International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R M.2034
(02/2013)

Telegraphic alphabet for data communication by phase shift keying at 31 Bd in the amateur and amateur-satellite services

M Series

Mobile, radiodetermination, amateur and related satellite services

International Telecommunication Union

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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SNG	Satellite news gathering
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Note: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R M.2034

Telegraphic alphabet for data communication by phase shift keying at 31 Bd in the amateur and amateur-satellite services

(Question ITU-R 48-6/5)

(2013)

Scope

This Recommendation establishes a telegraphic alphabet and transmission protocols for phase shift keying at 31 Bd in the amateur and amateur-satellite services.

The ITU Radiocommunication Assembly,

considering

a) that phase shift keying at a data rate of 31 Bd has become a predominant transmission mode in the amateur and amateur-satellite services;

b) that phase shift keying at 31 Bd utilizes a telegraphic alphabet, commonly called "Varicode", optimized for the English language, in which more frequently used characters occupy fewer bits;

c) that telegraphic alphabets should be documented and updated from time to time to meet the needs of radiocommunication services,

recommends

1 that the Annex should be used to define Varicode characters and their applications in the amateur and amateur-satellite services.

Annex

1 Introduction

PSK-31 is a digital communication mode which is intended for live keyboard-to-keyboard conversations, similar to radioteletype. Its data rate is 31.25 Bd (about 50 words per minute), and its narrow bandwidth (approximately 60 Hz at –26 dB) reduces its susceptibility to noise. PSK-31's ITU emission designator is 60H0J2B. It uses either BPSK modulation without error correction or QPSK modulation with error correction (convolutional encoding and Viterbi decoding). In order to minimize occupied bandwidth, the output is cosine-filtered before reaching the transmitter audio input. PSK-31 is readily monitored and the most popular implementations use DSP software running on a computer soundcard.

Each transmission has a preamble, an idle signal of continuous zeroes corresponding to continuous phase reversals at the symbol rate of 31.25 reversals/second, and a postamble, continuous unmodulated carrier representing a series of logical ones. The absence of phase reversals squelches the decoder.

While a symbol rate of 31.25 Bd is typical of most amateur service use, the symbol rate can be varied in direct proportion to the frequency of phase reversals. Transmissions at symbol rates as high as 125 Bd have been achieved.

2 Varicode characters

Different characters are represented by a variable-length combination of bits called Varicode. Because shorter bit-lengths are used for the more common letters in the English language, Varicode improves efficiency in terms of the average character duration. Varicode is also self-synchronizing. No separate process is needed to define where one character ends and the next begins since the pattern used to represent a gap between two characters (at least two consecutive zeroes) never occurs in a character. Because no Varicode characters can begin or end with a zero (0), the shortest character is a single one (1) by itself. The next is 11, then 101, 111, 1011, and 1101, but not 10, 100, or 1000 (because they end with zeroes), and not 1001 (since it contains two consecutive zeros). This scheme generates the 128-character ASCII set with ten bits. The encoding philosophy, however, accommodates longer bit sequences which allow for additional characters, e.g. accented characters.

The Varicode character set is shown below. The codes are transmitted left bit first, with 0 representing a phase reversal on BPSK and 1 representing a steady carrier. A minimum of two zeros is inserted between characters. Some implementations may not handle all the codes below 32. Note that the lower case letters have the shortest patterns and so are the fastest to transmit.

The varicode character set control characters

Varicode	Abbreviation	Description
1010101011	NUL	Null character
1011011011	SOH	Start of Header
1011101101	STX	Start of Text
1101110111	ETX	End of Text
1011101011	EOT	End of Transmission
1101011111	ENQ	Enquiry
1011101111	ACK	Acknowledgment
1011111101	BEL	Bell
1011111111	BS	Backspace
11101111	HT	Horizontal Tab
11101	LF	Line feed
1101101111	VT	Vertical Tab
1011011101	FF	Form feed
11111	CR	Carriage return
1101110101	SO	Shift Out
1110101011	SI	Shift In
1011110111	DLE	Data Link Escape

Varicode	Abbreviation	Description
1011110101	DC1	Device Control 1 (XON)
1110101101	DC2	Device Control 2
1110101111	DC3	Device Control 3 (XOFF)
1101011011	DC4	Device Control 4
1101101011	NAK	Negative Acknowledgement
1101101101	SYN	Synchronous Idle
1101010111	ETB	End of Trans. Block
1101111011	CAN	Cancel
1101111101	EM	End of Medium
1110110111	SUB	Substitute
1101010101	ESC	Escape
1101011101	FS	File Separator
1110111011	GS	Group Separator
1011111011	RS	Record Separator
1101111111	US	Unit Separator
1110110101	DEL	Delete

Printable characters

Varicode	Glyph
1	SP
111111111	!
101011111	"
111110101	#
111011011	$
1011010101	%
1010111011	&
101111111	'
11111011	(
11110111	)
101101111	*
111011111	+
1110101	,
110101	-
1010111	.
110101111	/
10110111	0
10111101	1

Varicode	Glyph
1010111101	@
1111101	A
11101011	B
10101101	C
10110101	D
1110111	E
11011011	F
11111101	G
101010101	H
1111111	I
111111101	J
101111101	K
11010111	L
10111011	M
11011101	N
10101011	O
11010101	P
111011101	Q

Varicode	Glyph
1011011111	`
1011	a
1011111	b
101111	c
101101	d
11	e
111101	f
1011011	g
101011	h
1101	i
111101011	j
10111111	k
11011	l
111011	m
1111	n
111	o
111111	p
110111111	q

Varicode	Glyph
11101101	2
11111111	3
101110111	4
101011011	5
101101011	6
110101101	7
110101011	8
110110111	9
11110101	:
110111101	;
111101101	<
1010101	=
111010111	>
1010101111	?

Varicode	Glyph
10101111	R
1101111	S
1101101	T
101010111	U
110110101	V
101011101	W
101110101	X
101111011	Y
1010101101	Z
111110111	[
111101111	\
111111011	]
1010111111	^
101101101	_

Varicode	Glyph
10101	r
10111	s
101	t
110111	u
1111011	v
1101011	w
11011111	x
1011101	y
111010101	z
1010110111	{
110111011	|
1010110101	}
1011010111	~