Samuel F B Morse

EARLY BACKGROUND OF OUR TELEGRAPH CODES

by Lloyd Butler VK5BR

The Original article by the writer was first published in "Amateur Radio" September 1989
Further related information initiated by Tony Smith G4FAI and Kay Weeden (and which follows) was published in the May 1990 issue of "Amateur Radio"

INTRODUCTION

This article discusses the telegraph codes which were first developed and which have led up to the codes used in amateur radio today. In tracing their background, we are briefly introduced to some of those famous pioneers of telegraphy such as Morse. Wheatstone. Baudot and Murray. For the benefit of those amateurs who have yet to be introduced to the realms of RTTY and other forms of automatic serial data transmission, detail on the format of the various codes is included in tables and figures.

MORSE CODE

Samuel.F.B.Morse developed the first successful telegraph in the United States of America in the years leading up. to 1837. This was coincident with work carried out in England leading to a patent taken out for the telegraph, jointly by Sir Charles Wheatstone and William.F.Cooke, in 1837. (All of us are familiar with the Wheatstone Bridge which bears the name of Sir Charles.

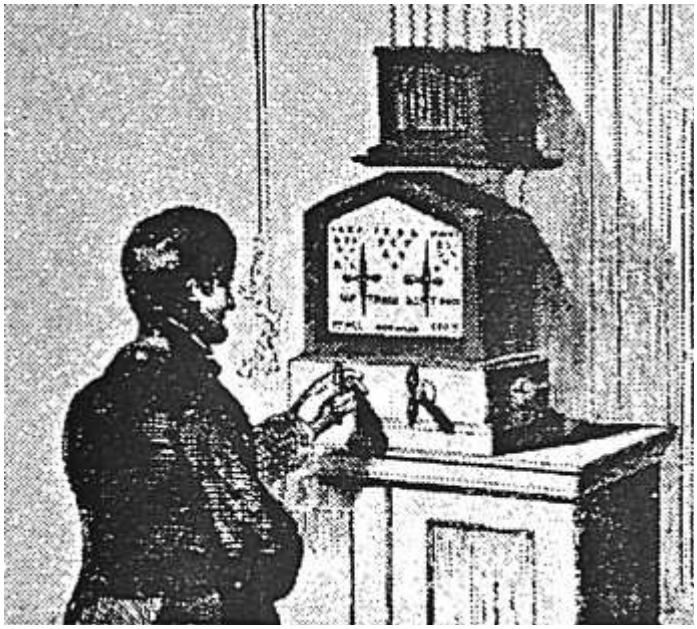
Although the bridge was originally devised by S.H.Christie. Wheatstone introduced it as a practical device.)

The Morse telegraph receiver incorporated an electromagnet which attracted an armature connected to encode the received signal on a band of paper, moved by clockwork. Morse's assistant, Alfred Vail, later redesigned the telegraph to include an electromagnetic sounder as the receiving instrument. Morse took out a patent for his telegraph in 1840.

The Morse telegraph was different to the Wheatstone/Cook telegraph which appears to have been a type of analogue system in which an electric current controlled the strength of an electromagnetic field that determined the degree of deflection of a magnetic needle. The needle was arranged to point at a specific alphabetic letter as determined by the controlling current. Morse used a two state (either mark or space) telegraph system as is still in use today.

With Government support, Morse built his first practical telegraph line between Washington D.C. and Baltimore Maryland (a distance of 64 km) in 1843. The first message was sent over the line on May 24. 1844.

For use on his telegraph, Morse developed a code for the various alphabetic letters, numeric figures and other characters, made up ,of 'combinations of short. long and very long mark elements called dots, dashes and long dashes respectively. A dash had a time period equal to two dots,a long dash had a time period equal to four dots and the time space between dots was equal to one dot. The format of the code, somewhat different from that which we use today, is shown in table 1.



Cooke & Wheatstone telegraph
used on the Croydon Railway 1845
(ref 10)

A	B	C	D	E	F	G
H	I	J	K	L	M	N
O	P	Q	R	S	T	U
V	W	X	Y	Z	&	
1	2	3	4	PERIOD	INTERROGATION	
5	6	7	8	COMMA	EXCLAMATION	
9	0					

Table 1 - The original Morse Code (Ref 1)

Morse actually introduced two versions of his Morse code. The code he used in 1837 had the same symbol for some of the phonetically similar letters. A new version, as shown in table 1 with unique symbols for each letter, was introduced around 1844 and became known as the American Morse code. An article by Tony Smith G4FAI (Ref 11) discusses this in more detail.

In 1851, the Morse code was simplified, by International Convention, to that shown in table 2. This International or Continental code is the one we all use today although at one time, both codes were apparently in use. According to a handbook by Victor.H.Laughter, published in 1909 (Ref 1), Morse code was used for overland service and Continental code was used between ships of the Navy and shore stations.

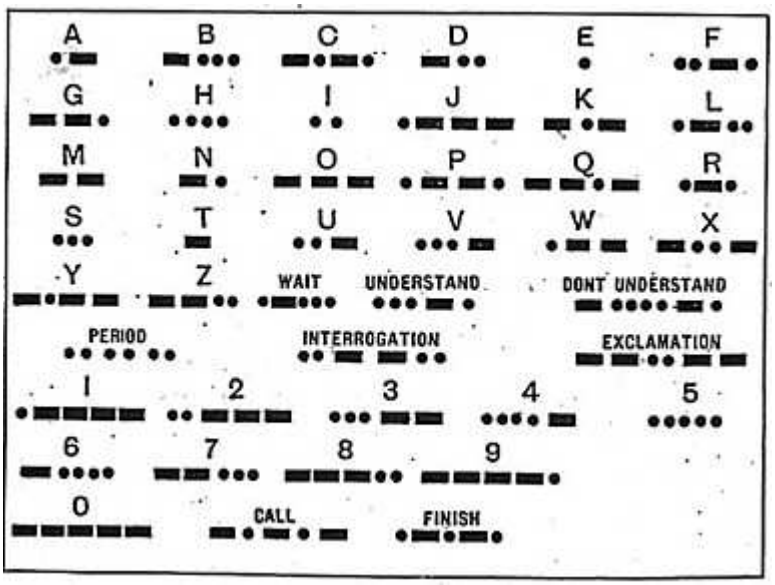


Table 2 - The Continental or International Code (Ref 1)

The timing format for our international code has been standardised as follows: A dash has a time equal to three dots. Time space between elements of a character is equal to one dot. The time space between letters of a word is equal to three dots. The time space between words was previously equal to five dots but this was changed by international agreement in 1949 to seven
dots.

Table 3, originating from the G4FAI article, compare thesymbols used for alphabetic letters in the three versions of the code.

	1837 code	*American Morse (1844)*	*International Morse (1851)*
A	•••	•–	•–
B	••··	–•••	–•••
C	•••	•••	–•–•
D	••·•	–••	–••
E	•	•	•
F	••·•	••–•	••–•
G	•••	––•	––•
H	••••	••••	••••
I	•–	••	••
J	•••	•–––	•–––
K	–•–	•––	–•–
L	———	———	•–••
M	–••	––	––
N	–•	–•	–•
O	••	••	–––
P	•••••	•••••	•––••
Q	••–•	••–•	––•–
R	••	•••	•–•
S	•–•	•••	•••
T	––•	–	–
U	•––	••–	••–
V	–	•••–	•••–
W	••–	•––	•––
X	––	•••–	–••–
Y	•–	••••	–•––
Z	•–•	••••	––••

Table 3 - Changes in Morse Code over the years

MACHINE TELEGRAPH CODES

Other codes have been introduced with the development of keyboard operation and machine telegraphy. Codes were developed by Jean Maurice Baudot and Donald Murray using five elements of mark or space in serial form for each character symbol. Five elements are insufficient to separately define all letters of the alphabet, numeric figures and punctuation and hence two character symbols were allocated to shift between letters and figures or punctuation so that each other character symbol performed two functions. Added to each five element symbol were also two additional elements to define the start and stop of the symbol for synchronisation.

The five element codes are still in use today in the communications services, including amateur radio, but these codes are quite different to the first code introduced by Baudot. The Baudot code was designed to suit manual operation from a pianoforte type keyboard of five keys, one for each element in a symbol. This original code is also known as the CCITT No 1 code and this is shown in table 4. (CCITT is an abbreviation for Consultative Committee for International Telegraph and Telephone).

Sl. No. of combination	Lower Case	Upper Case	Code elements				
			1.	2	3	4	5
1	A	1	1	0	0	0	0
2	B	8	0	0	1	1	0
3	C	9	1	0	1	1	0
4	D	0	1	1	1	1	0
5	E	2	0	1	0	0	0
6	F	*	0	1	1	1	0
7	G	7	0	1	0	1	0
8	H	+	1	1	0	1	0
9	I	*	0	1	1	0	0
10	J	6	1	0	0	1	0
11	K	(	1	0	0	1	1
12	L	=	1	1	0	1	1
13	M	)	0	1	0	1	1
14	N	*	0	1	1	1	1
15	O	5	1	1	1	0	0
16	P	%	1	1	1	1	1
17	Q	/	1	0	1	1	1
18	R	—	0	0	1	1	1
19	S	.	0	0	1	0	1
20	T	*	1	0	1	0	1
21	U	4	1	0	1	0	0
22	V	!	1	1	1	0	1
23	W	?	0	1	1	0	1
24	X	,	0	1	0	0	1
25	Y	3	0	0	1	0	0
26	Z	:	1	1	0	0	1
27	Carriage Return		1	1	0	0	0
28	Line Feed		1	0	0	0	1
29	Letter shift (space)		0	0	0	0	1
30	Figure shift (space)		0	0	0	1	0
31	Error		0	0	0	1	1
32	Instrument Idle		0	0	0	0	0

0 indicates space=positive current in a Baudot multiplex.
1 indicates Mark=negative current in a Baudot multiplex.
* indicates Free for internal use by a country or administration.

Table 4 - The Baudot or CCITT Code No 1 (Ref 5)

The code used today has been based on automatic telegraph systems in which the operator is relieved of the burden of setting up individual code elements. Instead, to automatically form the elements, the operator has only a single key of a typewriter keyboard for each character. This code, which is accredited to Murray, has been defined as the CCITT No 2 code. United States amateur radio operators have generally adopted a version of a 'Military Standard' code which has a few minor symbol and punctuation changes to that of the Murray or CCITT No 2 code. The reason for the US amateur choice is largely associated with the ready availability of military surplus machines in the post-1945 years. Other amateurs, particularly in Europe, have standardised on the CCITT No 2 code. The code is shown in table 5, with variations to suit particular services. One limitation of the five element codes is that there is no provision for both upper and lower case alphabetic letters.

-FIVE-UNIT TELEPRINTER-CODE ALPHABETS.

Bit Numbers 5 4 3 2 1	Letters Case	Figures Case				
			US Alphabets			
	International Alphabet #2	International Alphabet #2	Military Std	Weather	TWX	Telex
0 0 0 0 0	Blank*	Blank*	Blank*	—	Blank*	Blank*
0 0 0 0 1	E	3	3	3	3	3
0 0 0 1 0	Line Feed	Line Feed	Line Feed	Line Feed	Line Feed	Line Feed
0 0 0 1 1	A	—	—	↑	—	—
0 0 1 0 0	Space	Space	Space	Space	Space	Space
0 0 1 0 1	S	(Apos) '	Bell	Bell	Bell	(Apos) '
0 0 1 1 0	I	8	8	8	8	8
0 0 1 1 1	U	7	7	7	7	7
0 1 0 0 0	Car. Ret	Car. Ret	Car. Ret	Car. Ret	Car. Ret	Car. Ret
0 1 0 0 1	D	WRU	$	↗	$	WRU
0 1 0 1 0	R	4	4	4	4	4
0 1 0 1 1	J	Aud Sig	(Apos) '	↙	(Comma) ,	Bell
0 1 1 0 0	N	(Comma) ,	(Comma) ,	○		(Comma) ,
0 1 1 0 1	F	†	!	→	‡	$
0 1 1 1 0	C	:	:	◎	WRU	:
0 1 1 1 1	K	(	(	←	‡	(
1 0 0 0 0	T	5	5	5	5	5
1 0 0 0 1	Z	+	"	+	"	"
1 0 0 1 0	L	)	)	↖	‡	)
1 0 0 1 1	W	2	2	2	2	2
1 0 1 0 0	H	†	Stop	↓		#
1 0 1 0 1	Y	6	6	6	6	6
1 0 1 1 0	P	0	0	0	0	0
1 0 1 1 1	Q	1	1	1	1	1
1 1 0 0 0	O	9	9	9	9	9
1 1 0 0 1	B	?	?	⊕	‡	?
1 1 0 1 0	G	†	&	↘	&	&
1 1 0 1 1	Figures	Figures	Figures	Figures	Figures	Figures
1 1 1 0 0	M	.	.	.	.	.
1 1 1 0 1	X	/	/	/	/	/
1 1 1 1 0	V	=	;	ⓘ	‡	;
1 1 1 1 1	Letters	Letters	Letters	Letters	Letters	Letters

Notes: Transmission Order: Bit 1→Bit 5.
* "Blank" in US; "No Action" in International Alphabet #2.
† Unassigned (domestic variation, not used internationally).

Table 5 - The Murray or CCITT Code No 2 with variations (Ref 8)

In Australia, in line with a United States trend, we refer to the code we use for amateur radio teletype (RTTY) as the Baudot code when, in fact, it would be more appropriate to call it the Murray code. According to George Henry K9GWT (Ref 6), it is actually called the Murray code in some countries.

The code used for many years in teleprinter and teletype service by the old PMG's Dept (Telecom Aust.y when this article was published.) is similar to
the CCITT No 2 code. A copy of Telegraphy II (ref 9), issued around 1940 and part of the PMG Course of Technical Instruction, specifically deals with teleprinter and teletype machines and systems of that day. This publication gives no specific name to the code and refers to it simply as the five unit code.

THE ASCII CODE

With the development of computers and high speed data exchange, ASCII has become a common serial data code and this code uses seven mark or space elements or bits to define each character. ASCII is an abbreviation for American National Standard Code for Information Interchange and was adopted by the American National Standards

Institute in 1968. The code actually utilises an eight bit byte with the eighth bit often used for parity error check on the other bits. Additional start and stop bits are also included when operated in the non-synchronous mode as used in the teletype service. With seven bits available, all letters (including upper and lower case), all numerals and all punctuation characters are allocated a unique character symbol or byte. The arrangement of the first seven bits, for each of the characters, is shown in table 6.

The ASCII code is much more versatile than the five element codes with one bit state difference between upper and lower letters and additional symbols for control and printing operations, particularly suited to use with computers.

The ASCII Data Code

7	0	0	0	0	1	1	1	1
6	0	0	1	1	0	0	1	1
5	0	1	0	1	0	1	0	1
4321								
0000		NUL	DLE	SPC	0	@	P		p
0001		SOH	DC1	!	1	A	Q	a	q
0010		STX	DC2	"	2	B	R	b	r
00011		ETX	DC3	#	3	C	S	c	s
0100		EOT	DC4	$	4	D	T	d	t
0101		ENQ	NAK	%	5	E	U	e	u
0110		ACK	SYN	&	6	F	V	f	v
0111		BEL	ETB	'	7	G	W	g	w
1000		BS	CAN	(	8	H	X	h	x
1001		HT	EM	)	9	I	Y	i	y
1010		LF	SUB	*	:	J	Z	j	z
1011		VT	ESC	+	;	K	[	k	{
1100		FF	FS	,	<	L	\	l	|
1101		CR	GS	-	=	M	]	m	}
1110		SO	RS	.	>	N	^	n	~
1111		SI	US	/	?	O	_	o	DEL

ACK = acknowledge
BEL = signal bell
BS = backspace (←)
CAN = cancel
CR = carriage return
DC1 = device control 1
DC2 = device control 2
DC3 = device control 3
DC4 = device control 4
DEL = (delete)
DLE = data link escape
ENQ = enquiry (WRU)
EM = end of medium
EOT = end of trans.
ESC = escape
ETB = end of block
ETX = end of text

FF = form feed (home)
FS = file separator
GS = group separator
HT = horizontal tab (→)
LF = line feed (↓)
NAK = not acknowledge
NUL = null
RS = record separator
SI = shift in
SO = shift out
SOH = start of heading
SPC = space
STX = start of text
SUB = substitute
SYN = synchronous idle
US = unit separator
VT = vertical tab (↓)

Note: "1" = mark = hole in punched tape

Table 6 - The ASCII Code (ref 6)

START & STOP BITS

The five element codes and the ASCII code use similar start and stop elements or bits. The start bit is a zero or space signal equal in period of time to a single character bit. The stop bit is a one or mark signal with a minimum period of time between that of one and two character bits, depending on the system. The maximum stop period is as long as desired as the stop mark condition remains until the next character is initiated by the start space pulse.

Typical timing formats for a character train in the five unit and ASCII codes are shown in figures 1 and 2, respectively.

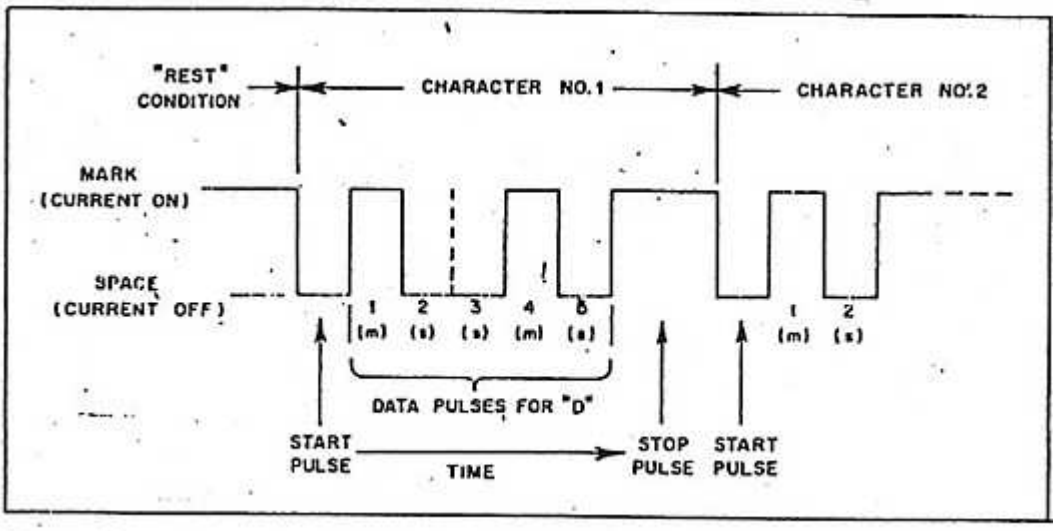


Fig. 1 — Time sequence of a typical Baudot character, the letter D.

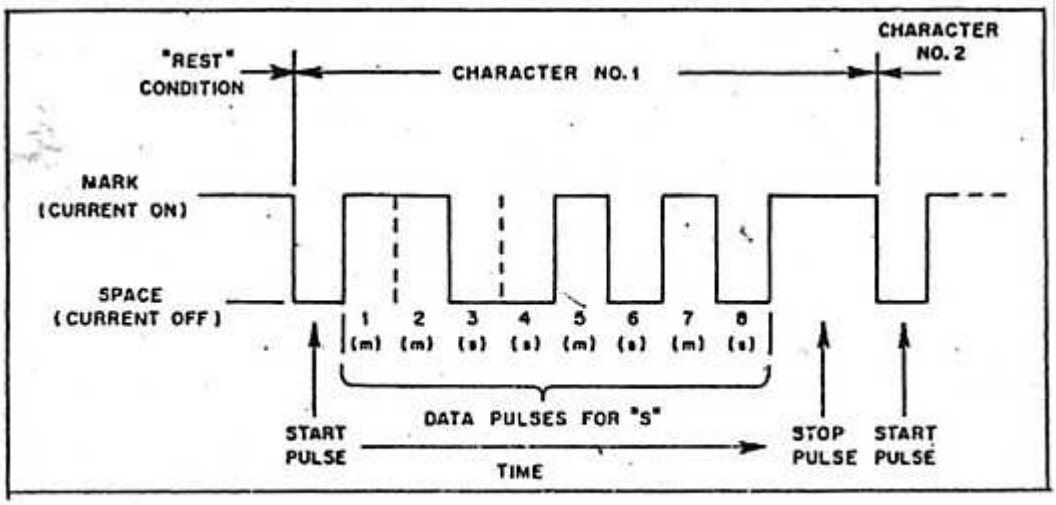


Fig. 2 — Time sequence of a typical ASCII character, the letter S. The eighth or parity bit may be set for any of four conditions: (1) always mark, (2) always space, (3) odd parity or (4) even parity. All four choices are in common usage.

SUMMARY

In conclusion, we see that the manual code we use today and call Morse is really a development of the original Morse code called the International or Continental code. The teletype code we use today and call Baudot is really the Murray or CCITT No2 code. Some things we manage to get right as the code we call ASCII is really ASCII.

Without doubt, the manual code we use will always be known as Morse and in Australia, the five unit code will continue to be called Baudot by the radio amateur. Not withstanding this, it is interesting to examine the background of these codes, an important part of our communications history.

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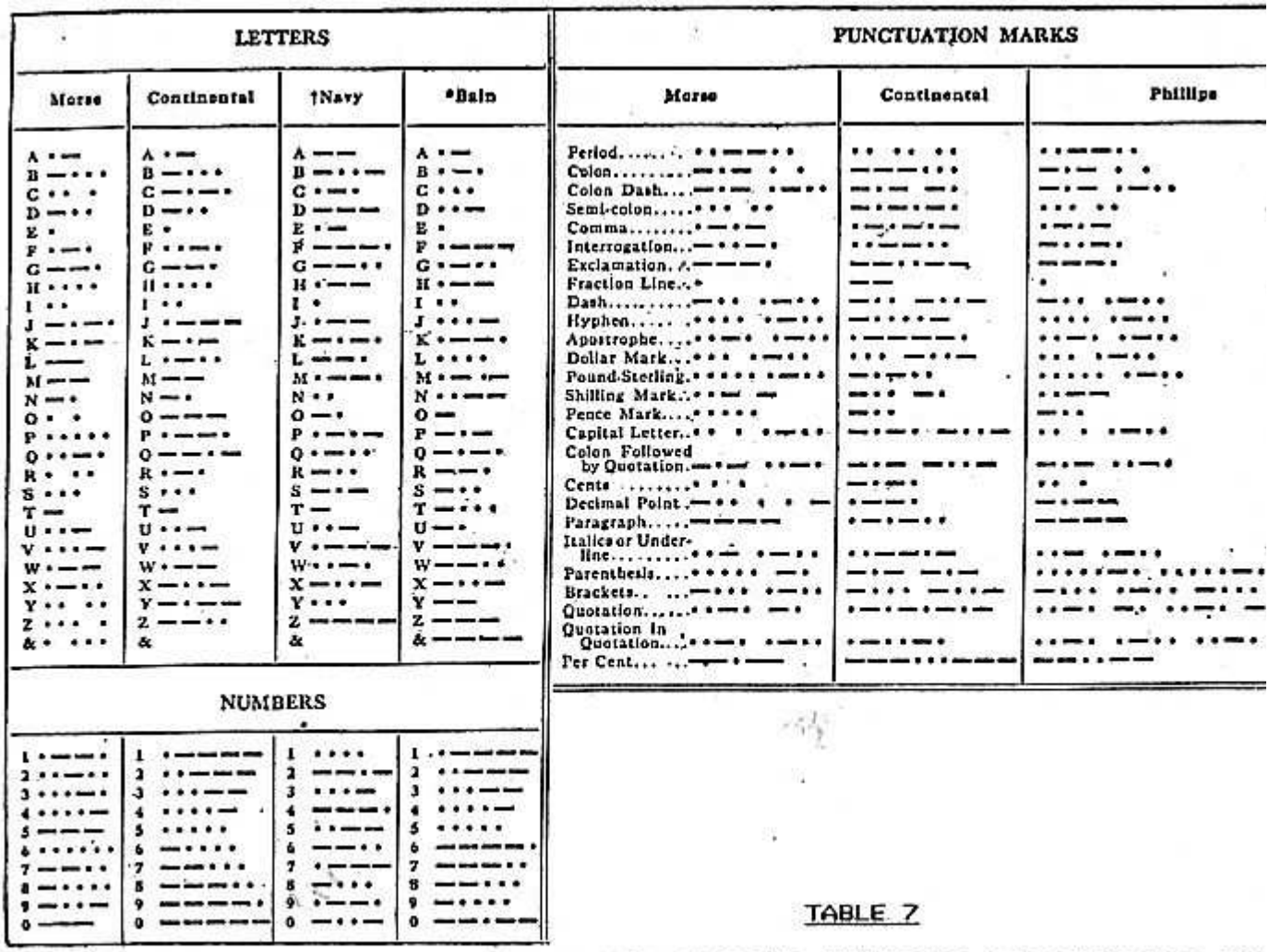
ADDENDUM to SEPTEMBER 1989 ARTICLE

Since submitting the article, the writer has received a copy of the Hawkins Electrical Guide No 8 from Trevor Howard (VK5BWF) of Port Lincoln. This book, published in 1917, describes a number of further versions of Morse code, the Navy code, the Bain code and the Philips code (Refer Table 7).



LETTERS

Morse	Continental	†Navy	*Bain
A • —	A • —	A — —	A • —
B — • • •	B — • • •	B — • • —	B — • — •
C — • — •	C — • — •	C — • — •	C • • •
D — • •	D — • •	D — — —	D • • —
E •	E •	E •	E •
F • • — •	F • • — •	F — — — •	F • — — —
G — — •	G — — •	G — — • •	G • — •
H • • • •	H • • • •	H • — —	H • — —
I • •	I • •	I • —	I • •
J — • — —	J • — — —	J • — — —	J • • • —
K — • —	K — • —	K — • — •	K • — — •
L — • •	L • — • •	L — — •	L • • •
M — —	M — —	M • — — •	M • — • —
N — •	N — •	N • •	N • • — —
O — — —	O — — —	O — •	O —
P • — — •	P • — — •	P • — • —	P — • —
Q — — • —	Q — — • —	Q • — — •	Q — • — •
R • — •	R • — •	R — • •	R — — •
S • • •	S • • •	S — • —	S — •
T —	T —	T —	T — • •
U • • —	U • • —	U • • —	U — •
V • • • —	V • • • —	V • — — —	V — — — •
W • — —	W • — —	W • — — •	W — — • —
X — • • —	X — • • —	X — • • —	X — • • —
Y — • — —	Y — • — —	Y — • •	Y — —
Z — — • •	Z — — • •	Z — — — —	Z — — —
& • — • • •	&	&	& — — — —

NUMBERS

1 • — — — —	1 • — — — —	1 • — — —	1 • — — — —
2 • • — — —	2 • • — — —	2 — — — •	2 • • — — —
3 • • • — —	3 • • • — —	3 • • • —	3 • • • — —
4 • • • • —	4 • • • • —	4 — — — •	4 • • • • —
5 • • • • •	5 • • • • •	5 • • • •	5 • • • • •
6 — • • • •	6 — • • • •	6 — • • •	6 — — — — •
7 — — • • •	7 — — • • •	7 • — — —	7 — — — • •
8 — — — • •	8 — — — • •	8 — • • •	8 — — • • •
9 — — — — •	9 — — — — •	9 • — — •	9 — — — •
0 — — — — —	0 — — — — —	0 — • • —	0 — — • — —

PUNCTUATION MARKS

Morse	Continental	Phillips
Period	• • — — • •	• • — — • •
Colon	— — — • • •	— • — • •
Colon Dash	— • — • — • •	— • — • — • •
Semi-colon	— • — • — •	• • • • •
Comma	• — • — • —	• — • —
Interrogation	• • — — • •	— • • — •
Exclamation	— — • — —	— — — •
Fraction Line	— —	•
Dash	— • • • • —	— • • • • —
Hyphen	— • • • • —	• • • • • —
Apostrophe	• — — — — •	• — — • — •
Dollar Mark	• • • — • • —	• • • • — • •
Pound-Sterling	— • — • •	• • • • • • — • •
Shilling Mark	— • • — •	• • — —
Pence Mark	— • •	— • •
Capital Letter	— • — • — • — •	• • • — • •
Colon Followed by Quotation	— • — — • — • —	— • — • — • — •
Cents	— • — •	• • •
Decimal Point	• — • — • —	• — — —
Paragraph	• — • — • •	— — — —
Italics or Underline	• • — — • —	• • — • — •
Parenthesis	— • — — • —	• • • • — • • • • — •
Brackets	— • • • — • —	— • • • — • — • • • — •
Quotation	• — • — • — •	• • — • — • — • •
Quotation In Quotation	• — • — • — • —	• — • — • — • — •
Per Cent	— — — • • — — —	— — • • — —

TABLE 7

EARLY CODES INCLUDING THE NAVY CODE, THE BAIN CODE AND PHILIPS CODE

According to the supporting text, the Navy code was used up to November 1912 when the Navy replaced it with Morse. The Hawkins book is an American publication and they are assumed to be referring to the USA Navy.

The Bain code was stated to be obsolete at the time of publication but had been previously used in parts of America and Europe with the Bain Chemical Telegraph System. No further detail was given.

The Philips code was used for press work in the United States. The letters and numerals of this code are the same as in Morse but there are differences in some of punctuations and other symbols. (However, there is quite a bit more to the Philips Code and this is decribed by Tony Smith G4FAI and Kaye Weeden in a following section headed "The Philips Code")

The publication further states that. at that time, there were three codes in general use. The Morse code was used exclusively in the United States and Canada. The Continental code was used in all European and other countries and for all submarine telegraphy by international agreement. The third code was the Philips, referred to in the previous paragraph. The book discusses further the understandable confusion which existed in the early days of wireless telegraphy at sea when both Morse code and Continental code were in use before the Continental code was standardised. The trans-atlantic ships carried Continental code operators and the United States coastal steamers carried Morse code operators.

All in all. we have now accounted for six different versions of the Morse, or near similar, type code:

Early Morse 1837 American Morse 1844

International or Continental code 1851

The Navy code The Bain code

The Philips code.

Surprising, isn't it!

Subsequent to the "Amateur Radio article", September 1989, The following was published in "Amateur Radio" May 1990

THE PHILLIPS CODE

Information on the Philips Code from Tony Smith & Kaye Weedon. - Introduced by Lloyd Butler VK5BR in the May 1990 issue of "Amateur Radio"

In my article "Early Background of Telegraph Codes" (Amateur Radio Sept 1989), I made a brief reference to the Phillips Code. Subsequent to the publication, I have received a letter from Tony Smith G4FAI giving us further detail on this code. Apart from many other contributions Tony makes to various radio and electronics journals, he is the editor of "Morsum Magnificat", a publication devoted to the historic aspects of telegraphy and available through a small subscription via Tony.

Tony also refers to an article in "Morsum Magnificat", concerning the Phillips code and written by Kaye Weedon of Norway. Kaye Weedon is an electrical communications engineer who worked for Kodak for 43 years and who is very interested in researching early communications history.

In this article, Kaye refers to another article on telegraphy which he had published in "Volund 1985", a journal of the Norsk Teknisk Museum. Further information on the Phillips code can be gleaned from the Volund article
.
I have had further letters from both Tony and Kaye and a copy, from Kaye, of the Volund article. With their kind permission, we reprint Tony's original letter, Kaye's article from "Morsum Magnificat" and a section relevant to the Phillips code from the English summary of Kaye's article in Volund 1985.

From Tony Smith, G4FAI, London (17.11.89).
To Lloyd Butler, VK5BR,

Dear Lloyd,
I was most interested in your article about early telegraph codes in "Amateur Radio", September 1989, and was pleased to see that you found information from some of my PW articles to be of use.

However, I think you may have misunderstood the nature of the Phillips code which, as you say was used for press work in the USA. This was basically a system of word or phrase abbreviations used to speed up the transmission of press copy and intended to be sent by normal (American) Morse. As you noted, the punctuation signs are the same as the normal American code apart from a few symbols which were presumably worked out to be more efficient in transmission bearing in mind the purpose of the code.

I enclose for your information a copy of an article referring to the Phillips code which is in the winter issue of Morsum Magnificat and which gives an example of the use of the code.

I'm also enclosing details of MM. There's no obligation, of course, but if you are interested in the historical aspects of telegraphy you may find a subscription worthwhile.

Incidentally, you mention the US Navy code. You may be interested to know that that had a fore-runner, the Army General Purpose or "Wig-wag" code which was sent either by flag or by conventional Morse instruments.

Yours sincerely,

Tony Smith

Phillips Code Reborn - article from "Morsum Magnificat" winter 1989

Sooner or later the venerable Phillips code had to be revived. The following appeared in a "New Products" notice in "Newsweek", May 9, 1988.

"... the Panasonic Industrial Co ... has developed a new software program for certain Panasonic electric typewriters that could increase the speed and accuracy of typists. The program, called FasType, automatically converts Gregg shorthand abbreviations ... into full typed text. If, for example, a secretary types the abbreviation "asap" on the keyboard, the system will automatically type out the words "as soon as possible" ... Panasonic claim the program increases office productivity in two ways: by reducing the number of keystrokes needed for data entry, and by eliminating some potential spelling errors.

FasType ... has a 1,400-word standard glossary that includes days of the week, months, salutations, common nouns and standard business terms. A separate "user glossary" allows operators to store abbreviation unique to their job ..."

It is interesting to quote an example (ref.1) of the abbreviations used in the Phillips code era which lasted, in the US, 1879-1919. The Phillips code was only used by commercial high-speed operators and almost entirely for press work. Speed of message handling was their bread and butter — unlike Europe where bonus pay was unknown, telegraphists were offered no incentives and, in the German Post Office, higher speed was seen as a possibility of reducing staff.

Phillips code enabled US operators to send for hours at 45-50 wpm, at times even more, but it also transferred a burden to the receiving operator.

Example: "Mems o cx Cgs rptg and cv cmns o eno cap wo krp xgn ifo thr adhts wi cmb aga ay emt to crpns, bt cujx es dtmd efo qpt peo f sq stas wi efy dm z ay osn."

Which "translates" as:

"Members of Congress representing under cover combinations of enormous capital who corrupt legislation in favour of their adherents will combine against any embarrassment to the corporations, but courageous and determined effort on the part of the people of the separate states will effectually demoralize any opposition."

In the Phillips code the computer was the human brain on the telegraph operator whose functions are described thus (refs. 2, 3, 4):

"Working Phillips involved very remarkable brain work. First, both operators had to know the Phillips code by heart. The sender would automatically encode his abbreviated message in Morse, (American Morse, ie Vail's code) . The receiving operator performed the almost incredible task of hearing the sounder in a noisy room, immediately decoding the message from "Phillips" into the readable language of the original message which his pen recorded on paper. (Later written by typewriter.)

In press work, the use of the Phillips code ... materially lightened the burden of the telegraph operators, some of whom could now handle 50 to 55 wpm. for hours.

Around 1907, such operators augmented their annual pay of 400-500 dollars by a bonus of 25-50 percent using their privately owned typewriters."

The burden is now taken over by the computer and its software but the "operator", now the "FasType" secretary, has to master the Gregg shorthand abbreviations, duplicating the Morse operator's initial learning process of 109 years ago.

Where the old-time operators stored the abbreviations in their minds but could look them up in the Phillips code book, the modern secretary has them stored in the computer program for instant reference if the human memory is not adequate.

References

1w. Weedon: "Sounder, skrivemaskin, bonus, Phillips-Kode og "Vibroplex", VOLUND 1985, Norsk Teknisk Museum, p.67

2w. Weedon: ibid, p.72.

3w. Weedon: "Faster Manual Morse", Morsum Magnificat Nr 11 Spring 1989, p45.

4w. Murray, Donald: "The Typewriter and Piecework in Telegraphy". Post Office Electrical Engineer's Journal, Vol 1, 1908, pp 18-21.

Extract from Reference 1w above (by Kay Weedon)

The introduction 1879, by Walter Phillips, of the PHILLIPS CODE BOOK marked another advance in faster message handling. Essentially, this code substituted "words" of 2 to 4 letters for those of 5 or more. This gave savings of 30 to over 50 per cent of actual signals transmitted. The Phillips Code was used almost only for press matter intended for the large number of newspaper over the US continent and was not permitted for ordinary telegrams.

At one time 1907, before the general introduction of the "Vibroplex" key, two U.S. operators on one, rare, occasion netted 50 wpm over 8 hours, using reception by sounder, typewriter, and Phillips code.

Controversy on who devised the Morse Code

In the December 1989 issue of "Amateur Radio", Mervyn Eunson VK4SO introduced an article "MORSE CODE IS A MYTH "

The Eunson article describes much of the development of the telegraph in USA. He discusses the partnership formed by Morse including Alfred Lewis Vail who he describes as a technical genius. Morse claimed credit for the development of the early telegraph system and took out a patent on the system. Many publications credit him with that development of that system and the Code which led up to the present code we normally call Morse Code.

Mervyn Eunson has clearly carried out a lot research on the history of the telegraph and his article expresses the opinion that the system developed was essentially the work of Alfred Vail rather than Morse who led the partnership. He also believes that Vail alone developed the code which led up to the code we use today.

The Eunson article is well worth reading for more detail.