)
 | UInt32  | 4      | Unknown (ODA writes 0)
@@ -2919,13 +2974,13 @@
 | Name             | AcDb:Security
 | Compressed       | 1
 | Encrypted        | 0
 | Page size        | 0x7400

-This section was introduced in R18. The AcDb:Security section is optional in the fileâ\200
\224it is present if the file was saved with a password.
+This section was introduced in R2004. The AcDb:Security section is optional in the fileâ
\200\224it is present if the file was saved with a password.

-R18: The section is present in the file if the SecurityType entry at location 0x18 in the
file is greater than 0.
+R2004: The section is present in the file if the SecurityType entry at location 0x18 in th
e file is greater than 0.
```

Strings are prefixed with a 32-bit length (not zero terminated).

```
 | Type     | Length | Description
 |----------|--------|------------
@@ -2964,21 +3019,21 @@
```

This region holds the actual objects in the drawing. These can be entities, table entries,
dictionary entries, and objects. This second use of objects is somewhat confusing; all ite
ms stored in the file are â\200\234objectsâ\200\235, but only some of them are object objec
ts. Others are entities, table entries, etc. The objects in this section can appear in any
order.

Not all objects present in the file are actually used. All used objects can eventually be
traced back to handle references in the Header section. So the proper way to read a file is
to start reading the header and then tracing all references from there until all reference
s have been followed. Very occasionally a file contains e.g. two APPID objects with the sam
e name, of which one is used, and the other is not. Reading both would be incorrect due to
a name clash. To complicate matters more, files also exist with table records with duplicat
e names. This is incorrect, and the software should rename the record to be unique upon rea
ding.

```
-For R18 and later the section data (right after the page header) starts with a RL value of
```

```
 0x0dca (meaning unknown).
+For R2004 and later the section data (right after the page header) starts with a RL value
of 0x0dca (meaning unknown).

 ## 20.1 Common non-entity object format

 Objects (non-entities) have the following general format:

  | Version | Field type | DXF group | Description
  |---------|-------|-------|------------
  |         | MS    |       | Size in bytes of object, not including the CRC
  | R2010+  | MC    |       | Size in bits of the handle stream (unsigned, 0x40 is not inter
preted as sign). This includes the padding bits at the end of the handle stream (the paddin
g bits make sure the object stream ends on a byte boundary).
-| Commmon
+| Common
  |         | OT    |       | Object type
  | R2000-R2007
  |         | RL    |       | Size of object data in bits (number of bits before the handles
), or the â\200\234endbitâ\200\235 of the pre-handles section.
  | Common:
  |         | H     | 5     | Objectâ\200\231s handle
@@ -3011,11 +3066,11 @@
 Drawing entities, which are of course objects, have the same format as objects, with some
additional standard items:

        MS : Size of object, not including the CRC
     R2010+:
        MC : Size in bits of the handle stream (unsigned, 0x40 is not interpreted as sign).
-    Commmon:
+    Common:
        OT : Object type
     R2000+ Only:
        RL : Size of object data in bits
     Common:
         H : Objectâ\200\231s handle
@@ -3182,11 +3237,12 @@
 MLEADER
 MLEADERSTYLE
 OLE2FRAME
 PLACEHOLDER
 PLOTSETTINGS
-RASTERVARIABLESSCALE
+RASTERVARIABLES
+SCALE
 SORTENTSTABLE
 SPATIAL_FILTER
 SPATIAL_INDEX
 TABLEGEOMETRY
 TABLESTYLES
@@ -3194,15 +3250,46 @@
 VISUALSTYLE
 WIPEOUTVARIABLE
 XRECORD
 ```

+Todo:
+
+```
+ASSOCNETWORK
+ASSOCGEOMDEPENDENCY
+BLOCKGRIPLOCATIONCOMPONENT
+BLOCKALIGNMENTPARAMETER
+BLOCKALIGNMENTGRIP
+BLOCKBASEPOINTPARAMETER
+BLOCKFLIPACTION
+BLOCKFLIPPARAMETER
+BLOCKFLIPGRIP
+BLOCKLINEARGRIP
```
```

```
+BLOCKLOOKUPGRIP
+BLOCKROTATIONGRIP
+BLOCKMOVEACTION
+BLOCKROTATEACTION
+BLOCKSCALEACTION
+BLOCKVISIBILITYGRIP
+DYNAMICBLOCKPURGEPREVENTER
+MESH
+RENDERENVIRONMENT
+SECTION_MANAGER
+DETAILVIEWSTYLE
+SECTIONVIEWSTYLE
+PDFDEFINITION
+DGNDEFINITION
+DWFDEFINITION
+UNDERLAY
+```
+
 For objects with non-fixed values, taking the object type minus 500 gives an index into th
e class list, which then determines the type of object. For instance, an object type of 501
 means that this object is of the class which is second in the class list; the **classdxfna
me** field determines the type of the object.

 See the sections on EED a description of that areas.

```
-### 20.4 OBJECT PRESCRIPTIONS
+## 20.4 OBJECT PRESCRIPTIONS
```

 The object prescriptions are given in the following form:

```
     ITEM TYPE-CODE DXF-CODE DESCRIPTION

@@ -3211,11 +3298,14 @@
 ### 20.4.1 Common Entity Data

 The following data appears at the beginning of each entity in the file, and will be referr
ed to as Common Entity Data in the subsequent entity descriptions.

         Length               MS    --  Entity length (not counting itself or CRC).
-        Type                 BS    0   1 (internal DWG type code).
+    R2010+:
+        Handle Stream Size   MC    --  not counted in the Length
+    Common:
+        Type                 OT    0   internal DWG type code. BS or OT since R2010.
     R2000+ Only:
         Obj size             RL        size of object in bits, not including
                                        end handles

     Common:
         Handle               H     5   code 0, length followed by the handle bytes.
@@ -3841,11 +3931,11 @@
 Class properties:

  | App name             | ObjectDBX Classes  |
  |----------------------|--------------------|
  | Class number         | Dynamic (>= 500)   |
-| DWG version          | R18 |
+| DWG version          | R2004 |
  | Maintenance version  | 0 |
  | Class proxy flags    | 0x401 |
  | C++ class name       | AcDbArcDimension |
  | DXF name             | ARC_DIMENSION |

@@ -4235,11 +4325,11 @@
 Class properties:

  | App name             | ObjectDBX Classes  |
  |----------------------|--------------------|
  | Class number         | Dynamic (>= 500)   |
-| DWG version          | R18 |
```
```

```
+| DWG version          | R2004 |
  | Maintenance version  | 0 |
  | Class proxy flags    | 0x401 |
  | C++ class name       | AcDbRadialDimensionLarge |
  | DXF name             | LARGE\_RADIAL\_DIMENSION |

@@ -5076,21 +5166,24 @@
 ### 20.4.44 DICTIONARY (42)

 Basically a list of pairs of string/objhandle that constitute the dictionary entries.

 ```
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   S   0 42 (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 42 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
 R13-R14 Only:
     Obj size   RL   size of object in bits, not including end handles
 Common:
-    Numreactors   S   number of reactors in this object
+   Numreactors   BL   number of reactors in this object
 R2004+:
     XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
@@ -5170,46 +5263,46 @@
 R2000+:
     Linespacing Style   BS 73
     Linespacing Factor   BD 44
     Unknown bit   B
 R2004+:
-    Background flags   BL 90 0 = no background, 1 = background fill, 2 =
+   Background fill flag BL 90 0 = no background, 1 = background fill, 2 =
                                  background fill with drawing fill color, 0x10 = text
                                  frame (R2018+)

-IF background flags has bit 0x01 set, or in case of R2018 bit 0x10:
-    Background scale factor
+IF Background fill flag has bit 0x01 set, or in case of R2018 bit 0x10:
+   Background fill scale factor
                          BL 45 default = 1.5
-    Background color   CMC 63
-    Background transparency
+   Background fill color CMC 63
+   Background fill transparency
                          BL 441
-END IF background flags 0x01/0x10
+END IF Background fill flags 0x01/0x10
 R2018+
     Is NOT annotative   B
 IF MTEXT is not annotative
     Version   BS   Default 0
     Default flag   B   Default true
 BEGIN REDUNDANT FIELDS (see above for descriptions)
     Registered application H   Hard pointer
-    Attachment point   BL
-    X-axis dir   3BD 10
-    Insertion point   3BD 11
+   Ignore Attachment   BL
+   X-axis dir   3BD 11
```
```

```
+    Insertion point      3BD  10
     Rect width            BD  40
     Rect height           BD  41
-    Extents width         BD  42
     Extents height        BD  43
+    Extents width         BD  42
 END REDUNDANT FIELDS
     Column type           BS  71  0 = No columns, 1 = static columns, 2 = dynamic
                                   columns
 IF Has Columns data (column type is not 0)
     Column height count   BL  72
-    Columnn width         BD  44
+    Column width          BD  44
     Gutter                BD  45
     Auto height?           B  73
     Flow reversed?         B  74
 IF not auto height and column type is dynamic columns
-REPEAT Column heights
+REPEAT Column height count
     Column height         BD  46
 END REPEAT END
 IF (has column heights)
 END IF (has columns data)
 END IF (not annotative)
@@ -5238,25 +5331,25 @@
 ### 20.4.47 LEADER (45)

 ```
     Common Entity Data
     Unknown bit   B -- Always seems to be 0.
-    Annot type   BS -- Annotation type (NOT bit-coded):
+   Annot type   BS 73 Annotation type (NOT bit-coded):
                                   Value 0 : MTEXT
                                   Value 1 : TOLERANCE
                                   Value 2 : INSERT
                                   Value 3 : None
-    path type   BS --
+   path type   BS 72
     numpts   BL -- number of points
     point   3BD 10 As many as counter above specifies.
     Origin   3BD -- The leader plane origin (by default itâ\200\231s the firs
t
                                   point).
     Extrusion   3BD 210
     x direction   3BD 211
     offsettoblockinspt   3BD 212 Used when the BLOCK option is used. Seems to be an
                                   unused feature.
-R14+:
+R14-R2007:
     Endptproj   3BD -- A non-planar leader gives a point that projects the
                                   endpoint back to the annotation. It’s the offset
                                   from the endpoint of the leader to the annotation,
                                   taking into account the extrusion direction.
 R13-R14 Only:
@@ -5269,27 +5362,28 @@
                                   taller, probably by some DIMvar amount.)
     Box width   BD 41 MTEXT extents width. (A text box is slightly wider,
                                   probably by some DIMvar amount.)
     Hooklineonxdir   B   hook line is on x direction if 1
     Arrowheadon   B   arrowhead on indicator
-R13-R14 Only:
+R13-R14 Only:
     Arrowheadtype   BS   arrowhead type
+R13-R14 Only:
     Dimasz   BD   DIMASZ at the time of creation, multiplied by
                                   DIMSCALE
     Unknown   B
     Unknown   B
     Unknown   BS
     Byblockcolor   BS
```
```

```
     Unknown               B
     Unknown               B
 R2000+:
-    Unknown              BS
     Unknown               B
     Unknown               B
 Common:
     Common Entity Handle Data
-                          H 340  Associated annotation activated in R14. (hard pointer)
+R13+:
+                          H 340  Associated annotation activated in R14. (soft owner
+Common:
                           H   2  DIMSTYLE (hard pointer)
     CRC                   X  --
 ```

 20.4.47.1 Example:
@@ -5538,20 +5632,23 @@

 ### 20.4.51 BLOCK CONTROL (48)

 ```
     Length               MS  --  Object length (not counting itself or CRC).
-    Type                 BS 0&2  48 (internal DWG type code).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  48 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Owner handle (soft pointer) of root object (0).
     EED                   X  -3  See EED section.
 R13-R14 Only:
     Obj size             RL      size of object in bits, not including end handles
 Common:
-    Numreactors           L      Number of persistent reactors attached to this obj
+    Numreactors          BL      Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag     B      If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
@@ -5578,20 +5675,23 @@

 ### 20.4.52 BLOCK HEADER (49)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 49 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC   -- not counted in the Length
+Common:
+   Type   OT   0 49 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Owner handle (soft pointer) of root object (0).
     EED   X -3 See EED section.
 R13-R14 Only:
     Obj size   RL   size of object in bits, not including end handles
 Common:
-    Numreactors   L   Number of persistent reactors attached to this obj
+   Numreactors   BL   Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
```
```

```
@@ -5663,20 +5763,23 @@

 ### 20.4.53 LAYER CONTROL (50) (UNDOCUMENTED)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 50 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 50 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Owner handle (soft pointer) of root object (0).
     EED   X -3 See EED section.
 R13-R14 Only:
     Obj size   RL   size of object in bits, not including end handles
 Common:
-    Numreactors   L   Number of persistent reactors attached to this obj
+   Numreactors   BL   Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
@@ -5699,11 +5802,14 @@

 ### 20.4.54 LAYER (51)

 ```
     Length               MS  --  Object length (not counting itself or CRC).
-    Type                 BS 0&2  51 (internal DWG type code).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  51 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  code 0, length followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -5766,20 +5872,23 @@

 ### 20.4.55 SHAPEFILE CONTROL (52) (UNDOCUMENTED)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 52 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 52 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Owner handle (soft pointer) of root object (0).
     EED   X -3 See EED section.
 R13-R14 Only:
     Obj size   RL   size of object in bits, not including end handles
 Common:
-    Numreactors   L   Number of persistent reactors attached to this obj
+   Numreactors   BL   Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
@@ -5816,11 +5925,14 @@
```
```

```
|                              | Character set (bitmask) = 0x0000ff00
| 1002 (Bracket)               | â\200\230}â\200\231 (optional) |

```
```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  53 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  53 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  code 0, length followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -5871,20 +5983,23 @@

 ### 20.4.57 LINETYPE CONTROL (56) (UNDOCUMENTED)

```
```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  56 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  56 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Owner handle (soft pointer) of root object (0).
     EED                    X  -3  See EED section.
 R13-R14 Only:
     Obj size              RL      size of object in bits, not including end handles
 Common:
-    Numreactors            L      Number of persistent reactors attached to this obj
+    Numreactors           BL      Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
                                   object, otherwise XDictionary handle is stored as in
                                   R2000 and earlier.
 Common:
@@ -5911,11 +6026,14 @@

 ### 20.4.58 LTYPE (57)

```
```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  57 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  57 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  code 0, length followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -5982,20 +6100,23 @@

 ### 20.4.59 VIEW CONTROL (60) (UNDOCUMENTED)

```
```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  60 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  60 (internal DWG type code).
 R2000+:
```

```
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Owner handle (soft pointer) of root object (0).
     EED                    X  -3  See EED section.
 R13-R14 Only:
     Obj size              RL      size of object in bits, not including end handles
 Common:
-    Numreactors            L      Number of persistent reactors attached to this obj
+    Numreactors           BL      Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
                                   object, otherwise XDictionary handle is stored as in
                                   R2000 and earlier.
 Common:
@@ -6018,11 +6139,14 @@

 ### 20.4.60 VIEW (61)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 61 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 61 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 code 0, length followed by the handle bytes.
     EED   X -3 See EED section.
@@ -6116,20 +6240,23 @@

 ### 20.4.61 UCS CONTROL (62) (UNDOCUMENTED)

 ```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  62 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  62 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Owner handle (soft pointer) of root object (0).
     EED                    X  -3  See EED section.
 R13-R14 Only:
     Obj size              RL      size of object in bits, not including end handles
 Common:
-    Numreactors            L      Number of persistent reactors attached to this obj
+    Numreactors           BL      Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
                                   object, otherwise XDictionary handle is stored as in
                                   R2000 and earlier.
 Common:
@@ -6152,11 +6279,14 @@

 ### 20.4.62 UCS (63)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 63 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 63 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
```
```

```
 Common:
     Handle                H   5  code 0, length followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6214,11 +6344,14 @@

 ### 20.4.63 TABLE (VPORT) (64) (UNDOCUMENTED)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 64 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 64 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 code 0, length followed by the handle bytes.
     EED   X -3 See EED section.
@@ -6252,11 +6385,14 @@

 ### 20.4.64 VPORT (65)

 ```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  65 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  65 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6380,11 +6516,14 @@

 ### 20.4.65 TABLE (APPID) (66) (UNDOCUMENTED)

 ```
     Length   MS -- Object length (not counting itself or CRC).
-    Type   BS 0&2 66 (internal DWG type code).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 66 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Owner handle (soft pointer) of root object (0).
     EED   X -3 See EED section.
@@ -6416,11 +6555,14 @@

 ### 20.4.66 APPID (67)

 ```
     Length                MS  --  Object length (not counting itself or CRC).
-    Type                  BS 0&2  67 (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  67 (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6463,11 +6605,14 @@
```

```
 ### 20.4.67 DIMSTYLE CONTROL (68) (UNDOCUMENTED)

 ```
     Length               MS  --  Object length (not counting itself or CRC).
-    Type                 BS 0&2  68 (internal DWG type code).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  68 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Owner handle (soft pointer) of root object (0).
     EED                   X  -3  See EED section.
@@ -6498,11 +6643,11 @@
 ```

 ### 20.4.68 DIMSTYLE (69)

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
+    Length               MS  --  Object length (not counting itself or CRC).
     Type                 BS   0  69 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
@@ -6699,21 +6844,24 @@
 ```

 ### 20.4.69 VIEWPORT ENTITY CONTROL (70) (UNDOCUMENTED)

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS 0&2  70 (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  70 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Owner handle (soft pointer) of root object (0).
     EED                   X  -3  See EED section.
 R13-R14 Only:
     Obj size             RL      size of object in bits, not including end handles
 Common:
-    Numreactors           B   L  Number of persistent reactors attached to this obj
+    Numreactors          BL      Number of persistent reactors attached to this obj
 R2004+:
     XDic Missing Flag     B      If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.
 Common:
@@ -6736,12 +6884,15 @@
 ```

 ### 20.4.70 VIEWPORT ENTITY HEADER (71)

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS 0&2  71 (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  71 (internal DWG type code).
 R2000+:
```
```

```
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6796,12 +6947,15 @@
 |          |  H    |  340  | Handle to scale (AcDbScale) object (hard pointer). See paragra
ph 20.4.92. |

 ### 20.4.72 GROUP (72): Group of ACAD entities

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS   0  72 (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  72 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6838,12 +6992,15 @@
 ```

 ### 20.4.73 MLINESTYLE (73):

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS   0  73 (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  73 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -6912,12 +7069,15 @@
 NOTE: OBJECTS LISTED AFTER THIS POINT DO NOT HAVE FIXED TYPES. THEIR TYPES ARE DETERMINED
 BY FINDING THE CLASS ENTRY WHOSE POSITION IN THE CLASS LIST + 500 EQUALS THE TYPE OF THIS O
 BJECT

 ### 20.4.74 DICTIONARYVAR (varies)

 ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS   0  72 (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  72 (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -7015,11 +7175,11 @@
             pt0         2RD  10  control point
             if (isrational)
               weight     BD  40  weight
             endif
           End repeat
-R24:
-R2010:
```

```
           Numfitpoints   BL  97  number of fit points
           Begin repeat numfitpoints times:
             Fitpoint    2RD  11
           End repeat
           Start tangent 2RD  12
@@ -7125,11 +7285,11 @@
 Class properties:

  | App name              | ObjectDBX Classes  |
  |-----------------------|--------------------|
  | Class number          | Dynamic (>= 500)   |
-| DWG version           | R18                |
+| DWG version           | R2004                |
  | Maintenance version   | 0                  |
  | Class proxy flags     | 0x480              |
  | C++ class name        | AcDbField          |
  | DXF name              | FIELD              |

@@ -7178,11 +7338,11 @@
  |          |       |       | Other error = 64
  |          | BL    |    96 | Evaluation error code
  |          | TV    |   300 | Evaluation error message
  |          | ...   |   ... | The field value, see paragraph 20.4.99.
  |          | TV    | 301,9 | Value string (DXF: written in 255 character chunks)
-|          | TV    |    98 | Value string length
+|          | BL    |    98 | Value string length
  |          | BL    |    93 | Number of child fields
  |          |       |       | Begin repeat child fields
  |          | TV    |     6 | Child field key
  |          | ...   |   ... | The field value, see paragraph 20.4.99.
  |          |       |       | End repeat child fields
@@ -7192,11 +7352,11 @@
 Class properties:

  | App name              | ObjectDBX Classes  |
  |-----------------------|--------------------|
  | Class number          | Dynamic (>= 500)   |
-| DWG version           | R18                |
+| DWG version           | R2004                |
  | Maintenance version   | 0                  |
  | Class proxy flags     | 0x480              |
  | C++ class name        | AcDbFieldList, inherits AcDbIdSet |
  | DXF name              | FIELDLIST          |

@@ -7216,11 +7376,11 @@
 Class properties:

  | App name              | ObjectDBX Classes  |
  |-----------------------|--------------------|
  | Class number          | Dynamic (>= 500)   |
-| DWG version           | R21                |
+| DWG version           | R2007                |
  | Maintenance version   | 45                 |
  | Class proxy flags     | 0xFFF              |
  | C++ class name        | AcDbGeoData        |
  | DXF name              | GEODATA            |

@@ -7246,11 +7406,11 @@
  |          |       |       | Light years = 19, Parsecs = 20
  |          | BD    |       | Unit scale factor vertical
  |          | BL    |       | Units value vertical (same enumeration as for the units value
  |          |       |       | horizontal)
  |          | 3BD   |       | Up direction
-|          | 3RD   |       | North direction
+|          | 2RD   |       | North direction
  |          | BL    |       | Scale estimation method: None = 1, User specified scale factor = 2,
  |          |       |       | Grid scale at reference point = 3, Prismodial = 4
  |          | BD    |       | User specified scale factor
  |          | B     |       | Do sea level correction
```

```
 |         | BD   |      | Sea level elevation
@@ -7284,11 +7444,11 @@
 |         |      |      | Repeat for each geo mesh face
 |         | BL   |      | Face index 1
 |         | BL   |      | Face index 2
 |         | BL   |      | Face index 3
 |         |      |      | End repeat geo mesh faces
-|         |      |      | If DWG version is R21 or lower:
+|         |      |      | If DWG version is R2007 or lower:
 |         |      |      | Below is CIVIL data. AutoCAD 2010 always writes civil data.
 |         | B    |      | Has civil data? (true)
 |         | B    |      | False
 |         | RD   |      | Reference point Y
 |         | RD   |      | Reference point X
@@ -7311,12 +7471,15 @@
 ### 20.4.79 IDBUFFER (varies)

 (holds list of references to an xref)

 ```
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   S   0 (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
@@ -7431,12 +7594,15 @@

 ### 20.4.81 IMAGEDEF (varies)

 ```
 (used in conjunction with IMAGE entities)
-    Length                MS  --  Entity length (not counting itself or CRC).
-    Type                   S   0  (internal DWG type code).
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Length (char) followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -7481,12 +7647,15 @@

 ### 20.4.82 IMAGEDEFREACTOR (varies)

 ```
 (used in conjunction with IMAGE entities)
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   S   0 (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
@@ -7517,12 +7686,15 @@
```
```

```

### 20.4.83 LAYER_INDEX

```
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   BS   0 (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
@@ -7533,12 +7705,12 @@
 R2004+:
     XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
                                   object, otherwise XDictionary handle is stored as in
                                   R2000 and earlier.
 Common:
-    timestamp1   BL 40
-    timestamp2   BL 40
+   timestamp1   BL 40 last_updated days
+   timestamp2   BL 40 last_updated msec
     numentries   BL   the number of entries
 Repeat numentries times:
     Indexlong   BL   a long
     Indexstr   TV   8 a layer name
 End repeat
@@ -7572,11 +7744,14 @@

20.4.84 LAYOUT (varies)

```
     Length                MS  --  Entity length (not counting itself or CRC).
-    Type                  BS   0  (internal DWG type code).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Length (char) followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -7955,12 +8130,15 @@
 |       | B     | 290 | Default flag (default value is false).

### 20.4.90 PROXY (varies):

```
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   BS   0 typecode (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
@@ -7995,12 +8173,15 @@

20.4.91 RASTERVARIABLES (varies)

```
 (used in conjunction with IMAGE entities)
-    Length                MS  --  Entity length (not counting itself or CRC).
-    Type                  BS   0  typecode (internal DWG type code).
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Length (char) followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -8047,12 +8228,15 @@
 |        | B      | 290 | Has unit scale          |

 ### 20.4.93 SORTENTSTABLE (varies)

 ```
-    Length   MS -- Entity length (not counting itself or CRC).
-    Type   BS   0 typecode (internal DWG type code).
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
 R2000+:
     Obj size   RL   size of object in bits, not including end handles
 Common:
     Handle   H   5 Length (char) followed by the handle bytes.
     EED   X -3 See EED section.
@@ -8105,12 +8289,15 @@

 ### 20.4.94 SPATIAL_FILTER (varies)

 ```
 (used to clip external references)
-    Length                MS  --  Entity length (not counting itself or CRC).
-    Type                  BS   0  typecode (internal DWG type code).
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Length (char) followed by the handle bytes.
     EED                    X  -3  See EED section.
@@ -8169,12 +8356,15 @@
 ```

 ### 20.4.95 SPATIAL_INDEX (varies):

 ```
-    Length                MS  --  Entity length (not counting itself or CRC).
-    Type                  BS   0  typecode (internal DWG type code).
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
 R2000+:
     Obj size              RL      size of object in bits, not including end handles
 Common:
     Handle                 H   5  Length (char) followed by the handle bytes.
     EED                    X  -3  See EED section.
```

```
@@ -8186,12 +8376,12 @@
     XDic Missing Flag     B      If 1, no XDictionary handle is stored for this
                                  object, otherwise XDictionary handle is stored as in
                                  R2000 and earlier.

 Common:
-    timestamp1            BL
-    timestamp2            BL
+    timestamp1            BL  40  last_updated days
+    timestamp2            BL  40  last_updated msec
     unknown                X      rest of bits to handles
     Handle refs            H      parenthandle (hard owner)
                                   [Reactors (soft pointer)]
                                   xdictionary (hard owner)
 ```
@@ -8333,18 +8523,18 @@
 0D688 54 B0   crc
 ```

 ### 20.4.96 TABLE (varies)

-The TABLE entity (entity type ACAD_TABLE) was introduced in AutoCAD 2005 (a sub release of R18), and a large number of changes were introduced in AutoCAD 2008 (a sub release of R21). The table entity inherits from the INSERT entity. The geometric results, consisting of table borders, texts and such are created in an anonymous block, similarly to the mechanism in the DIMENSION entity.
+The TABLE entity (entity type ACAD_TABLE) was introduced in AutoCAD 2005 (a sub release of R2004), and a large number of changes were introduced in AutoCAD 2008 (a sub release of R2007). The table entity inherits from the INSERT entity. The geometric results, consisting of table borders, texts and such are created in an anonymous block, similarly to the mechanism in the DIMENSION entity.
 The anonymous block name prefix is â\200\234*Tâ\200\235. For the AutoCAD 2008 changes see paragraph 20.4.96.2.

 TODO: document roundtrip data with connections to AcDbTableContent and AcDbTableGeometry.

-20.4.96.1 **_Until R21_**
+20.4.96.1 **_Until R2007_**

-This paragraph describes the table DWG format until R21. In R24 the format was changed to make use of table content to contain all data (AcDbTableContent).
+This paragraph describes the table DWG format until R2007. In R2010 the format was changed to make use of table content to contain all data (AcDbTableContent).

 ```
     Common Entity Data
     Ins pt               3BD  10
 R13-R14 Only:
@@ -8618,13 +8808,13 @@
                                  0x80000 is set in table overrides flag

     CRC                   X ---
 ```

-**20.4.96.2** **_R24 and later_**
+**20.4.96.2** **_R2010 and later_**

-In the R24 format the old table data structures were replaced with new data structures, of which the root is the AcDbTableContent class. The old data structures are still used in the DXF format. An R24 DXF file contains both the old and new structures, where the new structures are optionally used. If AutoCAD can store all data just using the old structures it does not always write the new structures in DXF. In an R24 DWG file, always the new structures are used. The table then points to a AcDbTableContent object, which contains most of the actual data. Note that AcDbTableContent was already introduced in AutoCAD 2008 (R21), but in R21 it was indirectly referenced through the tables extension dictionary entry `ACAD_XREC_ROUNDTRIP` (TODO: describe details on `ACAD_ROUNDTRIP_2008_TABLE_ENTITY` and for 2007).
+In the R2010 format the old table data structures were replaced with new data structures, of which the root is the AcDbTableContent class. The old data structures are still used in the DXF format. An R2010 DXF file contains both the old and new structures, where the new s
```

tructures are optionally used. If AutoCAD can store all data just using the old structures it does not always write the new structures in DXF. In an R2010 DWG file, always the new st ructures are used. The table then points to a AcDbTableContent object, which contains most of the actual data. Note that AcDbTableContent was already introduced in AutoCAD 2008 (R200 7), but in R2007 it was indirectly referenced through the tables extension dictionary entry `ACAD_XREC_ROUNDTRIP` (TODO: describe details on `ACAD_ROUNDTRIP_2008_TABLE_ENTITY` and fo r 2007).

```
 |Version|Field type|DXF group| Description                          |
 |-------|----------|---------|--------------------------------------|
 |       |  ...     |         | Common entity data                   |
 | R2010+|  RC      |         | Unknown (default 0)                  |
@@ -8667,11 +8857,11 @@
 |       |  BL      |         | End row index                        |
 |       |          |         | End repeat row ranges
```

20.4.97 TABLECONTENT

-This represents the table content (AcDbTableContent) that replaces the old table data stru ctures that were introduced in AutoCAD 2005. Table content was introduced in AutoCAD 2008 a nd supports more advanced features like e.g. multiple contents per cell. In AutoCAD 2008 th e table content was written as a separate object in DWG and referenced by roundtrip data in the table entityâ\200\231s extension dictionary. In DXF this is still the case even for R2 4. In a R24 DWG file, the table content is part of the table entity data and is no longer p resent as a separate object. Possibly for backwards compatibility with the AutoCAD 2007 (R2 1) format, this separate data container was created instead of extending the ACAD_TABLE en tity.
+This represents the table content (AcDbTableContent) that replaces the old table data stru ctures that were introduced in AutoCAD 2005. Table content was introduced in AutoCAD 2008 a nd supports more advanced features like e.g. multiple contents per cell. In AutoCAD 2008 th e table content was written as a separate object in DWG and referenced by roundtrip data in the table entityâ\200\231s extension dictionary. In DXF this is still the case even for R2 010. In a R2010 DWG file, the table content is part of the table entity data and is no long er present as a separate object. Possibly for backwards compatibility with the AutoCAD 2007 format, this separate data container was created instead of extending the ACAD_TABLE enti ty.

The table content class inherits from 3 other classes, which never exist independently so they will all be described in this paragraph. AcDbTableContent inherits from AcDbFormattedT ableData, which inherits from AcDbLinkedTableData, which inherits from AcDbLinkedData. Clas s AcDbLinkedTableData contains most of the data (rows, columns, cells, cell contents).

```
 |Version|Field type|DXF group| Description                          |
 |-------|----------|---------|--------------------------------------|
@@ -8763,11 +8953,11 @@
 |       |          |         | Begin repeat field references        |
 |       |  H       |         | Handle to field (AcDbField), hard owner.|
 |       |          |         | End repeat field references          |
 |       |          |         | **AcDbFormattedTableData** fields    |
 |       |  ...     |         | The tableâ\200\231s cell style override fields (see paragraph 20.4
.101.4). The tableâ\200\231s |
-|       |          |         | base cell style is the table styleâ\200\231s overall cell style (p
resent from R24 onwards).                                            |
+|       |          |         | base cell style is the table styleâ\200\231s overall cell style (p
resent from R2010 onwards).                                          |
 |       |  BL      |  90     | Number of merged cell ranges         |
 |       |          |         | Begin repeat merged cell ranges      |
 |       |  BL      |  91     | Top row index                        |
 |       |  BL      |  92     | Left column index                    |
 |       |  BL      |  93     | Bottom row index                     |
@@ -8832,11 +9022,11 @@
 |       |  ...     |         | Item value (variant), see paragraph 20.4.98.|
 |       |          |         | End repeat custom data items         |
```

20.4.101 TABLESTYLE

-The table style object repesents the style for the table entity. Like the table entity, ta ble style was introduced in AutoCAD 2005. In AutoCAD 2008 new cell style data was introduce d, which was stored in a separate container object: CELLSTYLEMAP, see paragraph 20.4.102 fo

r more details. The cellstyle map can contain custom cell styles, whereas the TABLESTYLE on
ly contains the Table (R24), _Title , _Header and _Data cell style.
+The table style object repesents the style for the table entity. Like the table entity, ta
ble style was introduced in AutoCAD 2005. In AutoCAD 2008 new cell style data was introduce
d, which was stored in a separate container object: CELLSTYLEMAP, see paragraph 20.4.102 fo
r more details. The cellstyle map can contain custom cell styles, whereas the TABLESTYLE on
ly contains the Table (R2010), _Title , _Header and _Data cell style.

20.4.101.1 _TABLESTYLE format until R21_

```
    Common OBJECT data, see paragraph 20.1.
@@ -8869,30 +9059,30 @@
    Data unit type       BL  91  As defined in the ACAD\_TABLE entity.
    Format string        TV   1
End repeat row styles
```

-#### 20.4.101.2 R24 TABLESTYLE format
+#### 20.4.101.2 R2010 TABLESTYLE format

Version	Field type	DXF group	Description
	RC	-	Unknown
	TV	3	Description
	BL	-	Unknown
	BL	-	Unknown
	H	-	Unknown (hard owner)
	...		The cell style with name â\200\234Tableâ\200\235, see paragraph 20.4.101.4.
-|	BL	90	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R24).
+|	BL	90	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R2010).
			The cell style ID is used by cells, columns, rows to reference a cell style in the
			tableâ\200\231s table style. Custom cell style IDâ\200\231s are numbered starting at 101.
	BL	91	Cell style class, 1= data, 2 = label. The default value is label.
	TV	300	Cell style name
	BL		The number of cell styles (should be 3), the non-custom cell styles are present
			only in the CELLSTYLEMAP.
			Begin repeat cell styles (for data, title, header in this order)
	...		The cell style fields, see paragraph 20.4.101.4.
-|	BL	-	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R24).
+|	BL	-	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R2010).
			The cell style ID is used by cells, columns, rows to reference a cell style in the
			tableâ\200\231s table style. Custom cell style IDâ\200\231s are numbered starting at 101.
	BL	-	Cell style class, 1= data, 2 = label. The default value is label.
	TV	-	Cell style name
			End repeat cell styles

```
@@ -9016,11 +9206,11 @@
```

	...		Common AcDbObject fields, see paragraph 20.1.
	BL	90	Number of cell styles
			Begin repeat cell styles
	...		Cell style fields, see paragraph 20.4.101.4.
-|	BL	90	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R24).
+|	BL	90	Cell style ID, 1 = title, 2 = header, 3 = data, 4 = table (new in R2010).
			The cell style ID is used by cells, columns, rows to reference a c

```
ell style in the |
  |       |       |     | tableâ\200\231s table style. Custom cell style IDâ\200\231s are nu
mbered starting at 101. |
  |       |  BL   |  91 | Cell style class, 1= data, 2 = label. The default value is label.
|
  |       |  TV   | 300 | Cell style name                 |
  |       |       |     | End repeat cell styles          |
@@ -9052,15 +9242,18 @@
  |       |  BD   |  95 | Unknown (0).                    |
  |       |       |     | End repeat contents             |
  |       |       |     | End repeat columns              |
  |       |       |     | End repeat rows                 |

-### 20.4.104 XRECORD (varies):
+### 20.4.104 XRECORD (varies)

  ```
-    Length               MS  --  Entity length (not counting itself or CRC).
-    Type                 BS   0  typecode (internal DWG type code).
+    Length               MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size   MC  --  not counted in the Length
+Common:
+    Type                 OT   0  typecode (internal DWG type code).
 R2000+:
     Obj size             RL      size of object in bits, not including end handles
 Common:
     Handle                H   5  Length (char) followed by the handle bytes.
     EED                   X  -3  See EED section.
@@ -9118,36 +9311,669 @@
 00B1B 40 3E 00 01 00 46 00 B4 @>...F.. 0100 0000 0011 1110 0000 0000 0000 0001 0000 0000 0
100 0110 0000 0000 1011 0100
 00B23 00 40 41 0C 30          .@A.0    0000 0000 0100 0000 0100 0001 0000 1100 0011 0000
 00B28 45 76                   crc
  ```

+### 20.4.105 AcDbEvalExpr subclass
+
+```
+ parentid   BL   0
+ major version   BL 98 default: 33
+ minor version   BL 99 default: 29
+ value_code   BS 70 dxf code of the next value
+ If value_code == 40
+ num40   BD 40
+ Else If value_code == 10
+ pt2d   2RD 10
+ Else If value_code == 11
+ pt3d   3RD 11
+ Else If value_code == 1
+ text1   T   1
+ Else If value_code == 90
+ long90   BL 90
+ Else If value_code == 91
+ handle91   H 91 (code 5)
+ Else If value_code == 70
+ short70   BL 70
+ End If value_code
+ nodeid   BL   -
+```
+
+### 20.4.106 AcDbShHistoryNode subclass
+
+```
+ major version   BL 90 Seen 27-33
+ minor version   BL 91 Seen 29-106
+ trans   16xBD 40 transformation matrix
+ color   CMC 62
+ step_id   BL 92
```

```
+  material                H 347
+```
+
+### 20.4.107 ACSH\_BOX\_CLASS
+
+Class properties:
+
+| App name              | ObjectDBX Classes  |
+|---------------------|-------------------|
+| Class number          | Dynamic (>= 500)   |
+| DWG version           | R2000              |
+| Maintenance version | 0                  |
+| Class proxy flags     | 499                |
+| C++ class name        | AcDbShBox          |
+| DXF name              | ACSH\_BOX\_CLASS   |
+
+```
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
+R2000+:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Handle                 H   5  Length (char) followed by the handle bytes.
+    EED                    X  -3  See EED section.
+R13-R14 Only:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Numreactors           BL      number of reactors in this object
+R2004+:
+    XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
+                                  object, otherwise XDictionary handle is stored as in
+                                  R2000 and earlier.
+
+Common:
+    AcDbEvalExpr          ...     See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...     See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    length                BD  40
+    width                 BD  41
+    height                BD  42
+
+    Handle refs            H      parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.108 ACSH\_WEDGE\_CLASS
+
+Class properties:
+
+| App name              | ObjectDBX Classes  |
+|---------------------|-------------------|
+| Class number          | Dynamic (>= 500)   |
+| DWG version           | R2000              |
+| Maintenance version | 0                  |
+| Class proxy flags     | 499                |
+| C++ class name        | AcDbShWedge        |
+| DXF name              | ACSH\_WEDGE\_CLASS |
+
+Same fields as ACSH\_BOX\_CLASS.
+
+```
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
```

```
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
+R2000+:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Handle                 H   5  Length (char) followed by the handle bytes.
+    EED                    X  -3  See EED section.
+R13-R14 Only:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Numreactors           BL      number of reactors in this object
+R2004+:
+    XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
+                                  object, otherwise XDictionary handle is stored as in
+                                  R2000 and earlier.
+
+Common:
+    AcDbEvalExpr          ...     See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...     See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    length                BD  40
+    width                 BD  41
+    height                BD  42
+
+    Handle refs            H      parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.109 ACSH\_SPHERE\_CLASS
+
+Class properties:
+
+| App name | ObjectDBX Classes |
|---|---|
| Class number | Dynamic (>= 500) |
| DWG version | R2000 |
| Maintenance version | 0 |
| Class proxy flags | 499 |
| C++ class name | AcDbShSphere |
| DXF name | ACSH\_SPHERE\_CLASS |

```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
+   AcDbShHistoryNode   ...   See 20.4.106 AcDbShHistoryNode subclass
+   major   BL 90
+   minor   BL 91
+   radius   BD 40
```
```

```
+
+    Handle refs           H      parenthandle (soft pointer)
+                                 [Reactors (soft pointer)]
+                                 xdictionary (hard owner)
+```
+
+### 20.4.110 ACSH\_CYLINDER\_CLASS
+
+Class properties:
+
+| App name              | ObjectDBX Classes  |
|-----------------------|--------------------|
| Class number          | Dynamic (>= 500)   |
| DWG version           | R2000              |
| Maintenance version   | 0                  |
| Class proxy flags     | 499                |
| C++ class name        | AcDbShCylinder     |
| DXF name              | ACSH\_CYLINDER\_CLASS|

```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
+   AcDbShHistoryNode   ...   See 20.4.106 AcDbShHistoryNode subclass
+   major   BL 90
+   minor   BL 91
+   height   BD 40
+   major_radius   BD 41
+   minor_radius   BD 42
+   x_radius   BD 43
+
+   Handle refs   H   parenthandle (soft pointer)
+   [Reactors (soft pointer)]
+   xdictionary (hard owner)
+```
+
+### 20.4.111 ACSH_CONE_CLASS
+
+Class properties:
+

App name	ObjectDBX Classes
Class number	Dynamic (>= 500)
DWG version	R2000
Maintenance version	0
Class proxy flags	499
C++ class name	AcDbShCone
DXF name	ACSH_CONE_CLASS

+
+Same fields as ACSH_CYLINDER_CLASS.
+

```
+```
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
+R2000+:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Handle                 H   5  Length (char) followed by the handle bytes.
+    EED                    X  -3  See EED section.
+R13-R14 Only:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Numreactors           BL      number of reactors in this object
+R2004+:
+    XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
+                                  object, otherwise XDictionary handle is stored as in
+                                  R2000 and earlier.
+
+Common:
+    AcDbEvalExpr          ...     See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...     See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    height                BD  40
+    major_radius          BD  41
+    minor_radius          BD  42
+    x_radius              BD  43
+
+    Handle refs            H      parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.112 ACSH\_PYRAMID\_CLASS
+
+Class properties:
+
+| App name | ObjectDBX Classes |
|---|---|
| Class number | Dynamic (>= 500) |
| DWG version | R2000 |
| Maintenance version | 0 |
| Class proxy flags | 499 |
| C++ class name | AcDbShPyramid |
| DXF name | ACSH\_PYRAMID\_CLASS |

```
+```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
```
```

```
+    AcDbEvalExpr          ...     See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...     See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    height                BD  40
+    sides                 BL  92
+    radius                BD  41
+    topradius             BD  42
+
+    Handle refs            H      parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.113 ACSH\_FILLET\_CLASS
+
+Class properties:
+
+| App name              | ObjectDBX Classes  |
|-----------------------|--------------------|
| Class number          | Dynamic (>= 500)   |
| DWG version           | R2000              |
| Maintenance version   | 0                  |
| Class proxy flags     | 499                |
| C++ class name        | AcDbShFillet       |
| DXF name              | ACSH\_FILLET\_CLASS|

```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
+   AcDbShHistoryNode   ...   See 20.4.106 AcDbShHistoryNode subclass
+   major   BL 90
+   minor   BL 91
+   num_edges   BL 93
+   Repeat num_edges
+   edges   BL 94
+   End Repeat num_edges
+   num_radiuses   BL 93
+   Repeat num_radiuses
+   radiuses   BD 41
+   End Repeat num_radiuses
+   num_startsetbacks   BL 96
+   num_endsetbacks   BL 97
+   Repeat num_endsetbacks
+   endsetbacks   BD 43
+   End Repeat num_endsetbacks
+   Repeat num_startsetbacks
+   startsetbacks   BD 42
+   End Repeat num_startsetbacks
+
```
```

```
+    Handle refs           H      parenthandle (soft pointer)
+                                 [Reactors (soft pointer)]
+                                 xdictionary (hard owner)
+```
+
+### 20.4.114 ACSH\_CHAMFER\_CLASS
+
+Class properties:
+
+| App name | ObjectDBX Classes |
|---|---|
| Class number | Dynamic (>= 500) |
| DWG version | R2000 |
| Maintenance version | 0 |
| Class proxy flags | 499 |
| C++ class name | AcDbShChamfer |
| DXF name | ACSH\_CHAMFER\_CLASS |

```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
+   AcDbShHistoryNode   ...   See 20.4.106 AcDbShHistoryNode subclass
+   major   BL 90
+   minor   BL 91
+   unknown   BL 92
+   base_dist   BD 41
+   other_dist   BD 42
+   num_edges   BL 93
+   Repeat num_edges
+   edges   BL 94
+   End Repeat num_edges
+   unknown   BL 95
+
+   Handle refs   H   parenthandle (soft pointer)
+   [Reactors (soft pointer)]
+   xdictionary (hard owner)
+```
+
+### 20.4.115 ACSH_TORUS_CLASS
+
+Class properties:
+

App name	ObjectDBX Classes
Class number	Dynamic (>= 500)
DWG version	R2000
Maintenance version	0
Class proxy flags	499
C++ class name	AcDbShTorus
DXF name	ACSH_TORUS_CLASS

```
+
+```
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
+R2000+:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Handle                 H   5  Length (char) followed by the handle bytes.
+    EED                    X  -3  See EED section.
+R13-R14 Only:
+    Obj size              RL      size of object in bits, not including end handles
+Common:
+    Numreactors           BL      number of reactors in this object
+R2004+:
+    XDic Missing Flag      B      If 1, no XDictionary handle is stored for this
+                                  object, otherwise XDictionary handle is stored as in
+                                  R2000 and earlier.
+
+Common:
+    AcDbEvalExpr          ...     See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...     See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    major_radius          BD  41
+    minor_radius          BD  42
+
+    Handle refs            H      parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.116 ACSH\_BREP\_CLASS
+
+Class properties:
+
+| App name | ObjectDBX Classes |
|---|---|
| Class number | Dynamic (>= 500) |
| DWG version | R2000 |
| Maintenance version | 0 |
| Class proxy flags | 499 |
| C++ class name | AcDbShBrep |
| DXF name | ACSH\_BREP\_CLASS |

+
```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
```
```

```
+    AcDbShHistoryNode    ...      See 20.4.106 AcDbShHistoryNode subclass
+    major                BL  90
+    minor                BL  91
+    3DSOLID                       See chapter 20.4.41
+
+    Handle refs           H       parenthandle (soft pointer)
+                                  [Reactors (soft pointer)]
+                                  xdictionary (hard owner)
+```
+
+### 20.4.117 ACSH\_BOOLEAN\_CLASS
+
+Class properties:
+
+| App name              | ObjectDBX Classes  |
+|-----------------------|--------------------|
+| Class number          | Dynamic (>= 500)   |
+| DWG version           | R2000              |
+| Maintenance version   | 0                  |
+| Class proxy flags     | 499                |
+| C++ class name        | AcDbShBoolean      |
+| DXF name              | ACSH\_BOOLEAN\_CLASS |
+
```
+   Length   MS -- Object length (not counting itself or CRC).
+R2010+:
+   Handle Stream Size   MC -- not counted in the Length
+Common:
+   Type   OT   0 typecode (internal DWG type code).
+R2000+:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Handle   H   5 Length (char) followed by the handle bytes.
+   EED   X -3 See EED section.
+R13-R14 Only:
+   Obj size   RL   size of object in bits, not including end handles
+Common:
+   Numreactors   BL   number of reactors in this object
+R2004+:
+   XDic Missing Flag   B   If 1, no XDictionary handle is stored for this
+   object, otherwise XDictionary handle is stored as in
+   R2000 and earlier.
+
+Common:
+   AcDbEvalExpr   ...   See 20.4.105 AcDbEvalExpr subclass
+   AcDbShHistoryNode   ...   See 20.4.106 AcDbShHistoryNode subclass
+   major   BL 90
+   minor   BL 91
+   operation   RC 280
+   operand1   BL 92
+   operand2   BL 93
+
+   Handle refs   H   parenthandle (soft pointer)
+   [Reactors (soft pointer)]
+   xdictionary (hard owner)
+```
+
+### 20.4.118 ACSH_HISTORY_CLASS
+
+Class properties:
+
+| App name | ObjectDBX Classes |
+|-----------------------|--------------------|
+| Class number | Dynamic (>= 500) |
+| DWG version | R2000 |
+| Maintenance version | 0 |
+| Class proxy flags | 499 |
+| C++ class name | AcDbShHistory |
+| DXF name | ACSH_HISTORY_CLASS |

```
+
+```
+    Length                MS  --  Object length (not counting itself or CRC).
+R2010+:
+    Handle Stream Size    MC  --  not counted in the Length
+Common:
+    Type                  OT   0  typecode (internal DWG type code).
+R2000+:
+    Obj size              RL       size of object in bits, not including end handles
+Common:
+    Handle                 H   5  Length (char) followed by the handle bytes.
+    EED                    X  -3  See EED section.
+R13-R14 Only:
+    Obj size              RL       size of object in bits, not including end handles
+Common:
+    Numreactors           BL       number of reactors in this object
+R2004+:
+    XDic Missing Flag      B       If 1, no XDictionary handle is stored for this
+                                   object, otherwise XDictionary handle is stored as in
+                                   R2000 and earlier.
+
+Common:
+    AcDbEvalExpr          ...      See 20.4.105 AcDbEvalExpr subclass
+    AcDbShHistoryNode     ...      See 20.4.106 AcDbShHistoryNode subclass
+    major                 BL  90
+    minor                 BL  91
+    owner                  H 260  code 2
+    h_nodeid              BL  92
+    show_history           B 280
+    record_history         B 281
+
+    Handle refs            H       parenthandle (soft pointer)
+                                   [Reactors (soft pointer)]
+                                   xdictionary (hard owner)
+```
+
 # 21 Data section AcDb:ObjFreeSpace

-The meaning of this section is not completely known. The ODA knows how to write a valid se
ction, but
-the meaning is not known of every field.
+From R13 to R2000 this section is the third section, which is immediately followed by the
SECOND FILE HEADER (R13-R2000). See chapter 26.

-## 21.1 Until R18
+## 21.1 Until R2007

| Type | Length | Description |
|---|---|---|
| Int32 | 4 | 0 |
| UInt32 | 4 | Approximate number of objects in the drawing (number of handles). |
| Julian datetime | 8 | If version > R14 then system variable TDUPDATE otherwise TDUUPDATE. |
| UInt32 | 4 | Offset of the objects section in the stream. |
| UInt8 | 1 | Number of 64-bit values that follow (ODA writes 4). |
| UInt32 | 4 | ODA writes 0x00000032. |
| UInt32 | 4 | ODA writes 0x00000000. |
| UInt32 | 4 | ODA writes 0x00000064. |
| UInt32 | 4 | ODA writes 0x00000000. |
| UInt32 | 4 | ODA writes 0x00000200. |
| UInt32 | 4 | ODA writes 0x00000000. |
| UInt32 | 4 | ODA writes 0xffffffff. |
| UInt32 | 4 | ODA writes 0x00000000. |
| UInt32 | 4 | Offset of the objects section in the stream. 0 since R2000 |
| UInt8 | 1 | Number of 64-bit values that follow (Always 4). |
| UInt64 | 8 | max32, 0x00000032. |
| UInt64 | 8 | max64, 0x00000064. |
| UInt64 | 8 | maxtbl, 0x00000200. |
```

```
   |
+| UInt64          | 8      | maxrl, 0xffffffff.
   |
+
+## 21.2 Since R2010
+
+| Type            | Length | Description
   |
+|-----------------|--------|-----------------------------------------------------------
---|
+| Int64           | 8      | 0
   |
+| UInt64          | 8      | Approximate number of objects in the drawing (number of handle
s).|
+| Julian datetime| 8      | If version > R14 then system variable TDUPDATE otherwise TDUUP
DATE.|
+| UInt8           | 1      | Number of 64-bit (resp. 128-bit) values that follow (Always 4)
.  |
+| UInt64          | 8      | max32, 0x00000032.
   |
+| UInt64          | 8      | max32 hi, 0x00000000.
   |
+| UInt64          | 8      | max64, 0x00000064.
   |
+| UInt64          | 8      | max64 hi, 0x00000000.
   |
+| UInt64          | 8      | maxtbl, 0x00000200.
   |
+| UInt64          | 8      | maxtbl hi, 0x00000000.
   |
+| UInt64          | 8      | maxrl, 0xffffffff.
   |
+| UInt64          | 8      | maxrl hi, 0x00000000.
   |
```

22 Data section: AcDb:Template

-This section is optional in releases 13-15. The section is mandatory in the releases 18 an d newer. The template section only contains the MEASUREMENT system variable.
+This section is optional in releases r13-r2000. The section is mandatory in the releases R 2004 and newer. The template section only contains the MEASUREMENT system variable.

```
| Type    | Length | Description                                                          |
|---------|--------|----------------------------------------------------------------------|
| Int16   | 2      | Template description string length in bytes (the ODA always writes   |
|         |        | 0 here).
@@ -9155,11 +9981,11 @@
|         |        | codepage to encode the bytes).                                       |
| UInt16  | 2      | MEASUREMENT system variable (0 = English, 1 = Metric).               |
```

23 Data section AcDb:Handles (OBJECT MAP)

-## 23.1 R13-15
+## 23.1 R13-2000

The Object Map is a table which gives the location of each object in the file This table i s broken into sections. It is basically a list of handle/file loc pairs, and goes (somethin g like) this:

```
Set the "last handle" to all 0 and the "last loc" to 0L;
@@ -9177,13 +10003,13 @@
End top repeat
```

Note that each section is cut off at a maximum length of 2032.

-## 23.2 R18
+## 23.2 R2004

```
-This section is compressed and contains the standard 32 byte section header. The decompres
sed data in this section is identical to the â\200\234Object Mapâ\200\235 section data foun
d in R15 and earlier files, excepts that offsets are not absolute file addresses, but are i
nstead offsets into the AcDb:Objects logical section (starting with offset 0 at the beginni
ng of this logical section).
+This section is compressed and contains the standard 32 byte section header. The decompres
sed data in this section is identical to the â\200\234Object Mapâ\200\235 section data foun
d in R2000 and earlier files, excepts that offsets are not absolute file addresses, but are
 instead offsets into the AcDb:Objects logical section (starting with offset 0 at the begin
ning of this logical section).

 # 24 Section AcDb:AcDsPrototype_1b (DataStorage)

 At this moment (December 2012), this sections contains information about Acis data (region
s, solids).

@@ -9630,119 +10456,74 @@
 }
 handleToDataRecord {
 }
 ```

-# 25 UNKNOWN SECTION
+# 26 SECOND FILE HEADER (R13-R2000)

-This section is largely unknown. The total size of this section is 53. We simply patch in
"known to be valid" data. We first write a 0L, then the number of entries in the objmap +3,
 as a long. Then 45 bytes of "known to be valid data". Then we poke in the start address fo
r objects at offset 16.
+This is directly after the ObjFreeSpace section. See chapter 21.

-The 45 bytes of known to be valid data are:
-
-    0xA7,0x62,0x25,0x00,0xF6,0xAF,0x25,0x02,
-    0x3B,0x04,0x00,0x00,0x04,0x32,0x00,0x00,
-    0x00,0x00,0x00,0x00,0x00,0x64,0x00,0x00,
-    0x00,0x00,0x00,0x00,0x00,0x00,0x02,0x00,
-    0x00,0x00,0x00,0x00,0x00,0xFF,0xFF,0xFF,
-    0xFF,0x00,0x00,0x00,0x00
-
-# 26 SECOND FILE HEADER (R13-R15)
-
-## 26.1 Beginning sentinel
+Beginning sentinel

     {0xD4,0x7B,0x21,0xCE,0x28,0x93,0x9F,0xBF,0x53,0x24,0x40,0x09,0x12,0x3C,0xAA,0x01 };

-    RL : size of this section
-     L : Location of this header (long, loc of start of sentinel).
-    RC : "AC1012" or "AC1014" for R13 or R14 respectively
-    RC : 6 0's
-     B : 4 bits of 0
-    RC : 0x18,0x78,0x01,0x04 for R13, 0x18,0x78,0x01,0x05 for R14
-
-    RC : 0
-     L : header address
-     L : header size
-    RC : 1
-     L : class address
-     L : class data size
-    RC : 2
-     L : Object map address (natural table)
-     L : Object map size
-    RC : 3
-     L : Address of unknown section 3
-     L : size of that section
-
-     S : 14 (# of handle records following)
```
```

```
-
-    RC : size of (valid chars in) handseed
-    RC : 0
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) block control objhandle
-    RC : 1
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) layer control objhandle
-    RC : 2
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) shapefile control objhandle
-    RC : 3
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) linetype control objhandle
-    RC : 4
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) view control objhandle
-    RC : 5
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) ucs control objhandle
-    RC : 6
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) vport control objhandle
-    RC : 7
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) reg app control objhandle
-    RC : 8
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) dimstyle control objhandle
-    RC : 9
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) viewport entity header objhandle
-    RC : 10
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) dictionary objhandle
-    RC : 11
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) default multi-line style objhandle
-    RC : 12
-    RC : "size" characters of the handle
-
-    RC : size of (valid chars in) group dictionary objhandle
-    RC : 13
+```
+    RL : Size of this section
+    BL : Location of this header (long, loc of start of sentinel).
+    RC : "AC1012", "AC1013, "AC1014" or "AC1015" for AutoCAD releases.
+    RC : 5 0's
+    RC : Maintenance release version
+    RC : Byte 0x00, 0x01, or 0x03
+    BS : Acad version that writes the file (first byte is application version and second b
yte is application maintenance release version)
+    RS : Codepage
+
+    BS : Number of sections
+  Repeat Number of sections
+    RC : Id of section
```

```
+    BL : Section address
+    BL : Section size
+  End Repeat Number of sections
+
+    BS : 14 (# of handle records)
+  Repeat Number of handles
+    RC : size of handle in bytes
+    RC : index of handle
     RC : "size" characters of the handle
+  End Repeat Number of handles

     CRC

     RC : 8 bytes of junk (R14 only). Note that the junk is counted in the size of this
     section at the start.
+```
+
+Handles:
+
+```
+0: handseed
+1: block control objhandle
+2: layer control objhandle
+3: style control objhandle
+4: ltype control objhandle
+5: view control objhandle
+6: ucs control objhandle
+7: vport control objhandle
+8: appid control objhandle
+9: dimstyle control objhandle
+10: vx control objhandle
+11: dictionary objhandle
+12: mlstyle objhandle
+13: group dictionary objhandle
+```

 Ending sentinel

     {0x2B,0x84,0xDE,0x31,0xD7,0x6C,0x60,0x40,0xAC,0xDB,0xBF,0xF6,0xED,0xC3,0x55,0xFE}

 # 27 Data section: AcDb:AuxHeader (Auxiliary file header)

-The auxiliary file header contains mostly redundant information and was introduced in R15.
+The auxiliary file header contains mostly redundant information and was introduced in R200
0.

     RC : 0xff 0x77 0x01
     RS : DWG version:
          AC1010 = 17,
          AC1011 = 18,
@@ -9796,11 +10577,11 @@
      RL : 0
      RL : 0
      RL : 0
      RL : 0

-R2018+
+R2018+:

      RS : 0
      RS : 0
      RS : 0
```