35 AUTOMATIC SEND-RECEIVE TELETYPEWRITER SET (DATA COMMUNICATIONS)

GENERAL DESCRIPTION AND OPERATION

CONTENTS   PAGE

1. GENERAL

1.01   This section contains general descriptive information of the 35 Automatic Send-Receive Teletypewriter (ASR) Set for Data Communication. (See Figure 1.)

1.02   The 35 ASR Set is basically an electromechanical device capable, when properly adapted, of sending and receiving messages and other coded data over telephone networks, telegraph lines, or radio channels. All messages received or transmitted may be typed on either page size copy paper or continuous business forms. They may also be punched in paper tape with or without printing of the message on the tape, depending on the equipment combinations and options used.

1.03   This data communication ASR Set can send and receive data in both parallel and serial signals (ie, the bits making up a character may be either simultaneous or sequential). The character rate in either case is 100 words per minute. The bit rate of the serial signal is 110 baud.

1.04   Communication with other business machines within a data processing center can be accomplished by direct connection, using current (marking) and no-current (spacing) signals and either parallel or serial bit arrangements. The set can also communicate with remote senders and receivers to produce page copy or punched paper tape at the remote location, to accumulate data from the remote location, or to communicate with a computer center. The basic set can conduct long range communication via a 20 milliampere neutral current telegraph circuit. It has the flexibility for modification with controls to enable operation in business systems over switched network services. Communication with business machines using the American Standard Code for Information Interchange (ASCII) is available by direct connection or with the buffering of punched paper tape.
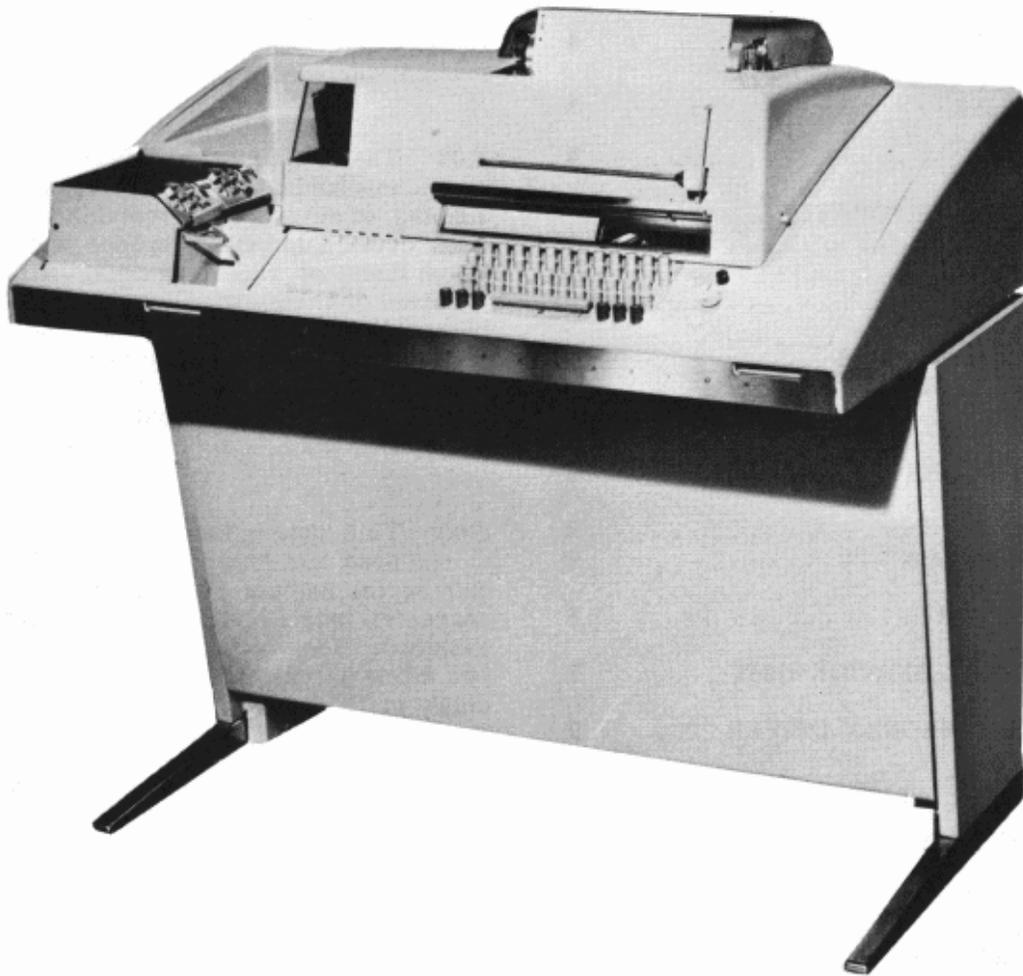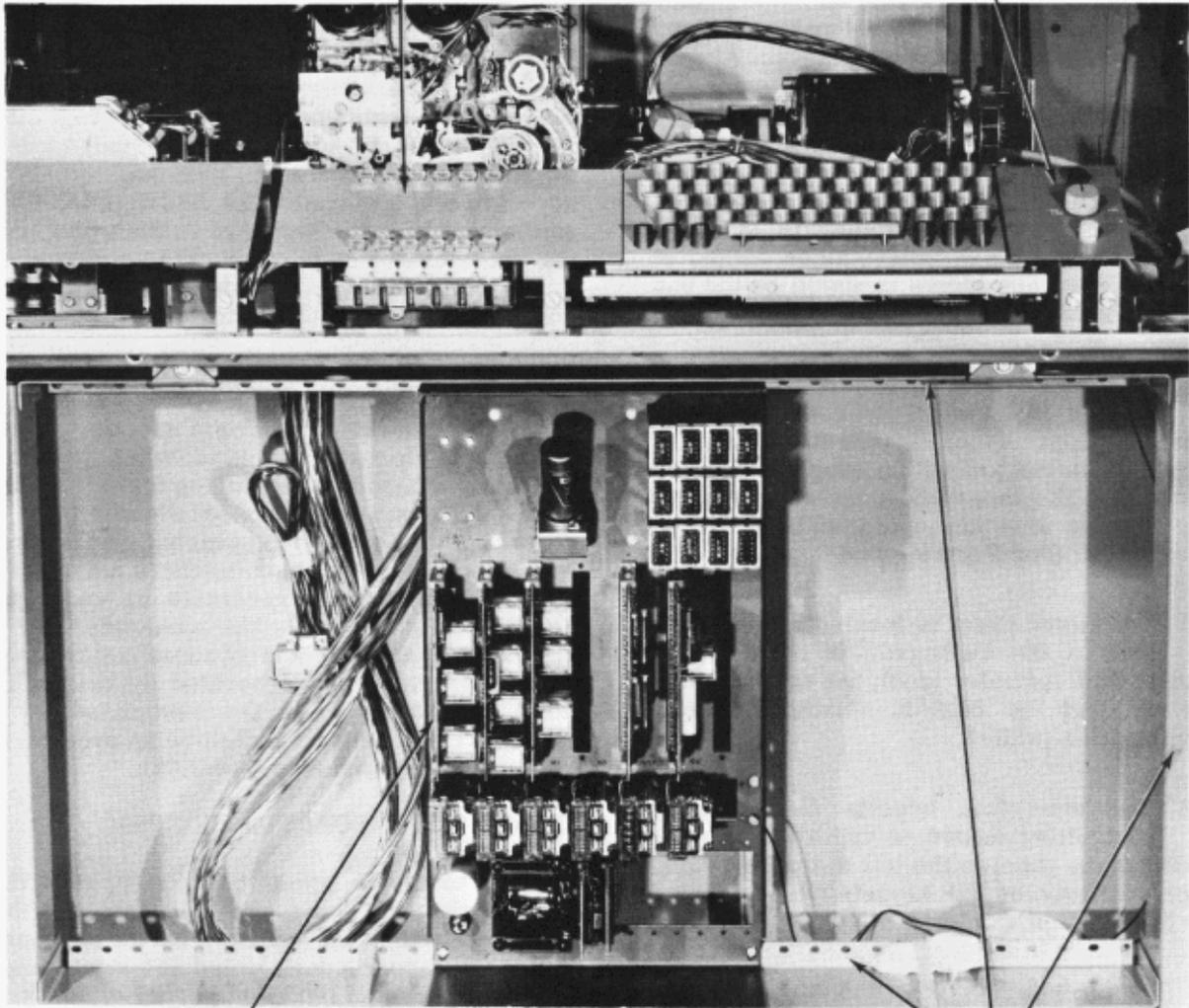
Figure 1 - 35 ASR Set (Data Communications)
with Dual Reader

PROGRAM CONTROL PANEL

POWER PANEL

RELAY PANEL ASSEMBLY
(Control Package)

RELAY RACK ASSEMBLY

Figure 2 -   35 ASR Set - Single Reader
with Covers Removed

2. COMPONENTS

CABINET

2.01 The 35 ASR cabinet houses all the components of the ASR Set. It is a floor standing enclosure made up of two main parts: the pedestal or lower cabinet, and the cover or upper cabinet.

(a) The pedestal supports a relay rack (Figure 2) on which is mounted the relay panel assembly (the control package) with space available for optional packages. Access to the relay rack is provided by a removable front panel. A pan is attached to the top of the pedestal to support the components of the set.

(b) The upper cabinet consists of an upper and lower cover which can be opened to service the components mounted on the pan of the pedestal.

2.02 The keyboard of the ASR Set extends through the lower cover of the upper cabinet for convenience in operation. All the controls of the set are within easy reach of the operator and the tapes and page copy are directly in view when the operator is sitting at the keyboard. (See Figure 1.)

(a) The power panel is located at the right side of the keyboard. It contains the end-of-line indicator (red), the rotary power switch, and the BREAK switch and lamp combination (white).

(b) Two six-button keysets for manually controlling modes of operation are located in the panel to the left of the keyboard. The positions on the keysets (Figure 3) are as follows (left to right):

(1) Top row

PROGRAM CONTROL
READER STEP
PRINT SUPPRESS
DATA BYPASS
STOP
START

(2) Bottom row - only two designated

PUNCH ON
PUNCH OFF

KEYBOARD

2.03 The keyboard is the component of the ASR Set that provides manual entry of data. It is mounted on a cradle in the cabinet pan where it supports a motor unit, typing unit, reperforator unit (punch), and the necessary gearing arrangements for transfer of rotary motion. The front of the keyboard (the keys) extends forward to place it in convenient operating position. The keys are positioned in four rows similar to the standard typewriter.

2.04 Parallel electrical signal output is a feature of this keyboard. It provides a keyboard for systems where character recognition, hybrid control or output to other equipment in the system is necessary. It is an eight-level keyboard that generates the ASCII code. Data can be sent from the keyboard to the typing unit, the reperforator or to other receivers external to the set by means of code selecting (relays) and signal generating (distributor) mechanisms.

2.05 The keyboard generates an upper case alphabet, Arabic numerals, space, 24 punctuation marks plus certain special symbols and control characters. The alphabet, numerals and those symbols appearing on the bottom half of the keytops are generated when the key is struck. Those symbols appearing on the upper half of the keytops (and some others not appearing on the keytop) are generated by holding the SHIFT key down while the associated key is struck. Non-printing control codes not available as primary keys are generated by holding the CTRL key down while the associated key is struck. The keyboard generates an even parity bit with every character (see 3.02).

TYPING REPERFORATOR (PUNCH)

2.06 The typing reperforator is a receiving unit which can combine into one by-product tape the data coming from the keyboard, the paper tape reader(s), and the signal lines. It is located at the left front corner of the keyboard and its operation may be seen through a window located at the left corner of the upper cabinet cover.

2.07 The reperforator (also called a tape punch) fully perforates one inch wide paper tape with eight code levels and a series of feed holes between the third and fourth code levels. It features typing between feed holes, print suppression on control codes, last printed character visibility, magnet controlled back space and fully perforated code holes.
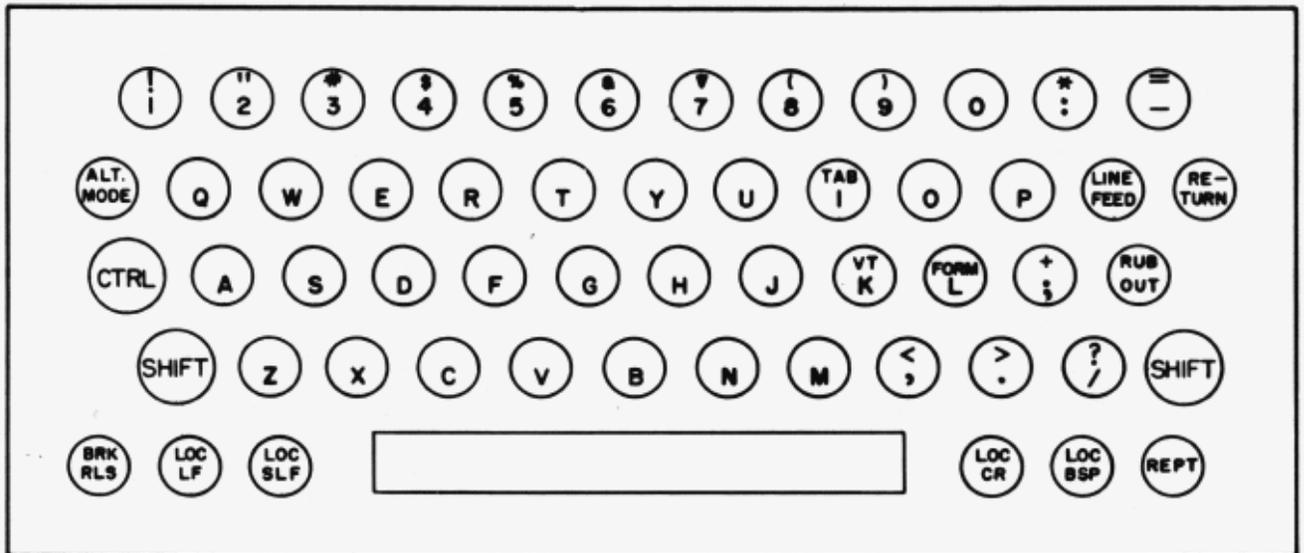
KEYBOARD
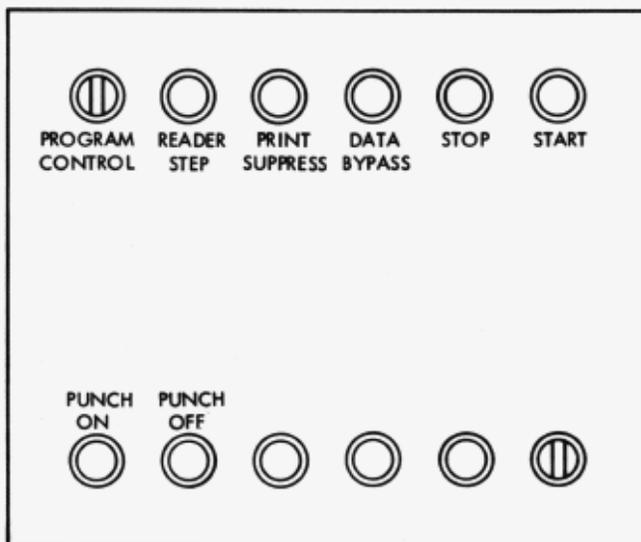
PROGRAM CONTROL PANEL
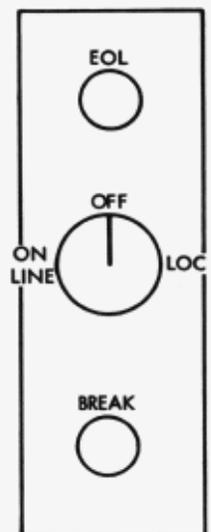
POWER PANEL

Figure 3 - Typical Keyboard and Control Panel Layout

2.08 Operation of the reperforator may be controlled locally by the mode keys (see 2.02(b)) or remotely by punch on and punch off control code responses. The unit can receive serial signals from the communication line or serial signals from parallel signal input devices by way of the distributor.

TYPING UNIT

2.09 The typing unit incorporates the necessary electrical and mechanical elements to translate the signaling code combinations into mechanical actions which print the messages and perform functions incidental thereto. The typing unit is mounted centrally on the keyboard, in front of the motor unit and intermediate gear assembly.

2.10 These ASR Sets employ sprocket feed typing units that advance single or multiple continuous forms around the platen by means of the sprockets located at each end of the platen. The code signals are applied to a two coil magnet associated with a selecting mechanism which interprets the signals and controls the mechanical action involved in typing a character or performing a required function. The code signals may originate from the keyboard, from the transmitter (tape reader) or from an external signal source.

2.11 The typing unit incorporates the following features:

(1) Types all the graphic characters in the ASCII. There are 64 graphic characters. These include the upper case alphabet, Arabic numerals, space (the invisible graphic) and 27 punctuation marks and special symbols. In certain applications, foreign language accents, characters and special symbols may be substituted for the standard graphics.

(2) Tabulates horizontally in response to TAB code combination.

(3) Tabulates vertically in response to VT code combination.

(4) Feeds out a form in response to FORM code combination.

(5) Returns typebox to left margin on RETURN code combination.

(6) Line feeds the form one or two lines (as preselected) in response to LF code.

(7) Backspaces the typing unit one character at a time in step with the by-product tape by operating LOC BS key.

(8) Recognizes a line break signal, responds by blinding the keyboard, lighting the BREAK lamp, stopping the transmitter and turning off the special programming controls.

(9) BELL and EOT codes are recognized by the typing unit stunt box which operates contacts. If the set is so adapted the bell will respond to BELL code.

(10) Print suppression is provided so that data may pass through the set without printing on the page. (The reperforator can record data which is not printed.)

(11) Spacing is suppressed on trema (..), circumflex ($\land$) and grave ($\setminus$) accents on units employing French accents.

(12) The type box returns to the left margin in addition to the functions performed in items (3) and (4) and the form will feed one or two lines (as preselected) in addition to the function performed in (5) in certain units.

TAPE READER BASE (TRANSMITTER DISTRIBUTOR BASE)

2.12 The tape reader base provides mounting facilities for the tape reader(s) and a multiple wire distributor unit. It is equipped with a motor unit and gears to drive the associated mechanisms at 100 wpm. The base is located in the ASR cabinet to the left of the punch so that perforated tape feeds directly from the punch into the reader (rear reader where dual readers are used).

2.13 The base used may be designed for one reader (transmitter) and one multiple wire distributor or for a dual reader and one distributor, depending upon the service of the set.

2.14 The motor supplied with the base is synchronous and operates at 3,600 rpm on 115 volts regulated 60 cycle ac. It draws about five amperes starting current and two amperes running current.

TRANSMITTER (TAPE READER)

2.15 The transmitter (tape reader) is mounted on its base in the ASR cabinet (2.12) and receives its motive power from the motor (2.14)

READER BASE
MOTOR UNIT   DISTRIBUTOR

ELECTRICAL SERVICE UNIT

KEYBOARD MOTOR UNIT

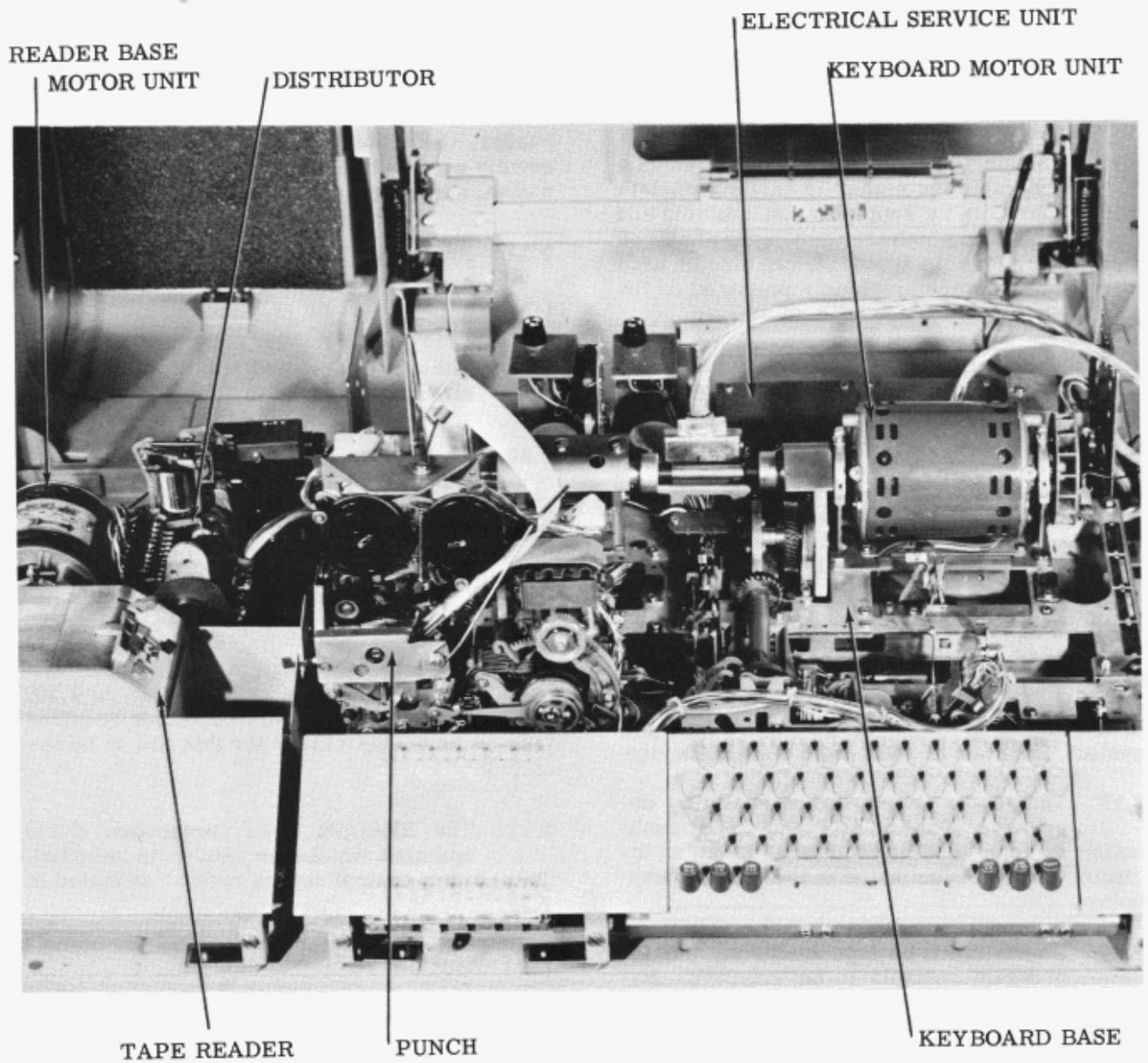TAPE READER   PUNCH

KEYBOARD BASE

Figure 4 - 35 ASR Set - Single Reader
Component Arrangement

located behind it. The reader consists of a sensing mechanism to read the eight level perforated tape. The information leaves the reader in the form of an eight wire parallel output. The information is then directed to a multiple wire distributor where it becomes an eleven unit sequential signal consisting of a start pulse, eight information pulses and a double unit stop pulse.

Single Reader Sets

2.16   The single reader set may be used as a program tape reader to partly automate data preparation by supplying the controls and fixed information which are unchanging whenever a particular form is typed. It can also be used to reprocess a tape previously prepared on the set.

2.17   The set can be used off line to prepare a by-product tape and then on line to send the data in that tape to a distant location. This procedure enables assurance of tape correctness and permits transmission at full 100 wpm speed. Internal control codes in the program tape are not punched in the by-product tape so that only the data is sent to the distant location with the local typing unit monitoring the traffic.

2.18   The set is equipped with a reader hold circuit that momentarily delays the reader after a control character is read. This eliminates the need for fill characters except to accommodate other equipment in a business system, such as in switched network service.

2.19   The reader is operated manually by depression of the START and STOP pushbutton switches. When the reader is on, an indicator lamp is illuminated in the START pushbutton.

2.20   There must be tape in the reader for program controls to be effective. Removal of the tape causes the set to revert to the normal condition by turning off all special controls except the punch control (the punch can be used when there is no tape in the program reader). If tape runs out of the reader, it is necessary to press the START pushbutton, after placing another tape in the reader, to get it to start.

2.21   The READER STEP pushbutton switch causes the reader to step exactly one character, transmitting what it reads. The reader is turned on in the print suppress modes and in the data by-pass mode.

2.22   The reader control lever is spring biased so that normally it is in the run position. It can be held in the free wheel position so that tape can be positioned in the unit by hand.

Dual Reader Sets

2.23   In dual reader sets the rear reader is used as a program tape reader as discussed in 2.16. The front reader is a data tape reader. Selected tape strips containing frequently used variable information, as customer names, addresses, etc, are read in this reader.

2.24   By-product tapes, as in 2.17, are normally read by the program tape reader (rear).

2.25   The set is equipped with a reader hold circuit as covered in 2.18.

2.26   The tape readers are started and stopped manually by depressing the START and STOP pushbutton switches. The program tape reader runs unless the data tape reader has been turned on by the internal control code. An indicator lamp in the START pushbutton lights when the readers are on.

2.27   The tape-out switch in the program tape reader operates as explained in 2.20. The tape-out pin in the data tape reader requires tape to be in the reader for this unit to be selected.

2.28   The READER STEP pushbutton (2.21) operates whichever reader is selected. The reader control levers operate as stated in 2.22.

DISTRIBUTOR

2.29   The distributor is a multiple wire electromechanical device which transmits sequential, start-stop signals from a parallel (multi-wire) input. In these sets it is mounted at the rear of the tape reader base (2.12) in the ASR cabinet. It is driven by the same motor that drives the reader(s).

2.30   It is used to translate continuous parallel (multi-wire) intelligence into the serialized signals required to operate associated local selector mechanisms and for transmission over an external signal line.

ELECTRICAL SERVICE UNIT

2.31 The electrical service unit is mounted in the cabinet pan directly behind the keyboard base. It consists of a main chassis that supports the elements of the unit as follows:

(a) A basic facilities assembly composed of convenience and copylight receptacles, main set fuse, power and signal line terminal boards, 6 volt ac copylight transformer, line-local relay and power panel connector.

(b) Power cord, three pin ground type, with a six foot length external to the cabinet.

(c) Two wiring fields to provide interconnecting facilities between various set units and the units and signal line.

(d) Two selector magnet drivers necessary for keying the typing unit and reperforator selectors.

SELECTOR MAGNET DRIVER

2.32 The two selector magnet drivers are identical solid state devices that couple the signal line to the selector magnets on the typing unit and reperforator (punch). The signal input is a 20 milliampere neutral signal. The selector magnet driver output is 500 milliamperes to the selector magnets. Each driver is mounted on a printed circuit card that plugs into a card edge connector on the electrical service unit.

MOTOR UNIT

2.33 The motor unit consists of a 1/20 horsepower synchronous motor cradled in a mounting bracket assembly. It is equipped with an overload device to protect the motor. The motor assembly is located in the right rear corner of the keyboard base and supplies rotary motion for the keyboard, typing unit, and reperforator mechanisms.

3. ELECTRICAL REQUIREMENTS

POWER REQUIREMENTS

3.01 The power input to the set is 115 volt ac $\pm$10 per cent single phase, 60 cycles $\pm$0.5 cycle. The power consumption of the set is 475 va. A 10 ampere time delay fuse protects the set components against high voltage surges or shorts.

SIGNAL REQUIREMENTS

3.02 Data is received and transmitted using the ASCII eight level data interchange code. The data interchange code is an eleven unit, equal bit code. The start bit, always transmitted as spacing, eight intelligence bits, and a stop pulse two bits in length and always transmitted as marking for synchronization purposes, make up the code. Intelligence bits one through seven may be either marking or spacing depending upon the character or function to be transmitted. The eighth bit is the parity bit and may be either marking or spacing in order to always supply an even number of marking pulses for each code combination transmitted (error detection feature). At an operating speed of 100 wpm, each bit is 9.09 milliseconds in length.

3.03 The dc signal received over the incoming line is an on-off (mark-space) current type sequential signal which varies from zero ampere (spacing) to 20 milliamperes (marking). In sets used with switched network services, a data set provides the 20 milliampere dc signals by demodulating ac tones that have been transmitted over telephone lines.

3.04 The incoming dc signals are amplified to 500 milliamperes marking and zero milliamperes spacing pulses by the selector magnet driver to operate the selectors of the set.

3.05 Local signals are developed with local battery when the set is operating in the LOC mode. The local battery is obtained from the punch selector magnet driver power transformer. This provides a signal for off-line operation of the set.

3.06 The tape reader and keyboard are parallel signal devices. The parallel signal is repeated by a set of relays. The contacts of these relays are connected to the distributor which translates the parallel input to serialized signals (2.29).

4. OPERATION (See Block Diagram - Figure 5)

General

4.01 The 35 ASR Data Communication Sets offer great flexibility in operation. Some of these capabilities were mentioned in paragraph one of this section. The sets respond to the American Standard Code for Information Interchange (ASCII) and can send and receive data in both parallel and serial signals. Basically, the sets operate over standard private lines

where the signal is transmitted as dc pulses. They can be modified for operation over telephone networks where tone (or frequency) modulation is used. The sets are initially wired for operation in a half duplex loop. They can be converted for full duplex application by simple changes in the wiring on the signal line terminal block.

4.02 These data communication sets may be equipped with a single (program control) tape reader or with a dual (program control and data) tape reader. The dual tape reader set affords greater versatility and convenience in operation; however, both sets will perform essentially the same functions.

Standard Features

4.03 The set is arranged for direct application of a 20 milliampere current, no-current private line circuit. Communication is by start-stop 11 bit signal at 110 baud rate. The punch and typing unit are both equipped with 500 milliampere electronic selector magnet drivers to provide high receiving margins. The keyboard, tape readers, and auxiliary parallel signal input devices gain access to the serial signal line through the distributor which converts simultaneous bit arrangements to sequential bit arrangements. Data set communication will provide access to switched service network facilities.

4.04 Program control is accomplished primarily by response to a set of internal control codes. The internal control codes are identical in bit arrangement to the ASCII control codes but the responses are different so that these control codes must be segregated from the ASCII code combinations and must not get outside of the set. Segregation is accomplished by a precedence code condition. The code combination DC_0 conditions the set to treat any following control codes as internal codes. The condition is terminated by the code combination NORMAL CODE. This returns the set to the normal condition wherein all code combinations are treated as ASCII. The suppression of internal control codes is accomplished at the point of conversion from parallel signal to serial signal. Internal control codes exist only as parallel signals and are never converted to serial signals.

4.05 There are 15 assigned internal control codes. See Table 1.

4.06 There are 8 unassigned internal control codes for special applications. These are the code combinations assigned in ASCII to data delimiters S_0 through S_7. The internal control code suppression feature also includes these code combinations. Although the internal control code recognition circuit does not recognize these codes, the associated relays have enough spare contacts to accommodate them. Three of these codes can be generated directly by the keyboard. The others can be entered into a program tape by over punching two different characters. In terms of the corresponding data delimiters, the control codes can be punched by the following keyboard operations:

S_0 CONTROL X
S_1 CONTROL Y
S_2 CONTROL Z
S_3 CONTROL C, backspace, CONTROL X
S_4 CONTROL D, backspace, CONTROL X
S_5 CONTROL E, backspace, CONTROL X
S_6 CONTROL F, backspace, CONTROL X
S_7 CONTROL G, backspace, CONTROL X

4.07 Data inputs can introduce both ASCII control codes and internal control codes. This requirement is often dictated by the source of the data. For example, by-product tapes from the set may be reprocessed later in the flow of a business process. Such tapes contain no internal control codes but might contain ASCII controls. Similarly, data tapes or line data received from an ASCII communications system might include ASCII control codes functional in that system. The ASCII control codes in such situations are treated as though they were data and the internal codes recognition is turned off as a data input device is called in. Access to internal controls from data input devices can be direct or indirect. Direct access is provided by enabling continual control code recognition with DC_0. This alternative is available if the data tapes or other input media are not used in communication with any equipment other than the set. The circuit control DC_0 will not appear in these cases by definition of the ASCII. Indirect access to internal controls is available without this restriction. The ASCII control code DC_1 will call in the program tape reader which can introduce the internal control code and return control to the data input device.

4.08 A remote input device can supply data directly to the set during data processing or with paper tape buffering. In on-line processing, the remote sender is turned on by sending XON or a proper code sequence. Since this will normally be sent from the program tape

SERIAL INPUT SIGNAL

(PARALLEL INPUT: CARD READER, CLOCK, ETC.)

PARALLEL OUTPUT SIGNAL

SERIAL OUTPUT

Optional Input Devices

Data Tape Reader

TAPE

Program Tape Reader

TAPE

Keyboard

OPERATOR

Manual Control

OPERATOR

Control Logic

Optional Program Device

Code Recognition

Distributor (Serializer)

ON OFF

ON OFF

PRINTING ON - OFF

FORMAT FUNCTIONS ON - OFF

Optional Auxiliary Receiver

Tape Punch

Page Printer

PARALLEL SIGNAL PATH ———

SERIAL SIGNAL PATH ———

CONTROL CIRCUITS - - - -

TABLE 1 - CONTROL CODES

KEYBOARD DESIGNATION	INTERNAL CODE NAME	SET RESPONSE
CONTROL A	DATA INPUT 1	Enables an auxiliary input device[1] or the data tape reader[2] and keyboard, disables other input devices and conditions set to respond to control codes as ASCII (6.01).
CONTROL B	AUXILIARY RECEIVER ON	Unblinds auxiliary receiver.
CONTROL C	AUXILIARY RECEIVER OFF	Blinds auxiliary receiver.
CONTROL D	NORMAL CODE	Conditions the set to respond to control codes as ASCII.
CONTROL E	DATA INPUT 2	Enables stepping switch input and keyboard. Disables other input devices (6.02) and conditions set to respond to control codes as ASCII.
CONTROL F	DATA INPUT 3	Enables auxiliary input device and keyboard. Disables other input devices (6.03) and conditions the set to respond to control codes as ASCII.
CONTROL G	PRINT RESTORE	Ends automatic print suppress mode of operation (unblinds typing unit and stops reader if preceded by a STOP code). Also PRINT RESTORE ends the with functions mode[1] or the maintain format mode[2] and the data by-pass mode.
CONTROL P	DC_0	Conditions set to respond to control codes as internal control codes. This code is always suppressed (4.04).
CONTROL Q	TAPE READER ON[1] PROGRAM TAPE READER ON[2]	Enables (program[2]) tape reader and keyboard and disables other input devices.
CONTROL R	PUNCH ON	Unblinds punch.
CONTROL S	STOP	Stops input device other than keyboard to permit keyboarding or other operator task. STOP also ends the manual print suppress mode by unblinding the typing unit and stopping the reader.
CONTROL T	PUNCH OFF	Blinds punch.
CONTROL U	AUTOMATIC PRINT SUPPRESS	Blinds the typing unit and keeps the reader running until the next PRINT RESTORE code if there is an intervening STOP code.
CONTROL V	WITH FUNCTIONS[1] MAINTAIN FORMAT[2]	Modifies print suppress modes and data by-pass modes by allowing ASCII controls, CR, LF, TAB, VT and FORM to be received by printer (and the punch in the case of data by-pass). This allows the typing unit to advance across and down a form when a section is not used.
CONTROL W	CARD EJECT	Commands a card reader to zip out the card being read. This appears as a lead on which an electrical pulse is provided to the card reader (6.03).

[1] Sets equipped with single tape reader.
[2] Sets equipped with dual tape readers.

reader, it must be followed by INTERNAL CODE-DATA INPUT 2 (or 3) or INTERNAL CODE-STOP to stop the program tape reader. To return to the program tape reader either at the conclusion of the data or to introduce an internal control, the remote sender must send DC_1 (XON) which can be recognized in the stunt box of typing units so equipped. The distant sender must stop after sending XON. This could be done by sending the sequence XON-XOFF-DE-LETE. The program tape reader must be programmed with one internal control character to allow time for the DELETE character to clear the typing unit following the sequence XON-XOFF-DELETE.

4.09   In sets with dual readers, transmission of data and recording on paper tape prior to processing in the set must also provide for inclusion of XON for switching from the data tape input to the program tape. In this case, the distant sender should not stop after sending XON, nor should the receiver start sending. This is accomplished by sending only XON (not XON-XOFF-DELETE) and by receiving the data on a receive-only punch or on an ASR Set with no tape in the reader. This automatically disables the XON response.

4.10   Transmission from the set during processing is compatible with the use of ASCII control codes in the communications facility. All internal control codes are suppressed and any required ASCII control codes can be generated by putting the set in the "normal mode." The same statements hold for subsequent transmission of by-product tapes. The by-product tapes are transmitted from the program tape reader. Since there is never DC_0 in the by-product tape, the program control switch can be on or off.

4.11   The set will stop whenever DC_3 (XOFF) is read in the program tape reader or in a parallel signal data input device.

4.12   The set can be operated off line so that the serial signals are contained within the set. This mode of operation is useful for preparing by-product tapes since it allows the transmission to take place later at maximum operating speed of 100 words per minute and it permits correction to be made in the by-product tapes off-line before transmission. Other uses for the local mode are for preparation of program tapes and for operator training and practice. The local mode is provided by turning the rotary power switch to the LOC position.

5.   CONTROLS

Private Line Communication

5.01   Private line communication is the simplest application of these sets. Communication is achieved by turning the rotary power switch to the ON LINE position and operating the keyboard, starting the tape reader, or turning on the punch. An interlock between the tape reader(s) and the page printer blinds the circuit such that the typing unit can only be blinded when (one of) the tape reader(s) is running. In this way, messages sent from outlying points to the ASR Set cannot be lost because of a print suppress condition.

5.02   The BREAK pushbutton switch is used to break the signal line to interrupt transmission from another location in emergencies. The local printer detects the break signal and lights the lamp inside the BREAK switch.

Program Control

5.03   The program control panel (Figure 3) is located to the left of the keyboard. The PROGRAM CONTROL twist switch turns the program control features on and off. The switch should be turned off during the preparation of program tapes so that the internal control codes can be punched. (Normally, they are suppressed.)

5.04   The PRINT SUPPRESS pushbutton switch starts a mode of operation in which the reader runs with the typing unit blinded. Other controls are unaffected. This mode of operation continues until the STOP code is read or until the STOP switch is operated. The blind is maintained until the last character cycle is finished.

5.05   The DATA BYPASS pushbutton switch allows the reader to run with the entire serial circuit blinded. This mode allows skipping over fixed information in the program (or data) tape up to the end of the section as marked by the PRINT RESTORE code. The print restore code terminates the data bypass mode. This mode can also be terminated by depressing STOP. The blind is maintained until the last character cycle is finished.

5.06   The keyboard controls include the following:

(a) The BRK RLS key unlatches the contacts and restores the set to normal following operation of the break signal feature.

(b) The LOC LF key causes the typing unit to feed out paper as long as the key is depressed. LOC S LF causes the paper to feed one line each time the key is depressed. Used together, a form may be rapidly advanced to the desired line. These keys are nontransmitting.

(c) The LOC CR key allows the type box to return to the left margin when operated. It is nontransmitting.

(d) The LOC BSP key causes the typing unit to back-up the type box one character and causes the punch to backspace the tape one character each time the key is depressed. If an auxiliary punch is connected to the set, it also is backspaced. (The punches must be turned on in order to backspace.) LOC BSP is also nontransmitting.

(e) The REPT key will cause a code combination selected on the keyboard to be repeated as long as the REPT key is held down.

5.07 The typing unit is normally on and will receive any serial signals that pass through the set except during the print suppression modes. The typing unit operates a margin indicator switch which lights the EOL lamp when the type box approaches the right hand margin.

5.08 The tape readers are started and stopped manually by operation of the START and STOP pushbutton switches. The program tape reader runs unless the data tape reader, in dual reader sets, has been turned on by internal control code. See 2.15-2.28.

5.09 The punch can be on whether program control is used or not. Normal usage calls for the punch to be code controlled from the program tape. The controls are covered in 2.06-2.08.

6. DATA INPUT DEVICES

6.01 DATA INPUT 1 calls in the data tape reader in dual reader sets. The controls required by the data tape reader are also suit-able for other input devices. In single reader sets, DATA INPUT 1 calls in an auxiliary input device. In both cases, the control consists of a DC power circuit to turn the device on and off in response to code selection of input device, reader start-stop control, reader hold on controls, reader hold on tabulation and form feed, reader step, print suppress modes, data bypass mode, and release (analogous to release by tape out contacts on data tape reader).

6.02 DATA INPUT 2 can call in an auxiliary input device. Besides having the control capabilities listed in 6.01, there is a special circuit for control of a stepping switch type of input device or electronic input device. This circuit turns on the distributor which drives the input device character by character. Another circuit connects the input device to the parallel signal input.

6.03 DATA INPUT 3 can also call in an auxiliary input device. The control features are identical to those listed in 6.01. In addition, a spare make contact is provided which can be used to control an edge punched card reader.

6.04 Parallel signal input devices can generate ASCII code combinations and internal controls.

6.05 Serial input devices are restricted to ASCII codes. For them to gain access to the internal codes, the program tape reader must be called in. Control can be reverted to the program tape reader from a serial input device by opening the release leads when the input device has finished. (DC_1 recognition contacts in the stunt box can be used to open these leads.)

6.06 Serial input devices require fill characters after certain ASCII control codes because the HOLD feature functions only on parallel input devices.

6.07 One auxiliary receiver can be controlled by the set. This can be a parallel or serial signal receiving device. More than one auxiliary receiver can be driven but only one of them can be turned on and off by the basic controls.