

## SECTION H — ELECTRICITY

### H04 ELECTRIC COMMUNICATION TECHNIQUE

**H04L TRANSMISSION OF DIGITAL INFORMATION, e.g. TELEGRAPHIC COMMUNICATION** (typewriters B41J; order telegraphs, fire or police telegraphs G08B; visual telegraphy G08B, G08C; teleautographic systems G08C; ciphering or deciphering apparatus per se G09C; coding, decoding or code conversion, in general H03M; arrangements common to telegraphic and telephonic communication H04M; selecting H04Q; wireless communication networks H04W) [4]

#### Note(s)

This subclass covers transmission of signals having been supplied in digital form and includes data transmission, telegraphic communication, or methods or arrangements for monitoring.

#### Subclass index

##### SYSTEMS CHARACTERISED BY:

The code used: Morse; Baudot; details.....	15/00, 17/00, 13/00
Otherwise: step by step; mosaic printers; other systems.....	19/00, 21/00, 23/00
BASEBAND SYSTEMS.....	25/00
MODULATED-CARRIER SYSTEMS.....	27/00
DATA SWITCHING NETWORKS.....	12/00
ARRANGEMENTS OF GENERAL APPLICATION	
Security: errors; secret.....	1/00, 9/00
Multiple communications; synchronising.....	5/00, 7/00
OTHER ARRANGEMENTS, APPARATUS OR SYSTEMS.....	29/00

#### 1/00 Arrangements for detecting or preventing errors in the information received (correcting synchronisation H04L 7/00; arrangements in the transmission path H04B)

- 1/02 • by diversity reception (in general H04B 7/02)
- 1/04 • • using frequency diversity
- 1/06 • • using space diversity
- 1/08 • by repeating transmission, e.g. Verdan system
- 1/12 • by using return channel
- 1/14 • • in which the signals are sent back to the transmitter to be checked
- 1/16 • • in which the return channel carries supervisory signals, e.g. repetition request signals
- 1/18 • • • Automatic repetition systems, e.g. van Duuren system
- 1/20 • using signal-quality detector [3]
- 1/22 • using redundant apparatus to increase reliability [3]
- 1/24 • Testing correct operation [3]

#### 5/00 Arrangements affording multiple use of the transmission path (multiplex communication in general H04J)

- 5/02 • Channels characterised by the type of signal
- 5/04 • • the signals being represented by different amplitudes or polarities, e.g. quadriplex
- 5/06 • • the signals being represented by different frequencies (combined with time-division multiplexing H04L 5/26)
- 5/08 • • • each combination of signals in different channels being represented by a fixed frequency

- 5/10 • • • with dynamo-electric generation of carriers; with mechanical filters or demodulators

- 5/12 • • the signals being represented by different phase modulations of a single carrier

- 5/14 • Two-way operation using the same type of signal, i.e. duplex (conditioning for two-way transmission in general H04B 3/20)

- 5/16 • • Half-duplex systems; Simplex/duplex switching; Transmission of break signals

- 5/18 • • Automatic changing of the traffic direction

- 5/20 • using different combinations of lines, e.g. phantom working

- 5/22 • using time-division multiplexing

- 5/24 • • with start-stop synchronous converters

- 5/26 • • combined with the use of different frequencies

#### 7/00 Arrangements for synchronising receiver with transmitter

- 7/02 • Speed or phase control by the received code signals, the signals containing no special synchronisation information

- 7/027 • • extracting the synchronising or clock signal from the received signal spectrum, e.g. by using a resonant or bandpass circuit [5]

- 7/033 • • using the transitions of the received signal to control the phase of the synchronising-signal-generating means, e.g. using a phase-locked loop [5]

- 7/04 • Speed or phase control by synchronisation signals

## H04L

- 7/06 • • the synchronisation signals differing from the information signals in amplitude, polarity, or frequency
- 7/08 • • the synchronisation signals recurring cyclically
- 7/10 • • Arrangements for initial synchronisation
- 9/00 Arrangements for secret or secure communication** (spread spectrum techniques H04B 1/69)
  - Note(s)**
  - In group H04L 9/06-H04L 9/32, in the absence of an indication to the contrary, classification is made in the last appropriate place.
- 9/06 • the encryption apparatus using shift registers or memories for blockwise coding, e.g. D.E.S. systems [5]
- 9/08 • • Key distribution [5]
- 9/10 • with particular housing, physical features or manual controls [5]
- 9/12 • Transmitting and receiving encryption devices synchronised or initially set up in a particular manner [5]
- 9/14 • using a plurality of keys or algorithms [5]
- 9/16 • • the keys or algorithms being changed during operation [5]
- 9/18 • Encryption by serially and continuously modifying data stream elements, e.g. stream cipher systems [5]
- 9/20 • • Pseudorandom key sequence combined element-for-element with data sequence [5]
- 9/22 • • • with particular pseudorandom sequence generator [5]
- 9/24 • • • • sequence produced by more than one generator [5]
- 9/26 • • • • producing a nonlinear pseudorandom sequence [5]
- 9/28 • using particular encryption algorithm [5]
- 9/30 • • Public key, i.e. encryption algorithm being computationally infeasible to invert and users' encryption keys not requiring secrecy [5]
- 9/32 • including means for verifying the identity or authority of a user of the system (security arrangements for protecting computers or computer systems against unauthorised activity G06F 21/00; dispensing apparatus actuated by coded identity card or credit card G07F 7/08; specially adapted for wireless communication networks H04W 12/00) [5]
- 9/34 • Bits, or blocks of bits, of the telegraphic message being interchanged in time [5]
- 9/36 • with means for detecting characters not meant for transmission [5]
- 9/38 • Encryption being effected by mechanical apparatus, e.g. rotating cams, switches, keytape punchers [5]
- 12/00 Data switching networks** (interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units G06F 13/00) [5]
  - 12/02 • Details [5]
  - 12/04 • • Switchboards [5]
  - 12/06 • • Answer-back mechanisms or circuits [5]
  - 12/08 • • Allotting numbers to messages; Counting characters, words or messages [5]
  - 12/10 • • Current supply arrangements [5]
  - 12/12 • • Arrangements for remote connection or disconnection of substations or of equipment thereof [5]
  - 12/14 • • Charging arrangements [5]
- 12/16 • • Arrangements for providing special services to substations [5]
- 12/18 • • • for broadcast or conference [5]
- 12/20 • • • for converting transmission speed from the inherent speed of a substation to the inherent speed of other substations [5]
- 12/22 • • Arrangements for preventing the taking of data from a data transmission channel without authorisation (means for verifying the identity or the authority of a user of a secure or secret communication system H04L 9/32) [5]
- 12/24 • • Arrangements for maintenance or administration [5]
- 12/26 • • Monitoring arrangements; Testing arrangements [5]
- 12/28 • characterised by path configuration, e.g. LAN [Local Area Networks] or WAN [Wide Area Networks] (wireless communication networks H04W) [5, 6]
- 12/40 • • Bus networks [5, 6]
- 12/403 • • • with centralised control, e.g. polling [6]
- 12/407 • • • with decentralised control [6]
- 12/413 • • • • with random access, e.g. carrier-sense multiple-access with collision detection (CSMA-CD) [6]
- 12/417 • • • • with deterministic access, e.g. token passing [6]
- 12/42 • • Loop networks [5, 6]
- 12/423 • • • with centralised control, e.g. polling [6]
- 12/427 • • • with decentralised control [6]
- 12/43 • • • • with synchronous transmission, e.g. time division multiplex (TDM), slotted rings [6]
- 12/433 • • • • with asynchronous transmission, e.g. token ring, register insertion [6]
- 12/437 • • • Ring fault isolation or reconfiguration [6]
- 12/44 • • Star or tree networks [5, 6]
- 12/46 • • Interconnection of networks [5, 6]
- 12/50 • Circuit switching systems, i.e. systems in which the path is physically permanent during the communication [5, 6]
  - 12/52 • • using time division techniques (in digital transmission systems H04L 5/22) [5, 6]
  - 12/54 • Stored and forward switching systems [5, 6]
  - 12/56 • • Packet switching systems [5, 6]
  - 12/58 • • Message switching systems (permutation- code selecting H04Q 3/02) [5, 6]
  - 12/60 • • • Manual relay systems, e.g. push-button switching [5, 6]
  - 12/62 • • • • with perforated tape storage [5, 6]
  - 12/64 • Hybrid switching systems [5, 6]
  - 12/66 • Arrangements for connecting between networks having differing types of switching systems, e.g. gateways [5, 6]
- 13/00 Details of the apparatus or circuits covered by groups H04L 15/00 or H04L 17/00**
  - 13/02 • Details not particular to receiver or transmitter
  - 13/04 • • Driving mechanisms; Clutches (in general F16)
  - 13/06 • • Tape or page guiding or feeding devices
  - 13/08 • • Intermediate storage means
  - 13/10 • • Distributors
  - 13/12 • • • Non-mechanical distributors, e.g. relay distributors
  - 13/14 • • • • Electronic distributors (in general H03K 17/00)
  - 13/16 • of transmitters, e.g. code-bars, code-discs
  - 13/18 • of receivers

15/00	<b>Apparatus or local circuits for transmitting or receiving dot-and-dash codes, e.g. Morse code</b> (teaching apparatus therefor G09B; keyboard switches in general H01H 13/70, H03K 17/94; telegraph tapping keys H01H 21/86; coding in connection with keyboards or like devices, in general H03M 11/00)	25/02	• Details (circuits in general for handling pulses H03K; in line transmission systems in general H04B 3/02)
15/03	• Keys structurally combined with sound generators [2]	25/03	• • Shaping networks in transmitter or receiver, e.g. adaptive shaping networks (impedance networks <u>per se</u> H03H) [2]
15/04	• Apparatus or circuits at the transmitting end	25/04	• • • Passive shaping networks [2]
15/06	• • with a restricted number of keys, e.g. separate key for each type of code element	25/05	• • Electric or magnetic storage of signals before transmitting or retransmitting for changing the transmission rate [7]
15/08	• • • with a single key which transmits dots in one position and dashes in a second position	25/06	• • Dc level restoring means; Bias distortion correction
15/10	• • • combined with perforating apparatus	25/08	• • Modifications for reducing interference; Modifications for reducing effects due to line faults
15/12	• • with keyboard co-operating with code-bars	25/10	• • Compensating for variations in line balance
15/14	• • • combined with perforating apparatus	25/12	• • Compensating for variations in line impedance
15/16	• • with keyboard co-operating with code discs	25/14	• • Channel dividing arrangements
15/18	• • Automatic transmitters, e.g. controlled by perforated tape	25/17	• • Interpolating arrangements [4]
15/20	• • • with optical sensing means	25/18	• • Arrangements for inductively generating telegraphic signals (induction coil interrupters H01H 51/34; dynamo-electric generators H02K)
15/22	• • Apparatus or circuits for sending one or a restricted number of signals, e.g. distress signals	25/20	• • Repeater circuits; Relay circuits
15/24	• Apparatus or circuits at the receiving end	25/22	• • • Repeaters for converting two wires to four wires (in general H04B); Repeaters for converting single current to double current
15/26	• • operating only on reception of predetermined code signals, e.g. distress signals, party-line call signals	25/24	• • • Relay circuits using discharge tubes or semiconductor devices
15/28	• • Code reproducing apparatus	25/26	• • • Circuits with optical sensing means
15/30	• • • Writing recorders	25/28	• • • Repeaters using modulation and subsequent demodulation
15/32	• • • Perforating recorders	25/30	• Non-synchronous systems
15/34	• • Apparatus for recording received coded signals after translation, e.g. as type-characters	25/32	• • characterised by the code employed
17/00	<b>Apparatus or local circuits for transmitting or receiving codes wherein each character is represented by the same number of equal-length code elements, e.g. Baudot code</b> (keyboard switches in general H01H 13/70, H03K 17/94; coding in connection with keyboards or like devices, in general H03M 11/00)	25/34	• • • using three or more different amplitudes, e.g. cable code
17/02	• Apparatus or circuits at the transmitting end	25/38	• Synchronous or start-stop systems, e.g. for Baudot code
17/04	• • with keyboard co-operating with code-bars	25/40	• • Transmitting circuits; Receiving circuits (repeater circuits, relay circuits H04L 25/52)
17/06	• • • Contact operating means	25/42	• • • using mechanical distributors
17/08	• • • combined with perforating apparatus	25/44	• • • using relay distributors
17/10	• • with keyboard co-operating with code-discs	25/45	• • • using electronic distributors (electronic distributors in general H03K 17/00) [2]
17/12	• • Automatic transmitters, e.g. controlled by perforated tape	25/46	• • • using tuning forks or vibrating reeds
17/14	• • • with optical sensing means	25/48	• • • characterised by the code employed (H04L 25/49 takes precedence) [2]
17/16	• Apparatus or circuits at the receiving end	25/49	• • • using code conversion at the transmitter; using predistortion; using insertion of idle bits for obtaining a desired frequency spectrum; using three or more amplitude levels [2]
17/18	• • Code selection mechanisms	25/493	• • • • by transition coding, i.e. the time-position or direction of a transition being encoded before transmission [3]
17/20	• • using perforating recorders	25/497	• • • • by correlative coding, e.g. partial response coding or echo modulation coding [3]
17/22	• • using mechanical translation and type-bar printing	25/52	• • Repeater circuits; Relay circuits
17/24	• • using mechanical translation and type-head printing, e.g. type-wheel, type-cylinder	25/54	• • • using mechanical distributors
17/26	• • using aggregate motion translation	25/56	• • • Non-electrical regenerative repeaters
17/28	• • using pneumatic or hydraulic translation	25/58	• • • using relay distributors
17/30	• • using electric or electronic translation	25/60	• • • Regenerative repeaters with electromagnetic switches
19/00	<b>Apparatus or local circuits for step-by-step systems</b>	25/62	• • • using tuning forks or vibrating reeds
21/00	<b>Apparatus or local circuits for mosaic printer telegraph systems</b>	25/64	• • • Start-stop regenerative repeaters using discharge tubes or semiconductor devices
21/02	• at the transmitting end	25/66	• • • Synchronous repeaters using discharge tubes or semiconductor devices
21/04	• at the receiving end		
23/00	<b>Apparatus or local circuits for systems other than those covered by groups H04L 15/00-H04L 21/00</b>		
23/02	• adapted for orthogonal signalling [2]		
25/00	<b>Baseband systems</b>		

**27/00 Modulated-carrier systems**

- 27/01 • Equalisers [5]
- 27/02 • Amplitude-modulated carrier systems, e.g. using on/off keying; Single sideband or vestigial sideband modulation (H04L 27/32 takes precedence) [2, 5]
- 27/04 • • Modulator circuits (in general H03C); Transmitter circuits
- 27/06 • • Demodulator circuits (in general H03D); Receiver circuits
- 27/08 • • Amplitude regulation arrangements
- 27/10 • Frequency-modulated carrier systems, i.e. using frequency-shift keying (H04L 27/32 takes precedence) [5]
- 27/12 • • Modulator circuits (in general H03C); Transmitter circuits
- 27/14 • • Demodulator circuits (in general H03D); Receiver circuits
- 27/144 • • • with demodulation using spectral properties of the received signal, e.g. by using frequency selective- or frequency sensitive elements [6]
- 27/148 • • • • using filters, including PLL-type filters [6]
- 27/152 • • • • using controlled oscillators, e.g. PLL arrangements [6]
- 27/156 • • • with demodulation using temporal properties of the received signal, e.g. detecting pulse width [6]
- 27/16 • • Frequency regulation arrangements
- 27/18 • Phase-modulated carrier systems, i.e. using phase-shift keying (H04L 27/32 takes precedence) [5]
- 27/20 • • Modulator circuits (in general H03C); Transmitter circuits
- 27/22 • • Demodulator circuits (in general H03D); Receiver circuits
- 27/227 • • • using coherent demodulation [6]

- 27/233 • • • using non-coherent demodulation [6]
- 27/24 • • Half-wave signalling systems
- 27/26 • Systems using multi-frequency codes (H04L 27/32 takes precedence) [5]
- 27/28 • • with simultaneous transmission of different frequencies each representing one code element
- 27/30 • • wherein each code element is represented by a combination of frequencies
- 27/32 • Carrier systems characterised by combinations of two or more of the types covered by groups H04L 27/02, H04L 27/10, H04L 27/18, or H04L 27/26 [5]
- 27/34 • • Amplitude- and phase-modulated carrier systems, e.g. quadrature-amplitude modulated carrier systems [5]
- 27/36 • • • Modulator circuits; Transmitter circuits [5]
- 27/38 • • • Demodulator circuits; Receiver circuits [5]

**29/00 Arrangements, apparatus, circuits or systems, not covered by a single one of groups H04L 1/00-H04L 27/00** (interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units G06F 13/00) [5]

- 29/02 • Communication control; Communication processing (H04L 29/12, H04L 29/14 take precedence) [5]
- 29/04 • • for plural communication lines [5]
- 29/06 • • characterised by a protocol [5]
- 29/08 • • • Transmission control procedure, e.g. data link level control procedure [5]
- 29/10 • • characterised by an interface, e.g. the interface between the data link level and the physical level [5]
- 29/12 • characterised by the data terminal [5]
- 29/14 • Counter-measures to a fault [5]