



Automatic “Answer Only” Set

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A series of automatic answering devices is one of the recent developments in the Laboratories' continuing program to provide better and more useful service to telephone customers. The newest of these machines is an “answer only” device designed to play a recorded message in response to an incoming call on an unattended telephone. In addition to use by a variety of telephone customers, “answer only” devices are being employed in a number of places within the telephone plant itself.

For the past few years, the operating telephone companies have been offering automatic telephone answering service to telephone customers for a moderate monthly charge. This service is provided by a device that is installed on the customer's premises and is connected to his telephone line. It automatically answers any incoming call to an unattended telephone with the customer's pre-recorded announcement, and then records the caller's response. The recorded incoming messages are available for immediate playback upon the customer's return.

The telephone answering service was begun, on a trial basis, with the F-50070 Teletranscriber. These trials resulted in the design of the 1A telephone answering set.^o Since then, the 1A set has undergone several modifications to make it conform more closely to the current needs of the users as brought to light by the continuing experience in the field. The Western Electric Company is now engaged in production of the 1BA telephone answering set which is the present version of the basic 1-type “answer and record” set.

Customer surveys have indicated a need for a simplified automatic telephone answering service or, as it has come to be called, an “answer only” service. A machine designed specifically for this use answers a call automatically with an announcement, pre-recorded by the customer, that does not solicit

a “left message” response from the caller. The machine, therefore, need not have facilities for recording messages from the telephone line.

A neighborhood theatre, for example, could make good use of “answer only” service. The recorded announcement would recite the day's program and the starting times of the feature film. Not only would the answering set remove a burden from the cashier or the manager during rush hours but it would also supply the information when the theatre is closed.

Moreover, there are uses for an “answer only” machine within the Bell System plant itself. In one current application, it serves as an automatic intercept device in an unattended community dial office. The machine is automatically cut in when a calling customer dials a non-working number. The pre-recorded announcement tells the caller that he has reached a non-working number, and advises him to consult the directory or to call an operator if assistance is needed.

Many users of “answer and record” machines also have an occasional need for the supplemental “answer only” service. Late model sets were therefore designed to provide the customer with the option of “answer and record” or “answer only” operation. The demand for “answer only” service exclusively was great enough, however, to justify the development of a machine designed specifically for this purpose. The 2A telephone answering set (see headpiece), designed by the Laboratories and now in

^o RECORD, November, 1953, page 439.

production by Western Electric, is the resulting automatic "answer only" set. It is small, comparatively simple, and economical to manufacture.

For the sake of standardization, the 2A set's basic design followed, insofar as possible, that of its predecessors: the 1A, 1AA and 1B telephone answering sets. For ease of maintenance, early availability and economy, many mechanical and electrical parts are common and interchangeable. The design also provided for anticipated special applications. In addition to the facilities that enable it to perform its principal functions, "answer only" and "community dial office intercept" service, other facilities are included that give the 2A set special operational features. These provide for the recording of a new announcement from a remote location, operating the machine in conjunction with key-telephone systems and controlling a special supplementary recorder. The last named would be used for the recording of incoming messages in special installations where a 1-type set would not be suitable. At present, external facilities are not available, however, to implement for the "remote-record" and supplementary recorder control features.

In a typical installation, a customer's telephone set and telephone line are connected to the 2A telephone answering set. The telephone is used to dictate and check the announcement that the customer wishes callers to hear. The set's power-cord plugs into any convenient 110-volt ac outlet. In dc areas, a vibrator-inverter, designed especially for the answering sets, may be used. The operating power consumption is 70 watts; the stand-by power drain (while the machine is waiting to answer a call) is practically negligible — less than 5 watts. This represents the power required to light two front panel indicator lamps.

The photograph at the head of this article shows the "answer only" set and its front panel controls: the on-off switch, the "function" switch and the operate button. A dictate light, a "ready" light and an illuminated Bell System medallion are also mounted on the front panel. When the on-off switch is turned to the "off" position, ac power is disconnected and the customer's telephone set is connected directly to his telephone line. The telephone can then be used in the normal manner, without regard for the answering set. When this switch is turned to the "on" position, a lamp behind the Bell System medallion lights to indicate that power is applied to the 2A set, and that the telephone set is connected to its internal mechanism as shown in Fig. 1. The machine is now ready for immediate use either for

recording an announcement by the telephone customer or answering an incoming call.

The switch at the upper left of the front panel in the headpiece bearing the three operational designations is used to choose the function to be performed by the 2A set. The ANNOUNCEMENT-DICTATE function, as the name applies, is used to record an announcement. To do this, the customer turns the knob to the DICTATE position; he depresses the operate ("O") button and holds it down. When the red indicator below the engraved word DICTATE lights up, he talks into the telephone handset. This red dictate light will remain lit during the dictation period and until the recording time limit is approached. At that time it will start to flash to warn the customer that the recording period is nearing an end. As soon as the customer finishes dictating his announcement he releases the "O" button. The machine immediately restores itself to the "ready" condition with no further manual operation.

The customer can listen to his recording by turning the function knob to the ANNOUNCEMENT-CHECK position and again depressing the operate button. The announcement is reproduced through the telephone handset. The reproduce level is attenuated approximately 15 db during the check period to

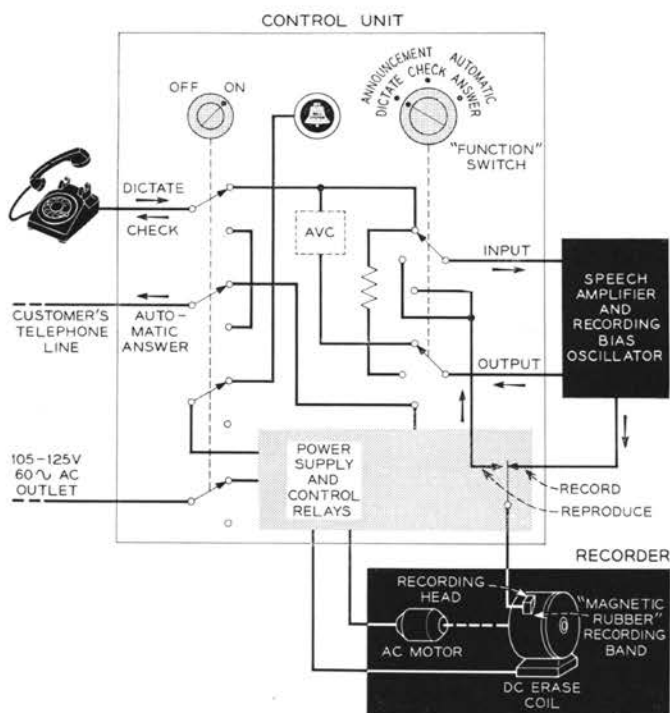


Fig. 1 — Simplified diagram showing speech paths in "answer only" set in the "record" position.

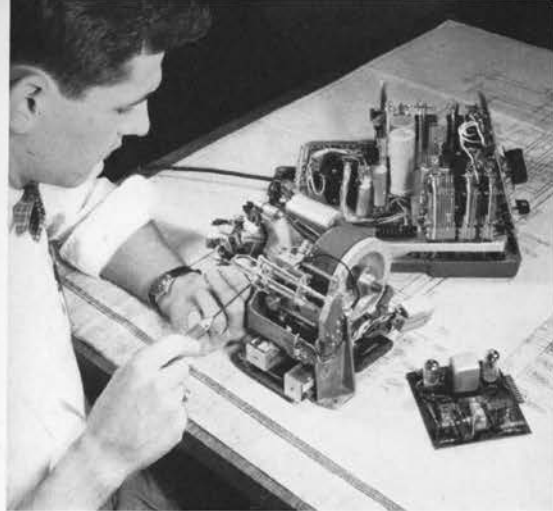


Fig. 2 — J. J. Onder adjusts the magnetic recorder of the "answer only" set. The control unit can be seen in the background, and the amplifier in the lower foreground at the right.

simulate the losses over long telephone connections. This results in a monitoring that encourages dictation at an acceptable announcement level. By requiring the user to depress and hold down the operate button, the latter is made to perform the combined functions of a start and stop button. Not only are economy and simplicity achieved, but also an important operational feature whereby the end of an announcement of any duration between 5 and 60 seconds is unconsciously and automatically made to coincide with the disconnect of the 2A set from the telephone line in answering operation.

The record-reproduce procedure may be repeated any number of times, without penalty, until the customer is satisfied with the context and duration of his announcement. The previous recording is erased completely and automatically at the start of each ANNOUNCEMENT-DICTATE operation. Erasure takes place in the 3.5-second interval between the depression of the operate button and the appearance of the dictate light. When the customer is satisfied with his announcement, he turns the function knob to AUTOMATIC ANSWER. At this time, an amber-colored indicator, below the front panel engraving, AUTOMATIC ANSWER, lights to indicate that the machine is ready to answer an incoming call.

The same announcement may be left in the 2A set indefinitely and may be played back repeatedly without degradation of level or quality. Also, as indicated above, the announcement may be changed at frequent intervals without any detrimental effects whatsoever. The long life of the magnetic recording medium and the fact that it can be used without being handled by the customer are two major features of the 1- and 2-type telephone answering sets.

The 2A telephone answering set is basically a magnetic recording recorder-reproducer with a miniature switching system. One of its principal physical features is the sub-assembly construction, which consists of three units: the control unit, the 10A recorder, and the 152A amplifier. These individual units are manufactured and tested independently, and are completely interchangeable. The control unit and recorder are mounted on an aluminum die-cast base. This control unit, attached to the base, is shown in the background of Fig. 2.

Printed wiring techniques are used in the construction of the 152A amplifier, shown in the right foreground of Fig. 2. The "card" contains a three-stage speech amplifier and a recording bias oscillator. It plugs into a receptacle on the control unit chassis. Two miniature and two sub-miniature electron tubes are used. Filamentary-type tubes were chosen for their rapid heat-up, and sub-miniatures, in particular, for their low microphonics. The tubes are activated only during the operating periods; in the stand-by condition, while the machine is awaiting an incoming call, power is disconnected from the amplifier. This technique results in a long electron tube service life.

Switching within the control unit enables the same amplifier to serve for both recording and reproducing. To produce a consistently high, uniform and acceptable recording level, despite large differences in customers' voice levels, a combination of electronic level control and magnetic medium compression is used. A simplified automatic volume control circuit regulates the gain of the amplifier during the ANNOUNCEMENT-DICTATE function.

The 10A recorder illustrated in the center foreground of Fig. 2 consists of an aluminum die-casting upon which are mounted a drive motor, magnetic recording drum and head, erase coil, control solenoids and switches. The magnetic recording medium, "magnetic rubber," is a Laboratories development. It is made by combining magnetic iron oxide with an elastomeric material. Hypalon (a chlorosulphonated polyethylene made by du Pont) is currently used as the base material because of its high abrasion resistance combined with suitable elasticity. The long service life of the magnetic rubber cannot be matched, at this time, by the conventional forms of magnetic recording media, under the usage imposed by "answer only" service.

The magnetic recording head has the conventional ring-type construction. The same head is used for both recording and reproducing. It rides in contact with the surface of the recording band and traces

a helical track 0.042 inch wide. The head motion along the width dimension of the band is obtained by means of a half-nut and lead screw. The latter is driven by a gear train in synchronism with the recording drum. High frequency recording bias, approximately 15 kc, generated by the 152A amplifier, is applied with the speech signals to the recording head during ANNOUNCEMENT-DICTATE operation. This produces a remanent magnetization on the magnetic rubber recording band.

The remanent magnetization is erased by the "bulk" dc method with an erase coil mounted close to the recording band. Since the length of the erase coil pole-pieces is the same as the width of the band, the entire magnetic band is erased in one revolution of the drum — the first revolution of the ANNOUNCEMENT-DICTATE cycle. The dc erasure was chosen for its simplicity and low cost although a somewhat lower playback noise level could be achieved with ac erasure. A 40-db signal to noise ratio adequate for this type of service is readily obtained in the 2A set.

A telephone company installer can set the maximum announcement time to any value between 5 and 60 seconds. The actual announcement cycle duration is continuously variable, between the 5-second minimum and the setting established by the installer, under the control of a traveling limit switch. This switch is moved along by the recording head carriage during DICTATE operation and is clamped, in a position corresponding to the end of the announcement, at the instant the operate button is released.

The 10A recorder drive motor has a self contained worm-gear speed reducer. It is connected to the magnetic recording drum shaft through a flexible damping coupling. The drum shaft carries a flywheel, as part of a friction slip-clutch, to reduce flutter. The output shaft of the motor drives the recording drum at a speed of approximately 20 rpm,



Fig. 3 — W. R. Goehner using a 2A answering set to test "magnetic rubber" recording bands.

which, for the 4-inch diameter of the drum, corresponds to a peripheral speed of 4.7 inches per second at the recording head.

The control unit of the 2A telephone answering set contains the front panel controls and indicators, the power supply, certain amplifier components including those of the automatic volume control circuit, and standard telephone-type relays for the high impedance ring-up, calling party disconnect and other control circuits. It also contains the connecting terminal boards for the telephone set and the telephone line.

Indications are that the demand for "answer only" service will continue to grow and that it will become an important customer service. Many sets are being used, with enthusiastic customer acceptance, in modes of operation extending beyond those originally anticipated. For example, a number of installations have been made for stock brokers who give their callers a brief, recorded indication of the condition of the market. Also, religious and other organizations use the service to transmit messages of an inspirational nature.



THE AUTHOR

C. M. TARIS received a B.S. degree in Physics from Yale University in 1948. After three years with the audio-video facilities development group of the National Broadcasting Company, he joined the Laboratories' Technical Staff. At the Laboratories, Mr. Taris has been engaged in the development of telephone answering sets as a member of the audio facilities development group. He is a member of the American Association for the Advancement of Science, American Institute of Physics, Institute of Radio Engineers, Society of Motion Picture and Television Engineers, Sigma Xi and Phi Beta Kappa.