



A TELEPHONE DICTATION RECORDER SYSTEM

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SUMMARY

After briefly reviewing the basic requirements of a dictation recorder system and alternative methods of operation, the article then specifically describes the A.T.E. system. After consideration of its integration with automatic telephone systems, details are given of its design, facilities and operation

THE SIGNIFICANT ADVANTAGES in economy and convenience offered by telephone dictation recorder systems extend to both business executives and typing staff. Dictation can be given as and when the demand occurs

and typing can proceed without interruption or the need for proficiency in shorthand. To be fully acceptable, however, the system must cater for all operating demands and be free from irksome restrictions.

GENERAL REQUIREMENTS OF A DICTATION RECORDER

A dictation recorder is required to record and reproduce speech only and is consequently not required to enter the high-fidelity range of sound reproduction. A recorder operating at a speed of $1\frac{1}{4}$ inches per second and having a reasonably flat response from 200 c/s to 4 kc/s is therefore normally considered satisfactory

Simple controls for the three following facilities are required:—

- (a) 'Dictate'
- (b) 'Stop'
- (c) 'Listen'

These controls must include facilities for the alteration of recordings and the final corrected message should be clear and readily understood.

The recorder should be readily accessible to as large a number of users as possible to ensure the most economic use of the system.

ALTERNATIVE DESIGNS OF DICTATION RECORDERS

Several designs of recorders using differing recording media and various operating methods, are available. Although magnetic recording is now generally used, at least one design retains the engraved recording medium. This system does not lend itself to easy alteration of a recording as inscribed recordings cannot be erased or altered. Alterations are indicated on an associated paper index strip at a point opposite the affected section. The typist must first refer to this and then to the amended dictation at the end of the recording. The recording medium is in the form of a plastic belt that can be used once only

Magnetic recording has become increasingly popular due to the ease of erasure and the corresponding convenience of amending recordings. The ability to re-use the recording medium repeatedly has considerable advantages of economy and convenience which also influence its popularity. A magnetic tape, at a conservative estimate, will serve a dictation pool over a period of twelve months.

Three types of magnetic recording media are in general use in dictation recorders, as follows.

1. Plastic disc with an iron-oxide coating. These discs normally provide a recording time of from six to twelve minutes each.
2. Plastic sheet, or paper sheet, having an iron-oxide coating and a recording time of up to twenty minutes.
3. Plastic tape having an iron-oxide coating and normally used in lengths that give thirty or sixty minutes recording time. This time can be increased by 50% or 100% by the use of 'long-play' or 'double-play' tapes.

Short-time recording devices produce the recordings in small batches that eliminate all possibilities of a typist waiting for, say, a 60-minute spool to be filled. On the other hand, devices catering for longer recording times reduce loading and unloading operations yet do not enforce waiting until spools are filled because the tapes can be removed and transcribed at the end of any recording session.

Plastic tape has been adopted as the recording medium on the A.T.E. dictation recording system.

Remote Control of Centralised Dictation Recorders

Maximum use of a dictation recorder requires access to it by a number of persons. The preferred method of access is by adaptation of an existing telephone system in which the standard telephone handset is used as the recording microphone.

After connection to the recorder is established by the usual dialling operation, control of it is required, involving the functions 'dictate', 'stop', 'listen'. Three methods of control have been applied commercially

1. Push button control using voice-frequency current

This method applies voice-frequencies generated at each access point. After connection to the recorder is secured, pre-selected voice frequencies are transmitted to line under the control of push buttons designated 'Dictate', 'Stop', 'Listen'. At the recorder, tuned filters direct these voice-frequency signals to the associated control.



Figure 1 Desk control tablet with associated telephone

2. Dial impulse control

After establishing connection by dialling the allotted code, all controls are effected from the telephone by dialling further reserved code numbers.

While this method has the merits of easy adaptation and absence of extra control units at the control points, operation is relatively slow, which is a particular disadvantage when a section of recording has to be altered and precise timing is essential.

3. Push button control using d.c./a.c. signals

After securing connection to the recorder by dialling, control is assumed by a small desk unit, mounting three push keys. The control is transmitted over the telephone line and an earth return. A 50 c/s potential having one leg earthed is extended to these three push keys which select either positive-going current, negative-going current or alternating current by means of diodes connected to earth via two of the push keys and a direct earth connection to the third. Corresponding discrimination is made at the control

centre between associated relays. This method is economic, rapid in response and convenient in use. It has been developed for application to the telephone dictation recorder under review and Figure 1 illustrates the desk tablet in association with an automatic telephone.

A.T.E. DICTATION RECORDER—ACCESS

Access to the recorder via a private automatic exchange involves the allocation of an exchange number only and the dialling of this code in the usual way. Special consideration is required, however, due to the extended holding time that is liable to occur with the use of the recorder. On exchanges using a line finder and associated final selector for the connecting circuits, traffic is liable to become congested should some of the limited number of connecting circuits be held for an excessive period by the recorder connection. Arrangements have therefore been made to release the normal connecting circuit once a circuit to the recorder has been established, retaining the recorder connection over a by-pass

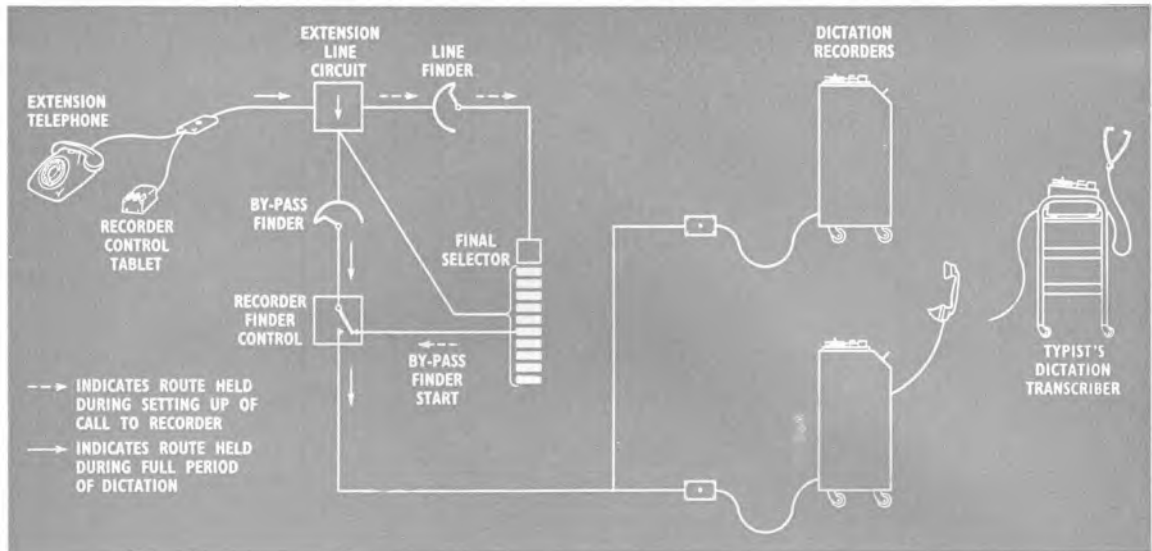


Figure 2. Dictation recorder access. Trunking arrangements using line finder and final selector

finder Figure 2 shows the trunking arrangements for this condition.

Upon dialling the extension number allotted to the recorder, a 'start' signal is passed over the final selector bank to a by-pass finder associated with the first free recorder. This finder hunts to a mark fed back from the final selector over the extension's line circuit. Upon reaching it, the

normal connecting circuit is released for further service, leaving the caller connected to the dictation recorder over the by-pass finder

When used with automatic exchanges using group selectors, it is a relatively easy matter to fit additional group selectors to cater for the additional traffic.

Figure 3 shows the trunking arrangements.

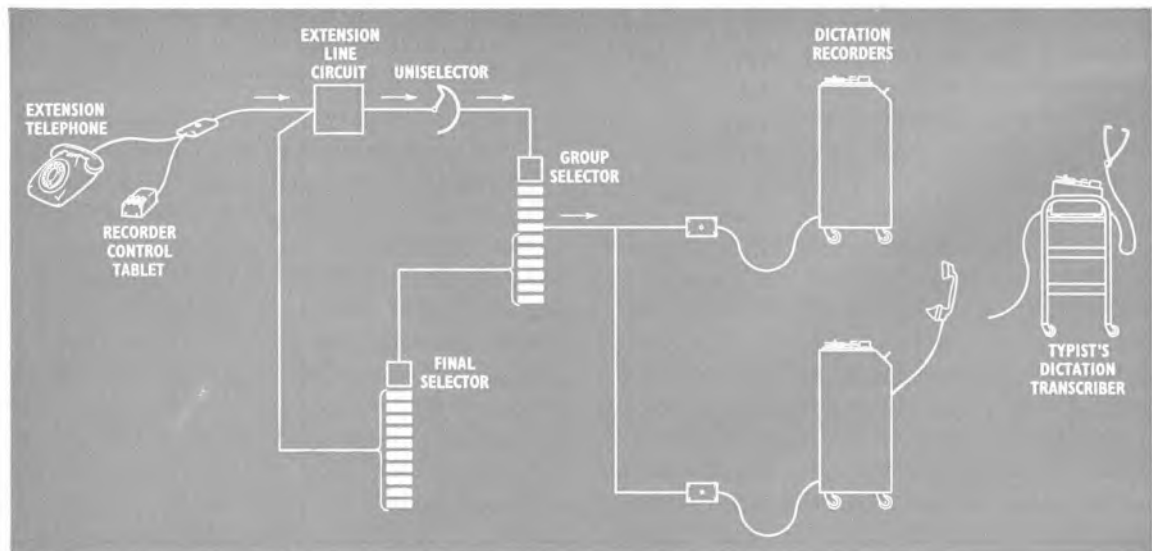


Figure 3. Dictation recorder access. Trunking arrangements using group selectors



Figure 4. Dictation recorder console

Upon dialling the allocated group selector level, the outlet to the first free recorder is seized and the caller is directly connected to the recorder.

Any number of selected extensions on a private automatic exchange may be given access to a dictation recorder as controlled by requirements and satisfactory traffic conditions.

Upon seizing a free recorder, an 800 c/s signal is extended to the caller denoting that control signals may be passed from the desk control tablet.

Upon releasing the recorder after a dictating session, a section of tape is automatically run off free from the control signal. This forms an effective barrier to playback of recordings made during a previous seizure of the recorder

THE DICTATION RECORDER CONSOLE

The dictation recorder console is illustrated in Figure 4 and contains a tape deck, record and replay amplifiers, power units and the control equipment.

A supervisory panel provides lamp indications of 'Power On', 'Machine in Use', 'Dictation Recorded', 'Operator Call' and 'Tape Full' Alarm is also given should a tape break and run completely off the spool or become displaced from its correct track.

Key switches are provided for control of the following conditions—'Night Service', 'Alarm Cut-off', 'Operator Speak', 'Reset' and 'Busy'. Three push keys provide the supervisor with dual control of 'Dictate', 'Stop', 'Listen'. A telephone handset enables the supervisor to communicate with a caller and record any special instructions regarding the dictation.

Connections to the exchange are made via a wall-mounted jack and plug which terminates the two line wires, the 'private' wire and the 50 V d.c. supply for relay switching purposes.

An a.c. mains input lead supplies the power required for the tape deck motors, amplifier and line signalling power unit.

Castors are fitted that enable the recorder console to be positioned at any convenient point.

RECORDER FACILITIES

The three elementary facilities of dictate, stop and listen, are considerably extended in practice by refinements that are indispensable to a fully satisfactory system. These refinements, however, can be made to function automatically—a considerable advantage from a remote control aspect. An example is that of 'Listen' in which the one push key controls the operations of (a) Stop, (b) Switch circuit from dictate to playback conditions, (c) Rewind at a faster speed, (d) Auto-stop at the commencement of a recording session, (e) Alternatively stop on release of 'Listen' push button, (f) Revert to forward wind, (g) Revert to slow speed, (h) Auto-stop at end of recording.

The facilities are described under the headings of Dictate, Stop, Listen and Miscellaneous Facilities.

Dictate

Momentary operation of the 'Dictate' push key causes the recorder to wind forward at a tape speed of $1\frac{7}{8}$ inches per second, with the head and the amplifier in the 'record' condition. A bias current at 45 kc/s is applied to the head to pre-condition the iron-oxide tape coating to accept a maximum level of undistorted signal. A 'control' signal is also applied to the head. This is a low-level 50 c/s current which is recorded on the tape when the recorder is running in the 'dictate' condition.

Speech signals from the telephone transmitter are received via the line circuit and are fed through the amplifier 'record' circuit to be mixed in the head with the bias and control signals.

Resumption of dictation after playback

During a recording session, a check may be required before the message is completed. To make this check, the tape is automatically stopped, rewound and replayed under the control of the 'Listen' key. During the replay, upon reaching the blank tape at the end of the recording, the tape is stopped automatically by an auto-stop feature that responds to the absence of a guard signal. In

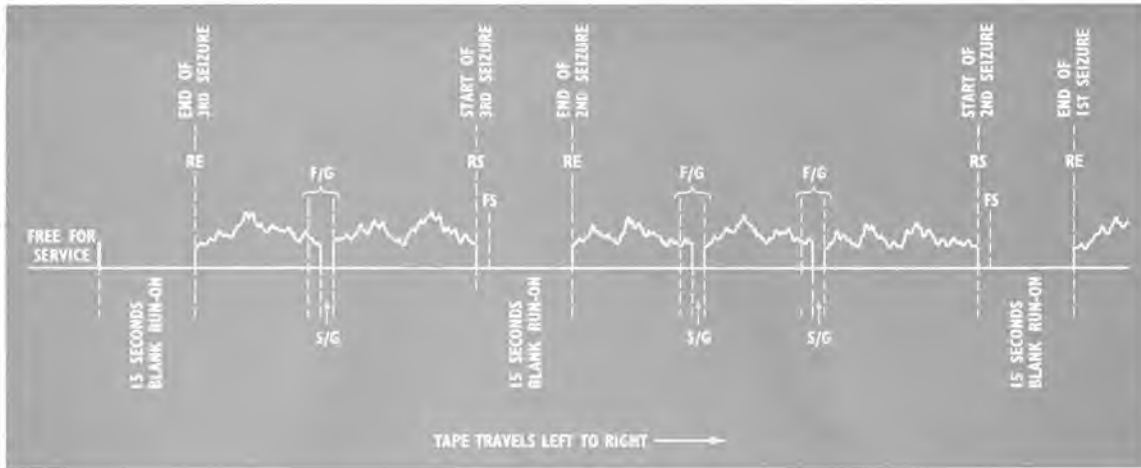


Figure 5. Graphic representation of recorded section of tape

FS—Point of stopping on rewind to start of recording
 FG—Over-run blank section after playback

SG—Reduced over-run section after rewind and restart

stopping, the inertia of the mechanism allows a short length of blank tape to pass the head. If dictation were resumed at this stage, subsequent replay would be unable to pass this blank section of tape as the auto-stop circuit would operate. To avoid this, the section of blank tape is automatically removed by an arrangement in which reoperation of the 'Dictate' key first rewinds the tape the short distance to the recorded section and then winds forward again under 'Dictate' conditions. This is illustrated on Figure 5 which shows that the section of blank tape is not entirely removed but the remaining section is so short that it is quite innocuous.

Pauses during normal dictation do not cause operation of the auto-stop circuit as application of the 50 c/s control signal is continued and this signal prevents release of the auto-stop relay

These conditions are shown graphically on Figure 5.

Stop

Momentary operation of the 'Stop' push key will stop the recorder under any running

condition initiated by the user. The 800 c/s tone, signifying that the recorder is available, is automatically returned to the telephone receiver upon the recorder responding to the stop signal.

A stop condition is also temporarily applied upon operation of the 'Listen' push key

A stop is applied upon calling the supervisor over the special call facility—digit 0.

An auto-stop condition is effective under the following conditions (a) At the beginning and end of a recorded section under listen conditions. (b) At the extreme end of a tape. (c) Upon tape breakage or misalignment.

The (b) and (c) arrangements are discussed later

Listen

Sustained operation of the 'Listen' push key will cause the recorder first to stop (if still running on dictate) and then rewind at the increased speed of 15 inches per second, to the beginning of the recordings made during any



Figure 6. Bulk erase unit

one seizure of the recorder. It will then stop automatically. On release of the 'Listen' key, the recorder will wind forward at slow speed and replay until it reaches the end of the recordings when it will again stop automatically. The 'Listen' push key may be released at any point of rewind to effect replay of the rewound section only.

Guard

Rewind cannot reach recordings made during previous seizures of the recorder. The intervention of an unrecorded section of tape which causes the auto-stop to function, provides this guard. This blank 'guard' section of tape is automatically inserted each time the recorder is relinquished.

During rewind over the recorded section of tape, the 50 c/s control signal is passed from the head, amplified and applied as a cut-off bias to the valve-operated auto cut-off circuit to prevent its operation. Any recorded message is also picked up with this signal.

Direct transition of control can be made from the 'Dictate' push key to the 'Listen' push key, and the reverse, without intermediate operation of the 'Stop' push key.

The 'Dictate' and 'Stop' push keys require momentary operation only, after which their function continues. The rewind function of the 'Listen' push key is effective for as long as the key is operated, up to the guard section of tape.

Miscellaneous Facilities

Alterations

Any part of a recording may be altered by a simple procedure. The affected part is located by manipulation of the 'Listen' push key. The 'Dictate' key is then operated, the alteration dictated and either the 'Listen' or 'Stop' key immediately depressed. These operations erase the previous recording and record the revised dictation, simultaneously.

Erasure for alterations is achieved by the 45 kc/s bias signal, the level of which is made abnormally high for this purpose. Erasure reduces recordings to an innocuous level that is quite satisfactory for the purpose. Erased words cannot be identified and when a revised message is recorded over them, they cannot be heard. This method of erasure eliminates the need for a separate 'erase' head with its associated circuits and equipment. All recording, playback and erasure operations are therefore performed by the one head.

Erasure

Erasure of complete spools of tape is effected by a bulk erase unit. See Figure 6. A coil wound on a laminated and gapped core is energised from 50 c/s mains supply current and the spool of tape is rotated through the resultant field. All traces of previous recordings are removed within 30 seconds.

Release and Guard

The user releases the recorder by replacing his handset thus interrupting the holding loop via the recorder control circuit. Should this release take place during playback and prior to the recorder reaching a 'home' position an automatic homing circuit takes control. During the homing run, the recorder is guarded against seizure by other callers.

While the blank section of tape resulting from the inertia of the stop arrangements will effect auto-stop under replay or automatic homing conditions, it is not long enough to effect auto-stop on rewind, due to the increased speed of rewind. To prevent access to recordings of previous users, it is therefore necessary to intersperse a blank 'guard' section of tape of sufficient length to effect auto-stop at rewind speed. This guard section must be added each time the recorder is relinquished by a user. Under these circumstances, therefore, a secondary motor start circuit assumes control and continues the forward run for ten to fifteen seconds, passing some two feet of unrecorded tape during this period. This blank section of tape provides an effective guard against attempted intrusion into pre-recorded tape sections by successive users. It also marks the beginning of recording sessions for auto-stop under replay conditions.

Upon reaching a 'home' position after release by a user, a lamp on the recorder supervisory panel indicates that a section of tape has been recorded during a completed recording session and that the recorder is available for further use.

End of tape precautions

When five minutes of recording time only is left on the spool, a 'pip-pip' warning is transmitted to the user's receiver. This signal is initiated from a metallised surface deposited on the non-active side of the tape at the appropriate distance from the end. To ensure that the machine cannot be re-seized with less than five minutes of dictation available, this signal also prepares a lock-out circuit that becomes effective upon release of the recorder. Alarm signals are also extended to the supervisor who

will then replace the recorded tape by an unrecorded one.

Should dictation continue to the end of the tape, a further metallised surface of the tape operates a stop circuit and prevents the total unwinding of the tape.

Broken or incorrectly loaded tape

Should the tape break or any other condition arise which removes the tape from its correct track, contacts normally separated by the tape will close to operate a stop circuit and extend appropriate alarms.

Loading and unloading of tape spools

To facilitate loading and unloading of tape spools on the recorder, locally operated 'Fast Wind' and 'Fast Rewind' controls are provided. These are made available by operation of a 'Supervisor's Busy' switch which ensures that the recorder cannot be seized during loading operations. See Figure 7

Supervisor call

A user can call the supervisor while holding the recorder connection, by dialling a further digit—'0'. Such a call automatically applies a stop signal to the recorder and renders the user's controls inoperative until the supervisor operates her 'Reset' key

Night service

All supervisory alarms are made inoperative by throwing the supervisor's 'Night-Service' key. In addition, should a user dial the '0' digit to call the supervisor during her absence, his local controls are not made inoperative.

Transcription

A separate transcription machine is provided for each typist. The tapes are played back from these via light-weight headphones. About four transcription machines are kept busy by one recorder. Control is secured by a two-button foot-control device covering the operations, 'Start/Rewind' and 'Stop'. Momentary operation of the 'Start/Rewind' foot button



Figure 7 Loading of tape spools on recorder

starts replay at $1\frac{7}{8}$ inches per second. Continuous depression of this button will cause the tape to rewind at 15 inches per second. Momentary operation of the 'stop' button brings the tape to rest. These simple and effective controls enable the typist to transcribe at her own speed so that there is no question of having to keep up with the speed of dictation.

'Fast Forward' and 'Fast Rewind' controls are provided on the machine for quick location of any part of a tape. (See Figure 8.)

TYPICAL CIRCUIT ELEMENT

A circuit element is shown on Figure 9 typifying techniques that are applied generally. This shows the line-signalling arrangements under the control of the three push keys mounted on the desk tablet. The controls are 'dictate', 'stop', 'listen', and connection to the recorder is made via the line circuit and earth return.

A 50 V direct-current supply, as required for normal operation of telephone dialling and speech circuits, is derived from the a.c. mains



Figure 8. Transcription machine

via transformer TR1, rectified at MR1 and smoothed by the resistance-capacity network R1, R2, C1, C2.

Winding 'C' of TR1 provides an a.c. supply

that is used to select any one of the three control conditions over the loop from the push keys DP, SP, LP. The control is effected by operation of relay D or L or both D and L simultaneously

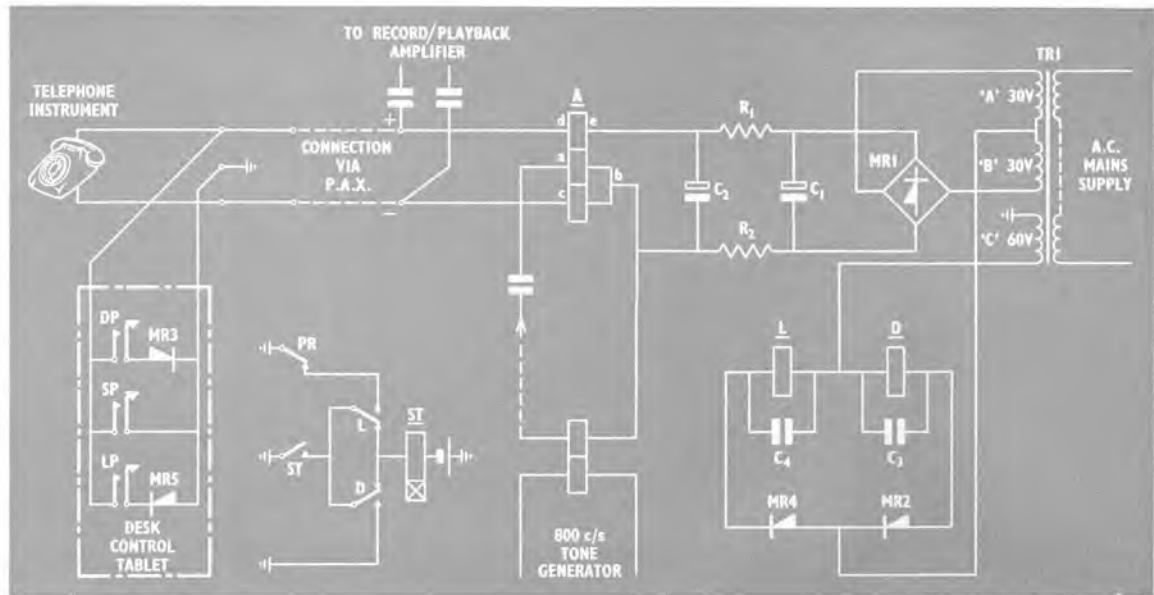


Figure 9 Line signalling circuit

The selection is made by the completion of a path for either a positive-going current, a negative-going current or an alternating current. The selected half-wave of the alternating current supply flows under the control of diodes MR2, MR3 and MR4, MR5. Alternating current flows via a direct connection to earth.

Upon operation of DP, the positive half-wave flows from earth, winding 'C' of TR1, relay D, diode MR2, centre-tapped winding of TR1, winding A or B, (depending upon phase relationship) positive-going limb of MR1, winding e.d. of impulsing relay A, over the line to push key DP, diode MR3 and earth return. Capacitor C3 smooths this half-wave current and relay D operates.

The circuit responds similarly to operation of push key LP but via negative-going diodes MR4, MR1, MR5 and via the telephone instrument (operated). Relay L operates.

The operation of push key SP connects full earth, enabling both half-waves to flow and both D and L relays to operate.

When separately operated, relay D and L contacts initiate the starting of the recorder motor via relay ST, but when operated together they release ST to stop the motor

Application of the 800 c/s tone to the telephone receiver is made via the third winding of the A relay

CONCLUSION

Operating reports from several installations confirm that the design successfully interprets operational requirements. As familiarity with its operation increases with use, so does appreciation of its facilities and convenience. The indications are that the adoption of telephone dictation recording systems will increase.