CALL/360:

Terminal Reference Manual

The BASIC language of CALL/360 is based upon the original development of the BASIC language done at Dartmouth College, Hanover, New Hampshire.

This manual contains operating instructions and describes the characteristics of the three terminals that may be used with CALL/360 – the IBM 2741, the Teletype† unit, Type 33, and the Teletype unit, Type 35.

General information on the system and the BASIC language may be found in the publication *CALL/360: BASIC Introduction.* The *CALL/360: BASIC Handbook* contains the detailed information on the BASIC language statements and commands. Reference material is provided in concise format on the *CALL/360: BASIC Reference Card.*

† Trademark of the Teletype Corp., Skokie, Illinois

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Contents

Introduction

CALL/360: BASIC combines the vast problem-solving capabilities of a modern computer with the operational simplicity of a typewriter keyboard. User terminals are linked by telephone lines to a centrally located computer. Each user operates his terminal much as he would an ordinary electric typewriter. There is no need for him to be familiar with, or even aware of, the operations of the computer itself. He is free to concentrate on the mathematics of the problem to be solved.

Three terminals are available for use with BASIC: the IBM 2741 and the two Teletype units, the Type 33 and the Type 35.
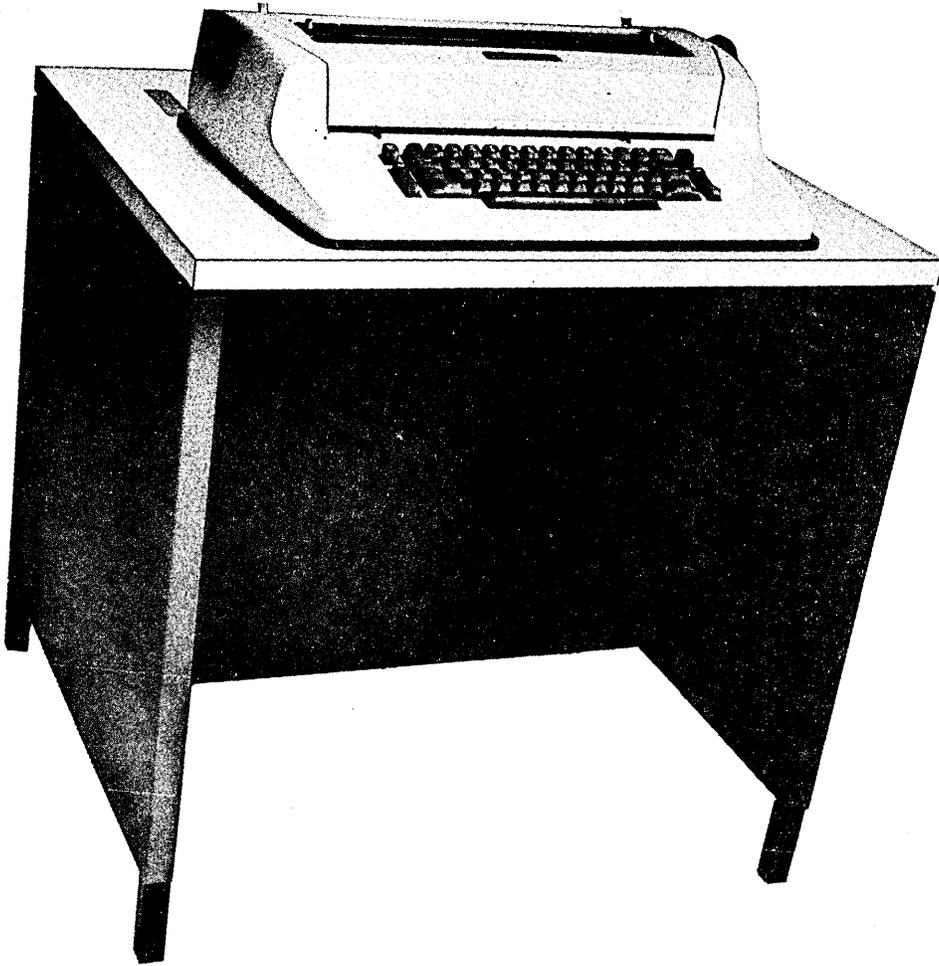
Figure 1. IBM 2741 Communication Terminal

Sign-On Procedure

To begin work, the user must establish a telephone connection and then identify himself to the computer. The user should:

1. Set the ON/OFF switch (at the right of the keyboard) to ON.
2. Set the COM/LCL switch (Communicate/Local, housed in the niche in the left side panel of the terminal) to COM.
3. Press the TALK button on the data set.
4. Lift the data set receiver, wait for a dial tone, and dial the system telephone number (the system answers the call with a steady, high-pitched tone). If the line is busy or there is no answer, hang up and dial again.
5. Press the DATA button on the data set firmly.
6. Replace the receiver in its cradle.

At this point the telephone connection has been made. Should the light in the DATA button go out during operations, the phone connection must be reestablished.

To identify himself to the computer, the user should be sure that paper has been inserted and then:

1. Press the RETURN key (next to the ON/OFF switch).
2. Wait for the system to print a greeting message and the words: USER NUMBER, PASSWORD --
3. On the same line, type the user number, a comma (no space after it), and the password.
4. Press the RETURN key.

NOTE: If a BCD 2741 is being used, the BACKSPACE key must be depressed—before execution of steps 1 through 4 above.

Each user is assigned a user number of three alphabetic and three numeric characters. The password, made up by the user, consists of up to eight characters in any combination. If the user number were ABC123 and the password were WXYZ90+*, the system's sign-on invitation (up to and including the two hyphens) and the user's typed response would be:

```
USER NUMBER,PASSWORD--ABC123,WXYZ90+*
```

The user types no blank spaces in the sign-on line unless blanks happen to be "characters" within the password itself. The password may not begin with a blank space, nor may it contain backspaces.

After the identification is accepted, the system replies by printing the word READY, and the user can then begin his problem-solving job.

Corrections

Deleting Incorrect Characters

To delete incorrectly typed characters before the line has been ended with the RETURN key, the user should:

1. Backspace to the point of the error.
2. Press the ATTN key (Attention, above the ON/OFF switch).

The system underlines the character and moves the paper up one line without moving the print element, and the user can resume typing from the point of the error. For example, the word PROTECT, misspelled as PROTCET, would be corrected by typing:

```
PROTCET
    ECT
```

Backspacing "erases" individual characters from the computer's storage unit. Characters cannot be erased by backspacing once a line has been ended with the RETURN key.

Deleting the Current Line

To delete a line before the RETURN key has been pressed, the user should:

1. Type ° (the degree symbol, the upshift J).
2. Press the ATTN key.

The system prints the word DELETED and ends the line automatically.

Deleting a Line Already Entered

To delete a program-statement line that has been completed, the user should:

1. Type the line number of the program statement to be deleted.
2. Press the RETURN key.

System commands cause an immediate response and cannot be deleted once they have been entered.

Breaking Execution

To interrupt the system while a program is running or being listed, the user should:

1. Press the ATTN key.

The system stops the program and prints:

```
STOP.
READY.
```

Sign-Off Procedure

To sign off, the user should:

1. Type the word OFF.
2. Press the RETURN key.
3. Wait for the system to reply with the time of day, the processing time, and the terminal time.
4. Set the ON/OFF switch to OFF.

It is not necessary to reset the COM/LCL switch unless the terminal is to be used for ordinary typing. The telephone connection is broken automatically.

If necessary, the user can disconnect without signing off by setting the ON/OFF switch to OFF.

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Operating Instructions: Teletypewriter Units
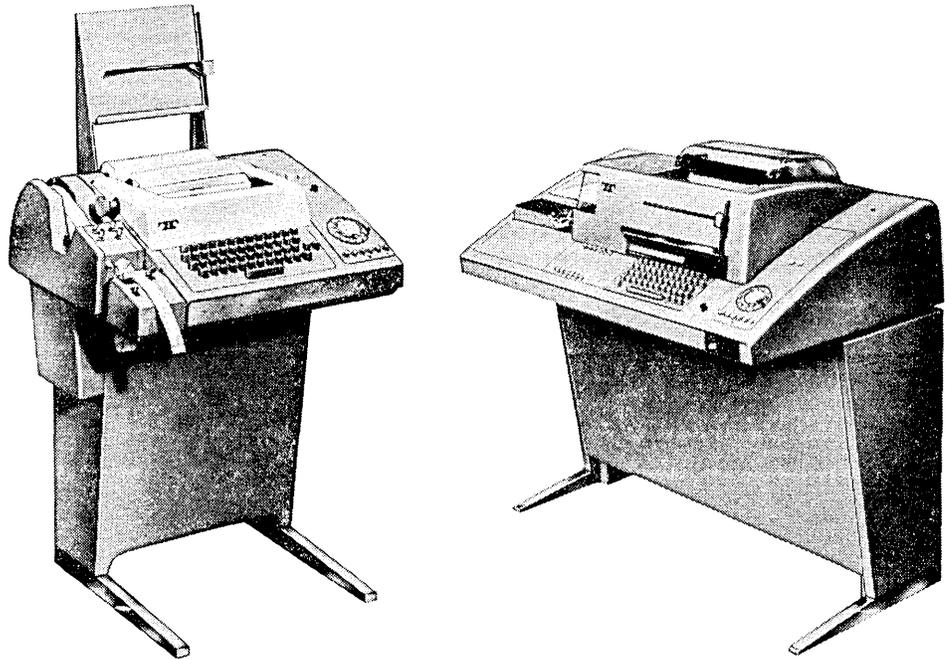
Figure 2. Teletype Units, Type 33 ASR (left) and Type 35 ASR

Sign-On Procedure

To begin work, the user must establish a telephone connection and then identify himself to the computer. The user should make sure that the volume control knob (under the key shelf on the right of the 33; between the keyboard and phone dial on the 35) is turned up enough so the dial tone will be audible, and then:

1. Press the ORIG button (Originate, at the left end of the row of buttons below the telephone dial), and wait for a dial tone.
2. Dial the system phone number (the system answers the call with a high-pitched constant tone). If there is no answer or the line is busy, disconnect (press CLR) and dial again.

At this point, the telephone connection has been made. To identify himself to the computer, the user should be sure that paper has been inserted and then:

1. Wait for the system to print a greeting message and the words:
   USER NUMBER,PASSWORD - -
1a. (Type 35 only) Press the K key (Keyboard, at the left end of the lower row of buttons on the left control panel) to unlock the keyboard.
2. Type the user number, a comma (no space after it), and the password.
3. Press the RETURN key.

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Each user is assigned a user number of three alphabetic and three numeric characters. The password, made up by the user, consists of up to eight characters in any combination. If the user number were ABC123 and the password were WXYZ90+*, the system's sign-on invitation (up to and including the two hyphens) and the user's typed response would be:

```
USER NUMBER,PASSWORD--ABC123,WXYZ90+*
```

The user types no blank spaces in the sign-on line unless blanks happen to be "characters" within the password itself. The password may not begin with a blank space.

After the identification is accepted, the system replies by printing the word READY, and the user can then begin his problem-solving job.

Corrections

Deleting Incorrect Characters

To delete incorrectly typed characters before the line has been ended with the RETURN key, the user should:

1. Hold down the SHIFT key.
2. Strike the letter "O" once for the first incorrect character in the line, and once for each character following it (including any blank spaces).

The back-arrow symbol (←) is printed for each "upshift" O. The user then types the correct character and all characters following it. For example, the word PROTECT, mis-spelled as PROTCET, would be changed by typing:

```
PROTCET←←←ECT
```

The back-arrow symbol "erases" individual characters from the computer's storage unit. Characters cannot be erased by the back-arrow once a line has been ended with the RETURN key.

Deleting the Current Line

To delete a line before it has been ended with the RETURN key, the user should:

1. Hold down the CTRL key (Control, at the left of the third keyboard row).
2. Strike the letter "X".

The system prints the word DELETED and ends the line automatically.

Deleting a Line Already Entered

To delete a program-statement line that has been completed, the user should:

1. Type the line number of the program statement to be deleted.
2. Press the RETURN key.

System commands cause an immediate response and cannot be deleted once they have been entered.

Breaking Execution

To interrupt the system while a program is running or being listed, the user should:

1. Press the BREAK key.
2. Press the BRK-RLS button (Break-Release, above the phone dial).
2a. (Type 35 only) Press the K key to unlock the keyboard.

The system stops the program and prints the words:

```
STOP.
READY.
```

Sign-Off Procedure

To sign off, the user should:

1. Type the word OFF.
2. Press the RETURN key.

The system replies with the time of day, the processing time, and the terminal time. The telephone connection is broken automatically.

If necessary, the user can disconnect without signing off by pressing the CLR button (Clear, below the phone dial).

Paper-Tape Operations

The Automatic Send/Receive (ASR) models have paper-tape facilities in a unit to the left of the keyboard. The ASR user, with the terminal off-line (not connected to the computer), can punch a program into tape and later sign on and read that program into the computer, or he can type a program on-line and then have the computer punch it into tape.

Punching Tape Off-Line

To prepare a tape off-line, the user should:

1. Turn on the Teletypewriter and the punch unit.
2. Simultaneously hold down the RUBOUT and REPT keys (next to the right SHIFT key) long enough for a few inches of tape leader to be punched
3. Type the program, ending each line with the RETURN and LINE FEED keys.
4. At the end of the program, hold down the RUBOUT and REPT keys long enough for a few inches of tape trailer to be punched.
5. Turn off the Teletypewriter and punch unit.

The Teletype unit, Type 33, is turned on and off with the LCL (Local) and CLR (Clear) buttons below the phone dial, and the punch is turned on and off with the ON and OFF buttons on the punch unit. The Teletype unit, Type 35, and punch unit are turned on and off with the MOTOR-ON knob on the left control panel. (See page 19 (Type 33) or page 26 (Type 35) for the use of the X-ON, X-OFF feature.)

Correcting Tape Errors

To correct an incorrectly punched character, the user should:

1. Backspace the tape to the point of the error (using the B.SP. button on the Type 33 punch, or the LOC B.SP. key next to the keyboard space bar on the Type 35).
2. Use the RUBOUT key to overpunch the incorrect character and any characters following it.
3. Punch the character correctly, and repunch any characters following it.

The RUBOUT key punches a full row of holes on the tape, overpunching any characters previously punched. The RUBOUT "character" is ignored when it is read by the computer.

Reading Tape

Paper tape that has been punched can be read and the characters transmitted to the computer. With the terminal signed on, the user should:

1. Type the command TAPE.
2. Press the RETURN key.
3. Set the tape feed-wheel switch on the tape reader to FREE.
4. Press the lock switch to open the tape gate.
5. With the tape surface facing upward, place the small tape feed holes of the leader over the tape feed wheel.
6. Close the tape gate.
7. Set the tape feed-wheel switch to START (on the Type 33) or RUN (on the Type 35).
7a. (Type 35 only) Press the T (or TTS) button and then the TD ON button.
8. Wait for the system to read the tape; the tape reader stops when it reaches the end of the tape.
8a. (Type 35 only) Press the TD OFF button and then the K button.
9. Type the command KEY.
10. Press the RETURN key.

Tape can be pulled free from the reader when the tape feed-wheel switch is set to FREE.

The CALL/360: BASIC system will recognize only the RUN and KEY commands after the TAPE command. The KEY command allows the system to recognize other commands.

Listing a Program on Tape

A program can be listed by the computer and the characters punched on tape. With the terminal signed on and a program loaded, the user should:

1. Type the system command LIST-NO-HEADER (do not end the line with the RETURN key).
2. Turn on the punch unit.
3. Simultaneously hold down the RUBOUT and REPT keys long enough for a few inches of tape leader to be punched.
4. Press the RETURN key.
5. Wait for the system to punch the program.
6. At the end of the program, hold down the RUBOUT and REPT keys long enough for a few inches of tape trailer to be punched.
7. Turn off the punch unit.

Equipment Characteristics

IBM 2741

The IBM 2741 Communication Terminal, shown in Figure 3, provides access to the system computer. The terminal incorporates the features of the IBM SELECTRIC® typewriter. The keyboard, however, is not identical.

The COM/LCL switch (Communicate/Local), located in a niche in the left side-panel of the terminal, must be set to COM when the terminal is connected to the computer (on-line) and set to LCL when it is used as a standard typewriter (off-line).

Figure 3. IBM 2741 Communication Terminal

Keyboard and Controls

Figure 4 shows the keyboard. All alphabetic and numeric characters are in the conventional arrangement. Special symbols are not in the conventional arrangement, but are placed in related groups to simplify their use. All alphabetic characters are capitals. The SHIFT key is used for typing the "upshift" special characters.

Figure 4. IBM 2741 Keyboard

In addition to the standard keys, the keyboard contains the following keys with specialized functions:

The BACKSPACE key:

1. To backspace.
2. To "erase" typing mistakes, when used with the ATTN key.
3. To indicate use of BCD 2741 keyboard.

The ATTN key (Attention):

1. To be used in the backspace-and-erase function.
2. To interrupt program execution.

The CLR/SET key (Clear/Set), to clear and set tab stops. The tab function may be used for off-line typing in Local. The TAB key must not be used when the terminal is connected to the computer.

Paper Insertion and Movement Controls

The 2741 paper-insertion and movement controls are illustrated in Figure 5.

The *platen knobs* rotate the platen forward or backward for manual positioning of forms. Pressing in the left knob permits free rotation of the platen for variable registration of forms.

The *multiple-copy control lever* adjusts the platen so that the print element strikes squarely on the paper. The lever is set to the first position (nearest the user) for a single sheet of paper, to the second position for one original and three carbon copies, and to the third position for one original and five or more copies. (See also the discussion of the impression-control lever in the section *Ribbon/Print Element Carrier.*)

The *paper bail* is the rod that holds the paper against the platen. It must be moved away from the platen while changing forms and may be set in the forward position to avoid carbon streaks when multiple-part forms are being used.

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Figure 5. IBM 2741 Paper Insertion and Movement Controls

The *paper guide* is an aid to paper alignment and may be freely moved to either the right or left.

The *paper-release lever* is set forward (in the released position so that paper slides freely) when paper is changed. It is kept in the released position when a pin-feed platen is installed.

The *line-space lever* may be set for either single spacing or double spacing.

A *margin stop* is positioned by pushing it in and sliding it to the desired setting. When changing margin settings, it may be necessary to space or backspace to move the carrier, since the margin stop does not slide past it.

The *typing-position indicator* marks the position of the print element. A warning bell rings when the carrier nears the right margin.

Pin-Feed Platen

As an optional feature, the standard friction-feed platen may be replaced by a pin-feed platen for use with forms with sprocket holes. Pin-feed platens are available in several widths from 5¼ in. to 13-1/8 in. (based on the hole-to-hole measurement of the paper).

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Ribbon/Print Element Carrier   The carrier, illustrated in Figure 6, holds the ribbon cartridge and print element.
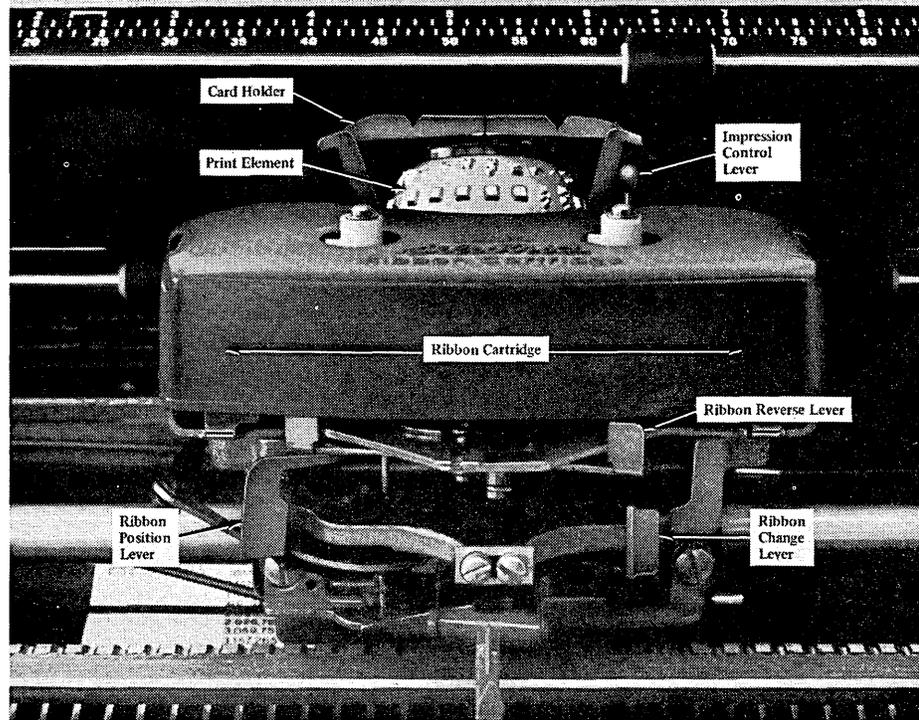
Figure 6. IBM 2741 Ribbon/Print Element Carrier

The clear plastic *card holder*, which rides between the print element and platen, is imprinted with a centered vertical line and a horizontal line, which serve as alignment aids for Local typing.

The *print element* is a MANIFOLD 72 element (IBM part No. 1167087), identified by the pitch number 10 under the arrowhead on the plastic cap and the code number 087 to the left of the snap lock.

The *ribbon-reverse lever* reverses the direction of the ribbon movement. Ribbon movement automatically reverses when the end of the ribbon is reached.

The *ribbon-position lever* has four settings (left to right), which permit the ribbon to be positioned so that either the top, middle, or bottom section of the ribbon is used. The rightmost position is used for stencil operation. Periodic repositioning of this lever extends the life of the ribbon and permits the used portion of the ribbon fabric to be re-inked.

The *ribbon-change lever*, set to the left for typing, is moved to the extreme right to lift the ribbon guides for ribbon changing.

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The red-knobbed *impression-control lever* adjusts the striking force of the print element. It is set to 1 for light impression, 3 for medium impression (one to five copies), and 5 for heavy impression. (See also the discussion of the multiple-copy control lever in the section *Paper Insertion and Movement Controls*.)

The removable plastic *ribbon cartridge* carries an identifying name and reorder number on its underside.

Ribbon Changing

The steps for changing the ribbon are listed below. The letters A, B, and C refer to Figure 7.
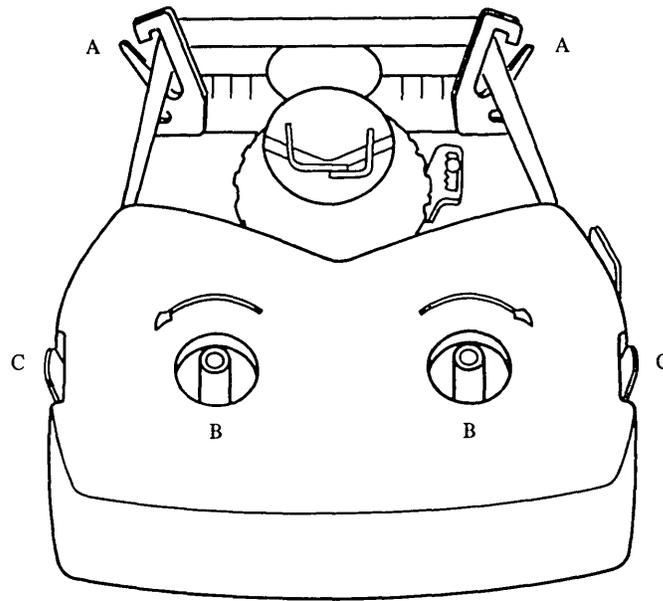
Figure 7. Ribbon Changing

To remove the ribbon cartridge, the user should:

1. Center the print element and ribbon carrier.
2. Set the ON/OFF switch to OFF.
3. Raise the cover of the terminal.
4. Move the ribbon-change lever to the far right to raise the ribbon lifts (A).
5. Remove the ribbon from the ribbon lifts (A).
6. Lift the cartridge off the spindles (B), freeing it from the retaining clips (C).
7. Rewind the excess ribbon by inserting a pencil in either of the top cartridge holes and turning it in the direction of the arrow.

To install a new cartridge:

1. Balance the cartridge on the spindles (B).
2. Pull out several inches of ribbon and thread it through the ribbon lifts (A).
3. Snap the cartridge down onto the spindles.
4. Move the ribbon-change lever back to the left, making sure that the ribbon is lowered between the print element and the plastic card holder.
5. Rewind any excess ribbon by turning either spindle (B), with thumb and forefinger, in the direction of the arrow.
6. Close the cover; turn on power.

Changing Print Elements

The print element is shown in Figure 8. When it is changed, the terminal should be in the lower-shift position and turned off. When an element is replaced or removed, it should be snapped directly into and out of position and not forcibly tilted or rotated on its post.
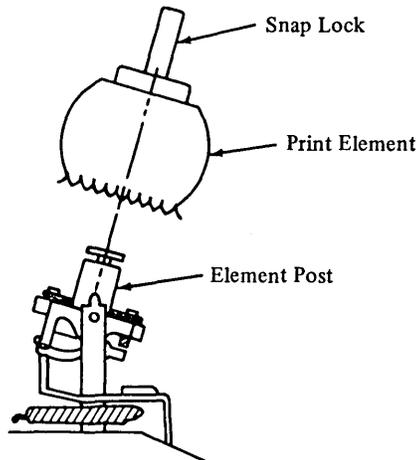
Figure 8. Position of Print Element While Being Removed or Replaced

To remove an element, the user should:

1. Turn off the terminal and raise the cover.
2. Make sure the terminal is in lower-shift position (that is, the arrowhead on the element cap is pointed toward the platen).
3. Lift the snap lock in the center of the cap and use it to lift the element from the post.

To replace an element:

1. Make sure the terminal is in lower-shift position.
2. Lift the snap lock and place the element on the post with the arrowhead on the cap pointed toward the platen.
3. Gently press the element down on the post until it clicks into place.
4. Push the snap lock on the element cap down into position.

If the element does not slide on or off freely, the user may reverse the direction of the post by putting the terminal in upper shift. The arrow on the element cap should then be pointed away from the platen.

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Test Procedures

Check-Loop Test

The check-loop test checks the electronic circuitry of the terminal and is performed with the Communicate/Local switch in the Local position. While the Attention key is held down, a single operation of any one of the character keys on the keyboard causes that character to print repeatedly. This indicates that the electronic circuitry is functioning properly and that the character would be transmitted if the terminal were operating in Communicate. Releasing the Attention key stops the repeat printing.

If the character does not print repeatedly, the electronic circuitry of the terminal is not functioning properly and appropriate maintenance personnel should be notified.

Echo Test

The echo test is provided by the system as a method of checking the communication line and is performed with the terminal signed on the system. The user should type the word ECHO, a space, and then a string of characters across the page. The computer responds by duplicating, on the next line, the first 74 characters of the alphameric string entered by the user.

If the two lines do not match, the user should disconnect, reestablish the phone connection, and try the echo test again. If trouble persists, maintenance personnel should be notified.

Installation Requirements
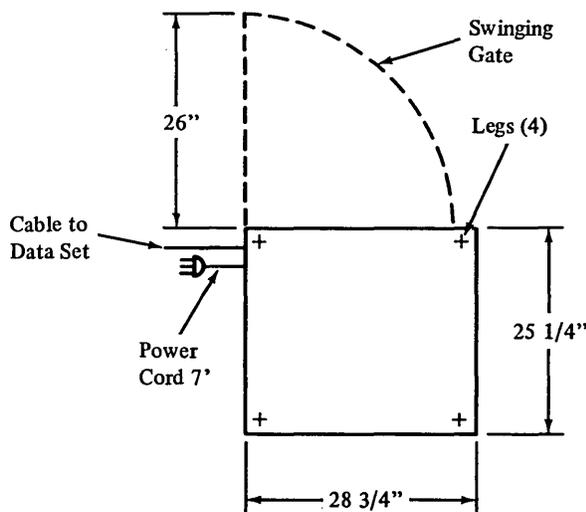
Dimensions: Width 28¾ in.   Depth 25¼ in.
Height (Overall) 36½ in.
Height (Desk-Top) 29 in.

Maximum Weight: 194 lbs.

Service Clearances: Front—30 in.   Rear—42 in.   Left—18 in.   Right—18 in.

Electrical Requirements:

Voltage	115 ± 10%	Service:	15 amps
Frequency	60 ± ½	Plug:	see notes
Phases	1	Receptacle:	see notes
KVA	0.15	Connector:	see notes

Environmental Specifications: BTU/Hr. 400 CFM

	Temp.	Rel. Hum.	W. B. Temp.
Operating:	50-110°F	10–80%	85°F max.
Non-Operating:	50-110°F	10–80%	85°F max.

```
                        Point-to-Point
 ┌────────┐ |            /
 │        | |  ┌─────────┐   /
 │  2741  | |──│ Common  │──  /──ɔ̶──  ──▶  System/360
 │        | |  │ Carrier │
 │        | |  │ Data Set│
 └────────┘ |  └─────────┘
```
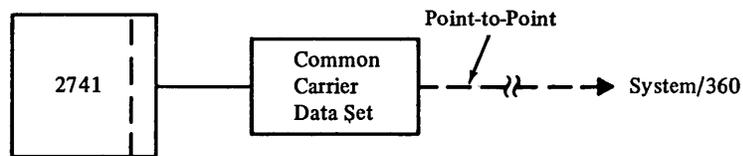
NOTES:

1. Plug types: Hubbell or Pass & Seymour 5267 (115 volts, nonlock). Customer provides matching receptacle: Hubbell or Pass & Seymour 5262 for 5267 plug.

2. Circuit should be separate three-wire single-phase branch circuit from power distribution panel, with green wire connected to ground, not current neutral.

3. For shipping, temperature limits are −40° and +150° F.

4. 2741 can communicate with CALL/360 over common-carrier switched telephone network with Western Electric Data Set 103A (or equivalent).

The Type 33 Teletype unit provides access to the system computer. It is available in two models: the Automatic Send/Receive (ASR) with a paper-tape punch and reader, and the Keyboard Send/Receive (KSR). Both models are shown in Figure 9.

Although most Type 33 units have the characteristics described on the following pages, a specific unit may have slight variations.
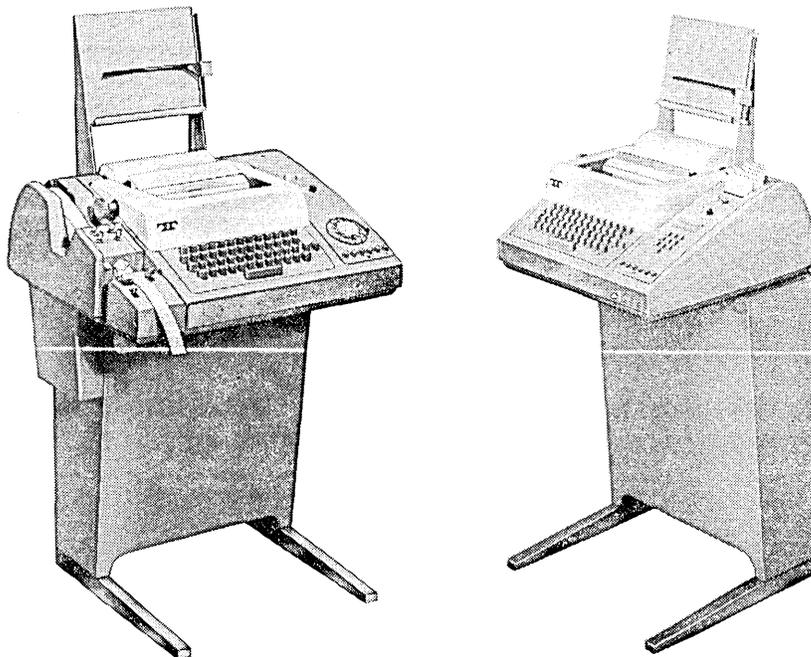
Figure 9. Teletype Units, Type 33 ASR (left) and KSR

Keyboard and Controls

Figure 10 shows the keyboard and control panels of the ASR. It contains all standard characters in the conventional arrangement as well as a number of special symbols. All alphabetic characters are capitals. The SHIFT key is used only for typing the "upshift" special characters. The CTRL key (Control, above the left SHIFT), like the SHIFT, is used in conjunction with other keys to perform special functions. Neither the SHIFT nor CTRL key is self-locking; each must be held down when used.

In addition to the standard keys, the keyboard contains several nonprinting keys with specialized functions:

The LINE FEED key (near the right end of the second row) moves the paper up one line without moving the ribbon carrier and printing mechanism. When the terminal is used off-line, the LINE FEED should be used after each line of typing to avoid over-printing of the next line.

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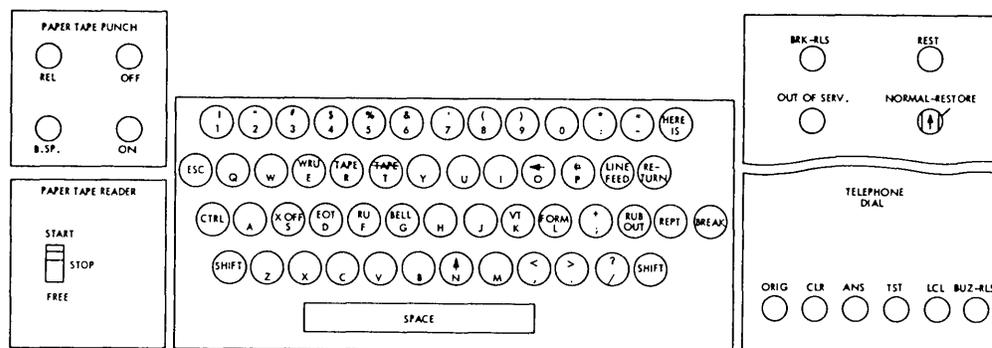
Figure 10. Type 33 ASR Keyboard

The RUBOUT key (below the LINE FEED) punches a full row of holes in the paper tape; this character is ignored when read by the computer. The RUBOUT key is used to punch tape leaders and trailers, and, when tape has been backspaced, to overpunch and thus delete a character previously punched.

Holding down the REPT key (Repeat, next to RUBOUT) causes repeated action of any other key pressed.

The BREAK key (next to REPT) is used to interrupt program execution. After breaking execution, the user should press the BRK-RLS button to unlock the keyboard.

The HERE IS and ESC (ALT MODE on some units) keys are not used by the system.

The CTRL key (Control, above the left SHIFT) is used in conjunction with the letter X to delete a typed line. On ASR models with the X-ON, X-OFF feature, it is used with the letter S to punch the X-OFF character and with the letter Q to generate the X-ON character.

The WRU (letter E), TAB (letter I), EOT (letter D), RU (letter F), BELL (letter G), VT (letter K), and FORM (letter L) functions of the CTRL key are not used by the system.

Right Control Panel

The right-hand control panel, also called the Attendant's Control Unit, has six buttons below the telephone dial; above the dial it has two lights, a button, and the NORMAL-RESTORE knob.

The ORIG button (Originate, at the left of the lower row) is pressed to obtain a dial tone before dialing. The volume control on the loudspeaker (under the keyboard shelf to the right) should be turned up enough so that the dial tone is audible. After connection has been made, volume can be turned down.

The CLR button (Clear) is pressed to turn off the Teletypewriter.

The ANS button (Answer) is not used by the system.

The TST button (Test) is used for testing purposes and may be ignored.

The LCL button (Local) is pressed to turn on the Teletypewriter when the unit is to be used off-line (not connected to the system) for typing or punching tape, or for changing tape or ribbon.

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The BUZ-RLS button (Buzzer-Release) is used to shut off the buzzer that sounds to warn of low paper supply. The light in the BUZ-RLS button remains on until paper has been replenished.

The NORMAL-RESTORE knob (above the telephone dial) is set to NORMAL except to change ribbon or tape, in which case it is twisted so that the arrow points to the OUT-OF-SERV light. The knob is momentarily set to RESTORE and then returned to the NORMAL position when the operation is completed.

The OUT-OF-SERV light (Out-of-Service) goes on when the NORMAL-RESTORE knob is pointed to it for ribbon or tape changing.

The BRK-RLS button (Break-Release) is used to unlock the keyboard after program execution has been interrupted with the BREAK key.

The REST light is not used.

Most units have a loudspeaker and a volume control knob (VOL) located under the keyboard shelf. The knob is turned clockwise to increase volume. On some units a telephone handset may be provided instead.

Paper-Tape Punch and Reader

The paper-tape punch and reader are housed in a unit to the left of the keyboard on the ASR. The punch generates a row of holes in the tape to represent each character (including nonprinting functions).

The control panel contains four buttons and a switch:

The ON and OFF buttons are used to turn the unit on and off.

The B.SP. button (Backspace) moves the tape backward one character each time it is pressed, so that incorrect characters can be deleted by overpunching with the RUBOUT character.

The REL button (Release) frees the tape so that it can be pulled through the punch. Tape that has been released from the punch contains no holes and cannot be fed through the reader.

The *feed-wheel switch* controls the movement of the paper-tape reel in the reader. This switch is set to the START position when tape is to be read. It is set to FREE when tape is to be positioned or released. When the switch is set to the STOP position, tape movement is halted.

The *chad box*, under the punch, collects the chad (bits of paper) and must periodically be emptied.

X-ON, X-OFF Feature

Stopping and starting of paper tape can be controlled by the computer when the optional X-ON, X-OFF feature is provided. When the letter S is struck while the CTRL (Control) key is held down, the X-OFF character is punched. When the ASR 33 reads the X-OFF character in the tape, it will turn off the paper-tape reader. It is suggested that the X-OFF character be followed by five RUBOUT characters.

The tape reader can later be turned on with the X-ON character (the CTRL key function of the letter Q) by the computer.

Replacing Tape

To place a new roll of tape in the punch, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Press the LCL button (below the dial).
3. Press the ON button on the punch unit.
4. Press the RUBOUT key (above the right SHIFT key on the keyboard) enough times to feed out any remaining tape.
5. Remove the used roll of tape from the holder.
6. Place the new roll of tape in the holder so that tape feeds from the top of the roll.
7. Ease the tape through the loading plate, striking the RUBOUT key until the tape passes through and is visible at the punch head.
8. Press the OFF button on the punch unit.
9. Press the CLR button (below the telephone dial).
10. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.

Paper Insertion

A buzzer sounds when the supply of paper is low. The buzzer may be silenced by pressing the BUZ-RLS button (Buzzer-Release, under the telephone dial). The light in the BUZ-RLS button remains on until the paper has been replenished.

To add paper, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Raise the Teletypewriter cover.
3. Tilt the paper release lever forward (Figure 11), raise the paper guide, and pull the remaining paper out from under the platen.
4. Lower the paper guide.
5. Lower the Teletypewriter cover.
6. Remove the used roll of paper.
7. Take the spindle from the used roll and insert it into the new roll.
8. Position the new roll so that the paper feeds out from under the roll toward the platen.
9. Raise the cover of the Teletypewriter.
10. Feed the paper over the straightener rod and under the platen.
11. Raise the paper guide, and feed the paper between it and the platen.
12. Pull the paper up a few inches and straighten it.
13. Push back the paper guide so that it rests on the paper.
14. Tilt the paper release lever back into its original position.
15. Lower the Teletypewriter cover (making sure the paper feeds out through the top).
16. Press the CLR key (Clear, below the telephone dial).
17. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.
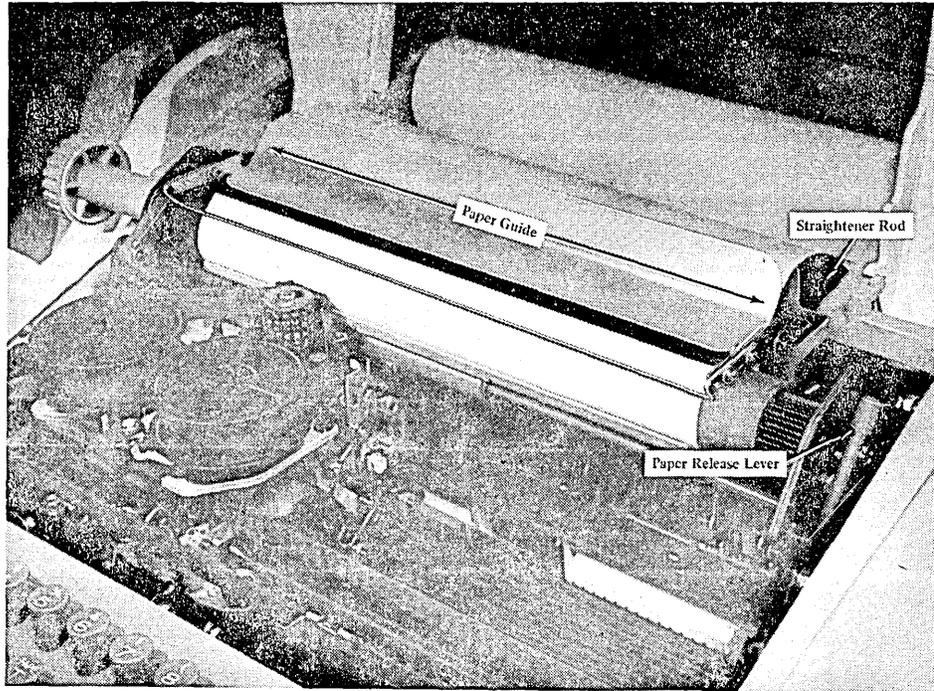
Figure 11. Type 33 ASR Paper Insertion and Movement Controls

Ribbon Changing

The Teletypewriter uses a specially made ribbon. To change it, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Raise the Teletypewriter cover.
3. Lift both ribbon spools (Figure 12) from their shafts.
4. Remove the ribbon from the ribbon guides and the ribbon reverse levers.
5. Remove the old ribbon from one spool.
6. Hook the end of the new ribbon to the hub of the empty spool (on spools having a barb, use it to pierce the ribbon) and wind the ribbon until the eyelet is on the spool.
7. Replace the spools on their shafts (make sure the spools go all the way down on their shafts and that ribbon feeds from outside the spools).
8. Thread the ribbon around the ribbon rollers, through the slots on the reverse levers, around the ribbon guides, and then through the slots on both the right and left side of the ribbon guides.
9. Turn the free spool to take up slack (the ribbon is properly threaded if the eyelet is between the spool and the reverse lever).
10. Lower the Teletypewriter cover (making sure the paper feeds out through the top).
11. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.

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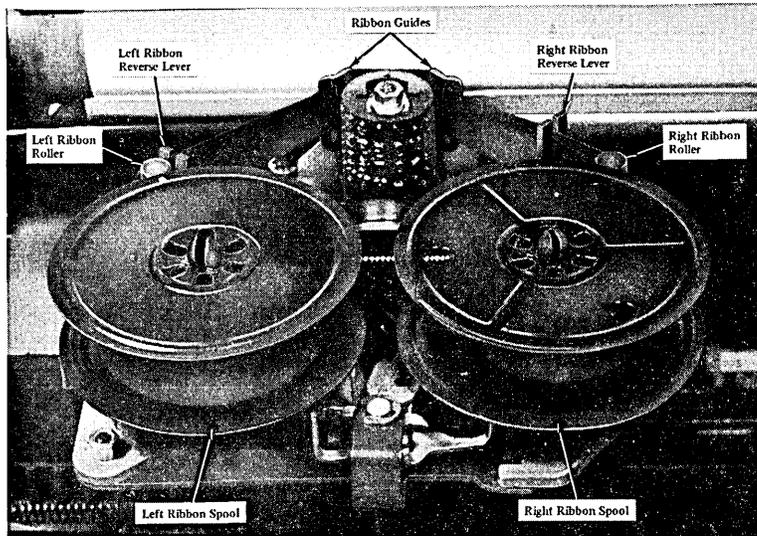
Figure 12. Type 33 ASR Ribbon Controls

Echo Test

The echo test is provided by the system as a method of checking the communication line and is performed with the terminal signed on the system. The user should type the word ECHO, a space, and then a string of characters across the page. The computer responds by duplicating, on the next line, all characters that were transmitted.

If the two lines do not match, the user should disconnect, reestablish the phone connection, and try the echo test again. If trouble persists, the proper maintenance personnel should be notified.

The Teletype unit, Type 35, provides access to the system computer. It is available in two models: the Automatic Send/Receive (ASR), with a paper-tape punch and reader, and the Keyboard Send/Receive (KSR). Both models are shown in Figure 13.

Although most Type 35 units have the characteristics described on the following pages, a specific unit may have slight variations.
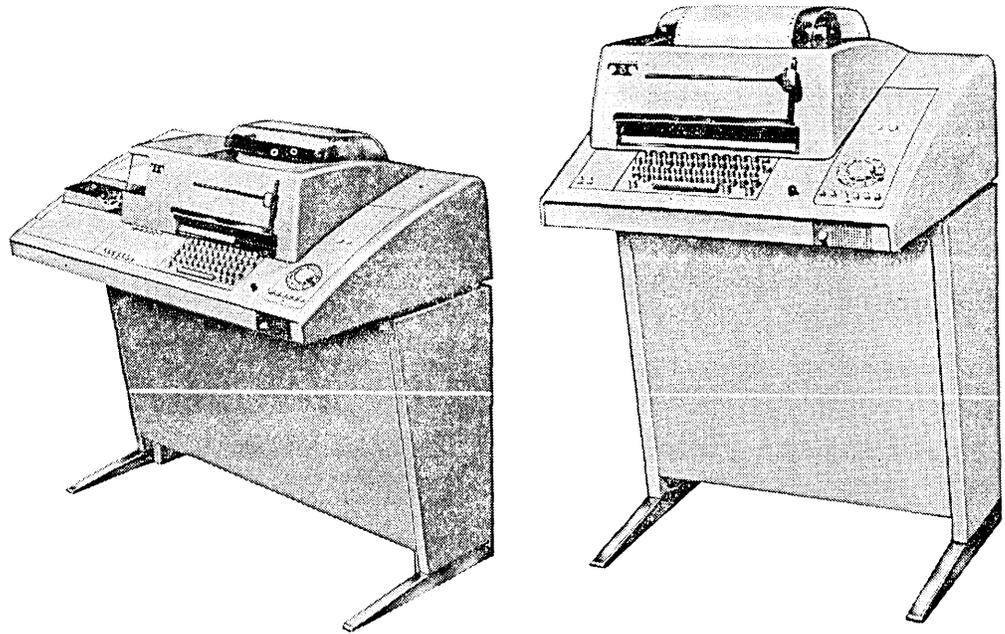
Figure 13. Teletype Units, Type 35 ASR (left) and KSR

Keyboard and Controls

Figure 14 shows the keyboard and control panels of the ASR. The keyboard contains all standard characters in the conventional arrangement, as well as a number of special symbols. All alphabetic characters are capitals. The SHIFT key is used only for typing the "upshift" special characters. The CTRL key (Control, above the left SHIFT), like the SHIFT, is used in conjunction with other keys to perform special functions. Neither the SHIFT nor CTRL key is self-locking; each must be held down when used.
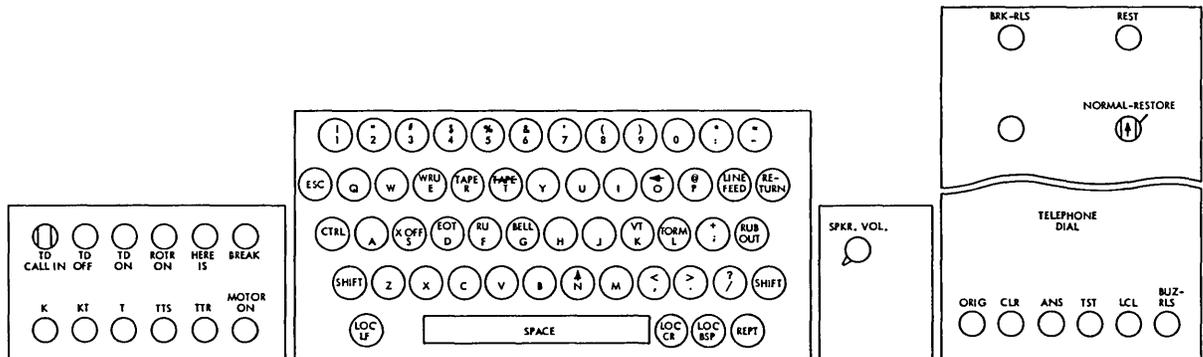
Figure 14. Type 35 ASR Keyboard and Control Panels

In addition to the standard keys, the keyboard also contains nonprinting keys with specialized functions.

The LINE FEED key (near the right end of the second row) moves the paper up one line without moving the ribbon carrier and printing mechanism. When the terminal is used off-line, the LINE FEED must be used after each line of typing to avoid overprinting of the next line.

The RUBOUT key (below the LINE FEED) punches a full row of holes in the paper tape; the character is ignored when read by the computer. The RUBOUT key is used to punch tape leaders and trailers and, when tape has been backspaced, to overpunch and thus delete a character previously punched.

Holding down the REPT key (Repeat, below the right SHIFT) causes repeated action of any other key pressed.

The LOC BSP (Local/Backspace, next to REPT) is used to backspace tape for correcting punching errors.

The LOC CR (Local/Carrier Return, next to LOC BSP) may be used to return the carrier without generating a carrier return (end-of-line) character. Ordinarily, it is used only when a program statement containing a lengthy expression requires more than one line of typing. No statement may contain more than 255 characters.

The LOC LF key (Local/Line Feed, below the left SHIFT) may be used as a Line Feed without generating a line-feed character. It is used in conjunction with the LOC CR.

The ESC key (ALT MODE on some units) is not used.

The CTRL key (Control, above the left SHIFT) is used in conjunction with the letter X to delete a typed line, with the letter S to punch the X-OFF character, and with the letter Q to generate the X-ON character.

The WRU (letter E), TAB (letter I), EOT (letter D), RU (letter F), BELL (letter G), VT (letter K), and FORM (letter L) functions of the CTRL key are not used by the system.

Most units have a volume control knob (SPKR VOL) for the loudspeaker located to the right of the keyboard. This knob is turned clockwise to increase volume. On some units a telephone handset may be provided instead.

A column indicator at the upper-right side of the keyboard indicates the column that has just been printed. When the LOC CR key is used, no carrier return is recorded and the column indicator does not return.

A red light to the right of the column indicator goes on to warn that the carrier is approaching the right margin.

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Right Control Panel

The right-hand control panel, also called the Attendant's Control Unit, has six buttons below the telephone dial; above the dial it has two lights, a button, and the NORMAL-RESTORE knob.

The ORIG button (Originate, at the left of the lower row) is pressed to obtain a dial tone before dialing. The volume control on the loudspeaker (under the keyboard shelf to the right) should be turned up enough so that the dial tone is audible. After connection is made, volume can be turned down.

The CLR button (Clear) is pressed to turn off the Teletypewriter.

The ANS button (Answer) is not used by the system.

The TST button (Test) is used for testing purposes and may be ignored.

The LCL button (Local) is pressed to turn on the Teletypewriter when the unit is to be used off-line (not connected to the system) for typing or punching tape, or for changing tape or ribbon.

The BUZ-RLS button (Buzzer-Release) is used to shut off the buzzer that sounds to warn of low paper supply. The light in the BUZ-RLS button remains on until paper has been replenished.

The NORMAL-RESTORE knob (above the telephone dial) is set to NORMAL except to change ribbon or tape, in which case it is twisted so that the arrow points to the OUT-OF-SERV light. The knob is momentarily set to RESTORE and then returned to the NORMAL position when the operation is completed.

The OUT-OF-SERV light (Out-of-Service) goes on when the NORMAL-RESTORE knob is pointed to it for ribbon or tape changing.

The BRK-RLS button (Break-Release) is used to enable the terminal to transmit after program execution has been interrupted with the BREAK key. The BRK-RLS button does not unlock the keyboard; the K button must also be pressed to allow keyboard transmission.

The REST light is not used.

Left Control Panel

The panel to the left of the keyboard contains two rows of six buttons each:

The TD CALL IN knob (at the far left of the top row) must be on when prepunched tape is being transmitted to the computer.

The TD OFF button (next to TD CALL IN) turns off the tape reader.

The TD ON button (next to TD OFF) turns on the tape reader.

The ROTR ON and HERE IS buttons are not used.

The BREAK button (next to HERE IS) is used to interrupt program execution. After breaking execution, the user must press the BRK-RLS button and then the K button.

The K button (Keyboard, at the far left of the lower row) is used to unlock the keyboard. It sets the unit for page copy only (not tape).

The KT button (Keyboard/Tape, next to K) sets the unit for simultaneous printing and tape punching.

The T button (Tape, next to KT) sets the unit for tape punching only (not printing) or for reading and transmitting tape that has already been punched. When prepunched tape is read, the characters transmitted are also printed at the terminal.

The TTS button (Tape-to-Tape Send, next to T) sets the unit for transmitting prepunched tape. The characters read and transmitted are not printed.

The TTR button (Tape-to-Tape Receiver, next to TTS) sets the unit for punching characters sent from the computer. The characters punched are not printed.

The MOTOR ON knob (next to TTR) allows the user to punch tape off-line without placing the terminal in Local.

Paper-Tape Punch and Reader

The paper-tape punch and reader are housed in a unit to the left of the keyboard on the ASR. The punch generates a row of holes in the tape to represent each character (including nonprinting functions).

The punch is controlled by the buttons on the lower row of the left control panel. The LOC BSP key, next to the space bar on the keyboard, controls backspacing in the punch.

The chad box, under the punch, collects the chad (bits of paper) and must periodically be emptied.

The tape reader is controlled by the feed-wheel (RUN/FREE) switch and the TD ON and TD OFF buttons on the left control panel. The TD ON and TD OFF buttons turn the reader on and off. The switch is set to FREE when tape is to be moved freely through the reader; it is set to RUN when tape is being read and when the reader is not in use.

X-ON, X-OFF Feature

Stopping and starting of paper tape can be controlled by the computer with the X-ON, X-OFF feature. When the letter S is struck with the CTRL (Control) key held down, the X-OFF character is punched. When the ASR 35 reads the X-OFF character in the tape, it will turn off the paper-tape reader. It is suggested that the X-OFF character be followed by five RUBOUT characters.

The tape reader can later be turned on with the X-ON character (the CTRL function of the letter Q) by the computer.

Replacing Tape

To place a new roll of tape in the punch, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Raise the Teletypewriter cover (release it by pushing in the two buttons on the sides of the cover).
3. Turn the MOTOR-ON knob on the left control panel.
4. Tear off any remaining old tape and then strike the RUBOUT key (above the right SHIFT key on the keyboard) enough times to feed out any remaining tape.
5. Remove the used roll of tape from the holder.
6. Set the new roll of tape in the holder so that tape feeds from the top of the roll.
7. Ease the tape through the tape guide arm and down into the chute, striking the RUBOUT key until the tape passes through the punch head and is visible.
8. Lower the Teletypewriter cover.
9. Turn off the MOTOR-ON knob.
10. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.

Paper Insertion

A buzzer sounds when the supply of paper is low. The buzzer may be silenced by pressing the BUZ-RLS button (Buzzer-Release, under the telephone dial). The light in the BUZ-RLS button remains on until paper has been replenished.

To add paper, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Raise the Teletypewriter cover.
3. Push the paper release lever back (Figure 15), raise the paper fingers, and pull the remaining paper out from under the platen.
4. Remove the used roll of paper.
5. Take the spindle from the used roll and insert it into the new roll.
6. Position the new roll with the spindle in the spindle grooves (paper should feed from under the roll toward platen).
7. Feed the paper over the straightener rod, under the platen, and up between the platen and paper fingers.
8. Pull the paper up a few inches and straighten it.
9. Push back the paper fingers so that they rest on the paper.
10. Pull the paper release lever forward into its original position.
11. Lower the Teletypewriter cover (making sure the paper feeds out through the top).
12. Press the CLR key (Clear, below the telephone dial).
13. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.
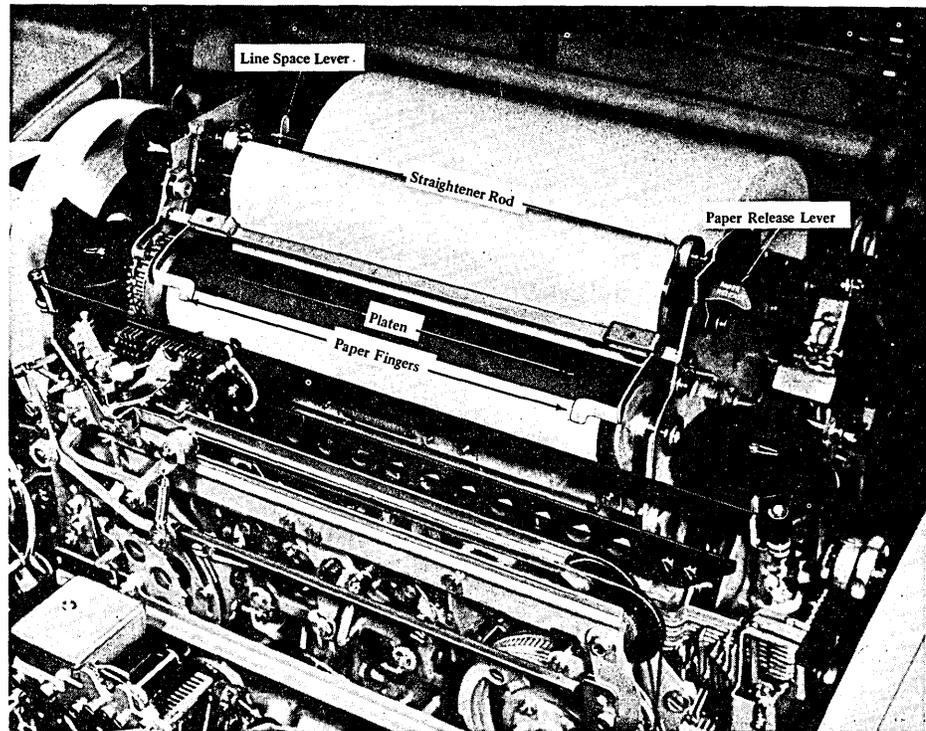
Figure 15. Type 35 ASR Paper Insertion and Movement Controls

Ribbon Changing

The Teletypewriter uses a specially made ribbon. To change it, the user should:

1. Twist the NORMAL-RESTORE knob (above the telephone dial) counterclockwise so that its arrow points to the OUT-OF-SERV light.
2. Raise the Teletypewriter cover.
3. Snap up the ribbon-spool locks (Figure 16) and lift both spools from their shafts.
4. Remove the ribbon from the ribbon rollers, the reverse levers, and the ribbon guides.
5. Remove the old ribbon from one spool.
6. Hook the end of the new ribbon to the hub of the empty spool (on spools having a barb, use it to pierce the ribbon) and wind the ribbon until the eyelet is on the spool.
7. Replace the spools on their shafts (make sure the spools go all the way down on their shafts and that ribbon feeds from outside the spools).
8. Snap the ribbon-spool locks down into position.
9. Thread the ribbon around the ribbon rollers, through the slots on the reverse levers, and around the ribbon guides.
10. Turn the free spool to take up slack (the ribbon is properly threaded if the eyelet is between the spool and the reverse lever).
11. Lower the Teletypewriter cover (making sure the paper feeds out through the top).
12. Twist the NORMAL-RESTORE knob to RESTORE so that a dial tone may be heard; then return it to NORMAL.

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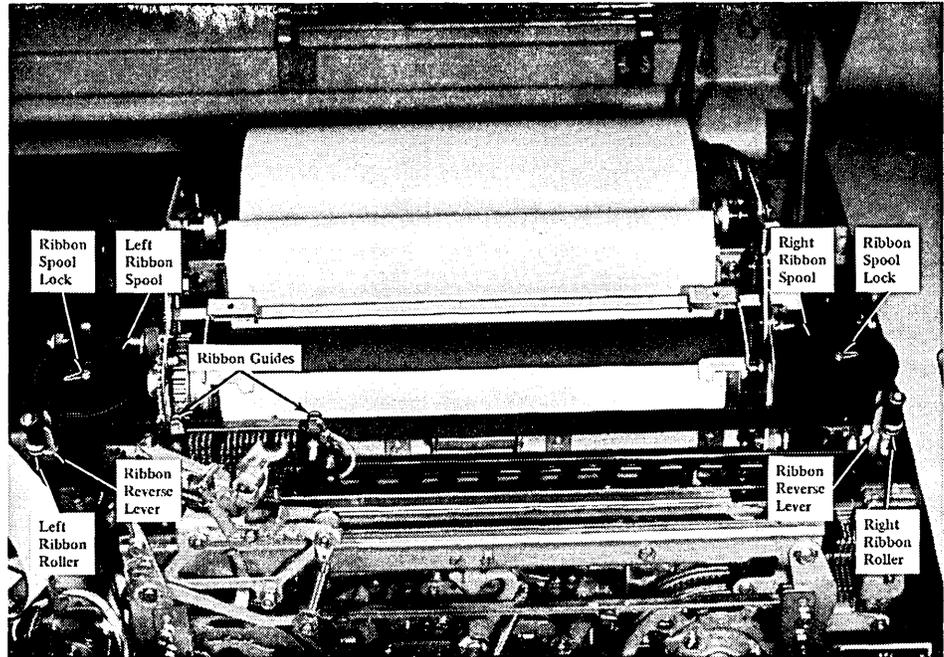
Figure 16. Type 35 ASR Ribbon Controls

Echo Test

The echo test is provided by the system as a method of checking the communication line and is performed with the terminal signed on the system. The user should type the word ECHO, a space, and then a string of characters across the page. The computer responds by duplicating, on the next line, all characters that were transmitted.

If the two lines do not match, the user should disconnect, reestablish the phone connection, and try the echo test again. If trouble persists, maintenance personnel should be notified.

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CALL/360: TERMINAL REFERENCE MANUAL

This Technical Newsletter provides replacement pages for the subject manual.
Pages to be inserted and/or removed are listed below:

3 - 4
9 - 10
15 - 16

Changes are indicated by a vertical rule in the left margin.

Please file this cover letter at the back of the manual to provide a record of changes.