

PAGING BY

LOW-COST METHODS FOR CONTACTING PEOPLE IN BUILDINGS

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PAGING SYSTEMS in factories, hotels and other large buildings can minimise loss of time involved in searching for people and can offer considerable economies in the cost of long-distance telephone calls. Some existing paging systems make use of audio public address systems, possibly interrupting music already being distributed. Other methods involve the carrying of small transceivers linked to a central point by radio or an inductive loop (references 1, 2).

The scheme discussed here is a visual one, which can have the advantage of silent operation. It is hence more unobtrusive and avoids disturbing people whom the call does not concern. It is also unaffected by ambient noise, which in some factories may mask audio messages. Moreover the call can be displayed continuously until answered. The essence of the system is that each person likely to be called has a denary number or letter code allotted to him, and any of these codes, as appropriate can be displayed visually at as many key positions as may be required, by means of wired control from a central exchange or lobby. When a person sees his number or letter code displayed, he then goes to the nearest internal telephone, or reports to a pre-arranged position.

DISPLAYS

It is necessary to decide how large and bright the slave displays of number or letter codes need to be at each position; they need not necessarily all be of the same type, provided they are compatible with the system in use, and smaller displays, such as miniature l.e.d. indicators, can be used in small rooms. If desired the visual display can at certain locations be supplemented by an audio tone which draws attention to it. There now exist a wide choice of digital display devices. Illuminated digits about 1in by 1in are given by a small lens system and lamp, the outlines being advanced by the application of a current pulse to a moving coil;

larger models are about 4½in by 2½in by 1½in. Many miniature alphanumeric displays are now available, the seven-segment type operation at 5V now tending to supersede the earlier 180V type with a separate cathode for each outline. The 5-volt design eases power supply problems, as the same supply can be shared by the associated TTL logic; on the other hand for long wiring runs, voltage drop has to be allowed for. There is evidence that decoder-drivers for 5V are more reliable than for 180V. Low-voltage L.E.D. displays have some advantage over the earlier 5V filament type. Several types are also obtainable in clusters of several digits and various strobing and sequential-drive arrangements can reduce the logic and interconnections needed per digit, as compared with systems using a group of separate digits. Electromagnetic

registers with up to 6 digits are readily available for various voltages, count sequentially, afford the simplest 'carry' from one digit to the next, and can have electrical reset. They are also cheaper than electronic indicators, but require rather heavy current pulses and in general cause audible clicks. Some more recent types give quieter operation, e.g. they can be driven by stepper motors and/or have more refined methods of 'carry'.

WIRING

When we consider a scheme for a master digital display and several slave displays distributed through a building, an important factor is the cost of the wiring. Cost of cable rises with the number of cores used and current carried, also insulation voltage, whilst installation cost depends chiefly on the length and

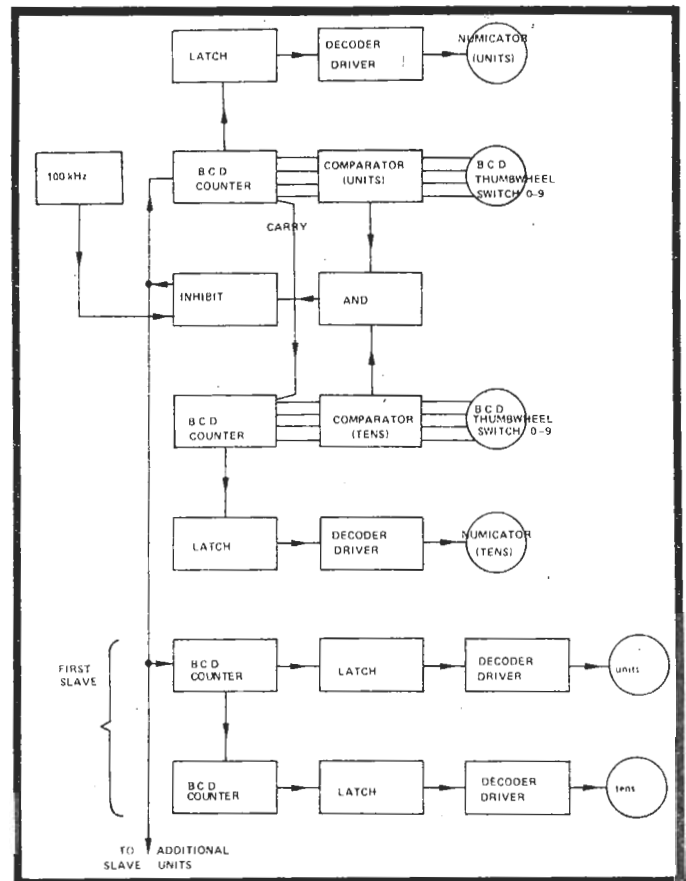


Fig. 1. A numeric-based paging system.

nature of the cable run, and whether wiring has to be concealed; the cost of concealment is much less in a new building, or in one already having ducts for other telecommunication services (not fire alarms), segregated from mains wiring.

Broadly speaking there is a choice between sending a rapid pulse-train to count from zero to the number required when the master controls are set, or alternatively arranging for the slaves merely to copy the central indication, without going through all the intermediate numbers. The former method fits in more readily with the use of only two wires, apart from power supplies, between the master and each slave, since to send BCD numbers over two wires would call for scanning and serial transmission. One possible method using numicators for silent operation is outlined in Fig. 1 (see also ref. 3). In this method, a multivibrator or u.j.t. pulse generator operates continuously, but drives the counters only when the number displayed at all locations differs from that set up on central denary thumbwheel switches. When no call is wanted, the operator resets them to 0000, 000 or 00, depending on the number of digits in use. Owing to

the speed of the count, only the final result is visible.

TONES

A system based on the transmission of audio tones simultaneously over a single pair of wires may commend itself owing to the low wiring cost, assuming that independent power supplies are available at the master and at each slave.

Such a scheme might use, for two digits, two binary-output thumbwheel switches marked 0-9 at the master. Each position would connect or disconnect one or more of four audio oscillators, requiring a total of 8 audio oscillators at the master for two denary digits in the display. The tones would be picked up at each slave by eight tone filter/detectors, for which modules are now available, the outputs then being decoded to control a two-digit display by numicators or other devices. Alternatively the decoding could be omitted and each tone filter/detector could turn on a thyristor controlling a coloured mains lamp. If desired the lamps could also be numbered 1-8. In this way (2^8-1) or 255 different codes would be available, compared with only 99 by the BCD method. Such a method is perhaps less readily comprehended by the viewer, but

enables more persons to be catered for, and the use of the higher-power mains lamps might sometimes be advantageous, particularly from the point of view of saving on power supplies.

Perhaps the simplest system however is afforded by the use of two stepping motors at the master and at each slave, in an add-subtract mode, driving registers of the required number of digits. The central operator would have two push-buttons — add and subtract, and would press these alternately as required until the appropriate number was displayed on counters driven by the motors. The slave motors would operate in synchronism and hence always display the same number as the master; during intervals of non-use, this would be reset to 0000. ●

References

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2. How to select the right system when shopping for a pager, G. C. Gedney, *Communications*, p.18-21, July, 1971.
3. Digital remote control system, H. N. Griffiths, *Wireless World*, Vol. 76, no. 1414, p. 175-177, April, 1970.