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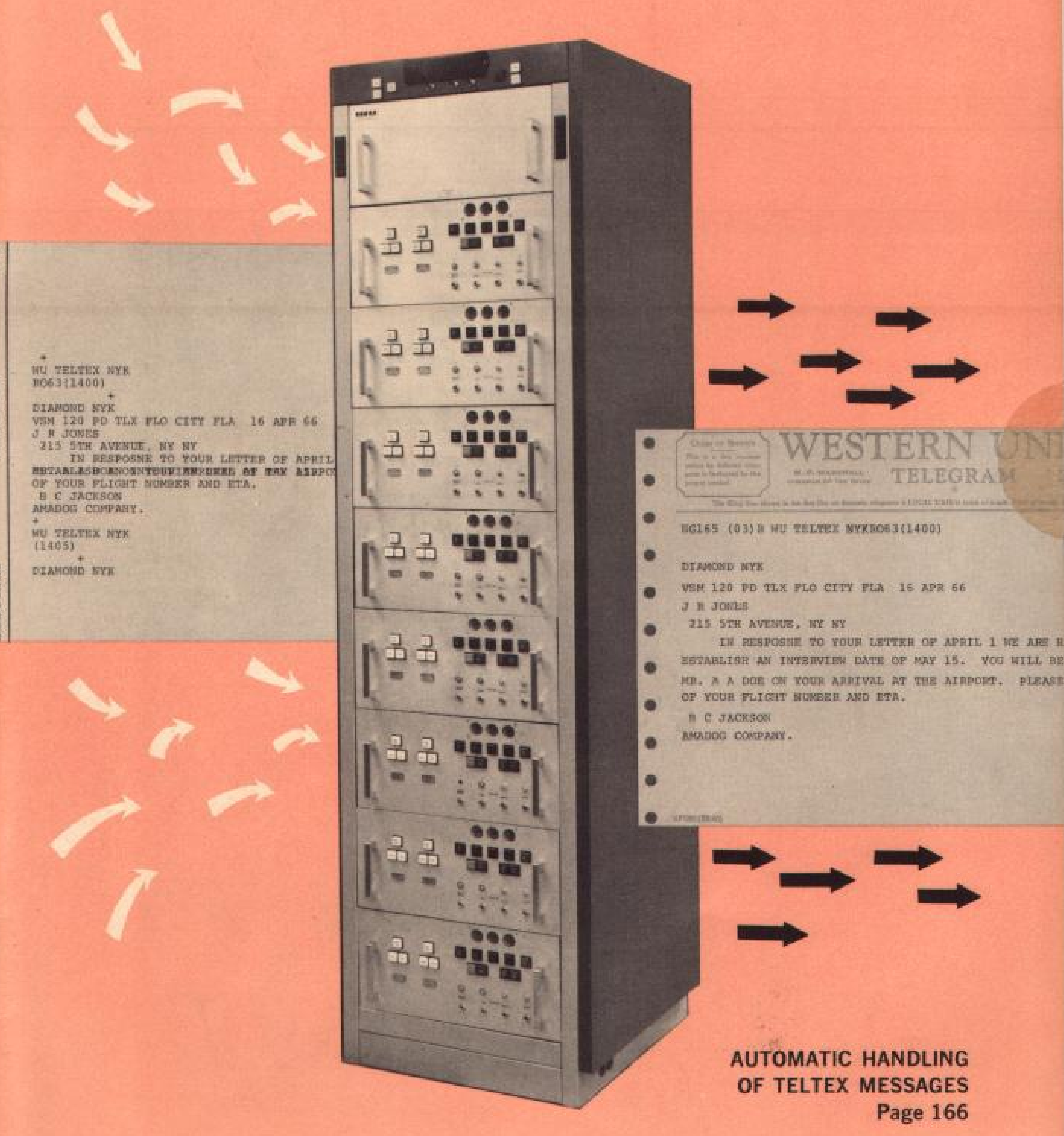

AUTOMATIC HANDLING OF TELTEX MESSAGES
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volume 20 number 4 october 1966

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Cover: Cabinet housing 8 Teltex Translators used to convert Teltex traffic to Public Message format.

Printed in U.S.A.

low speed outstation equipment

—Robert J. Ghiringhelli

Both high and low speed terminal devices may be connected to the General Services Administration Advanced Record System (GSA-ARS). However, at the present time the majority of stations in operation are low speed (up to 110 baud). Therefore, this article will concern itself only with the types of stations actually in use, and not the multiplicity of devices that can be employed.

Two types of outstations have been designed for the Advanced Record System (ARS); namely manual and automatic.

MANUAL OUTSTATIONS use one of the following types of terminal equipment:

28 ASR set-75 bauds (Baudot Code)

33 ASR&33 KSR sets-110 bauds (ASCII)

35 KSR set-110 bauds (ASCII Code)

The 33 KSR and 35 KSR sets are used primarily for "receiving only" positions (RO). The 28 ASR and the 33 ASR sets are equipped with a tape transmitter which permits operation of the set at the maximum speed.

The KSR set is not equipped with a tape transmitter. Therefore, transmission from this set is limited to the speed of the keyboard.

AUTOMATIC OUTSTATIONS are basically one type, the 35 ASR set-110 bauds (ASCII Code). This set is equipped with an automatic sending console which permits the station to have unattended sending from the tape transmitter.

Stations using the same code and speed may communicate directly via a Circuit Switch Network (CSN) connection. Stations with different terminal equipment and using different codes and speeds may only communicate by routing traffic through the Message Switching Center (MSC) where speed and code conversions are performed.

Both the manual and the automatic stations operate at a speed of 100 wpm.

Tie-In to CSN

Figure 1 illustrates the connection of an outstation of the District Office of the CSN.

The function of the Remote Control Unit and Polar Adaptor is the same as that in Telex outstations; i.e., motor control, monitor and interpret line signalling criteria, and relay of information to and from the teleprinter.

The operation of the station is half-duplex; i.e., send or receive, but not simultaneously. Each station is also equipped with low paper contacts to inhibit a connect condition from a station, when the paper supply in its page printer is low.

The Data Loop Transceiver or Type 70 Carrier Data Set transmits signals between the District Office (DO) and the outstation. If the outstation is located within 15 miles of the DO, the facility may use a Data Loop Transceiver. If the station is located more than 15 miles from the District Office, a Data Set is required.

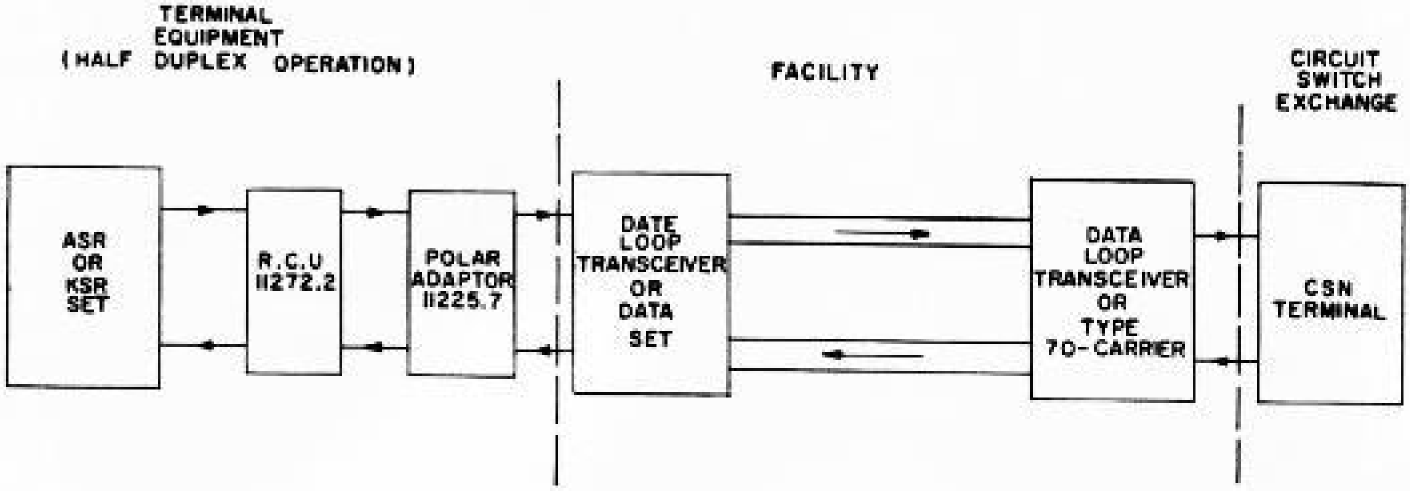

Figure 1. Interconnection of Outstation Terminal Equipment with CSN

How a Call Is Made

When the station is in the idle unconnected state, both the send and receive legs to the District Office are spacing. To initiate a call, the sending leg to the District Office is made marking. The District Office connects a register to the subscriber line which is initiating the call. This causes the leg sending to the station to also go marking. With both send and receive legs marking, the station is now placed in the connect mode. It now transmits the numeric directory call number of the station. These characters are received by the register and converted to a 2-out-of-5 code. The register proceeds to connect to the called party. If the called subscriber is available, a steady marking signal is sent to it. After 80 ms, the called subscriber recognizes this signal as an incoming call, its printer motor is turned on and a steady marking signal is returned on its send leg. The register then requests that the called subscriber station indentify itself. The register sends a FIGS D to a Baudot station or sends a WRU character to the ASCII stations.

Each outstation is equipped with an answer back device which consists of a coded drum and distributor. It may be triggered remotely by a specific character combination, (FIGS D or WRU). The drum of each outstation is coded to generate the call number of its own station in teleprinter code. Each station is also equipped with a non-contention feature to prevent its own answer back drum from being tripped when a request for an answer back is generated from its keyboard or Transmitter Distributor (TD).

The answer back of the called station is monitored by the register as it is transmitted back to the calling station. If the answer back does not compare with the call number sent in by the calling station, then the register transmits the characters, DER, followed by a steady spacing signal to that station. After 1300 ms, the station recognizes the spacing signal as a disconnect and returns steady spacing to the District Office. The printer motor of the station turns off and the station reverts to the idle state. If the answer back of the called station checks with that number in the register, then the register releases from the circuit, leaving the stations to engage in half-duplex communication.

To disconnect, either the calling or called station sends a continous spacing signal. After 1300 ms, the steady spacing signal is recognized as a disconnect and the connection is released; the send and receive legs of both stations are in a steady spacing condition.

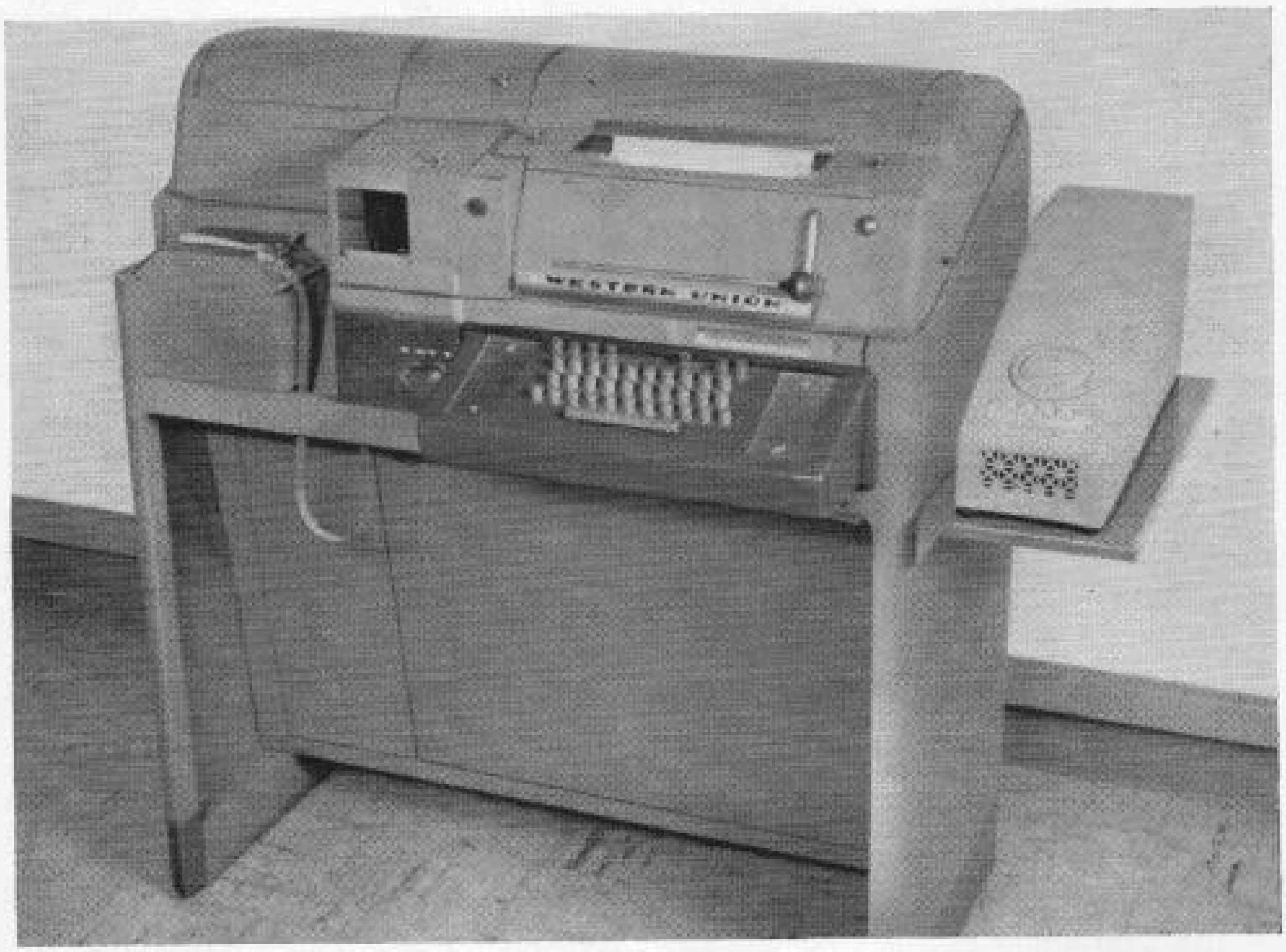

Figure 2. Model 28 ASR Set

28 ASR Outstation

In order to transmit a message from a Type 28 ASR outstation, shown in Figure 2, the operator depresses and holds the Request pushbutton on the Remote Control Unit (RCU). This activates the printer motors of the ASR set and causes the selector magnets of the printer to be blinded, thus preventing the printer mechanism from operating. With the Request button depressed, the leg sending to the District Office is marking, and thus requests a register in the District Office. When a register is connected, the steady marking signal is transmitted to the station placing it in the connect mode. The connect lamp on the RCU lights up. In the connect mode, the printer motors are maintained in the "on" state. The operator may now release the request push button and thus remove the blind from the printer. A Figs character is transmitted followed by the numeric directory call number of the called subscriber. The Figs character prepares ("preps") the register for the receipt of the call number. Any "Line Hits" or extraneous characters received before the Figs character are ignored.

The register then attempts to connect to the called subscriber. If the connection is successful, the operator will receive the answer back of the called party. If the party is busy or faulted, the register will return the characters OCC or DER respectively to the calling station, followed by a disconnect signal. With a disconnect signal, the printer motors turn off and the station reverts automatically to the idle mode.

With a connection established, half duplex transmission from either keyboard or tape transmitter is possible.

To terminate a call, the operator depresses and holds the Disconnect pushbutton on the Remote Control unit. This causes a steady spacing signal to be sent to the called station. After 1300 ms the steady spacing signal is interpreted as a disconnect signal by the distant station, and it returns steady spacing on its sending leg. Both stations now revert to their idle state.

33 ASR Outstation

The Type 33 ASR set, shown in Figure 3, is equipped with an automatic tape transmitter control circuit. A schematic of the Automatic Reader Control circuit, associated with this set, is shown in Figure 4. The tape transmitter switch has four positions; Start (momentary), Neutral (idle), Stop (momentary), and Free Wheel (lock).

In order to utilize the tape control feature of this set the operator, with the set in the LOCAL mode, prepares a punched tape in a prescribed format, consisting of a Prefix, the Message, and a Suffix.

The operator places the prepared tape in the transmitter. This action causes the "Tape-Out" contacts to close. He initiates a request for a register in the same manner as previously described for the Type 28 ASR operation. When the printer motor is turned on, power is applied to the T.D. control circuit. When the register attached signal, (the station goes into the connect mode) is received, the operator moves the T.D. switch momentarily to the "Start" position. This action causes the T.D. ON contact to close momentarily and operate the T.D. control relay. The relay locks by means of its own contact and the WRU and X-off stunt box contacts. A second set of relay

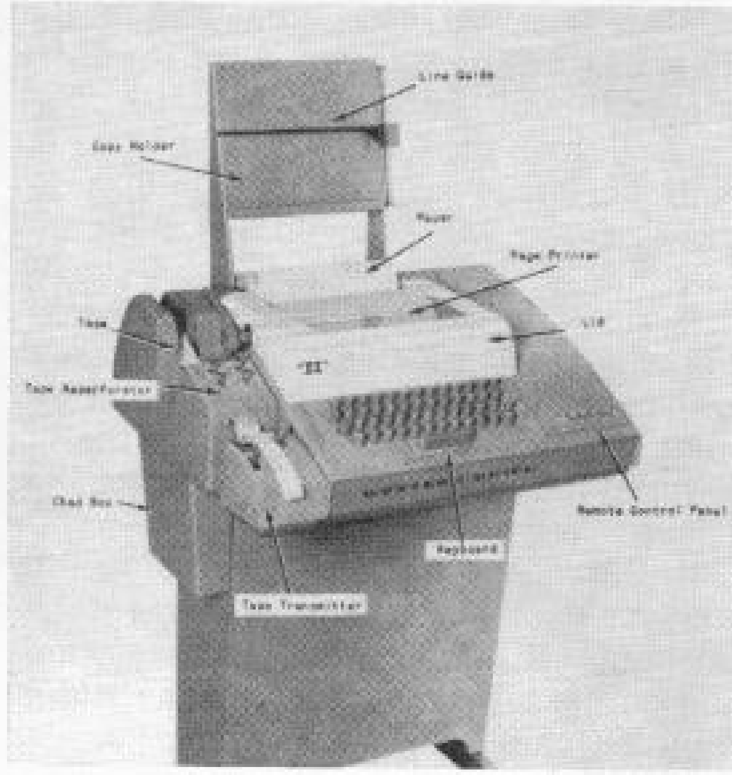

Figure 3. Model 33 ASR Set

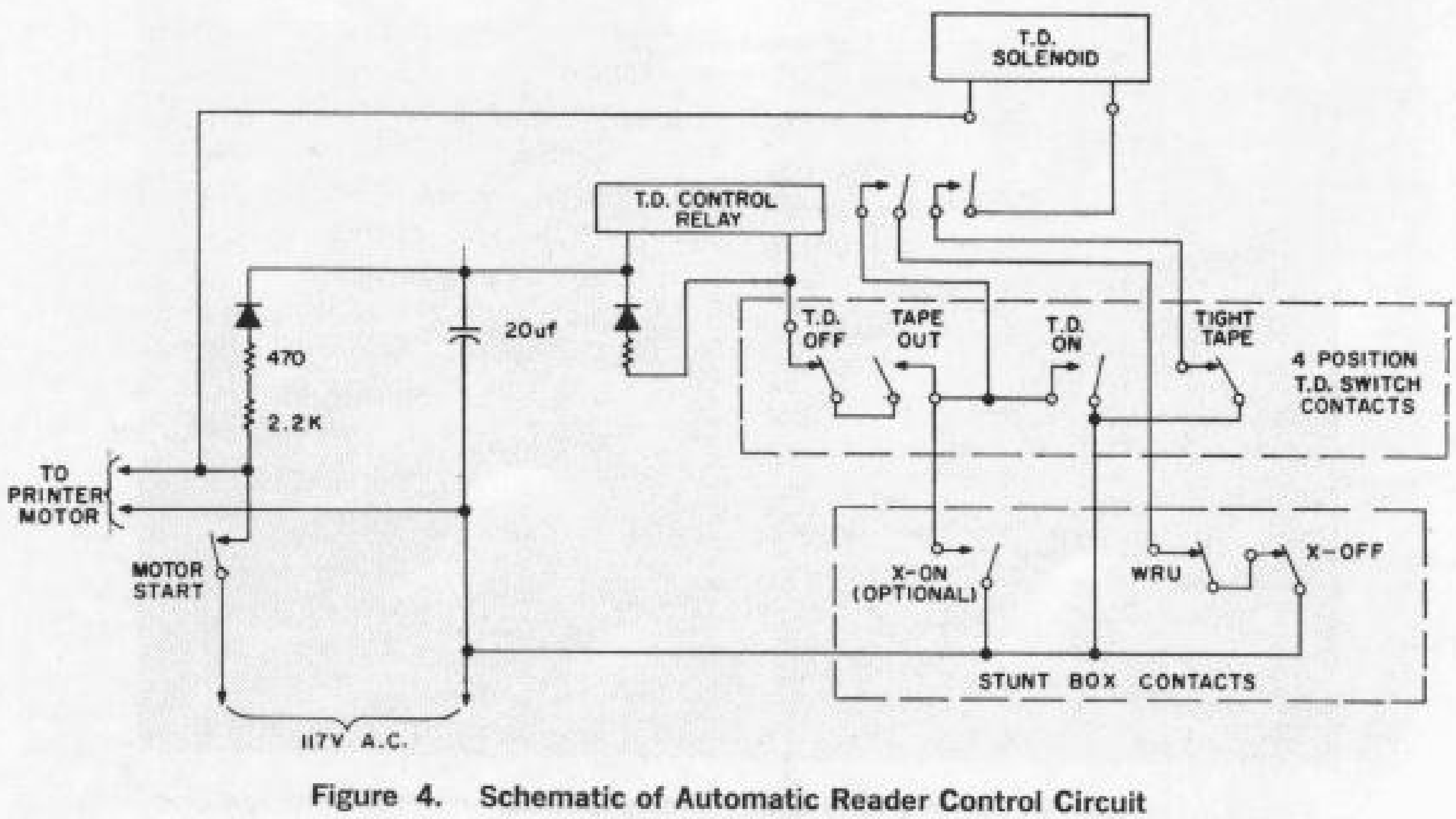

Figure 4. Schematic of Automatic Reader Control Circuit

contacts energizes the T.D. solenoid. With the solenoid operated, the characters (CR) (LF) [XXXXX (CR) (LF) (X OFF) (DEL) will be stepped through the T.D. and transmitted to the line. The left bracket ([) character "preps" the register to receive the call number in ASCII code form. When the character X-OFF is recorded on the local printer, the X-OFF stunt box contacts operate and break the lock circuit for the T.D. control relay, releasing it. This in turn de-energizes the T.D. solenoid and stops the T.D.

It should be noted that the Del character following the X-OFF character is sent to the line. This is due to the fact that the stunt box contacts operate during the interval of the following character transmission.

If the connection is successful, the operator re-starts the T.D. by momentarily closing the T.D. on contacts. The information on the tape is sent to the line and is recorded on a local page printer copy at the same time.

When the suffix of the message is transmitted, the operation of the X-OFF contact again de-energizes the T.D. control relay. The last character sent to the line is the WRU character. This causes the distant station's answer back to be tripped. After the answer back is received at the calling station, the operator may release the connection by depressing the disconnect button.

It will be noticed that a WRU (Who are You) character sent from this position will also stop the tape transmitter. This feature prevents "garbling" message transmission.

35 ASR Outstation

The Automatic Sending Console 11958-A is used with the Type 35 ASR set to provide automatic transmission of messages in punched paper tape form. Fig. 5 is a picture of this station.

The Automatic Sending Console consists of an equipment rack and a control panel. The control panel is mounted to the left of the 35 ASR keyboard and contains two pushbutton switches (ALARM-RESET & AUTO-ON) and a Tape Alarm lamp. The equipment rack is mounted within the pedestal of the ASR set. It comprises two rows of printed circuit cards, a relay shelf and a power supply.

The Transmitter Distributor used in the 35 ASR is a LBXD 800. This unit permits individual control of the transmitter and distributor. The sensing shaft and distribution shaft are separately controlled by their own magnets.

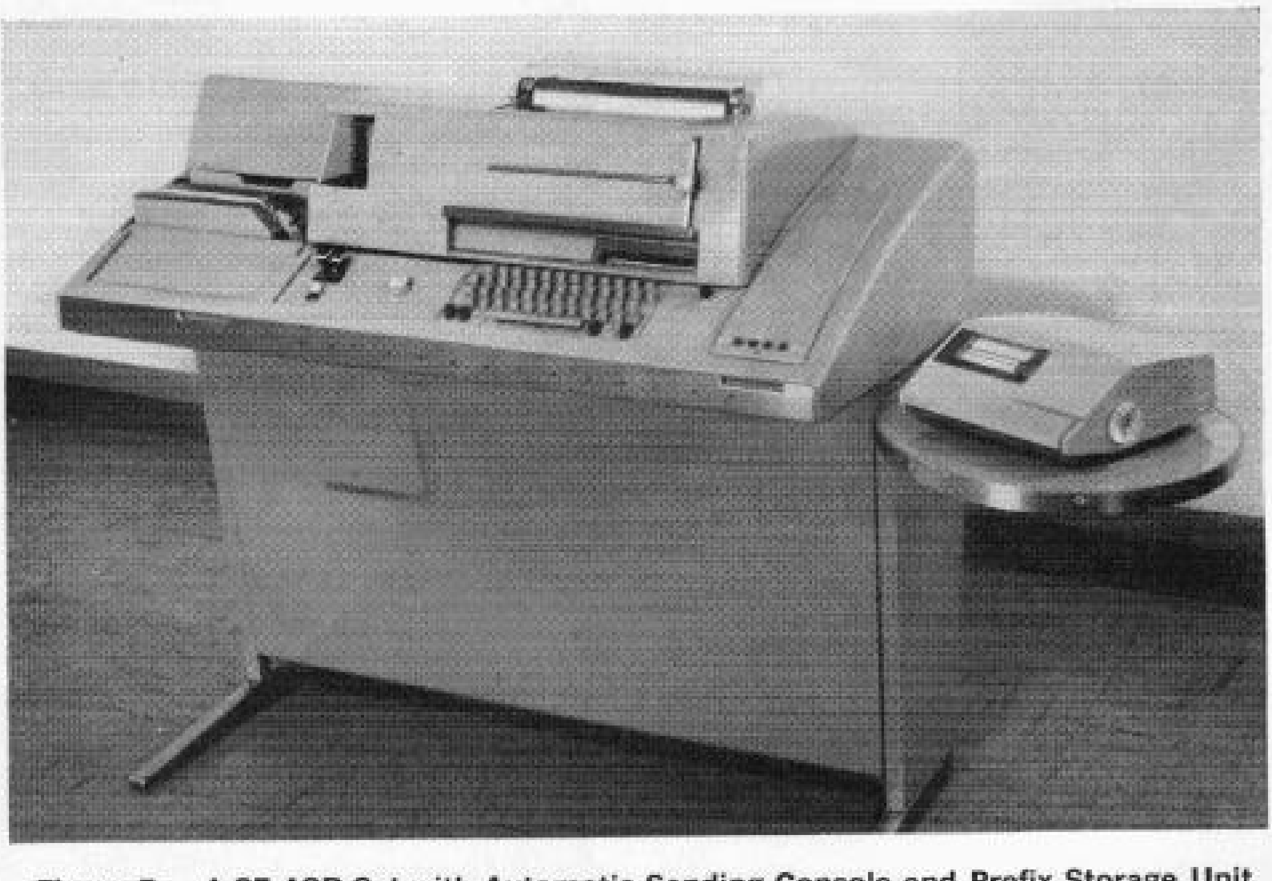

Figure 5. A 35 ASR Set with Automatic Sending Console and Prefix Storage Unit

Message Format

In order to transmit messages from the Automatic Sending Position in the automatic mode, a format is applied to each message. At the time the message is being "punched" a prefix and suffix is added. The prefix consists of the call numbers of the subscriber and certain function characters. The suffix consists of the X-OFF and WRU characters. A typical format is shown in Figure 6.

character Carriage Return (CR) at the end of the call number signifies that no more attempts to establish a connection will be made. The function characters (CR, LF) are used to separate the dialing information from the message on the home or page printer copy.

The X-OFF character is used only in the manual outstations and is not required for the automatic sending position. It is only included here to indicate that the same

```
                                              FIRST TRY
                                              SECOND TRY
                                              THIRD TRY
                                              END OF TRIES
PREFIX

      DEL...(CR)(LF)[01234(SP) [01234(SP)  [01234 CR CR LF X-OFF

START OF CALL
CALL NO.
END OF CALL NO.


MESSAGE

      MESSAGE HEADER
      TEXT ADDRESSEES
      MESSAGE TEXT
      END OF MESSAGE

SUFFIX

      (X-OFF)(WRU)
```

Figure 6. Message Format

In the Prefix, the DELETE (DEL) character is repeated as many times as necessary. The Left Bracket ([) character indicates the start of the call number. It is followed by the 1st try of the call number (01234) of the subscriber to whom the message is being sent. The character space (SP) signifies the end of the call number. Three attempts to effect a connect to the called subscriber are allotted for each message. Additional "Tries" may be inserted without affecting the stations operation. The format may be used for automatic as well as manual outstations.

In the Message portion of the format, the header, addresses text, and end of message are next punched in the tape.

The Suffix signifies that the message transmission is completed. The X-OFF character is used for transmitter control in the manually operated outstations only. For outstations using the Automatic Sending Console, the (WRU) character indicates the end of the message.

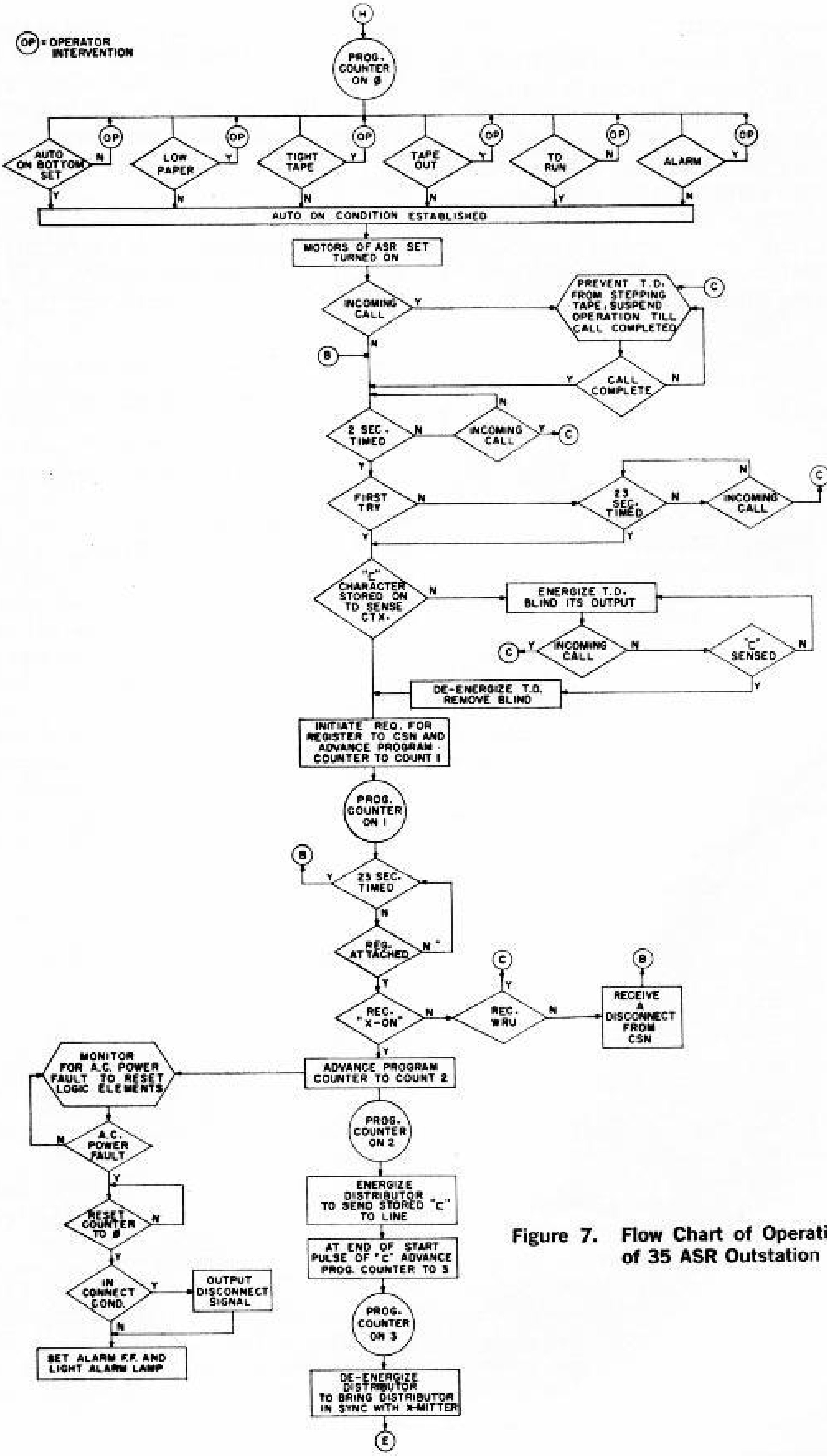

Figure 7. Flow Chart of Operation of 35 ASR Outstation

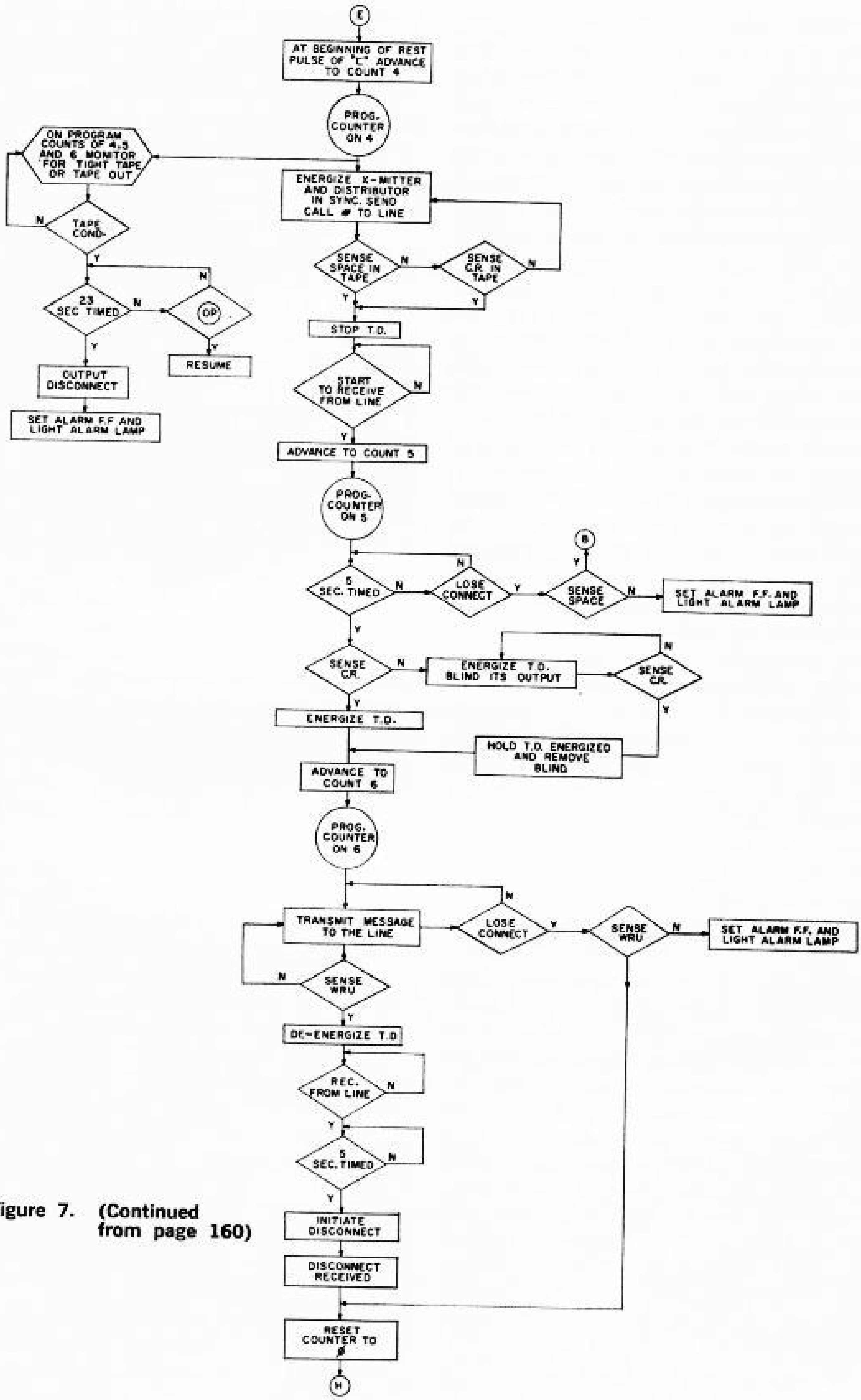

Figure 7. (Continued from page 160)

Operation

Figure 7 is a flow chart of the operation of the 35 ASR Outstation. This flow chart traces the functions and options performed with alarm features as protection against abnormal operations. The operation of the unit is divided into six main groups of functions or program counts.

The idle condition of the Automatic Sending Console ASC occurs on program count 0. To send taped messages automatically, the tape is placed in the tape transmitter and the transmitter switch is placed in the "run" position. The mode switch of the ASR set is placed on the "K" or "T" position. When the "AUTO ON" button on the control panel is depressed, it locks in the down position and the AUTO ON (AO) lamp lights. With no tight tape, no tape out, no low paper or other alarm conditions existing, the "AUTO ON" condition is established, as shown in Figure 7. This signifies that the ASC is ready for transmission and the ASR set is turned on.

A 2-second timer is then started. Any incoming call received during this interval will stop the timer, and prevent the tape transmitter clutch magnet from being energized until the call is disconnected. If no incoming call is received, after 2 seconds, a check is made to determine if this is the first attempt to route this message. If this is the first try, the Tape Step Clutch Magnet is energized to step the tape until the character left bracket ([) is sensed, while holding the T.D. output blinded.

If the check shows that this is not a first try, a 23-sec. timer starts timing. An incoming call made within this time, will interrupt the sequence of operation, and the position will revert to a "hold" mode. The 2-sec. timer will reset and start timing again when the call is disconnected. If no incoming call is received when the 23-sec. timer times out, the output of the distributor si blinded and the tape is stepped until the Left Bracket ([) character is sensed. The tape is stopped when this character is read and a request for a register is generated to the exchange. At the same time the program counter is shifted from 0 to 1.

On program count 1, the 2-second timer is reset, and the 23-sec. timer begins to time out until a connect signal is received from the exchange. If no connect signal (register attached) is received within 23 seconds, the program count resets to count 0 and the operation is repeated. Any noise hit (momentary ac power failure) at this time activitates an alarm condition which stops all further processing until the alarm is manually reset. When the connect signal is received, a distinction must be made as to whether the signal received was sent by the register requested, or from a register about to connect an incoming call (head-on collision). An incoming call is recognized by receiving a (WRU) character after the connect signal. Connection to a register for an outgoing call is verified by receiving an X-ON character after the connect signal. If the call is incoming, the program count is returned to count 0, to start processing the call again when the incoming call is completed.

The receipt of the connect signal is stored by means of a Flip-Flop. From this point in the program, monitor circuits are activated for the power supply. Should a noise hit occur and should the program counter be shifted erroneously to count 0, a disconnect signal is sent to the line. When the disconnect signal is received from the called party, the positioned is "alarmed."

When the X-On character is received, the program counter is advanced to count 2. The distributor clutch magnet (DCM) is energized and the character Left Bracket ([) is transmitted to the DO register and printed on the local page printer. The end of the start pulse of the Left Bracket character is used to advance the program counter to 3. During count 3, the DCM is de-energized. It is to be noted that count 2 is only used to provide a pulse to start the distributor moving from its Rest position. It is not necessary to keep the DCM energized for the length of the transmitted character, but only to move it off the reset position. Mechanical action will keep it rotating for one character.

From this point in the program, a tight tape or tape-out condition will cause the Tape Lamp on the control panel to light. With this condition, the 23-sec. timer is started, and the tape transmitter is prevented from operating. If the tape condition is not corrected within 23-sec., the call is disconnected and the alarm lamp is lit, signifying an alarm condition. The console is held in this condition until the alarm is cleared by the reset button on the control panel.

At the beginning of the rest pulse, of the Left Bracket ([) character transmission, the T.D. Auxiliary C contacts, open and advance the program count to count 4.

On count 4, the transmitter and distributor are energized in synchronism; the call number is sent to the register for routing, and it is also recorded on the page printer. At the end of the call number, either a Space or Carriage Return character is read by the sensing pins. When either of these two characters is "sensed," the Tape Sense Clutch Magnet (TSCM) is de-energized, stopping the tape transmitter and distributor. The program count is halted at this point until the answer back from the called station is received.

The receiving leg is monitored for the start of reception of the distant stations answer back. With the reception of the first character of the answer back, the program counter is advanced to count 5.

On count 5, a 5-second timer is started. This delay allows for the complete reception of the called station's answer back. If a disconnect signal should be received during the 5-sec. interval, the timer is reset and the tape sensing contacts are "read." If a Space character is "read," the program count is shifted to count 0 and the operation is repeated.

If a Space character is not "read," the Alarm Flip-Flop is set producing an alarm condition. The console is turned off until the alarm is manually reset.

If the connection is still intact after the 5-sec. delay, the output of the distributor is blinded, and the Tape Step Clutch Magnet is energized. The remaining "Tries" in the prefix are idled through the tape reader without being transmitted to the line. When the Carriage Return character after the last try is sensed in the T.D., a Flip-Flop is set. If the Carriage Return character is sensed during program count 4 at the end of the call number, the Flip-Flop has already been set. This signifies the end of the call number.

With Carriage Return Flip-Flop set, the operation of the T.D. Auxiliary C contacts, during the rest pulse, advances the program counter to count 6. The output of the distributor is unblinded and the message header, text addresses, message text and end-of-message are sent to the line and the local page printer.

When the WRU character is sensed in the T.D., the TSCM is de-energized, stopping the tape. Again the program operations are suspended until the answer back of the called station is returned to the Automatic Sending position. The disconnect procedure is started on the first character of the answer-back by starting the 5-sec. timer. This allows sufficient time for the complete reception of the distant stations answer back, and the answer back unit to come to rest. After the 5-sec. interval, a disconnect signal is sent on the line to the called station. The automatic console monitors for the reception of a disconnect signal before resetting the program counter to count 0. The unit is now restored to the idle condition unless there is tape in the T.D. If tape still remains in the T.D. then the cycle will be repeated.

If a disconnect signal is received, and a WRU character is not read in the tape, the alarm Flip-Flop is set indicating an alarm condition. The position will then turn off and stop transmitting the tape.

Whenever a fault condition occurs, the alarm Flip-Flop is set, the alarm lamp, within the base of the "Alarm Reset" pushbutton switch lights to give a visual indication, the motors of the ASR set are turned off, and the program counter is held on count 0. The AUTO ON condition is also blocked, thus preventing further operation in the automatic mode, until the alarm condition is manually reset by the operator.

For each message transmitted a local page printer copy is obtained. The copy includes the prefix, the called party's answer back, the message header, text addresses, message text, end-of-message and a confirming answer back.

Prefix Storage Unit

The Prefix Storage Unit, shown in Figure 8, is a magnetic tape device, which is used to store information in teleprinter code and generate this information on command. This unit is supplied as an option with the Automatic Sending Console. It is used to store addressing information, to facilitate the operator in the preparation of punched tapes for use in the automatic mode.

The unit consists of two tapes which are indexed in unison. One is a magnetic recording tape. The second is a mylar tape. The mylar tape serves as a visual record of what is recorded on the magnetic tape.

The magnetic tape is approximately 5 inches wide. Information is stored by mechanically moving a magnetic head horizontally across the width of the tape, while electrically driving the head with the output of a transmitter distributor. The teleprinter code is recorded serially across the width of the magnetic tape. The tape has 400 horizontal recording positions.

To obtain a read-out, the magnetic tape is positioned to the desired horizontal line and the read-out bar is depressed. This causes the magnetic head to be driven horizontally across the tape. The information stored on that particular line causes a voltage to be induced in the magnetic head. This voltage is amplified and drives a mercury reed polar relay. The contacts of the relay drive a local teleprinter circuit. A "read-out" may be made as often as desired without destroying the stored information.

The horizontal travel time of the head is fixed at approximately 8 seconds and is the limiting factor on how many characters may be recorded on a recording position. If the recording is made from a 100 wpm transmitter, a maximum of 80 characters may be recorded. If the recording is made from a 67 wpm, a maximum of 53 characters may be recorded.

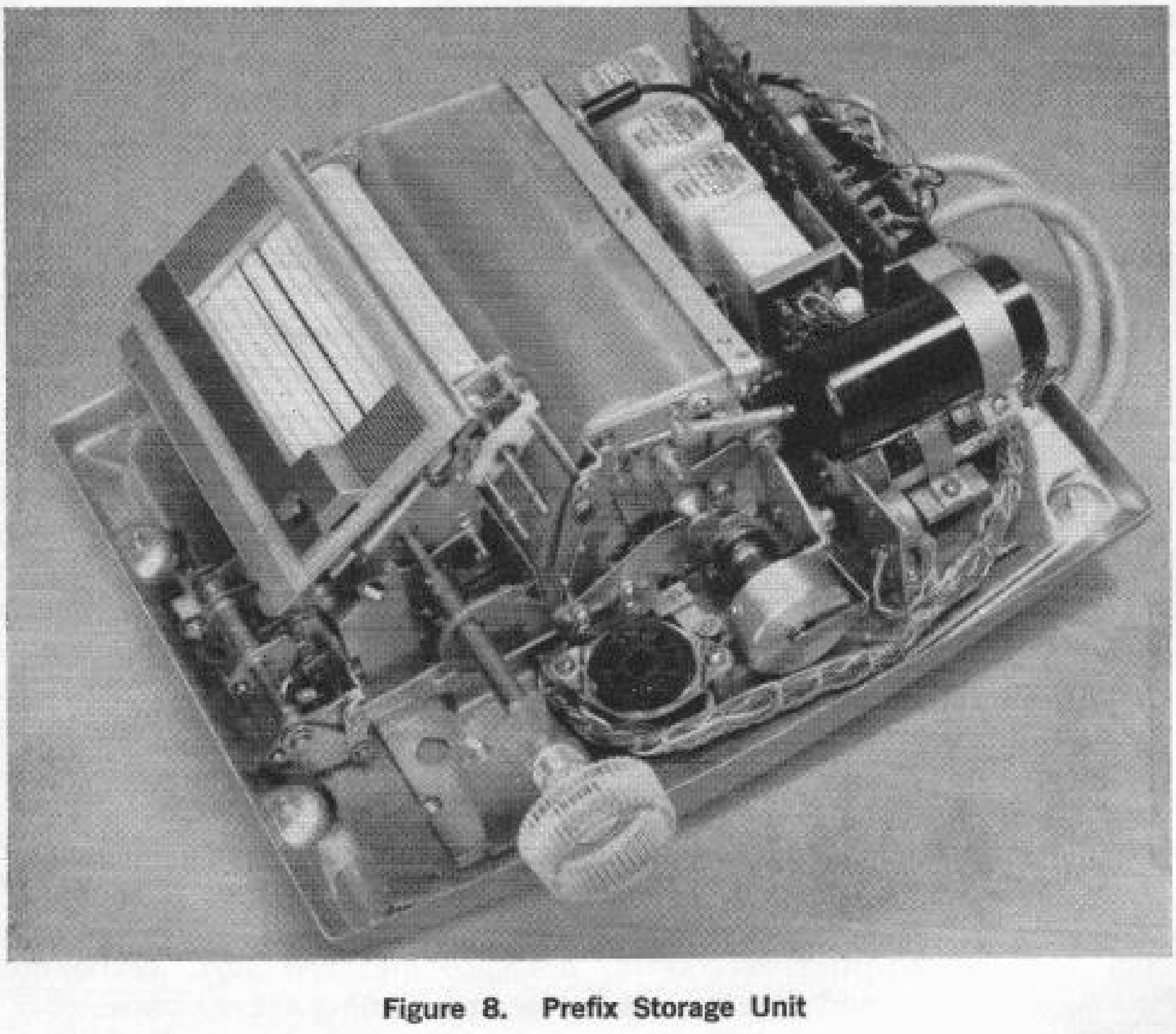

Figure 8. Prefix Storage Unit

Conclusion

Use of the prefix storage unit and automatic sending console represent the first time that an automated station has been used in a Circuit Switch Network configuration. Prior to this time, transmission in the Circuit Switch Networks depended on attended service. That is, the station had to be manually supervised by an operator.

This versatile outstation permits complete unattended service in transmission of messages from an outstation.

Acknowledgements

The author wishes to acknowledge the contributions of Mr. J. Chin who assisted in the design of the Automatic Sending Position and Mr. F. R. Firth for his contributions in the design of the manual stations.

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Editor's Note: This manuscript was submitted in March 1966 but publication was delayed because of the special Telex Issue published in July 1966.

ROBERT J. GHIRINGHELLI, Senior Systems Engineer in the Information Systems and Services Department is concerned with the Systems Engineering of the Information Services Computer System.

When he joined Western Union in 1957, he was assigned to the Telex program. He co-ordinated the installation, testing, cut-over and engineering revisions of the prototype Telex exchanges in New York, Chicago, San Francisco and Los Angeles. In 1960, as part of the Telex Engineering Department Mr. Ghiringhelli was involved in the design of certain adjunct features for the Telex System. In June 1965, Mr. Ghiringhelli became a member of the Systems Engineering group of the I.S. & S. Department.

Mr. Ghiringhelli received his degree in Electrical Engineering from Manhattan College in 1957. He is a member of the Institute of Electrical and Electronics Engineers. He holds one issued patent and several pending applications.

automatic handling of teltex messages

—Roy K. Lewis

Since Western Union began offering Telex service, the number of subscribers has rapidly increased. The ease of operation of Telex subscriber equipment, plus the permanent record which this service offers, has great appeal to modern business.

Teltex Service

Western Union inaugurated its Teltex service to enable our Telex subscribers to communicate with those subscribers who were not yet a part of the Telex network. This service allows a Telex subscriber to dial a special number which connects him to the Western Union office nearest the person he wishes to contact. The Telex subscriber sends his message to Western Union, and Western Union delivers this message via our Public Message Service to the addressee.

The Teltex receiving positions in the Western Union office are page printers. The message is received in duplicate, one copy to be processed for delivery to the addressee, the second copy to be returned to the originator. Because many of these messages must be relayed to branch offices for subsequent delivery to the addressee, a great percentage of them must be manually reperforated before they can be sent over Western Union's Public Message network. For example, a message intended for a Bronx, N. Y. addressee will be received on a page printer at the Western Union's main office in Manhattan. The message is manually repunched and transmitted over the Public Message System (Switching System 38) to the nearest branch office for delivery.

Because of the appeal of this service and the expansion of the Telex network the volume of Teltex messages has grown considerably over the past few years. Hence, there was a great need for an automatic means of placing a Teltex message into the Public Message System (PMS) format.

PMS Format

Several problems had to be overcome to make the formats compatible. First, PMS format requires that each message contain a number. This is needed to prevent the loss of a message, and for easy referral in case a question arises as to the text of a message. Second, many Telex subscribers end each line with two sequential carriage return characters. Since the PMS equipment recognizes a 2CR (carriage return) sequence as an end of message, the Teltex message has to be scanned to eliminate these extra CR's. Third, the dollar sign, upper case F in Telex, had to be translated to upper case D, which is used as a dollar sign in PMS. Fourth, the PMS end of message sequence (2CR's) must be inserted at the proper location in the message. A fifth consideration is the need for sending more than one message on a single connection to a Teltex receiving position. A sixth and most important problem is the lack of consistency among operators; i.e., once a connection has been made to a Tel(t)ex receiving position the operators do not always follow the specific message format as outlined in the Telex directory concerning Teltex messages. The most serious of these inconsistencies is the "disconnect." The customer may just send his message and disconnect, or he may send his messages, exchange answer-backs, then disconnect.

On-Line Translator

As a result of the careful study of these problems, the Teltex On-Line Translator, shown in Figure 1, has evolved. This solid-state translator is directly connected to the Telex exchange. The customer, on dialing the specific Teltex number, connects directly to the Translator.

The Translator consists of three primary sections, a receiving distributor section, a read-and-transfer section, and a sending distributor section. Thus, every character sent by the subscriber is received by an electronic distributor and stored. The character is read to determine if it should be: a) translated to another character (such as the dollar sign conversion), or b) completely deleted, or c) sent on with no changes. As soon as a character has been read and transferred it is sent out by the sending distributor.

The output of the Teltex On-Line Translator is normally connected to a reperforator which prepares a punched tape of the message. The output tape format is fully compatible with Western Union's PMS equipment, such as Switching Systems Plan 20, 21, 34, 36, 38 and can be swiched with no manual conversion.

When the subscriber connects to the automatic Teltex equipment, one restriction is placed on him. He must begin his transmission with an exchange of answer-backs, i.e., he must begin with FIGURES SHIFT, D. If he does not, he will be automatically disconnected. The reason for this is that, during transmission of the receiving position answer-back, a message number and the time of connection is inserted in the tape. These insertions are used for message control purposes. After sending this initial Figures Shift, D, the subscriber can send anything he wishes. Dollar signs are converted from the Telex pulse combination to the PMS pulse combination and excess Carriage Return, Letters and Line Feed characters are suppressed. The excess CR characters are suppressed to prevent a false disconnect as explained under PMS format. The excess Line Feed and Letters characters are eliminated because they do not perform a useful function, and take up unnecessary line time during retransmission of the message. If the subscriber ends his message and disconnects without exchanging answer-backs, the Translator will busy itself from the exchange and generate a 2CR sequence in the tape to signify a completed message. If the subscriber sends an exchange of answer-backs at the end of his message, the Translator, while sending its self-contained answer-back to the subscriber, will send a 2CR sequence into the reperforator.

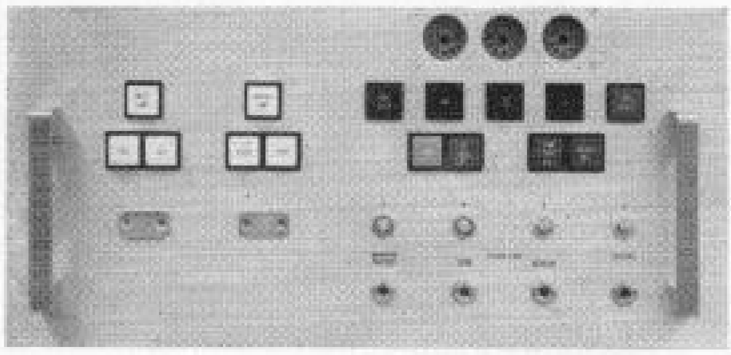


Figure 1. Front Panel of the On-Line Translator Showing Indicator Lamps

Multiple Messages

Should the subscriber desire to send more than one message on a single connection this can be done in two ways. If an ASR set is used by the subscriber he will probably elect to prepunch his messages off-line before establishing the Teltex connection. In this case, each message should be ended with a 4N sequence. The On-Line Translator will recognize this and put 2CR's in the punched tape between messages. Since we cannot stop the tape to insert message numbers on the second and subsequent messages, the subscriber is requested to put his own "Here Is" sequence in the tape at the beginning of the second and subsequent messages. This will facilitate inquiries. The second way of transmitting multiple messages on a single connection (using manual transmission) is to end the first one with an exchange of answer-backs. This causes the translator to put a 2CR sequence in the tape. The second message must be prefixed by another exchange of answer-backs. In this case the second message will be prefixed with a message number.

Special Features of the Translator

Special features of the On-Line Translator include:

- An output for a Monitor Page Printer which copies exactly what the subscriber sees on his printer. This copy can be used for billing purposes.
- An open-line stop feature to prevent drop-in characters in the perforated tape during the Disconnect.
- A Regenerative Repeater. Because of the separate receiving and sending distributors, the On-Line Translator can accept up to 40 percent signal bias and distortion, and will send perfect signals into the reperforator.
- A special receive-only Remote Control Unit to interface the Translator with the Telex Exchange. This unit consists of a mercury contact polar relay and a switching relay.
- A codable plug for easily setting up the city and channel designators of the Translator.
- Switches which allow for omitting the number on all messages, omitting the time insertion, manual disconnecting the customer, manual resetting or stepping of the numbering machine, and circuit close-out.
- Internal plug-in modules for rapid maintenance and repair.
- Each translator is individually fused and has its own loss of power alarm mechanism.

Time Storage Unit

The rack, shown in Figure 2 is used to house the On-Line Translator. It can accommodate up to eight separate Translators. The rack also houses the time storage unit. This unit, driven by a 60 cycle ac source, indicates the time in a 24-hour clock form, thus eliminating the need for AM and PM designations. The time digits change every 60 seconds. The 4-digit output of the clock is fed into all eight translator positions to allow their independent transmission of the time. If required, the time can be disconnected without impairing the operation of the On-Line Translator. The time storage unit also has a loss of power alarm.

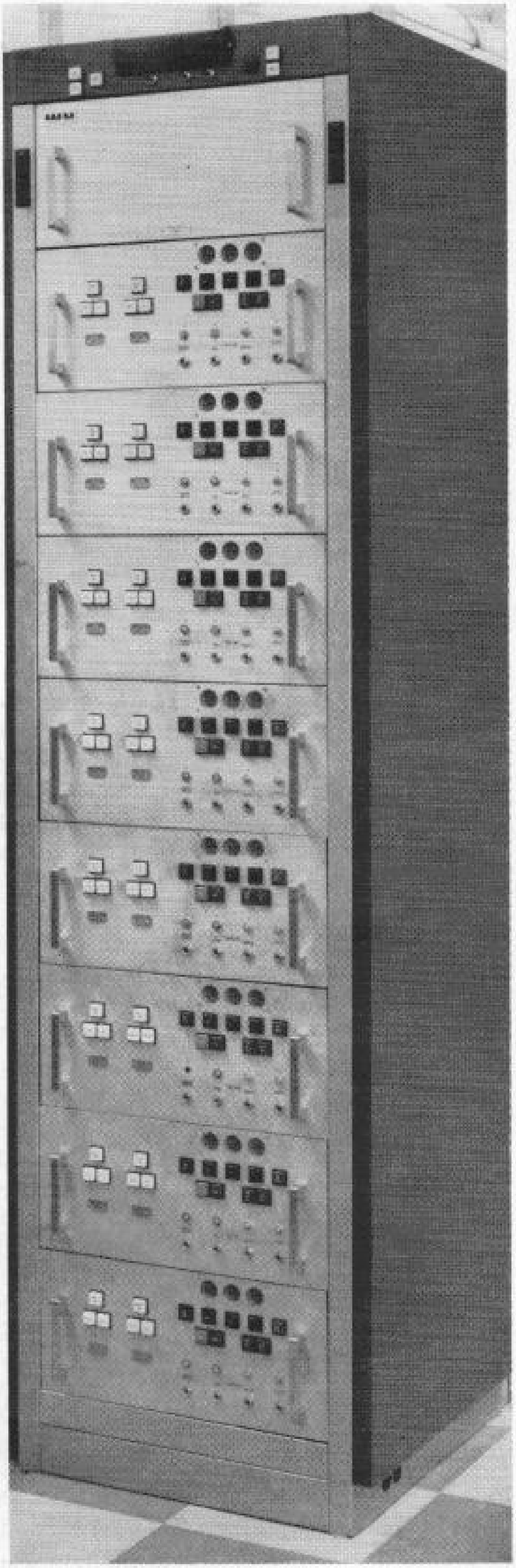


Figure 2. Eight On-Line Translators Installed in One Rack

Burster Format Converter

In terminal offices such as those using Switching Systems 34, 36 or 38, all messages have been placed in a form which allows them to be received on Western Union's Burster Printer. This means that each message must contain at least 22 lines—16 lines of text and 6 lines to step over the masthead of the next message blank. As an example, should a message contain only 4 lines of text, automatic equipment will "fill-in" the missing 18 line-feed characters to complete a complement of 22. Further, if the message contains over 16 lines of text, the automatic equipment must recognize this and insert enough line-feeds after 16 to step over the masthead of the second blank before resuming message transmission. It must then fill-in the complement of 22 lines on the last blank of the message.

Since the On-Line Translator was designed to work into any PMS office configuration, the burster format conversion equipment is not included as part of this unit. Therefore a second piece of equipment was developed for this purpose.

The Burster Format Converter is associated with the transmitting equipment of any terminal office. Like the On-Line translator, the Burster Format Converter comprises three sections: a receiving distributor, a sending distributor and a unit which reads the characters and, when necessary, inserts line feed characters. When a character is received at the receiving distributor, it is checked to see if it is a CR character. If it is not, it is immediately transferred to the sending distributor section where it is transmitted to the line. On seeing a Carriage Return character, the Burster Format Converter first checks to see what character follows the CR. If it is a Line Feed, the Converter counts it, and allows transmission to continue. On the 16th line-feed of the message, transmission is stopped and line-feed characters are generated to step over the masthead of the next Burster Printer message blank. Then, message transmission is resumed and the line-feed count is begun again. If a second CR character follows the first CR character, the sending transmitter is stopped and sufficient line-feeds are generated to complement a 22 line-blank.

Following the line-feed generator, after the two CR's, a Letters character is generated by the Converter. This Letters character is necessary to clear the Form Feed Burster printers which may be receiving the output of the Converter. When used with Switching System 38, the Converter will break the cross office connection after transmitting the final Letters character.

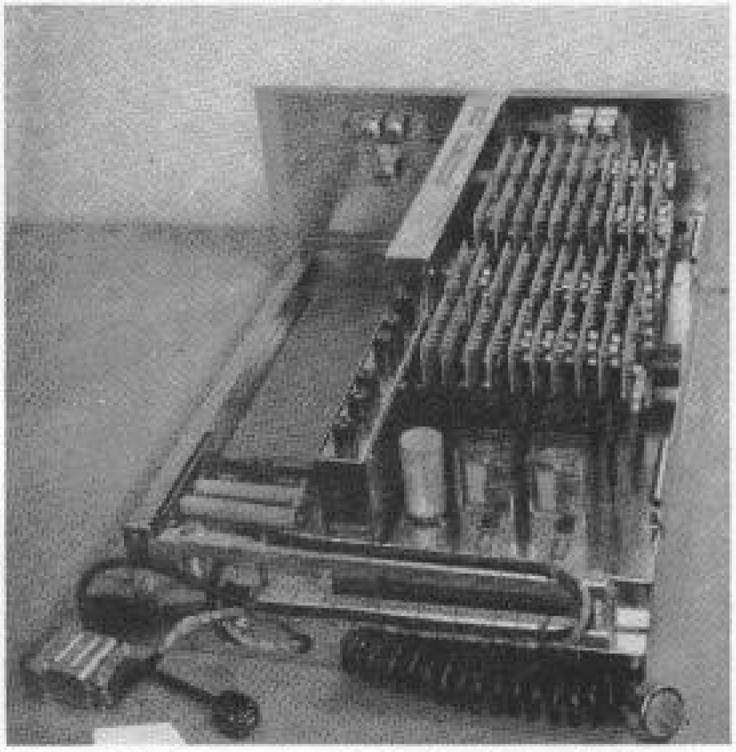


Figure 3. Rear view of the Interior of a Burster Format Converter Shelf

Figure 3 shows the interior of a Burster Format Converter shelf with logic cards and control relays mounted in the right half. A second unit may be mounted in the open left side of the shelf.

The front panel of a shelf housing two units is shown in Figure 4.

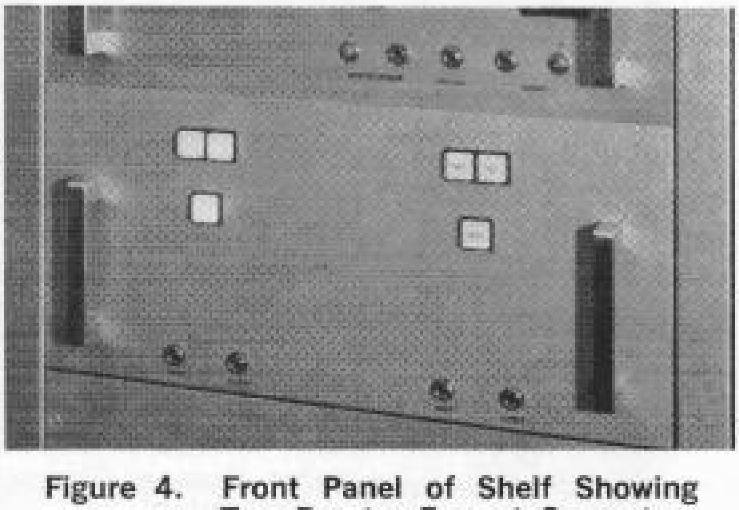
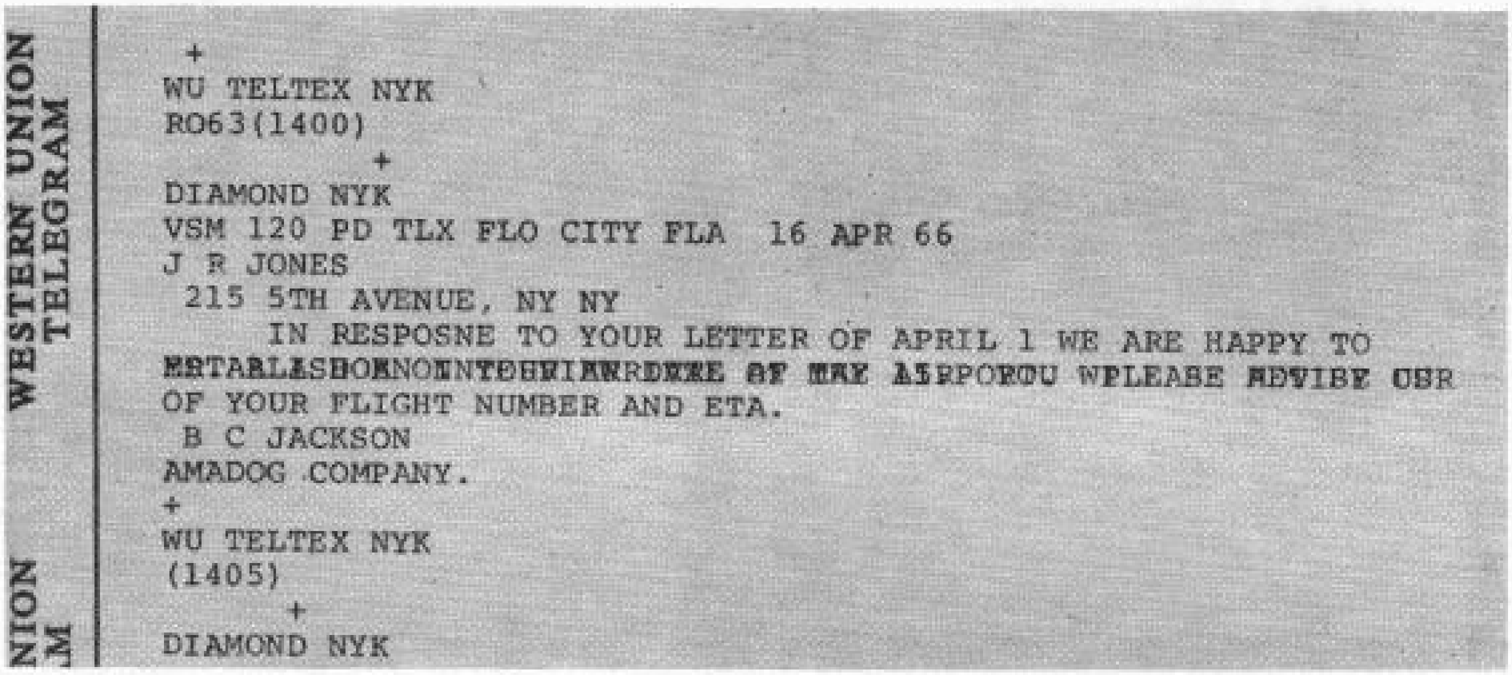


Figure 4. Front Panel of Shelf Showing Two Burster Format Converters

Special Features of the Converter

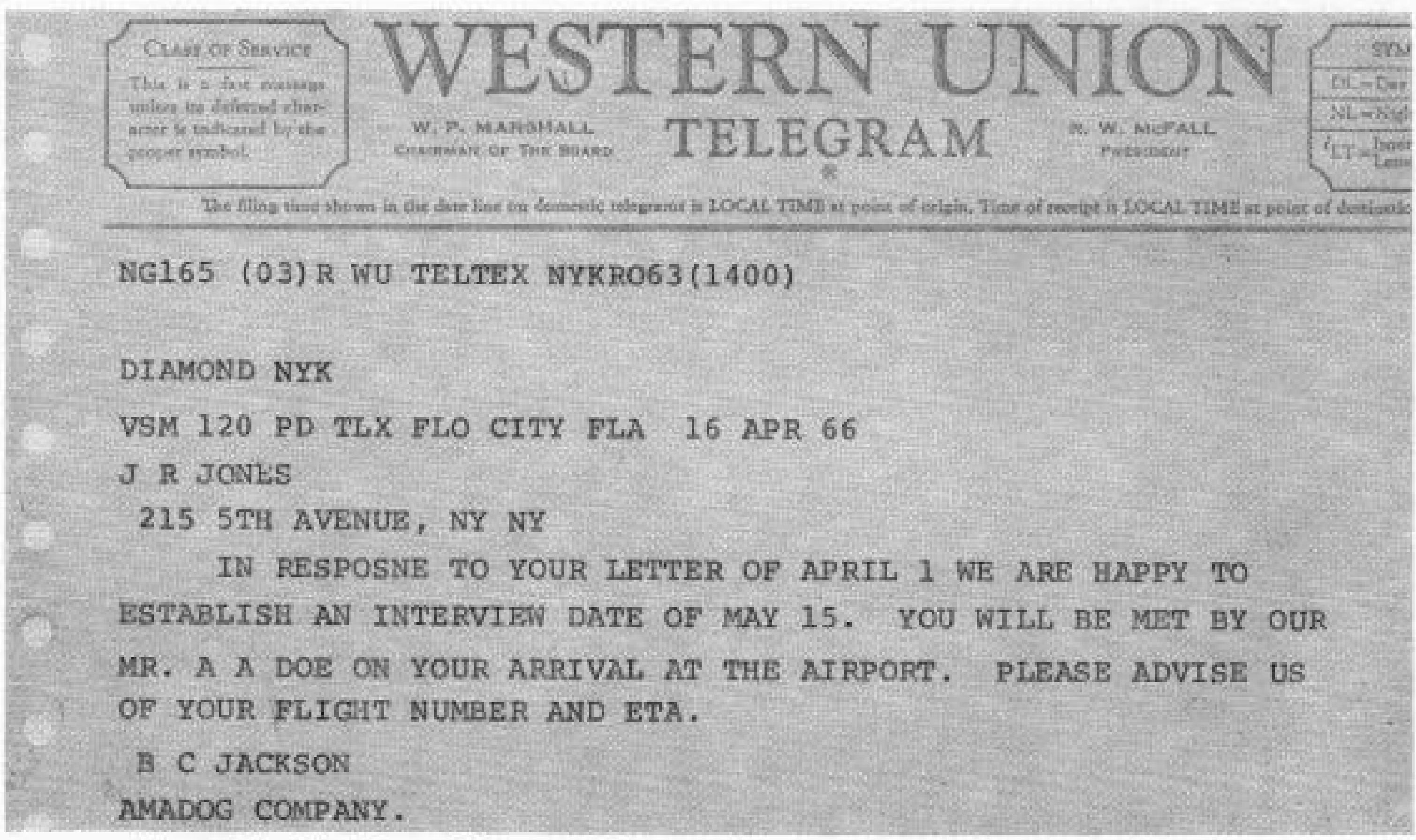
Special features in the Burster Format Converter include:

- Separate fusing and power failure alarm equipment.
- Automatic insertion of a line-feed character if a CR character is encountered not followed by a line-feed. This prevents overlining of the received message.
- Transmission of a channel designator as the first character of a new message. This is primarily an aid to maintenance. Should the sending transmitter or tape be bad, the transmitting position can readily be found.
- Up to 14 Burster Format Converters can be mounted on a single rack. The Format Converter can also be used in the same rack as the On-Line Translator if desired.




```
+
WU TELTEX NYK
RO63(1400)
     +
DIAMOND NYK
VSM 120 PD TLX FLO CITY FLA  16 APR 66
J R JONES
 215 5TH AVENUE, NY NY
     IN RESPOSNE TO YOUR LETTER OF APRIL 1 WE ARE HAPPY TO
ESTABLISHOBNOINTERVIEWRDATE OF MAY AIRPORTU WPLEASE ADVISE USR
OF YOUR FLIGHT NUMBER AND ETA.
 B C JACKSON
AMADOG COMPANY.
+
WU TELTEX NYK
(1405)
     +
DIAMOND NYK
```

Figure 4. A Typical Teltex Message as Received at the Translator




```
NG165 (03)R WU TELTEX NYKRO63(1400)

DIAMOND NYK
VSM 120 PD TLX FLO CITY FLA  16 APR 66
J R JONES
 215 5TH AVENUE, NY NY
     IN RESPOSNE TO YOUR LETTER OF APRIL 1 WE ARE HAPPY TO
ESTABLISH AN INTERVIEW DATE OF MAY 15.  YOU WILL BE MET BY OUR
MR. A A DOE ON YOUR ARRIVAL AT THE AIRPORT.  PLEASE ADVISE US
OF YOUR FLIGHT NUMBER AND ETA.
 B C JACKSON
AMADOG COMPANY.
```

Figure 5. The Same Message Shown in Figure 4, after It Has Been Processed by the Translator

Message Format

Figure 4 shows a typical Teltex message as received from a customer. Note the answer-back "WU TELTEX NYK" followed by the receiving position channel identifier "R", message number "063", and time "(1400)". On the next line is seen the customer's answer-back "DIAMOND NYK". After sending the message the customer again exchanges answer-backs. Note the omission of both the channel designator and message number in this final answer-back. Of special significance is the "overline" of the second and third lines of the text of the message. This overline is corrected when the message is switched to the final destination.

Figure 5 shows the message as received by the addressee. The characters in the top line are explained as follows: the NG165 (03) are locally generated characters supplied by the reperforator switching system from which the message was switched. The R is the channel designator of the Burster Format Converter. The WU TELTEX NYKR063 (1400) is the answer-back information described in the preceding paragraph. Note that the final answer-back does not appear in the delivered message.

Advantages of Translator

a) Exact copy delivered

Although the On-Line Translator and Burster Format Converter make corrections, additions and deletions to the message format, they do not correct spelling errors.

Thus, the delivered copy spelling will be delivered exactly as received, as can be witnessed by the spelling of RESPONSE in Figures 4 and 5.

b) Reduced Handling Time

With the use of the new Automatic Teltex On-Line Translator the message handling time will be greatly reduced.

c) Elimination of errors in reperforation

The possibility of error introduction by manual reperforation of the message is eliminated. Thus, faster and better service will be rendered to our Telex subscribers.

Roy K. Lewis, Supervisor in the Information Systems and Services Department, has been concerned with the techniques of handling Teltex messages on the Public Message Systems.

He was active in the development and design of many Western Union Public message systems such as Switching Systems Plans 34, 35, 36, 38 and 39. He was responsible for the development of the Electronic Regenerative Repeater and had a major role in the design of such equipment as the Form Feed Message Delivery System and the American Stock Exchange Transmission Plant.

Mr. Lewis received his B.S. degree in Electrical Engineering from Virginia Polytechnic Institute in 1955 and has been associated with Western Union since then.

He is a member of the I.E.E.E. and was on the Education Committee of this society for some time. He holds one patent on the Electronic Regenerative Repeater allowed in 1963.

new partners in progress —communications and computers

—R. W. McFall

Editor's Note: Russell W. McFall, President of Western Union, was the Keynote Speaker at the 21st National Conference and Exhibit of the Association For Computing Machinery, held in Los Angeles, California on August 30, 1966. A reprint of his address follows here.

Just a few years ago a communications man would have been an unlikely candidate as a keynote speaker for a meeting of computer experts. Computers and communications then were two separate and distinct fields, each operating largely within its own area, with little interplay between the two. The use of computers on-line in the operation of communication systems and real-time processing of data have joined computers and communications in a permanent partnership. . . . . Our first involvement with computers dates back to the early electromechanical models, when Western Union engineers worked with Dr. Howard Aiken in designing input/output circuits and adapting telegraph printers and reperforators for use with the Mark II computer. I might also mention that we have used computers since they first became available commercially to process payrolls; to provide accounting control of installations, removals, and inventories; and to produce statistical and management reports.

And, quite naturally, Western Union was equally involved during these early days in the designing of communications systems for business organizations for the specific purpose of gathering data from widely separated points for central processing.

Communications were first used for the real-time operation of computers, in the early 1950's, when the SAGE system was developed as an air defense network against manned bombers. This system was designed to handle radar information, and control interceptor aircraft and the activities of other defensive weapons.

More recently, the successes of our space program would have been impossible without real-time systems. Just a little more than a year ago, the first space-orbiting computer went aloft with astronauts Grissom and Young in the initial manned Gemini flight; and, with flawless perfection, it directed the first change of a spacecraft's orbit while in flight.

Just a few miles from where we are meeting today, in the Jet Propulsion Laboratory at Pasadena, computers linked by microwave with unmanned spacecraft are busy making history with computer-directed flights to the moon and distant planets. Western Union, incidentally, furnishes the terrestrial communication facility in that real-time system—a special 164-mile microwave link between NASA's deep-space tracking station in the Mojave Desert and the Jet Propulsion Laboratory.

The past ten years have seen rapid strides in the development of real-time technology and its application. Western Union's participation from the beginning is evident in the computer-operated systems it provides for government and industry. AUTODIN, for instance, represented a technological breakthrough in that it was the first nationwide communication system to employ computers on-line for the high-speed transmission of data fed into a network by means of punched cards, magnetic tape and perforated tape. Many of the techniques developed in designing AUTODIN for the Department of Defense have since been incorporated in the Advanced Record System for the General Services Administration, and in systems for industry.

These developments, obviously, make it possible to assemble and distribute knowledge, as information, on a scale never before possible. Even so, the assembly in memory banks of information in the several fields of human knowledge—for instant processing and retrieval—represents a tremendous task; but the potential rewards, I do believe, surpass those that have flowed from any single invention in the past; or that can be expected from the use of nuclear energy for peaceful purposes.

The "information explosion" is one of the most written-about and talked-about subjects today. While, as Dr. Oettinger has indicated, it is unlikely that the world will be overwhelmed by it, the situations existing in a number of fields make it plain that effective information management on a broad scale could result in great benefits.

Let us consider one—with which we, all, are well acquainted—the scientific, or technical, field. No one really knows how much technical information actually exists, or where to find useful parts of it. In these circumstances, research specialists are said to spend up to 25 percent of their time seeking useful information—wasting valuable time—because it is not possible for them to determine what research work has already been done in the fields of their interest. The total duplication effort has been placed as high as 50 percent of all R. & D. activity. Aside from widely publicized statistics and estimates, there can be little doubt that the gap in our ability to collect, evaluate, store, and retrieve technical information is costly and, very likely, wasteful.

Fortunately, we do not face the task of assembling all human knowledge in one memory bank; that would be impossible. Three major factors will work to make the task ahead manageable.

In the first place—as we all know, but some forget—not all knowledge is useful information, and no benefit is gained by storing useless information. Evaluating raw information in the broad fields of human knowledge will be a tremendous job, of course; but it will be, essentially, a one-time job, and of substantial help in reducing storage and processing problems.

The second factor is also selective in nature. The day when outstanding men comprehended almost all knowledge disappeared with Francis Bacon and Leonardo da Vinci, centuries ago. There are very few men today, indeed, who even wish access to all human knowledge. We are all specialists, and our needs for information are specialized. As a natural result, the development of systems has been on a system-by-system basis, each being designed to meet the individual requirements of a firm, a government agency, or a group with common interests. Progress in the future will, no doubt, continue to be on the same system-by-system basis, as the types of information brought under control for manipulation and retrieval are broadened. I expect, also, that many of the new systems will be regional in scope at first, then become nationwide and, ultimately, worldwide as more and more satellite communication facilities become available.

The third factor that will work to simplify the task ahead is the development of new means of supplying information/communication systems on a large scale, and at low cost. The concept of the information utility—providing a wide range of information systems and services to many subscribers through large, multiple-access computers—has naturally attracted considerable interest and attention. The background of most of those looking at this field, however, is one of experience with computers and data processing; and they are looking to communications to link their information utility systems in real-time operation.

I think you will be interested in Western Union's approach which stems from a base in communications and a decade of experience in the application of computers, first in communication systems and then in real-time information systems. Our plans to become a nationwide utility start with integration of the nationwide public message relay network and direct-dial Telex system into a single, computer-operated network. We have to put an integrated system of this kind in place to obtain the benefits of modern technology in terms of efficiency and improved communication service for our customers.

In the very first stages of this program, the flexibility of computer operation permits introduction of new communication services, and the additional computer capacity permits introduction of new information services. For instance, the first public service computer center scheduled in our program and installed at New York late last year, provides 3,000 Telex subscribers in eastern cities with new communication services. . . . .
. . . . . . The final phase of our longer-term program—scheduled to follow the installation next year of additional public service computer centers to extend new services to Telex customers nationwide—calls for the installation of third-generation computers at key locations across the country. These computers will perform all of the standard and new communication functions, and permit the integration of the public message and Telex services into a single system. In addition, as you well know, they perform information functions such as collection, storage, processing and retrieval of data. They also provide multiple access capabilities, permitting many users to get into a computer at the same time; and they have tremendous random-access memories.

This computer network, planned for completion after the installation of the initial public service computer centers, will permit improved automatic handling of a broad range of communication services providing, among other things, direct access to the computers. At the same time, the computers then in place will have ample capacity for Western Union to offer real-time information services to customers of many kinds.

A number of companies have already expressed their intention to provide similar information services. That is all to the good! We believe that the potential for new real-time information systems and services is so large, in the years ahead, that it will take the combined efforts and resources of the communication companies, the computer machinery companies, the professional skills in both fields, and many others to develop that potential fully.

I think we all recognize the excellent progress being made in advanced computer hardware. Formidable difficulties in other areas, however, are vexing our best minds. A great deal of work remains to be done in software and in basic information analysis, selection, and indexing. The classic disciplines of the 19th century—such as chemistry, physics, and physiology—used to operate in comparatively strict isolation; but that is no longer so. The old science areas are now intermixed; and there is overlapping, duplication, and dual-reporting. What is needed now is the management of information in a degree and on a scale never before attained.

There are few problems, however, that are beyond solution by that first and best computer of all—the human mind. The mind applies imagination in the manipulation and retrieval of billions of bits of information stored in the brain, combining them in strange and unbelievable ways to create new knowledge that never before existed. I think we can continue to depend on it for solutions to our information problems.

We already have a key tool for the successful management of information in the real-time information system. The computer's outstanding performance in the past suggests a tremendous potential for its real-time applications in the future. It is not necessary to indulge in numbers to realize that very few computers are linked as yet by communication lines in real-time operation, and that the great preponderance of computers now in service are operated off-line, in batch processing. Nor do we need numbers to foresee a tremendous growth in the application of computers in real-time systems in the years ahead.

The scope and complexity of some of the systems now under preliminary consideration stretch the imagination, to say the least. As you no doubt know, Congress is considering legislation to establish "a center for development and operation of a national science research data processing and information retrieval system," which would make scientific research information readily available "through an appropriate communications network." It is felt that a coordinated system of this kind is needed to facilitate and speed the retrieval of information from the 400-odd specialized information agencies that now exist—each serving a particular field of knowledge by providing subscribers with regularly issued compilations, critical reviews, bibliographies, and other information retrieval tools. . . . .

. . . . . . The pressure of demand for new information/communication systems and services is increasing, and it is accelerating the development of new imput/output devices. We begin to see machines that display selected information instantly and visually on demand. The use of new information retrieval devices will certainly modify the use of records as we know them today and, perhaps, make them unnecessary in many instances.

Machine storage of digital and graphic information for instant retrieval cannot help but affect, in time, our traditional dependence upon books, journals, and reprints. Many functions of the technical and educational publishing business appear headed for gradual transformation into a real-time information handling business. In fact, that was the stated purpose of certain recently announced mergers of publishing companies with firms having competence in the computer and data processing fields.

International computer-operated information networks, using satellite communication facilities, have a good chance of becoming a reality in the foreseeable future. Systems like these may well make possible such bold concepts as a world bank of medical knowledge and case histories, and a global weather information system.

In the medical field, for instance, international processing of information on birth defects might very well have enabled the profession to detect the pattern of use of thalidomide far earlier than it was, and thus have saved hundreds, if not thousands, of infants from deformity. Coordination of widely separated research efforts on deadly diseases, such as cancer, could bring immeasurable benefits to mankind.

Scholars in the arts and sciences are beginning, as I mentioned earlier, to give the computer attention as an educational and research aid. There were 400 computers in service on American campuses in 1964. Tying them together in a national information system would result in tremendous advances in the study of languages, literature, philosophy, history, the sciences, and the arts. . . . .

. . . .

. . . . . . The industrial revolution recast the mold and entire character of western civilization, and its influence has reached into the far corners of the earth. It has so deeply changed the economic, financial, social, and political fabric of human living that it is almost impossible for us to appreciate what life was like in the United States a century ago. Some of us here today can remember when the chief means of transportation were the horse and the railroads. All of us have lived long enough to have seen and felt the tremendous changes brought about by automotive, to say nothing of aeronautical and space, technology.

Today, we are embarked upon the information revolution, and I am certain that it will bring about changes far exceeding those of the slower-moving industrial revolution—and in far less time. The ultimate impact upon society of the new partnership of communications and computers in real-time information systems cannot be fully perceived as yet. It is just as well, probably, that not all of the problems that will require solution can be foreseen either.

Still, we can see enough of the potential of the real-time information/communication system to know that it is a powerful and promising new tool, and that it will facilitate enormously what Edward R. Murrow called the "great dialogue between man and that better part of himself known as knowledge." As real-time systems we cannot yet describe help man to gain a better understanding of the world he lives in and the problems that beset it, they will speed his application of the right solutions.

I am sure that we shall see benefits in our lifetime that will make us all feel that we have, truly, helped to make this a better world to live in.

Thank you.

R. W. McFall
President

format modifier for international messages

—by James A. D'Onofrio

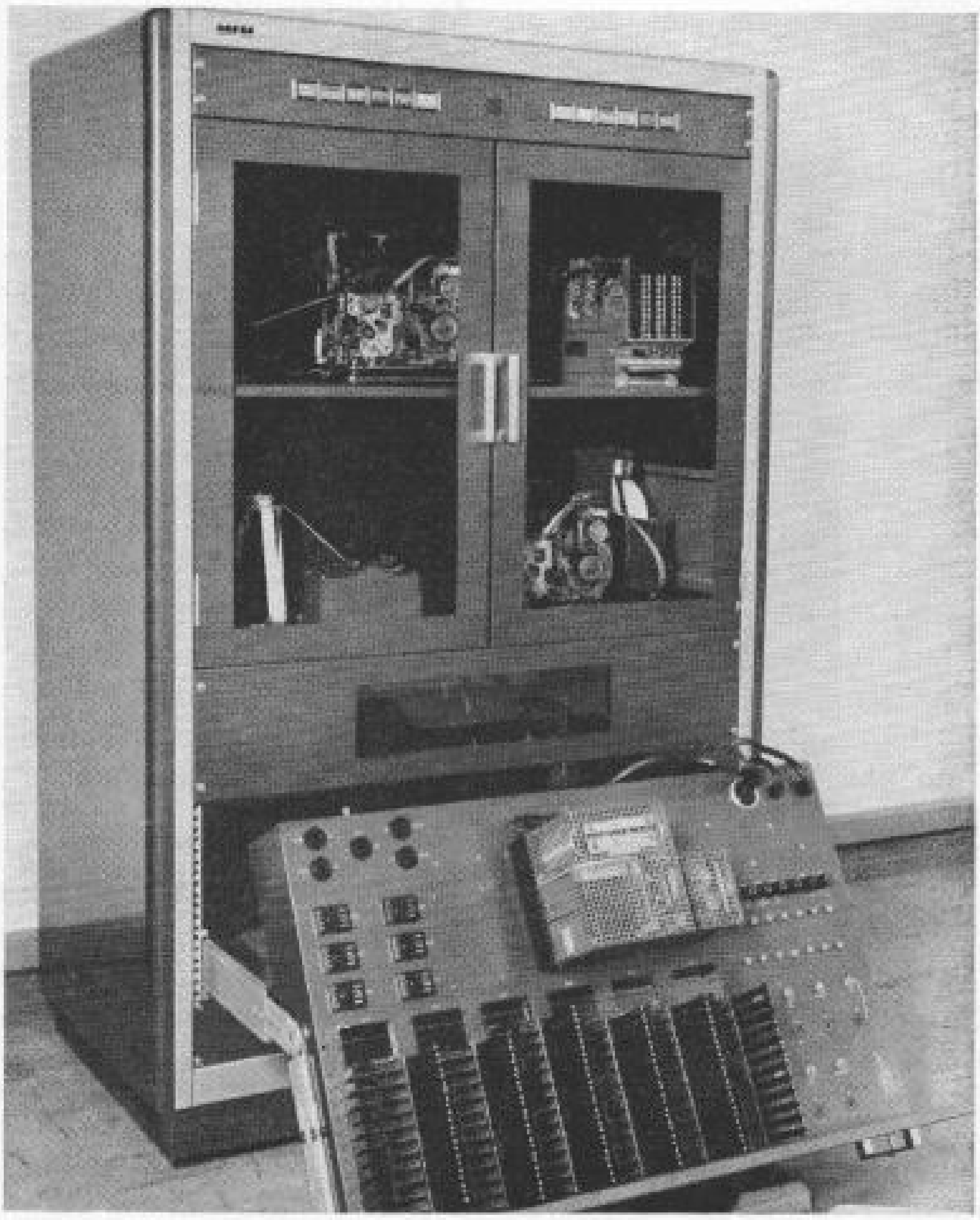


Figure 1—Format Modifier Cabinet

International Messages

Messages which are generated at points outside the United States for delivery to persons within the United States are classified as Inbound International Messages. These messages are sent to the United States by various international carriers, but are turned over to Western Union for delivery to the addressee. The messages are switched to the proper destinations via the Western Union Public Message System.

These messages received by Western Union are in the Standard CCITT F31 format. This format is illustrated in a typical message shown in Figure 2. In reference to Figure 2, note the required use of Carriage Return (CR), Line Feed (LF) and Letters (LTRS) characters as shown to the right of each line. The CCITT format, end-of-message sequence is shown at the bottom right of Figure 2.

ZCZC CLB 119	[ICR ILF ILTR]
PTSJ CO URGX 017	[ICR ILF ILTR]
CLEVELAND OHIO 17/16 27 015A EST	[ICR 3LF's ILTR]
HOTEL MANGO SANJUANPR	[ICR 3LF's ILTR]
PLEASE RESERVE DOUBLE ROOM FROM OCTOBER 16	[ICR ILF ILTR]
THROUGH 20 REFERENCE 29876Y	[ICR ILF 5 to 8 SPACES]
JOHN ALLEN	[ICR 3LF's ILTR]
COLL 16 20 29876Y	[ICR 10LF's ILTR NNNN ICR ILF 10LTRS]

Figure 2—Standard CCITT Format

In order to switch the international messages to the proper destinations via the PMS, the messages had to be manually reperforated. In the manual repunching process the CCITT format, as received from international carriers, had to be converted to a format compatible for switching over the Public Message System. In converting from the CCITT format to the PMS format, approximately 25 percent of the original message had to be modified. However, any extra manual handling process proves to be very time-consuming and uneconomical and also increases the chance of introducing errors into the final message text.

The standard CCITT format was not easily switched over the Western Union PMS for the following reasons:

1) if the 2 CR sequence is punched after each line of message text, it would appear as an end-of-message sequence in the PMS
2) the end-of-message sequence in CCITT format would not be recognized in the PMS
3) extraneous LF characters in the message text serve no useful purpose in the final message blank, therefore they should be deleted.
4) Western Union is required to insert a message identifying sequence preceding each message. The sequence must identify the international carrier, as well as prefix each message with a number.

Although the CCITT format, as shown in Figure 2, does not contain a 2CR sequence after any line of message text, some operators may not adhere strictly to the format. Therefore, the possibility of receiving a 2CR sequence after each line of text does exist.

The end-of-message sequence used in the CCITT format cannot be switched over the PMS because the equipment used in PMS is conditioned to search for a 2CR sequence and recognize it as the end-of-message.

With the volume of international traffic steadily increasing the need arose for a new method of handling this traffic, a method or system that would prove to be less time-consuming and more economical than the manual method. In response to this need Western Union has developed the Inbound International Format Modifier Cabinet, a system which automatically processes international traffic for proper switching via Western Union's PMS.

Format Modifier Cabinet

The Inbound International Format Modifier Cabinet shown in Figure 1 contains the following equipment:

a) An LPR 38 Typing-Reperforator, equipped with code reading contacts. It records incoming messages on perforated tape,

b) A model #12080.2 Tape Reader used to transmit messages stored in the perforated tape,

c) An Automatic Message Numbering Machine used to record the number of messages transmitted from the cabinet,

d) A second LPR 38 Typing-Reperforator, used to monitor outgoing traffic,

e) A card chassis which contains Western Union standard transistorized logic cards, low voltage power supplies, and associated transmitting and central relays. The logic circuits perform all the functions necessary to read and control the message tape and traffic transmitted to the line.

Associated with the system but located externally from the cabinet is a Model 28 Teleprinter used to monitor all incoming traffic.

Operation

A block diagram of the operation of one cabinet is shown in Figure 3(a) and is represented by the solid lines within Cabinet 1. The logic circuitry in the cabinet can be broken down into four sub-sections:

1) receiving section
2) transmitting section
3) electronic Message Waiting Indicator (MWI)
4) control and alarm section

Incoming traffic is received in the form of make-break or polar serial line signals which operate a polar relay located in the cabinet. The contacts of the polar relay provide the make-break signals necessary to operate the monitor printer and the LPR 38 Typing-Reperforator. The code reading contacts on the reperforator are used in conjunction with the logic circuitry to sense or read each incoming character.

When the first six LF's of the CCITT end-of-message sequence are counted and stored, the logic circuitry in the receiving section signal the Message Waiting Indicator that a complete message has been punched and stored in the tape. This will cause the MWI readout, located on the operator's panel, to advance by a count of "one."

The storing of the CCITT end-of-message sequence also conditions the automatic tape feed-out circuit for the receiving reperforator. When this circuit is activated by a "tight tape" signal from the tape reader, enough LTRS characters will be metered from the reperforator to get the last character of the message over the tape reader sensing pins.

Message tape from the receiving reperforator idles up to the tape reader. The tape reader "idles past" all LF, CR, LTRS, BLANK and N characters between messages at a rate 4 times faster than the normal transmission speed and automatically stops on the first character of the message. The sending ciircuitry checks the status of the message. The sending circuitry checks the status of the MWI, to insure that a complete message is waiting to be transmitted. If the MWI is on "zero" indicating the absence of a complete message, the tape reader "sits" on the first character until the MWI advances to "one" at which time message transmission begins.

The SEND functions of the cabinet begin with a message number transmission from the Automatic Message Numbering Machine. This number precedes each message and is used as a safeguard to identify each message in case they are lost due to transmission or equipment failure. Four characters can be easily coded to precede the number for use in identifying the transmitting channel and the city.

After the message number has been completed, the message on the tape is transmitted to the line. During this period each character is read by the sending section logic and any extraneous CR or LF characters will be deleted from the line. The tape reader steps over these characters in normal fashion while the logic circuitry "inhibits" them at the sending distributor.

Line signals formed at the electronic distributor activate a polar relay which provides make-break or polar serial signals to the line. This relay also operates the LPR 38 Typing-Reperforator used to monitor all outgoing traffic. This perforated tape copy provides a check on the sending circuitry and can be used if reruns of messages are required.

When the logic circuitry associated with the tape reader senses the first six LF characters in the CCITT end-of-message, tape motion is stopped while the standard Western Union PMS end-of-message, 2CR characters, is generated out to the line. This sequence places the sending logic in the IDLE conditions which causes the tape reader to "idle past" all LF, CR, LTRS, BLANK and N characters up to the first character of the next message.

The generating of the end-of-message sequence signals the MWI, indicating that a complete message was transmitted. The MWI readout will shift down by a count of one, while the sending electronics is reset for another message cycle.

System Flexibility

In some offices where the Inbound International Format Modifier is installed, the line speed of incoming traffic may be faster than the line speed of traffic leaving the cabinet. This situation creates a queuing problem at the tape reader, resulting in a pile-up of messages waiting to be sent. In order to solve this problem, two schemes may be utilized:

a) Flip-Flop operation—using one tape reader in each of two cabinets;

b) Conversion Repeater operation—using two tape readers in a single cabinet.

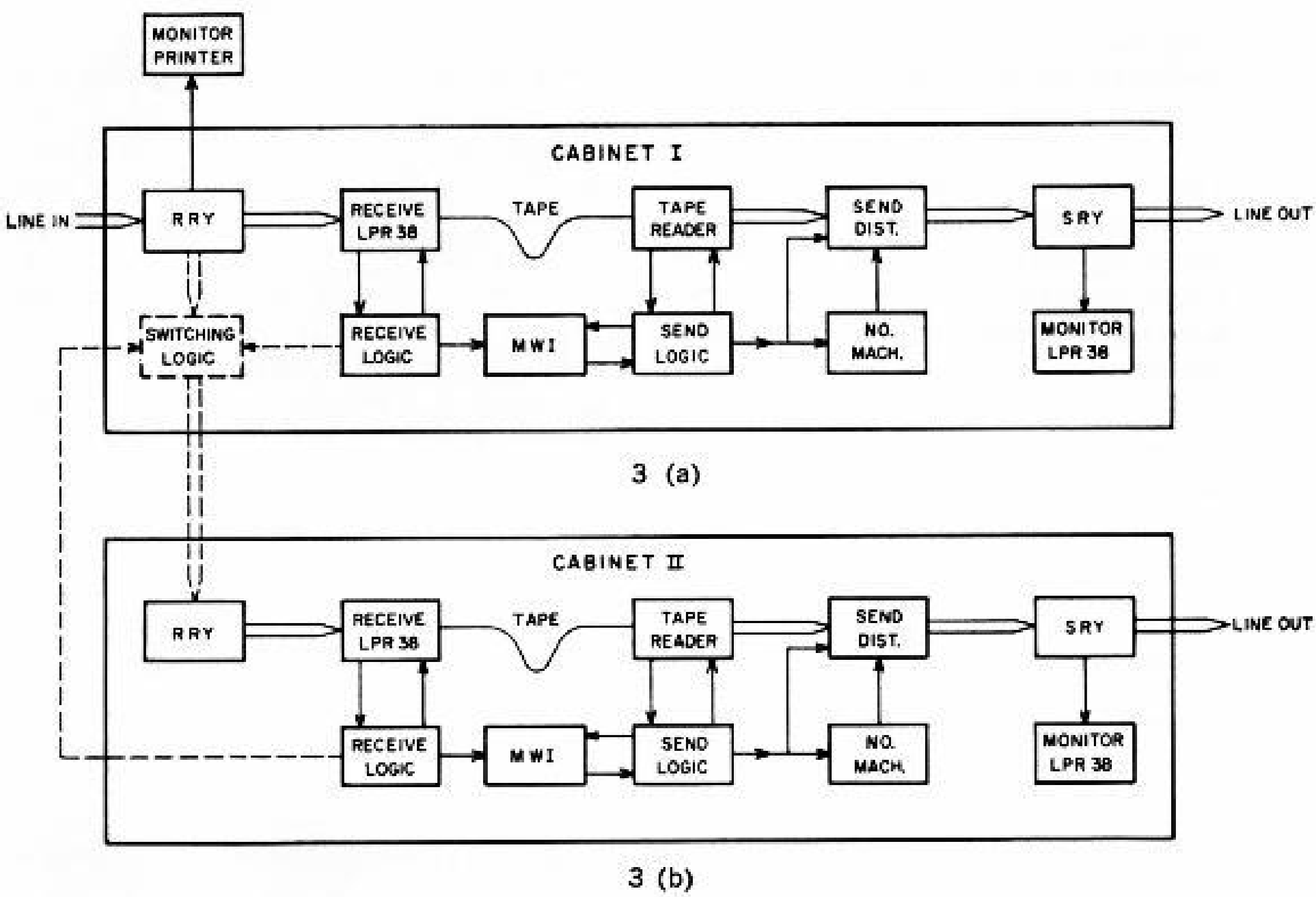


Figure 3. Block Diagram of the Flip-Flop operation.

A) Flip-Flop Operation

Flip-Flop operation prevents queuing during peak traffic loads by utilizing two outgoing lines and two transmitters. In this mode of operation, one incoming channel is switched between two cabinets for alternate reception of messages. The operation of each cabinet, however, is the same as the operation of the single cabinet configuration as explained previously.

A block diagram of the Flip-Flop operation is shown in Figures 3a and 3b. In the block diagram the extra control features between the two cabinets are represented by dotted lines.

The incoming line, terminated in Cabinet 1, operates the LPR 38 located in this cabinet. Logic circuitry senses the CCITT end-of-message sequence and automatically switches the incoming line into Cabinet 2, allowing the LPR 38 reperforator in this cabinet to follow incoming signal while the receiving reperforator in Cabinet I is inhibited from further operation. Logic circuitry in Cabinet 2 also senses the CCITT end-of-message and when detected will divert the incoming line back into cabinet I.

As an example, if an incoming channel is operating at 100 wpm, the input to each cabinet only averages 50 wpm. Thus, a 75 wpm output channel from each cabinet will more than adequately prevent a queuing problem.

A further advantage of this system is that one cabinet can be disconnected from operation for servicing by the activation of a switch. Thus all incoming traffic is continually received and the steady flow of traffic is uninterrupted.

B) Conversion Repeater Operation

The block diagram for Conversion Repeater operation is shown in Figure 4. This mode of operation utilizes two tape readers, A and B. Tape reader A steps at the same speed as the incoming line speed and performs the functions as outlined previously. However, line signals from this tape reader activate the Monitor Typing-Reperforator only, and are not sent out to the line.

The completely modified tape, (i.e., message format punched in this tape corresponds to Western Union PMS format), is transmitted via tape reader B at the slower outgoing line signal rate. This tape is controlled by a unique "pacing" switch. If tape from the monitor reperforator becomes too slack, the switch activates to stop transmission from tape reader A, allowing tape reader B to "catch-up." If the tape becomes too taut, the switch activates to stop tape reader B, affecting a feed-out of tape from the Monitor reperforator if necessary.

The slower tape reader, B, is able to keep up with the faster tape reader, A, since approximately 25% of the incoming characters are deleted by the conversion circuitry associated with tape reader A.

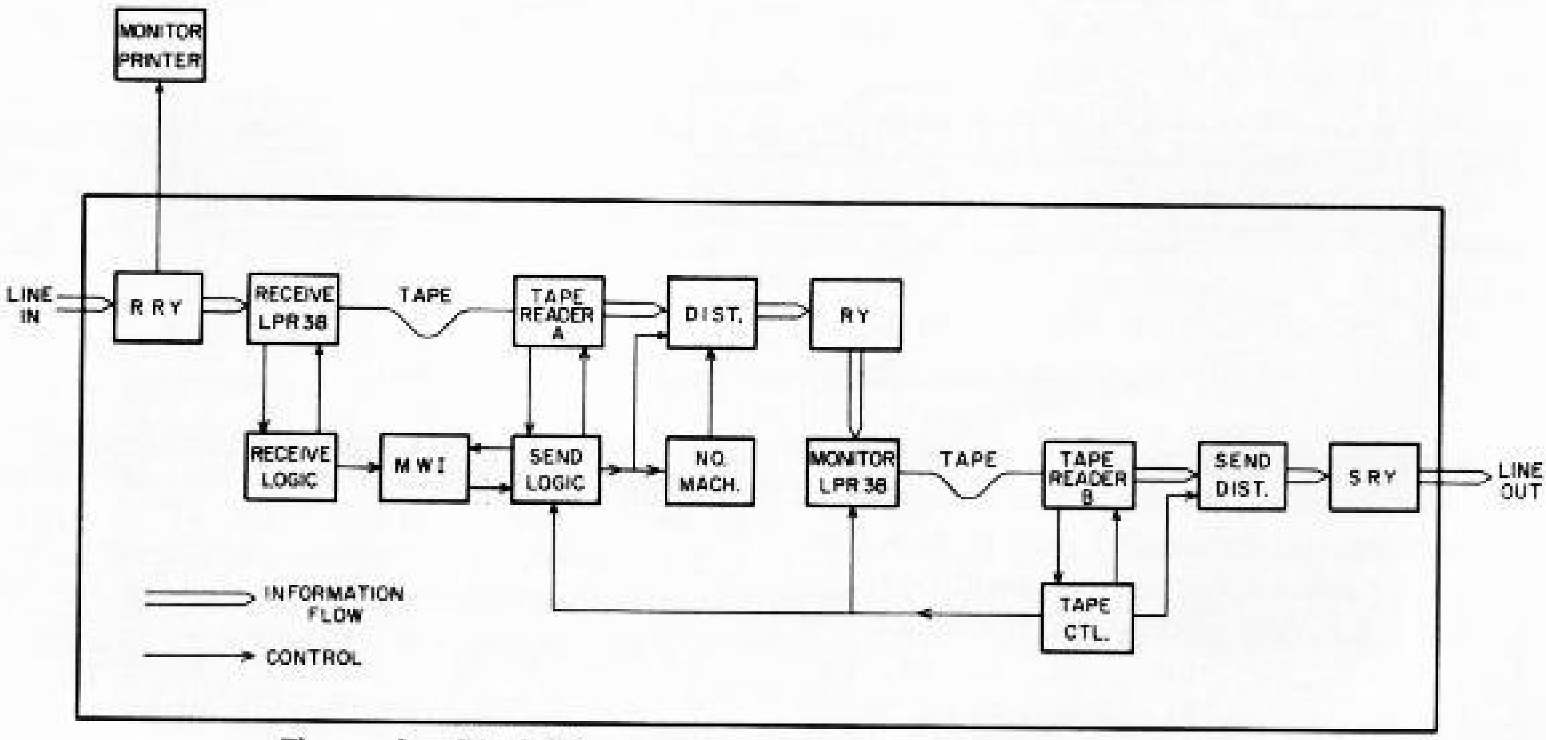


Figure 4. Block Diagram showing Conversion Repeater Operation.

For example, the incoming line speed may be 100 wpm, the conversion tape reader A is also 100 wpm, while the output tape reader B speed is 75 wpm.

Format Flexibility

The logic circuitry contained in the Inbound International Format Modifier Cabinet can be conditioned, by means of a manual switch, to convert the message format used by some of our subscribers to the format required by Western Union PMS. The operation of the system remains the same as in the handling of the CCITT format except in the case of reading the end-of-message sequence.

The equipment in the system remains the same for any type of format that is to be handled. However, the switch conditions the electronic circuitry in the receiving section to search for a particular end-of-message, in order to advance the MWI and to set up the automatic tape feed-out circuit. The switch also prepares the sending circuit to sense a certain end-of-message in order to generate the PMS standard end-of-message character.

This format flexibility becomes significant in those Western Union offices which handle various formats from more than one subscriber. Since the same system and equipment is used to process various formats, the spare parts used in the office can be interchanged very easily. Another advantage is that any one cabinet does not have to be tied down to any one particular type of format, but can be used to process any one of many formats. The change from one to another cabinet can be made simply by turning the switch to the appropriate position. The number of cabinets to be used as fallback is also cut to a minimum, since equipment and circuitry is not tied to any one format.

Special Features

The special features of the Inbound International Tape Modifier include:

- Alarm circuit with an audible alarm system, that resets itself automatically if the alarm conditions clears
- Open line stop circuit, that senses an open sending line and automatically stops the tape reader when the condition is detected
- Tape jam alarm circuit, that activates if message tape becomes jammed in the receiving reperforator
- Electronic MWI, consisting of a forward, backward shift register with steering logic, which has the capability of counting up to 10 messages
- Tape reader driven by a stepping motor, which has the capability of idling characters between messages at a faster rate than normal transmission speed.

JAMES A. D'ONOFRIO, in the Information Systems and Services Department, has been engaged primarily in the design of Solid-State Switching Systems. Since joining Western Union in 1964, he has been associated with PMS Switching into TELEX, the On-Line Translator, Burster Format Converter, Form-Feed Message Delivery System and Tape Reader Electronic chassis.

Mr. D'Onofrio received his Bachelor of Science degree in Electrical Engineering from Lafayette College in 1964.

western union expands its public message service

To help overcome the word barriers in communications between people, Western Union introduced a new personalized social communication service, the "MelodyGram."

The original song commissioned by Western Union, for this new singing-greeting service, is "I Want To Communicate With You." Ten different MelodyGrams are sung on conventional 33-1/3 rpm records. The records are imprinted with artwork and form an integral part of the greeting card design scheme.

MelodyGrams fill a definite need for a new personalized message-by-wire, which can be played over and over again.

The new service is a further extension of Western Union's expanded Public Message Service. Earlier last year, February 1965, Western Union introduced the Dollygram, the new dolls-by-wire service with a selection of 4 greetings on four different dolls. This service has been expanded from a demand for 200 dolls per month in March 1965 to approximately 19,000 dolls per month today.

book review

Communications Switching Systems by Murry Rubin and C. E. Haller. Reinhold Publishing Corp., New York 1966 (394 pages)

This book is an excellent summary of the latest Communications Switching Techniques for the engineers new to the communication field as well as for the experienced engineer.

The coverage of the latest techniques is ample. The material is organized and presented in a well integrated fashion. The style is almost tutorial. The concatenation of ideas makes reading very easy. The variety of selected references given at the end of each chapter is especially valuable in the field of communications.

The book starts with a historical description of communications, which orients the reader for the present techniques. It is interesting to note that many of the present modern ideas on communications were conceived in the very beginning of the communication's history. Most of the first important achievements and systems are described and, those ideas common to all of them are stressed.

Following this historical description, two chapters describe the fundamentals of system logic and switching components. These chapters are for the most part self-contained and no previous specific knowledge is required from the reader. The techniques of logic minimization (Karnaugh's Maps, minimization of sequential functions, etc.) are very clearly exposed.

Clarity is, in fact, the dominant feature of the book.

Keeping the same pace and style the book proceeds to Memory, Transmission and to Communications Network Structure. Most of the classical as well as the very new aspects and types of memory are presented. Basic transmission concepts, Multiplex, FDM, TDM, noise, fade, channel capacity, data transmission, modulation error control, etc., are discussed concisely. The emphasis is on fundamental ideas. No involved circuitry is to be found.

The section on Communications Network Traffic, adopts a system point of view basic criteria for system design procedure are explained. The chapter on Traffic is self-contained, and includes some simple mathematical formulation that illustrates and specifies the ideas involved.

In the final four chapters, the first three present a system point of view of switching system, a very basic topic, then some design techniques for switching systems and finally, the description of a switching system in an actual environment. The description, in a way, summaries all that had been presented in the book.

It ends with an interesting description of some modern equipments and systems. The title of this section, Survey of Switching Systems, is however misleading; it is not exactly a survey since only a few examples of switching systems are given and the chosen systems for instance, are not in all cases, as of today, the best equipment or system to do the job.

This book is specially recommended as fundamental reference material. It is an excellent general text for anyone in the communications field. Its pedagogical organization makes it highly recommended as a text for formal courses and/or a pleasant and easy reading book for self-study.

L. M. Camargo, M.S.
Broadband Division,
I.S.&.S. Department.

patents recently issued to western union

The following patents have been issued to Western Union since publication of the July issue of the TECHNICAL REVIEW:

Patent Number and Title	Assignor
3,263,058 Waveguide Aligner	H. J. Goonan
3,264,406 Teleprinter Control Device	P. J. Cohen F. R. Firth
3,266,047 Belt Drive Assembly for Facsimile Recorder	D. M. Zabriskie
3,270,134 Automatic Carriage & Line Feed Mechanism	J. J. Krakusky
3,271,576 Photo Electric Matrix Network	F. T. Turner

ASR Sets
Advanced Record System
Outstations

Ghiringhelli, R.J.: Low Speed Outstation Equipment

Western Union TECHNICAL REVIEW, Vol. 20, No. 4 (October 1966) pp. 154 to 165

Two types of low-speed outstations were designed for the Advanced Record System developed for General Services Administration. This article describes the Manual outstations and the Automatic outstations.

The interconnections of an outstation with the Circuit Switching Network is illustrated. The message format required for the automatic sending position is indicated.

By using a prefix storage unit and the automatic sending console, this equipment is the first illustration of the use of an automatic outstations in a Circuit Switch Network.

Solid State Devices
Public Services
Teltex

Lewis, R.K.: Automatic Handling of Teltex Messages

Western Union TECHNICAL REVIEW, Vol. 20, No. 4 (October 1966) pp. 166 to 171

Western Union inaugurated its Telex service to enable Telex subscribers to communicate with those subscribers not in the Telex network.

The On-Line Translator is directly connected to the Telex exchange. When the Teltex subscriber dials a Teltex number, he is directly connected to the Translator. This solid slate unit reduces handling time of messages, eliminates errors in reperforation and delivers an exact copy of the message received.

Computer Techniques
Computers
Announcements

McFall, R. W.: New Partners in Progress—Communications and Comunters.

Western Union TECHNICAL REVIEW, Vol. 20, No. 4 (October 1966) 1966) pp. 172 to 175

Russel W. McFall, President of Western Union delivered an address at the 21st National Conference of the Association for Computing Machinery on August 30, 1966. This article is a reprint of this address.

He said "Communications were first used for the real-time operations of computers in 1950 when SAGE was developed for the air defense network against manned bombers.—Western Union's participation in the real-time technology is evident in the computer-operated systems it provides for government and industry. The real-time information/communication potential is a powerful new tool in the Information revolution.

Message Format
Public Message Service

D'Onofrio, J. A.: Format Modifier for International Messages

Western Union TECHNICAL REVIEW, Vol. 20, No. 4 (October 1966) pp. 176 to 181

The Format Modifier Cabinet is a solid-state system which automatically processes international messages for distribution to their destination via Western Union's Public Message Service.

This article describes the standard CCITT format and points out the problems involved in manually repunching messages in this format before retransmission over Western Union Public Message Service. The article also describes the two types of operation of the Format Modifier Cabinet: the flip-flop operation and the conversion repeater operation.

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SERVICE TO OUR READERS: As a service to our readers, articles will be abstracted so that a complete file may be kept for future reference.

Circuit Switching
Logic
Broadband Switching

Camargo, M.S.: Book Review

Western Union TECHNICAL REVIEW, Vol. 20 No. 4 (October 1966) p. 184

This Book Review points out the merits of the book entitled, "Communications Switching Systems" by Murry Rubin and C. E. Holler, published by Reinhold Publishing Corp. in 1966. The book is recommended as a fundamental reference text for engineers new to the communications field.

Announcements
Miscellaneous

20 yr. Index

Western Union TECHNICAL REVIEW, Vol. 20 No. 4 (October 1966) p. 188

A new 20 yr. index of all the articles published in the TECHNICAL REVIEW will be available from The Editor in January 1966.

This announcement includes a form for requesting the index.

This form to be mailed to request the 20 yr. index (see p. 188)

New 20 Yr. Index

Because the interest and circulation of the Western Union TECHNICAL REVIEW has grown tremendously in the past five years, a new 20 yr index, of all the articles published in the first 20 volumes of our publication, will be printed for our new readers.

A 10 yr Index covering the publication from 1947 to 1957 was printed and is still available. Since then, 2 yr indexes have been printed in the October Issue of 1959, 61, 63, 65. With the importance of information retrieval in the communications field, a new index covering all past publications has become necessary.

This 20 yr index will be available about January 1, 1967. If you wish a copy, fill out the form below and mail it to us.

The Editor

The Editor
TECHNICAL REVIEW
Western Union
60 Hudson Street
New York, N.Y. 10013

I am interested in a copy of your 20 yr Index of articles which have appeared in the Western Union TECHNICAL REVIEW over the past 20 years.

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