

## Greek Character Encoding for Electronic Mail Messages

### Status of This Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

### Overview and Rational

This document describes a standard encoding for electronic mail [RFC822] containing Greek text and provides implementation guidelines. The standard is based on MIME [RFC1521] and the ISO 8859-7 character encoding. Although the implementation of this standard is straightforward several non-standard but "functional" - though unlikely to inter-operate - alternatives are in common use. For this reason we highlight common implementation and mail user agent setup errors.

### Description

In order to transfer Greek text via electronic mail the text is first translated into the ISO 8859-7 character set, and then encoded using either the Base64 (preferable for text that is mainly Greek) or the Quoted-Printable (justifiable in cases where some Greek words appear inside predominately Latin text) method, as defined in MIME.

The following table provides most common Greek encodings (see also [RFC1345]):

0646	37	M7	51	MC	23	69	LG	L1	G7	GO	GC	28	97	Description
----	--	--	--	--	--	--	--	--	--	--	--	--	--	-----
0386	ea	a2	86	cd	71	86								b6 Capital alpha with acute
0388	eb	b8	8d	ce	72	8d								b8 Capital epsilon with acute
0389	ec	b9	8f	d7	73	8f								b9 Capital eta with acute
038a	ed	ba	90	d8	75	90								ba Capital iota with acute
038c	ee	bc	92	d9	76	92								bc Capital omicron with acute
038e	ef	be	95	da	77	95								be Capital upsilon with acute
038f	f0	bf	98	df	78	98								bf Capital omega with acute
0390		c0	a1	fd		a1								c0 Small iota with acute and

													diaeresis		
0391	80	c1	a4	b0	41	a4	61		41	61	41	41	c1	Capital	alpha
0392	81	c2	a5	b5	42	a5	62		42	62	42	42	c2	Capital	beta
0393	82	c3	a6	a1	43	a6	67	23	43	67	43	44	c3	Capital	gamma
0394	83	c4	a7	a2	44	a7	64	40	44	64	44	45	c4	Capital	delta
0395	84	c5	a8	b6	45	a8	65		45	65	45	46	c5	Capital	epsilon
0396	85	c6	a9	b7	46	a9	7a		46	7a	46	49	c6	Capital	zeta
0397	86	c7	aa	b8	47	aa	68		47	68	47	4a	c7	Capital	eta
0398	87	c8	ac	a3	48	ac	75	5c	48	75	48	4b	c8	Capital	theta
0399	88	c9	ad	b9	49	ad	69		49	69	49	4c	c9	Capital	iota
039a	89	ca	b5	ba	51	b5	6b		4b	6b	4a	4d	ca	Capital	kappa
039b	8a	cb	b6	a4	52	b6	6c	5e	4c	6c	4b	4e	cb	Capital	lamda
039c	8b	cc	b8	bb	53	b7	6d		4d	6d	4c	4f	cc	Capital	mu
039d	8c	cd	b7	c1	54	b8	6e		4e	6e	4d	50	cd	Capital	nu
039e	8d	ce	bd	a5	55	bd	6a	21	4f	6a	4e	51	ce	Capital	xi
039f	8e	cf	be	c3	56	be	6f		50	6f	4f	52	cf	Capital	omicron
03a0	8f	d0	c6	a6	57	c6	70	3f	51	70	50	53	d0	Capital	pi
03a1	90	d1	c7	c4	58	c7	72		52	72	51	55	d1	Capital	rho
03a3	91	d3	cf	aa	59	cf	73	5f	53	73	53	56	d3	Capital	sigma
03a4	92	d4	d0	c6	62	d0	74		54	74	54	58	d4	Capital	tau
03a5	93	d5	d1	cb	63	d1	79		55	79	55	59	d5	Capital	upsilon
03a6	94	d6	d2	bc	64	d2	66	5d	56	66	56	5a	d6	Capital	phi
03a7	95	d7	d3	cc	65	d3	78		58	78	57	5b	d7	Capital	chi
03a8	96	d8	d4	be	66	d4	63	3a	59	63	58	5c	d8	Capital	psi
03a9	97	d9	d5	bf	67	d5	76	5b	5a	76	59	5d	d9	Capital	omega
03aa		da		ab		91							da	Capital	iota with diaeresis
03ab		db		bd		96							db	Capital	upsilon with diaeresis
03ac	e1	dc	9b	c0	b1	9b							dc	Small	alpha with acute
03ad	e2	dd	9d	db	b2	9d							dd	Small	epsilon with acute
03ae	e3	de	9e	dc	b3	9e							de	Small	eta with acute
03af	e5	df	9f	dd	b5	9f							df	Small	iota with acute
03b0		e0	fc	fe		fc							e0	Small	upsilon with acute and diaeresis
03b1	98	e1	d6	e1	8a	d6		61	41	61	61	e1	Small	alpha	
03b2	99	e2	d7	e2	8b	d7		62	42	62	62	e2	Small	beta	
03b3	9a	e3	d8	e7	8c	d8		63	47	63	64	e3	Small	gamma	
03b4	9b	e4	dd	e4	8d	dd		64	44	64	65	e4	Small	delta	
03b5	9c	e5	de	e5	8e	de		65	45	65	66	e5	Small	epsilon	
03b6	9d	e6	e0	fa	8f	e0		66	5a	66	69	e6	Small	zeta	
03b7	9e	e7	e1	e8	9a	e1		67	48	67	6a	e7	Small	eta	
03b8	9f	e8	e2	f5	9b	e2		68	55	68	6b	e8	Small	theta	
03b9	a0	e9	e3	e9	9c	e3		69	49	69	6c	e9	Small	iota	
03ba	a1	ea	e4	eb	9d	e4		6b	4b	6a	6d	ea	Small	kappa	
03bb	a2	eb	e5	ec	9e	e5		6c	4c	6b	6e	eb	Small	lamda	
03bc	a3	ec	e6	ed	9f	e6		6d	4d	6c	6f	ec	Small	mu	
03bd	a4	ed	e7	ee	aa	e7		6e	4e	6d	70	ed	Small	nu	

03be	a5	ee	e8	ea	ab	e8	6f	4a	6e	71	ee	Small xi
03bf	a6	ef	e9	ef	ac	e9	70	4f	6f	72	ef	Small omicron
03c0	a7	f0	ea	f0	ad	ea	71	50	70	73	f0	Small pi
03c1	a8	f1	eb	f2	ae	eb	72	52	71	75	f1	Small rho
03c2	aa	f2	ed	f7	af	ed	77	57	72	77	f2	Small final sigma
03c3	a9	f3	ec	f3	ba	ec	73	53	73	76	f3	Small sigma
03c4	ab	f4	ee	f4	bb	ee	74	54	74	78	f4	Small tau
03c5	ac	f5	f2	f9	bc	f2	75	59	75	79	f5	Small upsilon
03c6	ad	f6	f3	e6	bd	f3	76	46	76	7a	f6	Small phi
03c7	ae	f7	f4	f8	be	f4	78	58	77	7b	f7	Small chi
03c8	af	f8	f6	e3	bf	f6	79	43	78	7c	f8	Small psi
03c9	e0	f9	fa	f6	db	fa	7a	56	79	7d	f9	Small omega
03ca	e4	fa	a0	fb	b4	a0					fa	Small iota with diaeresis
03cb	e8	fb	fb	fc	b8	fb					fb	Small upsilon with diaeresis
03cc	e6	fc	a2	de	b6	a2					fc	Small omicron with acute
03cd	e7	fd	a3	e0	b7	a3					fd	Small upsilon with acute
03ce	e9	fe	fd	f1	b9	fd					fe	Small omega with acute

Note: All values are in hexadecimal.

The column headers refer to the following character sets:

0646 The ISO 2DIS 10646 code.

37 PC code page 737 also known as 437G. Note that some implementations of this code page do not include capital letters with acute.

M7 Character set 8859-7 as implemented in Microsoft Windows 3.1, Microsoft Windows 3.11, and Microsoft Windows 95.

51 IBM code page 851.

MC The Greek code page implemented on the Apple Macintosh computers.

23 IBM code page 423 (EBCDIC-CP-GR).

69 IBM code page 869.

LG Latin Greek (iso-ir-19).

L1 Latin Greek 1 (iso-ir-27). This page only contains the Greek capital letters whose glyphs do not exist in the Latin alphabet. The other capital letters are rendered using the equivalent Latin letter (e.g. "Greek capital letter alpha" is rendered as "Latin capital letter A"). When mapping "Latin Greek 1" text to ISO 8859-7 the Latin capital letters should only be transcribed to the equivalent Greek ones if a suitable heuristic determines that the

specific Latin letters are used to represent Greek glyphs.

G7 7 bit Greek (iso-ir-88).

G0 Old 7 bit Greek (iso-ir-18).

GC Greek CCITT (iso-ir-150).

28 Character set ISO 5428:1980 (iso-ir-55).

97 The target character set ISO 8859-7:1987 (ELOT-928) (iso-ir-126).

#### MIME Headers

A mail message that contains Greek text must contain at least the following MIME headers:

```
MIME-Version: 1.0
Content-type: text/plain; charset=ISO-8859-7
Content-transfer-encoding: BASE64 | Quoted-Printable
```

In the future, when all email systems implement fully transparent 8-bit e-mail as defined in RFC 1425 and RFC 1426 the message body encoding phase described in this standard will be no longer needed. In this case the requisite MIME headers are modified as follows:

```
MIME-Version: 1.0
Content-type: text/plain; charset=ISO-8859-7
Content-transfer-encoding: 8BIT
```

Even when RFC 1425 is used, Q or B encoding will continue to apply to message headers as detailed in the following section.

#### Optional

It is recommended, although not required, to support Greek encoding in mail headers as specified in RFC 1522. Specifically, the B-encoding format is to be the default method used for encoding Greek text in RFC-822 mail headers, and the Q-encoding format the method to use for the exceptional case of encoding a single Greek word or letter in an otherwise Latin-character-based header.

## Example

Below is a short example of Quoted-Printable encoded Greek email:

```
Date:      Wed, 31 Jan 96 20:15:03 EET
From:      Diomidis Spinellis <dds@senanet.com>
Subject:    Sample Greek mail
To:        Achilleas Voliotis <achilles@theseas.ntua.gr>
MIME-Version: 1.0
Content-ID: <Wed_Feb_14_18_49_50_EET_1996_0@senanet>
Content-Type: Text/plain; charset=ISO-8859-7
Content-Transfer-Encoding: Base64
```

```
yuHr5+zd8eEsCgrU7yDl6+vn7enq/CDh6/bc4uf07yDh8O/05evl3/Th6SDh8PwgMjYg4/Hc
7Ozh9OEuCG==
```

## Discussion

It is possible [RFC1428] (and unfortunately common practice) to set up an arrangement of mail user and transfer agents that allow end users to communicate with Greek e-mail messages while violating a number of standards. Such arrangements are unlikely to offer wide scale interoperability.

One common error is to arrange the rendering and composition of Greek messages by rigging a mail user agent hosted in an ISO 8859-1 environment to use a presentation font that contains Greek glyphs and a keyboard input method that generates Greek text using those glyphs. The resulting messages begin with header items indicating contents in the ISO 8859-1 character set and include text in a totally different encoding. Unfortunately this "solution" appears to "work" across similar systems and is widely used.

One other error is to tag Greek text generated on Microsoft Windows platforms as ISO 8859-7 without an intermediate translation phase. It is important to note that the character set used by the Microsoft Windows Greek implementations is NOT the same as the ISO 8859-7 representation. First of all, the character set used to represent Greek characters differs slightly from the ISO 8859-7 encoding (this difference was instrumented in order to rectify the appearance of an early version of Microsoft Word for Windows in which the end-of-section symbol clashed with the "Greek capital alpha with acute" glyph). In addition, a number of 8-bit characters available on Greek Windows implementations are not part of the ISO 8859-7 character set.

Note that the ISO 8859-7 encoding is equivalent to the Greek Standards Organisation EL0T-928 encoding.

#### References

- [ISO-8859] Information Processing -- 8-bit Single-Byte Coded Graphic Character Sets, Part 7: Latin/Greek alphabet, ISO 8859-7, 1987.
- [RFC822] Crocker, D., "Standard for the Format of ARPA Internet Text Messages", STD 11, RFC 822, UDEL, August 1982.
- [RFC1345] Simonsen, K., "Character Mnemonics & Character Sets" RFC 1345, Rationel Almen Planlaegning, June 1992.
- [RFC1425] Klensin, J., Freed N., Rose M., Stefferud E., and D. Crocker, "SMTP Service Extensions", RFC 1425, United Nations University, Innosoft International, Inc., Dover Beach Consulting, Inc., Network Management Associates, Inc., The Branch Office, February 1993.
- [RFC1426] Klensin, J., Freed N., Rose M., Stefferud E., and D. Crocker, "SMTP Service Extension for 8bit-MIME Transport", RFC 1426, United Nations University, Innosoft International, Inc., Dover Beach Consulting, Inc., Network Management Associates, Inc., The Branch Office, February 1993.
- [RFC1428] Vaudreuil, G., "Transition of Internet Mail from Just-Send-8 to 8bit-SMTP/MIME", RFC 1428, CNRI, February 1993.
- [RFC1521] Borenstein N., and N. Freed, "MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies", Bellcore, Innosoft, September 1993.
- [RFC1522] Moore K., "MIME Part Two: Message Header Extensions for Non-ASCII Text", University of Tennessee, September 1993.

## Security Considerations

Security issues are not discussed in this memo.

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