```
--- ODA-5.4.1.md        2023-11-23 21:17:02.825331305 +0100
+++ ODA-5.4.2-libredwg.md       2024-01-29 14:40:52.198061034 +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 rea
d at the bit level. Various parts of the drawing use data in compressed forms, which ar
e explained below. Here are the abbreviations used in this document for the various com
pressed forms:
+Much of the data in the DWG file format versions 13/14/2000/2004/2007/2010/2013/2018 m
ust 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 v
arious compressed 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 wi
thin 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 B
D. If 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
 record has the following format:

     Record number (raw byte) | Seeker (raw long) | Size (raw long)
@@ -590,26 +654,20 @@
 ----

     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 an
d
-        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-la
ter
-        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.
+    5:  Auxheader.  See chapter 27.
         This section is optional.

-Remarks: We have seen files with up to 6 sets in this section; the meaning of the sixt
h one is unknown. The Open Design Toolkit emits files with the first 5 sets only.
+Remarks: We have seen files with up to 6 sets in this section. 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 +1024,11 @@

 # 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 a
nd data sections.
```

+Like the R18/R2004 format the R21/R2007 format has sections and pages. There are syste
m sections 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. Th
e section map has information about which pages belong to which section. The file heade
r, which is at the beginning of the file, just after the meta data, contains the stream
 locations of the page map and section map.

@@ -1192,11 +1250,11 @@

 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 +1615,15 @@

 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 sep
arate 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 fil
es (see details in the DWG HEADER VARIABLES section of this document), except that stri
ng data is separated out into a string stream. See the Objects Section for details abou
t string stream location within an object. Also, the handles are separated out into a s
eparate 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 use
d in R18. Like the R18 compression, the compressed stream (source buffer) contains opco
des, offsets and lengths of byte chunks to be copied from either compressed or decompre
ssed buffer.
+The compression uses another variant of the LZ77 algorithm, different from the one use
d in R18/R2004. Like the R18/R2004 compression, the compressed stream (source buffer) c
ontains 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 by
te, bitwise and-ed with 0x07

@@ -1993,15 +2051,15 @@
 0xa6df411fbfb21ca3, 0xdc0731d78f8795da, 0x536fa08fdfd90e51, 0x29b7d047efec8728
 ```

 ## 5.13 Reed-Solomon encoding
 ```

```
-R21 uses Reed-Solomon (RS) encoding to add error correction. Error correction codes ar
e 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 imple
mentation, rather than to build one from scratch. When choosing to learn about the subj
ect, 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 med
ia to correct e.g. errors caused by a scratch on a CD. RS coding takes considerably stu
dy to master, and books on the subject require at least some mathematical base knowledg
e on academic level. For this reason itâ\200\231s recommended to use an existing RS imp
lementation, rather than to build one from scratch. When choosing to learn about the su
bject, 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 Berlekamp-Masssey for decoding. Note that there are many ways to encode and decode
, the implementation above is just one example. Though only 404 lines of code, the math
 involved is very 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 er
ror bytes per block of 255 bytes. For each 251 data bytes (k), 4 parity bytes are added
 to form a 255 byte (code word) block.

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

@@ -2082,11 +2140,11 @@
     ----------------------

     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 +2169,20 @@
          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 +2190,33 @@
          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 +2259,11 @@
         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 +2278,11 @@
         BL : TDUSRTIMER (Days)
         BL : TDUSRTIMER (Milliseconds into the day)
        CMC : CECOLOR
          H : HANDSEED The next handle, with an 8-bit length specifier preceding the ha
ndle
```

```
             bytes (standard hex handle form) (code 0). The HANDSEED is not part of the
 handle
-            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 +2468,11 @@
           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 +2661,11 @@
 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 0x
8A.
     RL : size of class data area.
@@ -2630,13 +2688,13 @@

 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 +2746,15 @@

 # 11 PADDING (R13C3 AND LATER)

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

-Occasionally AutoCAD will use the first 4 bytes of this area to store the value of the
- "measurement" variable. This padding was evidently required to allow pre-R13C3 version
s of AutoCAD 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
+ "measurement" 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 +2865,42 @@
  | Name             | AcDb:AppInfo
  | Compressed       | 1
  | Encrypted        | 0
  | Page size        | 0x80

-The AppInfo format depends on the application version (Acad version that wrote the fil
e) in 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 fil
e) in 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 16-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_v
ersion=â\200\2350.0â\200\235
-|         |         | registry_version=â\200\2353.3â\200\235 install_id_string=â\200\235
ODAâ\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 "AppInfoDataL
ist"
+| 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. Stri
ngs are encoded as a 16-bit length, followed by the character bytes (0-terminated), usi
ng unicode encoding (2 bytes per character).
+Since R2007 or class_version 3 the app info section consists of the following fields.
Strings are encoded as a 16-bit length, followed by 0-terminated unicode wide-chars (2
bytes per 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
 saved 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 applicat
ion." 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 +2909,11 @@
  | 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
number 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 32-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 followin
g:
@@ -2889,21 +2946,21 @@
  | Encrypted         | 0
  | Page size         | 0x7400
```

The contents of this section are unknown. In the following paragraphs is described wha
t the 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 +2976,13 @@
  | 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 fil
eâ\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 i
n the file is greater than 0.

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

 | Type      | Length | Description
 |-----------|--------|------------
@@ -2964,21 +3021,21 @@

 This region holds the actual objects in the drawing. These can be entities, table entr
ies, dictionary entries, and objects. This second use of objects is somewhat confusing;
 all items stored in the file are â\200\234objectsâ\200\235, but only some of them are
object objects. Others are entities, table entries, etc. The objects in this section ca
n 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 a
ll references have been followed. Very occasionally a file contains e.g. two APPID obje
cts with the same 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 tab
le records with duplicate names. This is incorrect, and the software should rename the
record to be unique upon reading.

-For R18 and later the section data (right after the page header) starts with a RL valu
e of 0x0dca (meaning unknown).
+For R2004 and later the section data (right after the page header) starts with a RL va
lue 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 i
nterpreted as sign). This includes the padding bits at the end of the handle stream (th
e padding 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 han
dles), or the â\200\234endbitâ\200\235 of the pre-handles section.
 | Common:
 |         | H          | 5         | Objectâ\200\231s handle
@@ -3011,11 +3068,11 @@
 Drawing entities, which are of course objects, have the same format as objects, with s
ome 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 si
gn).
-    Commmon:
+    Common:
        OT : Object type
```

```
     R2000+ Only:
        RL : Size of object data in bits
     Common:
         H : Objectâ\200\231s handle
@@ -3182,11 +3239,12 @@
 MLEADER
 MLEADERSTYLE
 OLE2FRAME
 PLACEHOLDER
 PLOTSETTINGS
-RASTERVARIABLESSCALE
+RASTERVARIABLES
+SCALE
 SORTENTSTABLE
 SPATIAL_FILTER
 SPATIAL_INDEX
 TABLEGEOMETRY
 TABLESTYLES
@@ -3194,15 +3252,46 @@
 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 int
 o the class list, which then determines the type of object. For instance, an object typ
 e of 501 means that this object is of the class which is second in the class list; the
 classdxfname 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 +3300,14 @@
 ### 20.4.1 Common Entity Data

 The following data appears at the beginning of each entity in the file, and will be re
ferred 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 +3933,11 @@
 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 +4327,11 @@
 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 +5168,24 @@
 ### 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
```
```

```
+    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 +5265,46 @@
 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 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 +5333,25 @@
 ### 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
first
                                     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 +5364,28 @@
                                     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:
     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 +5634,23 @@

 ### 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 +5677,23 @@

 ### 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 +5765,23 @@

 ### 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 +5804,14 @@

 ### 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 +5874,23 @@

 ### 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 +5927,14 @@
 |                          | 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 +5985,23 @@

 ### 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 +6028,14 @@

 ### 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 +6102,23 @@

 ### 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 +6141,14 @@

 ### 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 +6242,23 @@

 ### 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 +6281,14 @@

 ### 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 +6346,14 @@

 ### 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 +6387,14 @@

 ### 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 +6518,14 @@

 ### 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 +6557,14 @@

 ### 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 +6607,14 @@

 ### 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 +6645,11 @@
 ```

 ### 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 +6846,24 @@
 ```

 ### 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 +6886,15 @@
 ```

 ### 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 +6949,15 @@
 |          |  H    |  340  | Handle to scale (AcDbScale) object (hard pointer). See par
agraph 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 +6994,15 @@
 ```

 ### 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 +7071,15 @@
 NOTE: OBJECTS LISTED AFTER THIS POINT DO NOT HAVE FIXED TYPES. THEIR TYPES ARE DETERMI
 NED BY FINDING THE CLASS ENTRY WHOSE POSITION IN THE CLASS LIST + 500 EQUALS THE TYPE O
 F THIS OBJECT

 ### 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 +7177,11 @@
             pt0   2RD 10 control point
             if (israti
               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 +7287,11 @@
 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 +7340,11 @@
|          |      |       | 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 +7354,11 @@
 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 +7378,11 @@
 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 +7408,11 @@
|          |      |       | 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 +7446,11 @@
|          |      |       | 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 +7473,15 @@
 ### 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 +7596,15 @@

 ### 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 +7649,15 @@

 ### 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 +7688,15 @@
 ```

 ### 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 +7707,12 @@
 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 +7746,14 @@

### 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 +8132,15 @@
 | | 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 +8175,15 @@

### 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 +8230,15 @@
 |       | 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 +8291,15 @@

 ### 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 +8358,15 @@
 ```

 ### 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 +8378,12 @@
     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 +8525,18 @@
 0D688 54 B0   crc
 ```

 ### 20.4.96 TABLE (varies)

-The TABLE entity (entity type ACAD_TABLE) was introduced in AutoCAD 2005 (a sub releas
e 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, cons
isting 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 releas
e of R2004), and a large number of changes were introduced in AutoCAD 2008 (a sub relea
se 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, similarl
y 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 AcDbTableGeomet
ry.

-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 cha
nged to make use of table content to contain all data (AcDbTableContent).

 ```
     Common Entity Data
     Ins pt              3BD  10
 R13-R14 Only:
@@ -8618,13 +8810,13 @@
                                  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 us
ed in the DXF format. An R24 DXF file contains both the old and new structures, where t
he 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, alw
ays the new structures are used. The table then points to a AcDbTableContent object, wh
ich 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 exte
nsion 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 structur
es, 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, whe
re 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 R2010 DWG fil
e, always the new structures are used. The table then points to a AcDbTableContent obje
ct, which contains most of the actual data. Note that AcDbTableContent was already intr
oduced in AutoCAD 2008 (R2007), but in R2007 it was indirectly referenced through the t
ables extension dictionary entry `ACAD_XREC_ROUNDTRIP` (TODO: describe details on `ACAD
_ROUNDTRIP_2008_TABLE_ENTITY` and for 2007).

Version	Field type	DXF group	Description
	...		Common entity data
R2010+	RC		Unknown (default 0)

@@ -8667,11 +8859,11 @@

	BL		End row index
			End repeat row ranges

20.4.97 TABLECONTENT

-This represents the table content (AcDbTableContent) that replaces the old table data
structures that were introduced in AutoCAD 2005. Table content was introduced in AutoCA
D 2008 and supports more advanced features like e.g. multiple contents per cell. In Aut
oCAD 2008 the table content was written as a separate object in DWG and referenced by r
oundtrip data in the table entityâ\200\231s extension dictionary. In DXF this is still
the case even for R24. In a R24 DWG file, the table content is part of the table entity
 data and is no longer present as a separate object. Possibly for backwards compatibili
ty with the AutoCAD 2007 (R21) format, this separate data container was created instead
 of extending the ACAD_TABLE entity.
+This represents the table content (AcDbTableContent) that replaces the old table data
structures that were introduced in AutoCAD 2005. Table content was introduced in AutoCA
D 2008 and supports more advanced features like e.g. multiple contents per cell. In Aut
oCAD 2008 the table content was written as a separate object in DWG and referenced by r
oundtrip data in the table entityâ\200\231s extension dictionary. In DXF this is still
the case even for R2010. In a R2010 DWG file, the table content is part of the table en
tity data and is no longer present as a separate object. Possibly for backwards compati
bility with the AutoCAD 2007 format, this separate data container was created instead o
f extending the ACAD_TABLE entity.

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 AcDbFo
rmattedTableData, which inherits from AcDbLinkedTableData, which inherits from AcDbLink
edData. Class AcDbLinkedTableData contains most of the data (rows, columns, cells, cell
 contents).

Version	Field type	DXF group	Description

@@ -8763,11 +8955,11 @@

			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 styl
e (present from R24 onwards).
+|			base cell style is the table styleâ\200\231s overall cell styl
e (present 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 +9024,11 @@

	...		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 , table style was introduced in AutoCAD 2005. In AutoCAD 2008 new cell style data was introduced, which was stored in a separate container object: CELLSTYLEMAP, see paragraph 20.4.102 for more details. The cellstyle map can contain custom cell styles, whereas the TABLESTYLE only 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 , table style was introduced in AutoCAD 2005. In AutoCAD 2008 new cell style data was introduced, which was stored in a separate container object: CELLSTYLEMAP, see paragraph 20.4.102 for more details. The cellstyle map can contain custom cell styles, whereas the TABLESTYLE only 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 +9061,30 @@
    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 paragrap
h 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 ar
e numbered starting at 101. |
 |       | BL    |  91 | Cell style class, 1= data, 2 = label. The default value is lab
el. |
 |       | TV    | 300 | Cell style name                      |
 |       | BL    |     | The number of cell styles (should be 3), the non-custom cell s
tyles are present |
 |       |       |     | only in the CELLSTYLEMAP.            |
 |       |       |     | Begin repeat cell styles (for data, title, header in this orde
r) |
 |       | ...   |     | 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 ar
e numbered starting at 101. |
 |       | BL    |  -  | Cell style class, 1= data, 2 = label. The default value is lab
el. |
 |       | TV    |  -  | Cell style name                      |
 |       |       |     | End repeat cell styles               |
@@ -9016,11 +9208,11 @@
```

```
 |-------|-------|----:|--------------------------------|
 |       |  ...  |     | 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 cell style in the |
 |       |       |     | tableâ\200\231s table style. Custom cell style IDâ\200\231s ar
e numbered starting at 101. |
 |       |  BL   |  91 | Cell style class, 1= data, 2 = label. The default value is lab
el. |
 |       |  TV   | 300 | Cell style name                |
 |       |       |     | End repeat cell styles         |
@@ -9052,15 +9244,18 @@
 |       |  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 +9313,669 @@
 00B1B 40 3E 00 01 00 46 00 B4 @>...F.. 0100 0000 0011 1110 0000 0000 0000 0001 0000 00
00 0100 0110 0000 0000 1011 0100
 00B23 00 40 41 0C 30          .@A.0    0000 0000 0100 0000 0100 0001 0000 1100 0011 00
00
 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 vali
d section, 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 TDUUPD
ATE.
-| 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 ha
ndles).
+| Julian datetime	8	If version > R14 then system variable TDUPDATE otherwise T
DUUPDATE.
+| UInt8	1	Number of 64-bit (resp. 128-bit) values that follow (Alway
s 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 1
8 and newer. The template section only contains the MEASUREMENT system variable.
+This section is optional in releases r13-r2000. The section is mandatory in the releas
es R2004 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 +9983,11 @@
  |         |        | 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 tab
le is broken into sections. It is basically a list of handle/file loc pairs, and goes (
something like) this:

 ```
 Set the "last handle" to all 0 and the "last loc" to 0L;
@@ -9177,13 +10005,13 @@
 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 decom
pressed data in this section is identical to the â\200\234Object Mapâ\200\235 section d
ata found in R15 and earlier files, excepts that offsets are not absolute file addresse
s, but are instead offsets into the AcDb:Objects logical section (starting with offset
0 at the beginning of this logical section).
+This section is compressed and contains the standard 32 byte section header. The decom
pressed data in this section is identical to the â\200\234Object Mapâ\200\235 section d
ata found in R2000 and earlier files, excepts that offsets are not absolute file addres
ses, but are instead offsets into the AcDb:Objects logical section (starting with offse
t 0 at the beginning of this logical section).

 # 24 Section AcDb:AcDsPrototype_1b (DataStorage)

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

@@ -9630,119 +10458,74 @@
 }
 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 ob
jmap +3, as a long. Then 45 bytes of "known to be valid data". Then we poke in the star
t address for 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 seco
nd byte 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
R2000.

     RC : 0xff 0x77 0x01
     RS : DWG version:
          AC1010 = 17,
          AC1011 = 18,
@@ -9796,11 +10579,11 @@
      RL : 0
      RL : 0
      RL : 0
      RL : 0

-R2018+
+R2018+:

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