

Experience in transmitting accounting data

By J. F. Wilson

In the present context, the word “transmitting” is generally taken to refer to the transfer of signals, representing data, by electrical or electronic methods, but in order to cover the whole Bank of Scotland experience in the field it may be permissible to refer briefly to the origins of our transmission arrangements.

When we first decided, in 1958, to pioneer the introduction of automation to bank book-keeping in Britain, we were faced with the fact that no single one of our individual offices has a volume of transactions nearly sufficient to employ even the relatively modest punched-card equipment with which we intended to start. Consequently, the only way in which we could feed an automatic data-processing centre was by arranging for it to serve a group of our Branches, and this immediately raised the question of the transmission of input data from the Branches concerned to the central point.

It was of course simplest to start with a group of Edinburgh offices, none of which was more than 15 minutes’ walk from the data-processing unit, and at this stage our transmission was dealt with by physical delivery of the accounting media from Branches to the centre.

On that basis, we devised a system of centralized accounting and started operational working. However, we have 400 Branches scattered throughout Scotland, as well as six offices in London, and bank accounting involves a critical time problem because the Branch Manager must always have before him a report on each customer’s account, showing the position at the close of business on the previous day. Clearly, therefore, if we were to bring Branches which lie outside messenger-delivery distance from the accounting centre into the centralized scheme, while maintaining the standard of up-to-date status reporting which we accept as essential, something considerably faster than Her Majesty’s mail service was required.

Telex

It was at this stage that, in the course of discussion with the Telecommunications Department of the Post Office, there was brought to our notice the possibility of using the public Telex network for the automatic transmission of data, by encoding the data, as an “off-line” operation, into 5-channel perforated paper tape which can be read by the standard Telex automatic transmitter. The reasons for off-line tape preparation are probably obvious, including the opportunity to check the correctness of the tape before despatch, and economy in transmission time. The preparation of tape was first done

on teleprinters incorporating perforating devices, but we are now using, in most cases, adding or accounting machines which produce the tape as a by-product of a listing or proving operation.

At the central point, the Telex connection was terminated in a printing reperforator which produced a facsimile paper tape of the “chadless” type, permitting an interpretation of the data to be printed along the margin of the tape. This interpretation is, of course, of no value to the data-processing machines, but was considered helpful in facilitating handling of the tape by the operating staff.

There must be mentioned at this stage the very great interest shown and assistance provided to us, in embarking on automatic Telex transmission, by everyone with whom we came in contact in the Post Office Telecommunications Department, both in London and in Scotland. We were obviously concerned about the accuracy we could expect in transmissions and to check this, before the start of our operations, the Post Office conducted a test over the intended route by sending nearly half a million characters. During these test transmissions only four errors occurred, and we were more than satisfied that the system would meet our requirement.

The data we transmit consists of a series of entries to be recorded in customers’ accounts. These entries are either for amounts paid in to the accounts or for cheques drawn, and in each case show basically the account number and amount involved, but variations can occur in the exact form of entries, where, for example, a description of the item has to be inserted, or an intimation to the computer of an amount on which credit is to be deferred. Because of such variations, the number of characters required for transmitting an entry can vary from 15 up to 37, and we use the “Carriage Return” and “Line Feed” codings to indicate the end of each entry.

The route over which we commenced operational working of Telex transmission, in September 1959, was from Dunfermline, in Fife, to Edinburgh. This is a distance of some 16 miles, across the Firth of Forth.

From the start, most satisfactory results were obtained, the transmission speed being 400 characters per minute. In practical terms, this means that the whole day’s entries from the Branch concerned can be transmitted in about 20 minutes, although this period would probably be spread over at least three transmissions—one early in the forenoon containing the entries arising from the morning mail, one immediately after lunch with the start of the “over-the-counter” items, and the final

transmission as soon as possible after the doors are closed to customers for the day. Each tape sent consists of one or more batches of entries with a control total inserted at the end of each batch.

We have continued to use Telex for transmission, largely because production units of alternative systems are slow in coming forward, and offices in Aberdeen, Dundee and London are now using Telex for daily transmissions. The great advantages of the Telex equipment are the simplicity of operation, its very high degree of reliability, and the availability of servicing on a countrywide basis. In the case of Aberdeen and Dundee Telex connections already existed in the Branches, for communication purposes, and so only the addition of automatic transmitters was required to complete the tape transmission stations, but, whether the Branch staffs were previously familiar with Telex procedure or not, we found no difficulties arising in the operation of the equipment.

Faster systems

For our purposes, therefore, Telex transmission gave excellent results but, with an eye to the future, there seemed to be two compelling reasons for investigating later developments.

The first of these reasons was that we envisaged the development of our centralized system to include up to 50 Offices in the fairly near future, and this presented the problem of compressing the data reception from all transmitting points into the limited time available. Essentially, we must provide for a transmission from each point during a period of about two hours in the afternoon from, say, 3.30, when the first Branch might have its final batch ready, until 5.30, which we must normally regard as the latest hour at which a Branch could be expected to transmit. Obviously, if this development were to be achieved, we either had to multiply our Telex reception equipment or find a faster method of transmitting, and the former alternative seemed likely to involve waste of precious floor space, in addition to being rather cumbersome.

The second factor leading us away from Telex was the purely economic one that, where we do not already have a Telex connection at a Branch, the installation of one purely for tape transmission is quite expensive in annual rental. On the other hand, all our Offices have telephone lines, and if equipment for transmitting over the public telephone network became available we felt this might provide the right answer.

In July 1960, we had discussions with Ericsson Telephones Ltd., who were developing their Digital Data Link equipment with this precise requirement in view, and we agreed to carry out a prolonged field trial, using the Ericsson equipment and with full Post Office co-operation. The transmitter was set up in one of our Glasgow Offices which had already been sending data to Edinburgh by Telex, and after some initial testing we started to use it operationally in May 1961. It has been

in use, except for temporary fault periods, from that date up to the present, giving a speed of 25 characters per second, or four times that of Telex transmission.

The operation of the equipment is extremely simple. As STD is already in operation between Glasgow and Edinburgh, we have been fortunate in avoiding problems of operator interference. To transmit a tape the Glasgow operator dials the Edinburgh number, and when the call is answered each operator moves a selector switch from "Speech" to "Data." The tape is then read by a photoelectric reader in Glasgow, the signals transmitted over the line to Edinburgh and a facsimile tape produced there by a Creed Type 25 reperforator. Both input and output of this equipment consists of fully-punched 5-channel tape, and limited error-correction facilities are provided.

In parallel with our Ericsson trial, we became interested in the Automatic Telephone & Electric equipment, which is very fully described in another paper today* and we now have in operation a trial set of this type. The route on which it is employed is again Glasgow to Edinburgh, because of the large volume of data which is available from our Glasgow Offices, and the method of operation is similar.

In this case the speed is 75 characters per second, or 10 times the Telex rate. The equipment is similar to that used on the Commercial Union Assurance Company's trials, and incorporates error-detection and correction facilities.

The installation of the Automatic Telephone & Electric equipment was carried out extremely smoothly, and there have been very few snags in its operation. Because of the speed available, several offices are using the same transmitting point, and we have found some degree of variation in the efficiency with which tapes from the different Branches are transmitted. This seems to suggest either that the individual tape-producing machines are not working quite to the proper specifications or that the transmitter is not being properly handled by the operators from some of the Branches. The inconsistency is still under investigation, but it does seem clear to us that it arises from individual peculiarities, and the transmission equipment itself is behaving satisfactorily.

While both the sets of fast transmission equipment at present in use are provisional ones, the first production units are due in very shortly, and in the case of the Ericsson type the speed of the permanent equipment will be improved to 67 characters per second.

The greater speed obtainable by telephone line transmission has the slightly surprising effect of reducing running costs. Although the charges for telephone calls are about double those for Telex time, the increase in data-transmission speed means that little more than one-tenth of the call time is required, so that the final cost should be reduced to about a quarter of the equivalent Telex charges.

* The paper (by Mr. D. J. Dace) will be published in Vol. 6.—*Ed.*

Error rates

On the question of error rates and transmission accuracy, it is unfortunately impossible for us to quote exact figures. This is because our approach to the whole field of data processing has been rather less than scientific—our attitude has been that, when we saw a new development as a practical possibility, we ran a preliminary test, and if that proved satisfactory we immediately went over to operational working. We have had no reason to regret this policy, but it has meant, particularly in the data-transmission aspect, that our staff have had to be more concerned with putting the day's work through the system than with stopping to trace the source of each error. In elaboration of this, it should be explained that our first input process at the Centre incorporates a validity check on all data, and wherever an entry fails this check or a batch total fails to agree with the accumulated individual items, the procedure is to place the doubtful entry, or the difference figure, to a suspense account, advising details of the discrepancy to the Branch concerned for correction the following day. This checking system catches any transmission errors, but it also catches many errors made by the Branches in preparing tape, and in the pressure of operational working there just is not time to trace the source of each individual error. What we can say, however, is that, with both types of fast transmission equipment, if a fault develops it usually produces either a stoppage, or complete nonsense in the tape; so long as the equipment is *apparently* serviceable we are satisfied that the error rates involved are fractional compared with the human mistakes which we are obliged to accept as inevitable. So long, therefore, as we have to apply a validity check for these mistakes, it seems to us that any transmission errors are negligible by comparison and can readily be absorbed within the general procedure.

Two-way transmission

All the emphasis up to this point has been on transmission of data for accounting purposes *from* Branches

to the centre, because this is the direction in which speed is a critical factor. Although it is stepping slightly outside the data-transmission field, it may be helpful to mention that up till now all incoming tapes have been converted to punched cards for input to our computer, which is an IBM 1401, but we now have installed and connected to it a paper-tape reader and we hope that, within the next few weeks, we shall reach the stage of reading the tapes directly into the 1401. The actual processing work is carried out at the Computer Unit in the early evening and the output, in the form of a Status Report on all the moved accounts, is despatched to each Branch by mail. Normally, these lists reach the Offices by first post the following morning and no faster transmission is necessary, but in the exceptional case of the London Office concerned, where the list is not always received by first post, we do transmit back brief details of the updated figures. This is done by Telex, in the evening, usually after the Branch Staff have gone home, but the information is available to them immediately next morning. This is a case where high speed is not critical, but the automatic facility of the Telex receiver, which permits it to operate unattended, is ideal.

To come back, finally, to the main problem of transmission inward, I would say that our experience, taken as a whole, has been extremely satisfactory. The arrangements so far made are working well and we have every hope of rapid development in future. In this connection, one obvious improvement which may come would be the reception of data, at the central point, on magnetic tape instead of paper tape, but the additional cost of this facility might make it unacceptable in practice.

I hope that this outline of our experience has not been unduly laborious and that, in place of a documented report of trial results, you will accept the position that we now have six branches transmitting through four Telex stations, and seven offices using the two high-speed telephone-line systems, all operating day-in, day-out, and already treated by the people concerned as something no longer exceptional but simply as part of the routine procedure of the working day.

(For discussion see pp. 311/312)