THE FACTS ON FILE DICTIONARY OF TELE-COMMUNICATIONS

BY

JOHN GRAHAM

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PREFACE

Our world has become an increasingly complex place in which, as individuals, we are very dependent on other people and upon organizations. An event in some distant part of the globe can rapidly and significantly affect the quality of life in our home country.

This increasing interdependence, on both a national and international scale, has led us to create systems which can respond immediately to dangers, enabling appropriate defensive or offensive actions to be taken. These systems are operating all around us in military, civil, commercial and industrial fields.

The electronic computer is at the heart of many such systems, but the role of telecommunications is no less important. As we proceed through the 1980s, there will be a further convergence between the technologies of computing and telecommunications. The changes will be dramatic:

the paperless office
the database society
the cashless society
the office at home

We cannot doubt that the economic and social impact of these concepts will be very significant. Already, advanced systems of communication are affecting both the layman and the technician. Complex functions are being performed by people using advanced terminals which are intended to be as easy to use as the conventional telephone.

The aim of the book

Telecommunications principles are becoming increasingly important in education at undergraduate and graduate levels. All those engaged in the fast-growing systems industries are finding that a knowledge of telecommunications is essential to solve today's problems; this knowledge is also vital to those who are responsible for managing distributed organizations.

It is the aim of this book to help people with the terminology of this subject and, at the same time, to provide a convenient source of reference to basic telecommunication principles.

In common with many other modern technologies, the subject of telecommunications has developed a language of its own. At first sight, the words appear to be intelligible English but, of course, with the inevitable sprinkling of initials such as FSK (*frequency shift keying*). The close association with the computer industry gives rise to some major new fields of technical complexity, e.g. *packet switching*.

This book sets out to define such terms and, as far as possible, to adhere to definitions in keeping with international practice. The scope of the publication is wide, dealing with fundamental concepts in telephone and telegraph communications, switched communications systems, broadcast systems, and narrow and broad bandwidth systems.

The intention is to make the material intelligible to the layman as well as

equivalent to the range of sounds perceived by human ear. From 20 cycles per second to 20,000 cycles per second (20 kilocycles, written as 20 kHz).

The *radio frequency* spectrum includes a great range of frequencies, among which the more useful are in the range from 20,000 to 20,000,000,000 cycles per second. All forms of electromagnetic and light waves travel through space at the same speed of 300,000,000 metres per second. In radio broadcasting and communications, it is useful to consider the following frequency bands:

low frequency (*LF*). A range of signals from 30 kHz to 300 kHz. They are suitable for long-distance radio communication and are often used for military or trans-oceanic services. At the lower frequencies, a large *antenna* is needed to propagate and receive signals.

high frequency (*HF*). A range of signals from 3 million cycles per second to 30 million cycles per second, 3 to 30 Mega-Hertz (MHz). Used for long-distance communication, but the quality is dependent upon ionization in the upper atmosphere.

very high frequency (*VHF*). A range of signals from 30 MHz to 300 MHz. Used for short-distance radio communication.

ultra high frequency (*UHF*). A range of signals from 300 MHz to 3,000 MHz. Often used for television broadcasts, and covering *frequency bands* from 470 MHz to 940 MHz.

super high frequency (*SHF*). A range of signals from 3,000 MHz to 30,000 MHz, otherwise expressed as from 3 GigaHertz to 30 GigaHertz (GHz). ⇨ *frequency band* and *bandwidth*.

front-end processor A computer subsystem used mainly to *interface* a main *computer* or *host processor* to a communication *network*. It takes responsibility for the *communication control* activity rather than the *application programs* which are run in the host system. ⇨ *communications controller*.

FS ⇨ *file separator*.

FSK ⇨ *frequency shift keying*.

full availability transposition It is an objective in designing *exchanges* to minimize the number of *crosspoints*, whilst at the same time reducing the probability of *call blocking*. A method to achieve this optimization consists of arranging the cross-points in stages in which a number of matrixes known as switching groups occur. Full availability transposition is said to exist when the pattern of interconnection is such that every *group* in one stage has a connection to every group in the previous stage.

full duplex A *transmission channel* in which simultaneous two-way transmission is available. ⇨ *half duplex* and *simplex*.

full duplex error control A system of *error correction*, used in *data transmission* over *links* which have a long transmission delay time, such that a *transmitting terminal* transmits a whole series of *blocks* without waiting for the *receiving station* to acknowledge correct acceptance of each block separately. If an error is detected, individual *error blocks* are retransmitted or all blocks commencing with an error block are retransmitted. These techniques require blocks to be numbered, and the latter method is also referred to as *go back to N* technique.

full echo suppressor An *echo suppressor* in which the *speech signals* on each path are used to control the suppression loss in the other path of a *four-wire circuit* used for long-distance communication. Contrast with *half echo suppressor*.

fully provided route A *transmission path* designed to handle all the *offered traffic* without relying on any *alternative route* in times of *peak load*. ⇨ *high-usage route*.

functional compatibility Most modern communication systems are of modular design; i.e. it is possible to extend the capacity of the system by adding additional

process in setting up, maintaining or clearing a *call*. ⇨, for example, *signalling* and *signals*.

2. In the general case, any electrical pulses transmitted in a network to represent *message* information, or *control information* in handling the process of communication.

signal bandwidth The range of frequencies required to convey a particular *message signal* accurately over a *channel*. For example, a *speech channel* allows up to 4 kHz for transmission of *electrical signals* representing voices, whereas a *television channel* may require up to 6 MHz to contain all the information necessary in a *video signal*.

signal element A discrete pulse forming part of a *digital signal* and having a value determined by the *pulse amplitude*.

signal message A *message* made up of a number of *signal units* and transmitted on a *signalling* channel to control the set-up, maintenance or termination of a *call* in a *data network*.

signal phase ⇨ *phase*.

signal power A measure of the strength of any *electrical signal* and expressed in *Bels* or *decibels* (*dB*).

signal-to-listener echo ratio The ratio of *signal power* to the power of *echo* signals reflected back to the *transmitting station* and caused by changes in the electrical characteristics of a *circuit*. A form of signal impairment in transmission over long-distance *transmission paths*; e.g. intercontinental *telephone circuits*.

signal-to-noise ratio In any *radio transmission*, or in any communication *link*, a certain amount of *noise* is generated, and is carried as background interference to the desired *message signal*. If the signal-to-noise ratio is high, then the message is unlikely to be impaired; if it is low, the signal may well be severely impaired.

The problem is accelerated by the use of *amplifiers* which will amplify both noise and signal. *Repeaters* containing amplifiers are spaced at intervals along transmission cables to maintain an appropriate signal-to-noise ratio. These amplifiers are designed to amplify signals occurring in a critical frequency *bandwidth* in which the message signal arises; the bandwidth of the amplifier is restricted so that noise outside the critical bandwidth is rejected.

signal-to-quantizing noise ratio *Quantizing noise* occurs in *pulse code modulation* (*PCM*) systems and arises as part of the process of converting an *audio signal* to digital form and vice versa. If the *signal-to-noise ratio* is high, the *message signal* is not seriously impaired, but if the ratio is low the signal may be impaired.

signal unit (SU) A unit of information in a *signalling system* for a *public data network* and consisting of a defined number of *bits* which provide *information* to control the progress of *calls*. ⇨ *acknowledgement signal unit*, *initial signal unit*, *lone signal unit*, *multi-block synchronization unit*, *subsequent signal unit*, *synchronization signal unit*, and *system control signal unit*.

signalling This term is given to the procedures concerned with the establishment, maintenance and termination of *calls* in a *network*. *Signalling systems* have been evolved to cater for the development of all classes of communication systems, including *telephony*, *telegraphy* and *data communication*.

The simplest form of signalling occurs in a *local telephone network* in which various signals are transferred between the telephone instrument and the *local exchange*. For example, when a *subscriber* lifts the *handset* from the *switch hook*, an automatic *call request signal* is sent to the *line*. The response from the exchange is a *proceed-to-send signal* which is recognizable as a *dial*

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