

QRCode Encode SDK v2.1

USER MANUAL

AIPSYS Software Laboratory

<http://www.aipsys.com>

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1. Introduction	5
1.1. QRCode Barcode introduction	5
1.2 QRCode parameters introduction	8
1.3 Data capacity for QRCode versions	9
1.4. License	14
1.5. About trial version	21
2. Encoder SDK	22
2.1. Static link library	22
2.1.1 Constants	22
2.1.2 Data structure	22
2.1.3. Function or procedure	23
2.1.3.1. _InitQRCodeContext	23
2.1.3.2. _QRCodeEncode2File	24
2.1.3.3. _QRCodeEncode2Bitmap	24
2.1.3.4. _MicroQREncode2Bitmap	25
2.1.3.5. _MicroQREncode2File	25
2.1.3.6. _FreeQRCodeContext	25
2.1.4. Example for Microsoft visual C++	26
2.2. Dynamic link library	26
2.2.1 Constants	26
2.2.2. Data structure	27
2.2.2. Function or procedure	28
2.2.2.1. InitWorkSpace	28
2.2.2.2. QRCodeEncode2File	29
2.2.2.3. QRCodeEncode2Bitmap	29
2.2.2.4. FreeWorkSpace	29
2.2.3. Example for Microsoft visual C++	30
2.2.4. Example for Borland Delphi	31
2.2.4.1. Redeclaration of the data type and function	31
2.2.4.2. Example	32
2.2.5. Example for Microsoft visual Basic	33
2.2.5.1. Redeclaration of the data type and function	33
2.2.5.2. Example	34
2.2.6. Example for CA Visual Objects	34
2.2.6.1. Redeclaration of the data type and function	34
2.2.6.2. Example	35
2.3. ActiveX	36
2.3.1. Properties	36
2.3.1.1. PreferredVersion	36
2.3.1.2. SelectedVersion	36
2.3.1.3. CorrectionLevel	36
2.3.1.4. EncodeMode	37
2.3.1.5. EciMode	37

2.3.1.6.	Fnc1Mode	37
2.3.1.7.	StructuredAppend	37
2.3.1.8.	ProcessTilde	37
2.3.1.9.	AutoConfigure	38
2.3.1.10.	Margin	38
2.3.1.11.	PixelSize	38
2.3.1.12.	ForegroundColor	38
2.3.1.13.	BackgroundColor	38
2.3.1.7.	TextData	38
2.3.2.	Methods	39
2.3.2.1.	Encode2ImageFile	39
2.3.3.	Register activeX component	39
2.3.4.	Example for Microsoft visual C++	39
2.3.5.	Example for Borland Delphi	39
2.3.6.	Example for Microsoft visual Basic	40
2.4.	ASP Control for server side	40
2.4.1.	Properties	40
2.4.1.1.	nVersion	40
2.4.1.2.	nPixelSize	41
2.4.1.5.	nMode	41
2.4.1.6.	nMargin	41
2.4.1.7.	nLevel	41
2.4.1.8.	clForeground	41
2.4.1.9.	clBackGround	41
2.4.1.9.	strText	41
2.4.2.	Methods	42
2.4.2.1.	InitWorkspace	42
2.4.2.2.	FreeWorkspace	42
2.3.2.3.	Encode2File	42
2.4.3.	Register the ASP server component	43
2.4.4.	Example for ASP	43
3.	Decoder SDK	43
3.1.	Static link library	43
3.1.1.	Function or procedure	43
3.1.1.1.	_QRCodeDecodeImageFile	44
3.1.1.2.	_QRCodeDecode	44
3.1.1.3.	_QRCodeFree	44
3.1.2.	Samples	45
3.1.2.1	Example for Microsoft visual C++	45
3.2.	Dynamic link library	45
3.2.1.	Function or procedure	46
3.2.1.1.	QRCodeDecodeImageFile	46
3.1.1.2.	QRCodeDecode	46
3.1.1.3.	QRCodeFree	47

3.1.2. Samples	47
3.1.2.1 Example for Microsoft visual C++	47
3.1.2.2 Example for Microsoft visual Basic	48
4. Order Information	48
5. Affiliate program	50
6. Support Information	51
7. Product Information Link	52

1. Introduction

1.1. QRCode Barcode introduction

About QRCode

QR Code is a kind of 2-D (two-dimensional) symbology developed by Denso Wave (a division of Denso Corporation at the time) and released in 1994 with the primary aim of being a symbol that is easily interpreted by scanner equipment.

QR Code (2D Code) contains information in both the vertical and horizontal directions, whereas a bar code contains data in one direction only. QR Code holds a considerably greater volume of information than a bar code.



QR Code provides the following features compared with conventional bar codes. High Capacity Encoding of Data

While conventional bar codes are capable of storing a maximum of approximately 20 digits, QR Code is capable of handling several dozen to several hundred times more information. QR Code is capable of handling all types of data, such as numeric and alphabetic characters, Kanji, Kana, Hiragana, symbols, binary, and control codes. Up to 7,089 characters can be encoded in one symbol.

QR Code Data capacity	
Numeric only	Max. 7,089 characters
Alphanumeric	Max. 4,296 characters
Binary (8 bits)	Max. 2,953 bytes
Kanji, full-width Kana	Max. 1,817 characters



A QR Code symbol of this size can encode 300 alphanumeric characters

Small Printout Size

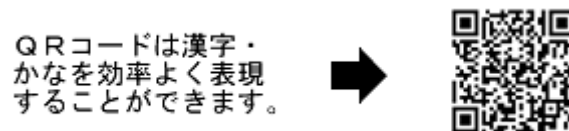
Since QR Code carries information both horizontally and vertically, QR Code is capable of encoding the same amount of data in approximately one-tenth the space of a traditional bar code. (For a smaller printout size, Micro QR Code is available)



Kanji and Kana Capability.

As a symbology developed in Japan, QR Code is capable of encoding JIS Level 1 and Level 2 kanji character set.

In case of Japanese, one full-width Kana or Kanji character is efficiently encoded in 13 bits, allowing QR Code to hold more than 20% data than other 2D symbologies.



Dirt and Damage Resistant

QR Code has error correction capability. Data can be restored even if the symbol is partially dirty or damaged. A maximum 30% of codewords*¹ can be restored*².

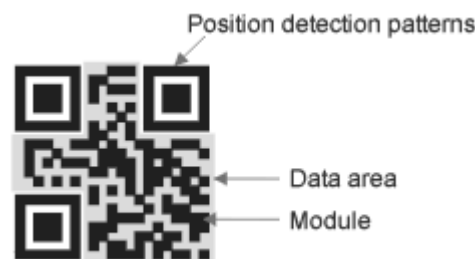
*1: A codeword is a unit that constructs the data area. In the case of QR Code, one codeword is equal to 8 bits.

*2: Data restoration may not be fully performed depending on the amount of dirt or damage..



Readable from any direction in 360°

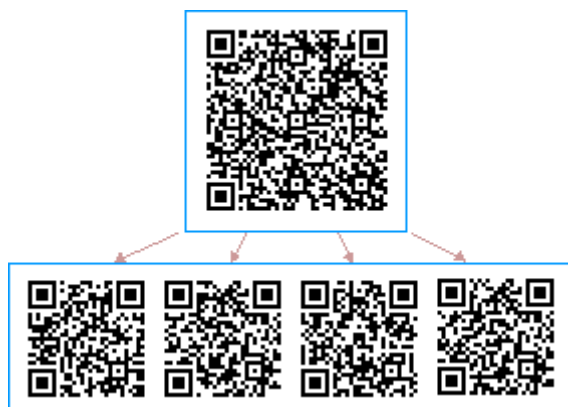
QR Code is capable of 360 degree (omni-directional), high speed reading. QR Code accomplishes this task through position detection patterns located at the three corners of the symbol. These position detection patterns guarantee stable high-speed reading, circumventing the negative effects of background interference.



Structured Append Feature

QR Code can be divided into multiple data areas. Conversely, information stored in multiple QR Code symbols can be reconstructed as single data symbols.

One data symbol can be divided into up to 16 symbols, allowing printing in a narrow area.

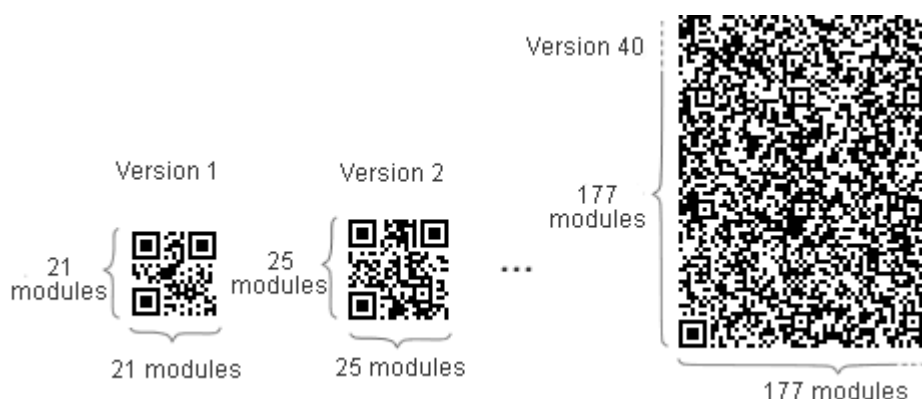


Symbol Version

The symbol versions of QR Code range from Version 1 to Version 40. Each version has a different module configuration or number of modules. (The module refers to the black and white dots that make up QR Code.) "Module configuration" refers to the number of modules contained in a symbol, commencing with Version 1 (21×21 modules) up to Version 40 (177×177 modules). Each higher version number comprises 4 additional modules per side.

Each QR Code symbol version has the maximum data capacity according to the amount of data, character type and error correction level. Check the maximum data capacity for each version.*Version and maximum data capacity table

In other words, as the amount of data increases, more modules are required to comprise QR Code, resulting in larger QR Code symbols.



Error Correction

QR Code has error correction capability to restore data if the code is dirty or damaged. Four error correction levels are available for users to choose according to the operating environment. Raising this level improves error correction capability but also increases the amount of data QR Code size.

To select error correction level, various factors such as the operating environment and QR Code size need to be considered.

Level Q or H may be selected for factory environment where QR Code get dirty, whereas Level L may be selected for clean environment with the large amount of data. Typically, Level M (15%) is most frequently selected.

QR Code Error Correction Capability*

Level L	Approx. 7%
Level M	Approx. 15%
Level Q	Approx. 25%
Level H	Approx. 30%

*Data restoration rate for total codewords (codeword is a unit that constructs the data area. One codeword of QR Code is equal to 8 bits.)

Error Correction Feature

The QR Code error correction feature is implemented by adding a Reed-Solomon Code*to the original data.

The error correction capability depends on the amount of data to be corrected. For example, if there are 100 codewords of QR Code to be encoded, 50 of which need to be corrected, 100 codewords of Reed-Solomon Code are required, as Reed-Solomon Code requires twice the amount of codewords to be corrected.

In this case, the total codewords are 200, 50 of which can be corrected. Thus, the error correction rate for the total codewords is 25%. This corresponds to QR Code error correction Level Q.

In the example above, the error correction rate for QR Code codewords can be considered as 50%. However, it is not always the case that codewords of not Reed-Solomon Code but only QR Code are susceptible to dirt and damage. QR Code therefore represents its error correction rate as a ratio of the total codewords.

(*) Reed-Solomon Code is a mathematical error correction method used for music CDs etc. The technology was originally developed as a measure against communication noise for artificial satellites and planetary probes. It is capable of making a correction at the byte level, and is suitable for concentrated burst errors

1.2 QRCode parameters introduction

Version : There are 40 sizes of QR Code symbols (called Version 1, Version 2 till Version 40). Version 1 measures 21 modules * 21 modules, Version 2 measures 25 modules * 25 modules and so on. Version 40 measures 177 modules * 177 modules.

correctionLevel: Supports 4 error correction levels

- 0: L (7% of the symbol codewords).
- 1: M (15% of the symbol codewords).
- 2: Q (25% of the symbol codewords).
- 3: H (30% of the symbol codewords)

Encoding:

- 0: Alphanumeric characters , digits 0 - 9; upper case letters A -Z and nine other characters: space, \$ % * + - . / :
- 1: Byte data (bytes 0-255)
- 2: Numeric data (digits 0-9).
- 3: Kanji characters (hexadecimal values 8140 -9FFC and E040 - EBBF)
- 4: Automatic adapt char type

Eci: Extended Channel Interpretation (optional): enables data using character sets other than the default set (e.g. Arabic, Cyrillic, Greek)

fnc1Mode: FNC1 mode is used for messages containing data formatted either in accordance with the UCC/EAN Application Identifiers standard or in accordance with a specific industry standard previously agreed with AIM International.

structuredAppendIndex:

structuredAppend : This allows files of data to be represented logically in up to 16 QR Code symbols.

processTilde: use the tilde character "~" to recognize special characters when "Apply Tilde" or "Process Tilde" is enabled. The following tilde options are available:

~dNNN: Represents the ASCII character encoded by the 3 digits NNN. For example, ~d009 represents a tab, ~d013 represents a return and ~d065 represents the character 'A'.

~1: Represents the character FNC1. When FNC1 appears in the first position (or in the fifth position of the first symbol of a Structured Append), it indicates that the data conforms to the UCC/EAN Application Identifier standard format.

When enabled it works as follows:

- ~: will be replaced with ~
- ~dxxx: will be replaced by the character whose ascii code is xxx. For example ~d065 will be replaced with A

StructuredAppendCounter(int): When the symbol is part of an Structured Append set, this is the total number of symbols in the set. Valid values : 2 to 16. If this is not set, or set to 1, the symbol is assumed to be standalone (no structured append used).

StructuredAppendIndex(int): When the symbol is part of an Structured Append set, this is the number of this symbol in the set. Valid values : 1 to 16.

1.3 Data capacity for QRCode versions

Version	Error Correction Level	Numeric	Alphanumeric	Byte	Kanji
1	L	41	25	17	10
	M	34	20	14	8
	Q	27	16	11	7
	H	17	10	7	4
2	L	77	47	32	20
	M	63	38	26	16
	Q	48	29	20	12
	H	34	20	14	8

3	L	127	77	53	32
	M	101	61	42	26
	Q	77	47	32	20
	H	58	35	24	15
4	L	187	114	78	48
	M	149	90	62	38
	Q	111	67	46	28
	H	82	50	34	21
5	L	255	154	106	65
	M	202	122	84	52
	Q	144	87	60	37
	H	106	64	44	27
6	L	322	195	134	82
	M	255	154	106	65
	Q	178	108	74	45
	H	139	84	58	36
7	L	370	224	154	95
	M	293	178	122	75
	Q	207	125	86	53
	H	154	93	64	39
8	L	461	279	192	118
	M	365	221	152	93
	Q	259	157	108	66
	H	202	122	84	52
9	L	552	335	230	141
	M	432	262	180	111
	Q	312	189	130	80
	H	235	143	98	60
10	L	652	395	271	167
	M	513	311	213	131
	Q	364	221	151	93
	H	288	174	119	74
11	L	772	468	321	198
	M	604	366	251	155
	Q	427	259	177	109
	H	331	200	137	85
12	L	883	535	367	226
	M	691	419	287	177
	Q	489	296	203	125

	H	374	227	155	96
13	L	1022	619	425	262
	M	796	483	331	204
	Q	580	352	241	149
	H	427	259	177	109
14	L	1101	667	458	282
	M	871	528	362	223
	Q	621	376	258	159
	H	468	283	194	120
15	L	1250	758	520	320
	M	991	600	412	254
	Q	703	426	292	180
	H	530	321	220	136
16	L	1408	854	586	361
	M	1082	656	450	277
	Q	775	470	322	198
	H	602	365	250	154
17	L	1548	938	644	397
	M	1212	734	504	310
	Q	876	531	364	224
	H	674	408	280	173
18	L	1725	1046	718	442
	M	1346	816	560	345
	Q	948	574	394	243
	H	746	452	310	191
19	L	1903	1153	792	488
	M	1500	909	624	384
	Q	1063	644	442	272
	H	813	493	338	208
20	L	2061	1249	858	528
	M	1600	970	666	410
	Q	1159	702	482	297
	H	919	557	382	235
21	L	2232	1352	929	572
	M	1708	1035	711	438
	Q	1224	742	509	314
	H	969	587	403	248
22	L	2409	1460	1003	618
	M	1872	1134	779	480

	Q	1358	823	565	348
	H	1056	640	439	270
23	L	2620	1588	1091	672
	M	2059	1248	857	528
	Q	1468	890	611	376
	H	1108	672	461	284
24	L	2812	1704	1171	721
	M	2188	1326	911	561
	Q	1588	963	661	407
	H	1228	744	511	315
25	L	3057	1853	1273	784
	M	2395	1451	997	614
	Q	1718	1041	715	440
	H	1286	779	535	330
26	L	3283	1990	1367	842
	M	2544	1542	1059	652
	Q	1804	1094	751	462
	H	1425	864	593	365
27	L	3517	2132	1465	902
	M	2701	1637	1125	692
	Q	1933	1172	805	496
	H	1501	910	625	385
28	L	3669	2223	1528	940
	M	2857	1732	1190	732
	Q	2085	1263	868	534
	H	1581	958	658	405
29	L	3909	2369	1628	1002
	M	3035	1839	1264	778
	Q	2181	1322	908	559
	H	1677	1016	698	430
30	L	4158	2520	1732	1066
	M	3289	1994	1370	843
	Q	2358	1429	982	604
	H	1782	1080	742	457
31	L	4417	2677	1840	1132
	M	3486	2113	1452	894
	Q	2473	1499	1030	634
	H	1897	1150	790	486
32	L	4686	2840	1952	1201

	M	3693	2238	1538	947
	Q	2670	1618	1112	684
	H	2022	1226	842	518
33	L	4965	3009	2068	1273
	M	3909	2369	1628	1002
	Q	2805	1700	1168	719
	H	2157	1307	898	553
34	L	5253	3183	2188	1347
	M	4134	2506	1722	1060
	Q	2949	1787	1228	756
	H	2301	1394	958	590
35	L	5529	3351	2303	1417
	M	4343	2632	1809	1113
	Q	3081	1867	1283	790
	H	2361	1431	983	605
36	L	5836	3537	2431	1496
	M	4588	2780	1911	1176
	Q	3244	1966	1351	832
	H	2524	1530	1051	647
37	L	6153	3729	2563	1577
	M	4775	2894	1989	1224
	Q	3417	2071	1423	876
	H	2625	1591	1093	673
38	L	6479	3927	2699	1661
	M	5039	3054	2099	1292
	Q	3599	2181	1499	923
	H	2735	1658	1139	701
39	L	6743	4087	2809	1729
	M	5313	3220	2213	1362
	Q	3791	2298	1579	972
	H	2927	1774	1219	750
40	L	7089	4296	2953	1817
	M	5596	3391	2331	1435
	Q	3993	2420	1663	1024
	H	3057	1852	1273	784

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1.5. About trial version

With 2D barcode encoder and decoder SDK, some of the input element will be replaced with char '*' before encoding, and some of the output element will be replaced with '*' after decoding.

With 1D linear barcode encoder and decoder, some of the input element will be replaced with char '0' before encoding, and some of the output element will be replaced with '0' after decoding.

The Trial version have 30 days' evaluation time, you must remove it from your computer and your application after expiration.

We will mail the licensed version or register serial no to you after you order it.

2. Encoder SDK

2.1. Static link library

2.1.1 Constants

Encoding scheme

```
ENC_ALPHA    0;
ENC_BYTE     1;
ENC_NUMERIC  2;
ENC_CHINESE  3;
```

FNC1 mode

```
FNC1_MODE_NO      0;
FNC1_MODE_FIRST   1;
FNC1_MODE_SECOND  2;
```

Correction Level

```
CORRECTION_LEVEL_L  0;
CORRECTION_LEVEL_M  1;
CORRECTION_LEVEL_Q  2;
CORRECTION_LEVEL_H  3;
```

Version for Micro QRCode

```
MICROQR_VER_M1  1;
MICROQR_VER_M2  2;
MICROQR_VER_M3  3;
MICROQR_VER_M4  4;
```

2.1.2 Data structure

The following data structure define the properties of the QRCode barcode, it can be transfered into function as parameter.

```
typedef struct _tagQRCODECONTEXT
{
    int preferredVersion;    //the preferred version of QRCode 1~40
    int selectedVersion;     //the selected version of QRCode 1~40
}
```

```

int* controlChars;          //control char num
int correctionLevel;        //error correction level
                             CORRECTION_LEVEL_L = 0;
                             CORRECTION_LEVEL_M = 1;
                             CORRECTION_LEVEL_Q = 2;
                             CORRECTION_LEVEL_H = 3;
int encoding;               //encoding mode,
                             ENC_ALPHA = 0;
                             ENC_BYTE = 1;
                             ENC_NUMERIC = 2;
                             ENC_KANJI_CHINESE = 3
int eci;
int fnc1Mode;               //fnc mode
                             FNC1_MODE_NO = 0;
                             FNC1_MODE_FIRST = 1;
                             FNC1_MODE_SECOND = 2;
int structuredAppendIndex;
int structuredAppendCounter;
int applicationIndicator;
int nSize;                  //if data is binary , use this variable to tell systemthe input length;
bool structuredAppend;      //structure appending mode if true
bool processTilde;          //processing tilde if true
bool autoConfigure;         //configure automaticlly if true
BYTE nMargin;               //size of white space of barcode
BYTE nPixelSize;            //the the pixel size when drawing barcode
COLORREF clBackGround;      //background color
COLORREF clForeGround;      //foreground color
char cData[7100];           //data to be encoded
} _QRCODECONTEXT,*_LPQRCODECONTEXT;

```

2.1.3. Function or procedure

2.1.3.1. _InitQRCodeContext

The _InitQRCodeContext function initilize the environment of QRCode encoding with default value.

```
void __stdcall _InitQRCodeContext (_QRCODECONTEXT * pQRCodeCtx);
```

Parameters

pQRCodeCtx

[in] define the QRCode attributes for encoding, refer structure type

`_LPQRCODECONTEXT`

Return values

None

2.1.3.2. `_QRCodeEncode2File`

The `_QRCodeEncode2File` function encode the data inputed with the defined attributes and save the barcode to an image file

```
BOOL __stdcall _QRCodeEncode2File (_QRCODECONTEXT * pQRCodeCtx,  
                                   LPCTSTR lpImageFile);
```

Parameters

`pQRCodeCtx`

[in] define the QRCode attributes for encoding, refer structure type
`_QRCODECONTEXT`

`lpImageFile`

[in] define the image file outputted, currently bitmap image supported

Return values

If the function succeeds, the return value is TRUE, otherwise , return FALSE.

2.1.3.3. `_QRCodeEncode2Bitmap`

The `_QRCodeEncode2Bitmap` function encode the data inputed with the defined attributes and return the bitmap handle of the QRCode barcode image

```
HBITMAP __stdcall _QRCodeEncode2Bitmap (  
_QRCODECONTEXT * pQRCodeCtx);
```

Parameters

`pQRCodeCtx`

[in] define the QRCode attributes for encoding, refer structure type
`_QRCODECONTEXT`

Return values

If the function succeeds, the return value is BITMAP handle of QRCode barcode, otherwise , return NULL.

2.1.3.4. **_MicroQREncode2Bitmap**

The **_MicroQREncode2Bitmap** function encode the data inputed with the defined attributes and return the bitmap handle of the QRCode barcode image

```
HBITMAP __stdcall _QRCodeEncode2Bitmap (  
    _QRCODECONTEXT * pQRCodeCtx);
```

Parameters

pQRCodeCtx

[in] define the QRCode attributes for encoding, refer structure type
_QRCODECONTEXT

Return values

If the function succeeds, the return value is BITMAP handle of QRCode barcode, otherwise , return NULL.

2.1.3.5. **_MicroQREncode2File**

The **_MicroQREncode2File** function encode the data inputed with the defined attributes and save the barcode to an image file

```
BOOL __stdcall _MicroQREncode2File (_QRCODECONTEXT * pQRCodeCtx,  
    LPCTSTR lpImageFile);
```

Parameters

pQRCodeCtx

[in] define the QRCode attributes for encoding, refer structure type
_QRCODECONTEXT

lpImageFile

[in] define the image file outputted, currently bitmap image supported

Return values

If the function succeeds, the return value is TRUE,otherwise , return FALSE.

2.1.3.6. **_FreeQRCodeContext**

The **_FreeQRCodeContext** function free environment of the QRCode encoding

```
BOOL __stdcall _FreeQRCodeContext ();
```

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.1.4. Example for Microsoft visual C++

Example1

```
#include "QRCodeEncodeLib.h"
....
_tagQRCODECONTEXT tQrCtx;
_InitQRCodeContext(&tQrCtx);
tQrCtx.preferredVersion = 2;
tQrCtx.selectedVersion = 2;
tQrCtx.correctionLevel = 0;
tQrCtx.encoding = 0;
tQrCtx.eci = 0;
tQrCtx.fnclMode = 0;
tQrCtx.structuredAppend = false;
tQrCtx.processTilde = true;
tQrCtx.autoConfigurate = false;
tQrCtx.nMargin = 10;
tQrCtx.nPixelSize = 4;
tQrCtx.clBackGround = RGB(255, 255, 255);
tQrCtx.clForeGround = RGB(255, 0, 0);
sprintf(tQrCtx.cData, "http://www.aipsys.com");
_QRCodeEncode2File(&tQrCtx, "c:\\qrcode.bmp");
_FreeQRCodeContext();
....
```

LIBRARY for linking

QRCodeEncodeLIB.LIB

2.2. Dynamic link library

2.2.1 Constants

Encoding scheme

ENC_ALPHA 0;

```

ENC_BYTE      1;
ENC_NUMERIC   2;
ENC_CHINESE   3;

```

FNC1 mode

```

FNC1_MODE_NO      0;
FNC1_MODE_FIRST   1;
FNC1_MODE_SECOND  2;

```

Correction Level

```

CORRECTION_LEVEL_L  0;
CORRECTION_LEVEL_M  1;
CORRECTION_LEVEL_Q  2;
CORRECTION_LEVEL_H  3;

```

2.2.2. Data structure

The following data structure define the properties of the QRCode barcode, it can be transfer into function as parameter.

```

typedef struct tagQRCODECONTEXT
{
    int    preferredVersion; //the preferred version of QRCode 1~40
    int    selectedVersion;  //the selected version of QRCode 1~40
    int*   controlChars;     //control char num
    int    correctionLevel;  //error correction level
                                CORRECTION_LEVEL_L
= 0;
                                CORRECTION_LEVEL_
M = 1;
                                CORRECTION_LEVEL_Q
= 2;
                                CORRECTION_LEVEL_
H = 3;
    int    encoding;         //encoding mode,
                                ENC_ALPHA   = 0;
                                ENC_BYTE    = 1;
                                ENC_NUMERIC  = 2;
                                ENC_KANJI_CHINESE
= 3
    int    eci;
    int    fnc1Mode;         //fnc mode
                                FNC1_MODE_NO   =

```

```

0;
                                                                    FNC1_MODE_FIRST
    = 1;
                                                                    FNC1_MODE_SECOND
    = 2;
    int    structuredAppendIndex;
    int    structuredAppendCounter;
    int    applicationIndicator;
    int    nSize;                //if data is binary , use this
variable to tell systemthe input length;
    bool   structuredAppend; //structure appending mode if true
    bool   processTilde;      //processing tilde if true
    bool   autoConfigure;     //configure automaticlly if true
    BYTE   nMargin;           //size of white space of barcode
    BYTE   nPixelSize;        //the the pixel size when drawing
barcode
    COLORREF clBackGround; //background color
    COLORREF clForeGround; //foreground color
    char    cData[7100];      //data to be encoded
} QRCODECONTEXT, *LPQRCODECONTEXT;

```

2.2.2. Function or procedure

2.2.2.1. InitWorkspace

The `_InitWorkspace` function initilize the environment of QRCode encoding with default value.

```
void __stdcall _InitWorkspace(QRCODECONTEXT *pQRCodeCtx);
```

Parameters

`pQRCodeCtx`

[in] define the QRCode attributes for encoding, refer structure type
QRCODECONTEXT

Return values

None

2.2.2.2. QRCodeEncode2File

The DataMatrixEncode2File function encode the data inputed with the defined attributes and save the barcode to an image file

```
BOOL __stdcall QRCodeEncode2File (QRCODECONTEXT *pQRCodeCtx,  
                                  LPCTSTR lpImageFile);
```

Parameters

pQRCodeCtx

[in] define the QRCode attributes for encoding, refer structure type
QRCODECONTEXT

lpImageFile

[in] define the image file outputted, currently bitmap image supported

Return values

If the function succeeds, the return value is TRUE, otherwise , return FALSE.

2.2.2.3. QRCodeEncode2Bitmap

The QRCodeEncode2Bitmap function encode the data inputed with the defined attributes and return the bitmap handle of the QRCode barcode image

```
HBITMAP __stdcall QRCodeEncode2Bitmap (  
QRCODECONTEXT *pQRCodeCtx);
```

Parameters

pQRCodeCtx

[in] define the QRCode attributes for encoding, refer structure type
QRCODECONTEXT

Return values

If the function succeeds, the return value is BITMAP handle of QRCode barcode, otherwise , return NULL.

2.2.2.4. FreeWorkSpace

The FreeWorkSpace function free environment of the QRCode encoding

```
BOOL __stdcall FreeWorkSpace();
```

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.2.3. Example for Microsoft visual C++

Example1

```
#include "QRCodeEncodedLL.h"

.....

tagQRCODECONTEXT tQrCtx;

InitWorkSpace(&tQrCtx);
tQrCtx.preferredVersion = 2;
tQrCtx.selectedVersion = 2;
tQrCtx.correctionLevel = 0;
tQrCtx.encoding = 1;
tQrCtx.eci = 0;
tQrCtx.fnclMode = 0;
// tQrCtx.structuredAppendIndex;
// tQrCtx.structuredAppendCounter;
// tQrCtx.applicationIndicator;
tQrCtx.structuredAppend = false;
tQrCtx.processTilde = true;
tQrCtx.autoConfigurate = false;
tQrCtx.nMargin = 10;
tQrCtx.nPixelSize = 4;
// tQrCtx.clBackGround = RGB(255, 255, 255);
tQrCtx.clForeGround = RGB(255, 0, 0);
sprintf(tQrCtx.cData, "http://www.aipsys.com");
QRCodeEncode2File(&tQrCtx, "c:\\qrcode.bmp");
FreeWorkSpace();

....

LIBRARY for linking
QRCodeEncodedLL.lib
RUNTIME LIBRARY
QRCodeEncodedLL.DLL
```

2.2.4. Example for Borland Delphi

2.2.4.1. Redeclaration of the data type and function

```
LPQRCODECONTEXT = ^TQRCODECONTEXT;
TQRCODECONTEXT = record
    preferredVersion : Integer;
    selectedVersion : integer;
    controlChars : ^integer;
    correctionLevel : integer;
    encoding : integer;
    eci : integer;
    fnc1Mode :integer;
    structuredAppendIndex : integer;
    structuredAppendCounter : integer;
    applicationIndicator : integer;
    structuredAppend : boolean;
    processTilde: boolean;
    autoConfigurate: boolean;
    cData: array[1..7100] of char;
    nSize : integer;
    nMargin : BYTE;
    nPixelSize : BYTE;
    clBackGround : TColor;
    clForeGround : TColor;
end;

procedure InitWorkSpace(pQRCodeCtx : LPQRCODECONTEXT ); stdcall; external
    'QRCODEENCODEDLL.DLL';

function  QRCodeEncode2File(pQRCodeCtx : LPQRCODECONTEXT;lpImageFile :PChar) :
    boolean; stdcall;external 'QRCODEENCODEDLL.DLL';

function  QRCodeEncode2Bitmap(pQRCodeCtx : LPQRCODECONTEXT) :
    HBITMAP;stdcall;external 'QRCODEENCODEDLL.DLL';

function  FreeWorkSpace : boolean;stdcall external 'QRCODEENCODEDLL.DLL';
```

2.2.4.2. Example

Example1

```
var
  ctx : TQRCODECONTEXT;
  s : string;
  i : Integer;
  bmp : HBITMAP;
  img : TBitmap;
  pCtx : LPQRCODECONTEXT;
begin
  pCtx := @ctx;
  InitWorkspace(pCtx);
  ctx.preferredVersion := Combobox1.ItemIndex + 1;
  ctx.selectedVersion := Combobox1.ItemIndex + 1;
  ctx.correctionLevel := Combobox3.ItemIndex;
  ctx.encoding := Combobox4.ItemIndex;
  ctx.fnc1Mode := Combobox5.ItemIndex;

  ctx.structuredAppendIndex := StrToInt(Edit1.Text);
  ctx.structuredAppendCounter := StrToInt(Edit6.Text);
  ctx.structuredAppend := CheckBox1.checked;
  ctx.processTilde := CheckBox2.checked;
  ctx.autoConfigure := CheckBox3.checked;
  ctx.nMargin := StrToInt(Edit3.Text);
  ctx.nPixelSize := StrToInt(Edit4.Text);
  ctx.clBackGround := ColorBox1.Color;
  ctx.clForeGround := ColorBox2.Color;
  if (Edit5.Text <> "") then
    StrMove(@ctx.cData,PChar(Edit5.Text),Length(Edit5.Text));
  image1.Picture.CleanupInstance;
  QRCodeEncode2File(pCtx,PChar('c:\1.bmp'));
  image1.Picture.LoadFromFile('c:\1.bmp');
  FreeWorkspace();
end;
```

Example 2

```
var
  ctx : TQRCODECONTEXT;
  s : string;
  i : Integer;
  bmp : HBITMAP;
```



```

img : TBitmap;
pCtx : LPQRCODECONTEXT;
begin
    pCtx := @ctx;
    InitWorkSpace(pCtx);
    ctx.preferredVersion := Combobox1.ItemIndex + 1;
    ctx.selectedVersion := Combobox1.ItemIndex + 1;
    ctx.correctionLevel := Combobox3.ItemIndex;
    ctx.encoding := Combobox4.ItemIndex;
    ctx.fnc1Mode := Combobox5.ItemIndex;

    ctx.structuredAppendIndex := StrToInt(Edit1.Text);
    ctx.structuredAppendCounter := StrToInt(Edit6.Text);
    ctx.structuredAppend := CheckBox1.checked;
    ctx.processTilde := CheckBox2.checked;
    ctx.autoConfigure := CheckBox3.checked;
    ctx.nMargin := StrToInt(Edit3.Text);
    ctx.nPixelSize := StrToInt(Edit4.Text);
    ctx.clBackGround := ColorBox1.Color;
    ctx.clForeGround := ColorBox2.Color;
    if (Edit5.Text <> "") then
        StrMove(@ctx.cData,PChar(Edit5.Text),Length(Edit5.Text));
    image1.Picture.CleanupInstance;
    bmp := QRCodeEncode2Bitmap(pCtx);
    img := TBitmap.Create;
    img.Handle := bmp;
    image1.Picture.Assign(img);
    img.Free;
    ShowMessage('Make QRCode barcode successfully');
    FreeWorkSpace();
end;

```

2.2.5. Example for Microsoft visual Basic

2.2.5.1. Redclaration of the data type and function

Private Declare Function DataMatrixEncode2SMSImage Lib
 "DataMatrixEncodeDll.dll" (ByVal pBuf As String, ByVal ImgFile As String, ByVal
 nWidth As Long, ByVal nHeight As Long) As Boolean

Private Declare Function DataMatrixDecodeImageFile Lib
 "DataMatrixDecodeDll.dll" (ByVal pFile As String, ByVal pBuf As Any, ByVal
 pSize As Long) As Boolean

2.2.5.2. Example

Example1

```
.....  
If (DataMatrixEncode2SMSImage("ABCDEFGHJKLMNOP", "c:\pic4.bmp", 72, 28)) Then  
    MsgBox ("SUccess, Trial version will replace some char of input with '*' randomly")  
Else  
    MsgBox ("failed")  
End If.....
```

2.2.6. Example for CA Visual Objects

2.2.6.1. Redclaration of the data type and function

```
_dll FUNC FreeWorkSpace() as LOGIC PASCAL:QRcodeEncodedLL.FreeWorkSpace  
  
_dll FUNC InitWorkSpace(stCode) as void PASCAL:QRcodeEncodedLL.InitWorkSpace  
  
_dll FUNC QRcodeEncode2File(stCode as ptr,cBitmap as psz) as LOGIC  
    PASCAL:QRcodeEncodedLL.QRcodeEncode2File  
  
  
_dll FUNC Encode2File(pData as psz,nCorrectionLevel as int,nMargin  
    as int, nPixelSize as int,c1Background as DWORD, c1Foreground  
    as DWORD,cBitmap as psz) as LOGIC  
    PASCAL:QRcodeEncodedLL.Encode2File  
  
STRUCTURE QRCODECONTEXT ALIGN 1  
    MEMBER preferredVersion as int  
    MEMBER selectedVersion as int  
    MEMBER controlChars as int  
    MEMBER correctionLevel as int  
    MEMBER encoding as int  
    MEMBER eci as int  
    MEMBER fnc1Mode as int  
    MEMBER structuredAppendIndex as int  
    MEMBER structuredAppendCounter as int  
    MEMBER applicationIndicator as int  
    MEMBER processTilde as byte  
    MEMBER structuredAppend as byte  
    MEMBER autoConfigure as byte
```

```

MEMBER dim cData[7100+1] as byte
MEMBER nSize as int
MEMBER nMargin as byte
MEMBER nPixelSize as byte
MEMBER clBackGround as DWORD
MEMBER clForeGround as DWOR

```

2.2.6.2. Example

```

METHOD MakeQRCode1( ) CLASS Testwindow

LOCAL stQRCode as QRCODECONTEXT
LOCAL lSucceed:=.F. as LOGIC
LOCAL owarningBox as EvewarningBox
LOCAL oApp as App
LOCAL cText as STRING
oApp:=GetAppObject()
cText:="Test"
stQRCode := MemAlloc(_sizeof(QRCODECONTEXT))
InitWorkspace(stQRCode)
stQRCode.preferredVersion:=3
stQRCode.selectedVersion:=3
stQRCode.correctionLevel:=1
stQRCode.encoding:=4
* stQRCode.eci:=0
* stQRCode.fnc1Mode:=0
* stQRCode.structuredAppendIndex:=0
* stQRCode.structuredAppendCounter:=0
* stQRCode.applicationIndicator:=0
stQRCode.nSize :=Len(cText)
* stQRCode.structuredAppend:=false
* stQRCode.processTilde:=true
* stQRCode.autoConfigurate:=false
stQRCode.nMargin:=15
stQRCode.nPixelSize:=4
IF stQRCode.nSize < 10
    MemCopyString(@stQRCode.cData, PadR(cText,10," "), 10)
ELSE
    MemCopyString(@stQRCode.cData, cText, stQRCode.nSize)
ENDIF

```

```

lSucceed:=QRCodeEncode2File(stQRCode,String2Psz("c:\temp\qrcodetest.bmp"))
IF lSucceed = .F.
    oWarningBox:=EveWarningBox{"No QR code created!"+CHR(13)+"Program will be
closed"}
    oWarningBox:Show()
ELSE
    oWarningBox:=EveWarningBox{"QR code created
(c:\temp\qrcodetest.bmp)!"+CHR(13)+"Program will be closed"}
    oWarningBox:Show()

ENDIF
FreeWorkSpace()
MemFree(stQRCode)
self:EndWindow()
oApp:Quit()

```

2.3. ActiveX

2.3.1. Properties

2.3.1.1. PreferredVersion

preferred version of QRCode 1~40

short PreferredVersion

2.3.1.2. SelectedVersion

The property set the selected version of QRCode 1~40

short SelectedVersion

2.3.1.3. CorrectionLevel

The property set the error correction level

```

CORRECTION_LEVEL_L = 0;
CORRECTION_LEVEL_M = 1;

```

```
CORRECTION_LEVEL_Q = 2;  
CORRECTION_LEVEL_H = 3;
```

short CorrectionLevel

2.3.1.4. EncodeMode

The property set the encoding scheme of QRCode barcode

```
ENC_ALPHA = 0;  
ENC_BYTE = 1;  
ENC_NUMERIC = 2;  
ENC_KANJI_CHINESE = 3
```

short EncodeMode

2.3.1.5. EciMode

The property set the eci mde of QRCode barcode

short EciMode

2.3.1.6. Fnc1Mode

The property set the fnc1 mode of QRCode barcode

short Fnc1Mode

2.3.1.7. StructuredAppend

The property set if QRCode is structured append

bool StructuredAppend

2.3.1.8. ProcessTilde

The property set if QRCode is process tilde

bool ProcessTilde

2.3.1.9. AutoConfigure

The property set if version of QRCode is auto configured

bool AutoConfigure

2.3.1.10. Margin

The property set barcode Margin

bool Margin

2.3.1.11. PixelSize

The property set module Size of barcode image

bool PixelSize

2.3.1.12. ForegroundColor

The property set the Foreground color of DataMatrix barcode

OLE_COLOR ForegroundColor

2.3.1.13. BackGroundColor

The property set the Background color of DataMatrix barcode

OLE_COLOR BackGroundColor

2.3.1.7. TextData

The property set the data to be encoded

BSTR TextData

2.3.2. Methods

2.3.2.1. Encode2ImageFile

The method Encode2ImageFile encode the data inputed and save the barcode image to file.

```
boolean Encode2ImageFile(BSTR lpImageFile);
```

Parameters

lpImageFile

[in] specify the barcode image file to be saved

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.3.3. Register activeX component

```
Regsvr32 QRCodeEncodeOcx.OCX
```

2.3.4. Example for Microsoft visual C++

To refer it in VC:

Run Visual C++;

Select menu project, click **add to project** item, then click components
and controls

Select Registered ActiveX controls then select QRCodeEncodeOcx.Ocx

```
#include "QRCodeEncodeOcx.h"
```

```
CQRCodeEncodeOcx objQRCode;  
objQRCode.TextData = "http://www.aipsys.com";  
objQRCode.AutoConfigurate = true;  
objQRCode.EncodMode = 1;  
objQRCode.PixelSize = 4;  
objQRCode.ForegroundColor = RGB(255,0,0);  
objQRCode.Margin = 10;  
objQRCode.Encode2ImageFile("c:\\qr.gif");
```

2.3.5. Example for Borland Delphi

To install it to Delphi:

Run Delphi

Select menu-> component, click Import ActiveX Control item,
Select DataMatrixEncodeOcx ActiveX module when dialog shows,
Install it. You can find the component in the Active Page

Uses

```
... QRCodeEncodeOcx_TLB;  
objQR : TQRCodeEncodeOcx;  
begin  
  objQR.TextData := 'http://www.aipsys.com';  
  objQR.PixelSize := 4;  
  objQR.EncodeMode := 1;  
  objQR.AutoConfigure := true;  
  objQR.ForegroundColor := &HFF00FF  
  objQR.Margin := 10  
  objQR.Encode2ImageFile('c:\qr.gif');  
end;
```

2.3.6. Example for Microsoft visual Basic

```
Private Sub Command1_Click()  
  QRCodeEncodeOCX1.TextData = "http://www.aipsys.com"  
  QRCodeEncodeOCX1.PixelSize = 4  
  QRCodeEncodeOCX1.EncodeMode = 1  
  QRCodeEncodeOCX1.ForegroundColor = &HFF00FF  
  QRCodeEncodeOCX1.Margin = 10  
  QRCodeEncodeOCX1.CorrectionLevel = 1  
  QRCodeEncodeOCX1.SelectedVersion = 3  
  QRCodeEncodeOCX1.ProcessTilde = True  
  QRCodeEncodeOCX1.Encode2ImageFile("c:\qrcode.gif")  
End Sub
```

2.4. ASP Control for server side

2.4.1. Properties

2.4.1.1. nVersion

The property set the selected version of QRCode 1~40

short nVersion

2.4.1.2. nPixelSize

The property set the module width of QRCode barcode

short nPixelSize

2.4.1.5. nMode

The property set the encoding mode of QRCode barcode

short nMode

2.4.1.6. nMargin

The property set the margin of QRCode barcode

short nMargin

2.4.1.7. nLevel

The property set the error correction level of QRCode barcode

short nLevel

2.4.1.8. clForeground

The property set the Foreground color of DataMatrix barcode

OLE_COLOR clForeground

2.4.1.9. clBackGround

The property set the Background color of DataMatrix barcode

OLE_COLOR clBackGround

2.4.1.9. strText

The property set the data to be encoded

BSTR strText

2.4.2. Methods

2.4.2.1. InitWorkspace

The method InitWorkspace initialize the working environment

BOOL InitWorkspace().

Parameters

none

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.4.2.2. FreeWorkspace

The method FreeWorkspace destroy the working environment

BOOL FreeWorkspace().

Parameters

none

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.3.2.3. Encode2File

The method Encode2File encode the data inputed and save the barcode image to file.

boolean Encode2File(BSTR strImageFile);

Parameters

strImageFile

[in] specify the barcode image file to be saved

Return values

If the function succeeds, the return TRUE, otherwise , return FALSE.

2.4.3. Register the ASP server component

Regsvr32 QRCodeEncodeASP.DLL

2.4.4. Example for ASP

```
<%
    set obj = Server.CreateObject("QRCodeEncodeCOM.EncodeService")
    obj.InitWorkspace()
    obj.nVersion = 3      ' Version
    obj.nMargin = 5      ' Margin
    obj.nLevel = 1       ' Correction Level
    obj.nPixelSize = 2   ' Module size
    obj.strText = "Http://www.aipsys.com/#65292;"
    obj.Encode2File("C:\1.gif")
    obj.FreeWorkspace()
    response.Write("<img src='1.gif'>")
    response.Write("<br>")
    response.Write("Trial Version randomly change element of input with * <br>")
%>
```

3. Decoder SDK

3.1. Static link library

Structure of the QRCode decoding result:

```
typedef struct tagResult
{
    BYTE *pData;    //result of decoding result
    int nSize;      //data length
    int xPos;       //Left top position of barcode at image
    int yPos;       // Left top position of barcode at image
} Result;
```

3.1.1. Function or procedure

3.1.1.1. _QRCodeDecodeImageFile

The _QRCodeDecodeImageFile function read QRCode figure from image and decode it to text or binary data.

Result * __stdcall _QRCodeDecodeImageFile(char *pImageFile,int *pCount);

Parameters:

pImageFile char *

[in] the image file containing QRCode figure, it can be BMP,GIF,PNG,JPG or TIF formats.

pCount int

[out] the barcodes the function found and the number of the result returned. The pointer need be allocate memory before calling the function.

Return values

Result *, the first result pointer. If having more barcodes, move the pointer to get the next barcode result.

NULL decode failure or no barcode found.

3.1.1.2. _QRCodeDecode

The _QRCodeDecode function read QRCode figure from image opened and decode it to text or binary data.

Result * __stdcall _QRCodeDecode (HBITMAP hImage,int *pCount);

Parameters:

hImage HBITMAP

[in] the bitmap handle containing QRCode figure,

pCount int

[out] the barcodes the function found and the number of the result returned. The pointer need be allocate memory before calling the function.

Return values

Result *, the first result pointer. If having more barcodes, move the pointer to get the next barcode result.

NULL decode failure or no barcode found.

3.1.1.3. _QRCodeFree

The _QRCodeFree function free the result memory;

```
void _stdcall _QRCodeFree(Result *r,int nCount);
```

Parameters:

r **Result ***

 [in] the result pointer;

nCount **int**

 [in] number of the result;

Return values

N/A

3.1.2. Samples

3.1.2.1 Example for Microsoft visual C++

```
#include "QRCodeDecodeLib.h"
.....
Result *pResult;
int  nBarcodes
char *pFile = "c:\\qrcode.jpg";

pResult = _QRCodeDecodeImageFile(pFile,&nBarcodes);
if(pResult)
{
    char buf[8192];
    Result *p = pResult;
    for (int I=0; I < nBarcodes; I++)
    {
        memset(buf,0,sizeof(buf));
        memcpy(buf,p->pData,p->nSize);
        MessageBox(buf);
    }
    _QRCodeFree(pResult,nBarcodes);
}
.....
LIBRARY Linked:
    QRCodeDecodelib.lib
```

3.2. Dynamic link library

Structure of the QRCode decoding result:

```
typedef struct tagResult
{
    BYTE *pData;    //result of decoding result
    int nSize;      //data length
    int xPos;       //Left top position of barcode at image
    int yPos;       // Left top position of barcode at image
} Result;
```

3.2.1. Function or procedure

3.2.1.1. QRCodeDecodeImageFile

The QRCodeDecodeImageFile function read QRCode figure from image and decode it to text or binary data.

Result * __stdcall QRCodeDecodeImageFile(char *pImageFile,int *pCount);

Parameters:

pImageFile **char ***

[in] the image file containing QRCode figure, it can be BMP,GIF,PNG,JPG or TIF formats.

pCount **int**

[out] the barcodes the function found and the number of the result returned. The pointer need be allocate memory before calling the function.

Return values

Result *, the first result pointer. If having more barcodes, move the pointer to get the next barcode result.

NULL decode failure or no barcode found.

3.1.1.2. QRCodeDecode

The QRCodeDecode function read QRCode figure from image opened and decode it to text or binary data.

Result * __stdcall QRCodeDecode (HBITMAP hImage,int *pCount);

Parameters:

hImage **HBITMAP**

[in] the bitmap handle containing QRCode figure,
pCount int
 [out] the barcodes the function found and the number of the result returned. The pointer need be allocate memory before calling the function.

Return values

Result *, the first result pointer. If having more barcodes, move the pointer to get the next barcode result.

NULL decode failure or no barcode found.

3.1.1.3. QRCodeFree

The QRCodeFree function free the result memory;

void _stdcall QRCodeFree(Result *r,int nCount);

Parameters:

r Result *

[in] the result pointer;

nCount int

[in] number of the result;

Return values

N/A

3.1.2. Samples

3.1.2.1 Example for Microsoft visual C++

```
#include "QRCodeDecodeDll.h"
.....
Result *pResult;
int nBarcodes
char *pFile = "c:\\qrcode.jpg";

pResult = QRCodeDecodeImageFile(pFile,&nBarcodes);
if(pResult)
{
    char buf[8192];
    Result *p = pResult;
    for (int I=0; I < nBarcodes; I++)
    {
```

```

        memset(buf,0,sizeof(buf));
        memcpy(buf,p->pData,p->nSize);
        MessageBox(buf);
    }
    QRCodeFree(pResult,nBarcodes);
}
.....

```

LIBRARY Linked:

QRCodeDecodeDll.lib

DYNAMIC LIBRARY ar runtime:

QRCodeDecodeDLL.dll

3.1.2.2 Example for Microsoft visual Basic

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Static Library			 \$495	 \$990	 \$2,180	 \$3,099	1.2
Dynamic Library		 \$125	 \$179	 \$379	 \$1,090	 \$2,199	1.2
ActiveX		 \$125	 \$179	 \$379	 \$1,090	 \$2,199	1.2
ASP Component			 \$179	 \$379	 \$1,090	 \$2,199	1.2
QRCode Encode SDK							
Static Library			 \$495	 \$990	 \$2,180	 \$3,099	1.2
Dynamic Library		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ActiveX		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ASP Component			 \$179	 \$379	 \$949	 \$2,199	1.2
DataMatrix Encode SDK							
Static Library			 \$495	 \$990	 \$2,180	 \$3,099	1.2
Dynamic Library		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ActiveX		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ASP Component			 \$179	 \$379	 \$949	 \$2,199	1.2
PDF417 Encode SDK							
Static Library			 \$495	 \$990	 \$2,180	 \$3,099	1.2
Dynamic Library		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ActiveX		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ASP Component			 \$179	 \$379	 \$949	 \$2,199	1.2
Aztec Encode SDK							
Static Library			 \$495	 \$990	 \$2,180	 \$3,099	1.2
Dynamic Library		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2

ActiveX		 \$125	 \$179	 \$379	 \$949	 \$2,199	1.2
ASP Component			 \$179	 \$379	 \$949	 \$2,199	1.2

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PRODUCT ID TABLE						
Packages	Single User	Small Company Developer	1 Developer	5 Developer	Unlimited Developer	Version
1D Barcode Encode SDK						
Static Library		300222295	300222296	300222297	300222298	1.2
Dynamic Library	300222332	300222333	300222334	300222335	300222336	1.2
ActiveX	300222367	300222368	300222369	300222370	300222371	1.2
ASP Component		300222388	300222389	300222390	300222391	1.2
QRCode Encode SDK						
Static Library		300222413	300222284	300222285	300222286	1.2
Dynamic Library	300222309	300222312	300222314	300222317	300222320	1.2
ActiveX	300222343	300222344	300222347	300222350	300222355	1.2
ASP Component		300222376	300222377	300222377	300222379	1.2
DataMatrix Encode SDK						
Static Library		300222291	300222292	300222293	300222294	1.2
Dynamic Library	300222321	300222322	300222324	300222325	300222326	1.2
ActiveX	300222357	300222358	300222359	300222360	300222361	1.2
ASP Component		300222380	300222381	300222382	300222383	1.2
PDF417 Encode SDK						
Static Library		300222280	300222281	300222282	300222283	1.2
Dynamic Library	300222299	300222300	300222301	300222303	300222305	1.2
ActiveX	300222337	300222338	300222339	300222340	300222341	1.2
ASP Component		300222372	300222373	300222374	300222375	1.2
Aztec Encode SDK						
Static Library		300222288	300222414	300222289	300222290	1.2
Dynamic Library	300222323	300222327	300222329	300222330	300222331	1.2
ActiveX	300222362	300222363	300222364	300222365	300222366	1.2
ASP Component		300222384	300222385	300222386	300222387	1.2

6. Support Information

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Barcode resources reference information

Introduction to [common barcode types](#)

[RSS barcodes renamed GS1-DataBar](#)

[Recommended sizes for barcodes](#)

Barcode specifications & Standards

- [American National Standards Institute](#)
- [Automatic Identification Manufacturer's Association](#)
- [Automotive Industry Action Group](#)
- [British Standards Institution](#) (BSI)
- [GS1](#) (formerly EAN International)
- [GS1 UK](#) (formerly the e-Centre)
- [GS1 US](#) (formerly UCC - Uniform Code Council)
- [Health Industry Barcode Standards](#)
- [ISO - International Standards Organisation](#)

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