IBM

129 Card Data Recorder
Operator's Reference Manual

IBM

129 Card Data Recorder

Operator's Reference Manual

This manual describes the functional and operating characteristics, and the operator procedures for the IBM 129 Card Data Recorder. The IBM 129, operating with or without a prepunched card program, is manually keyed (and corrected, in main storage), then automatically punches to provide conventional 80-column punched cards. The IBM 129 Card Data Recorders which perform these functions are available in three models:

Model 1: Punch-Verify
Model 2: Print-Punch
Model 3: Print-Punch-Verify

Keyed input errors may be erased and corrected before being punched into the card. Verification compares keyed data with data read into main storage; correction is then made in storage. After reverification in storage a correct card is punched.

This manual describes the Model 3 (punch-print-verify), which has a combined punch/read station. The Model 1 also has a combination station. Initial Model 2 machines (punch-print) have a separate punch station and read station, similar to the IBM 29 Card Punch. Model 2 machines, with serial numbers 2xxxx and higher, will have a combined punch/read station, similar to the Model 1 and 3 machines.

All operations are the same on all Model 2 machines, whether they have the separate punch station and read station, or the combined punch/read station.

The column indicator shows CC when a correction card should be punched in verify mode on Models 1 and 3. This CC indication is *not* available on initial shipment Model 1 and 3 machines. The CC indication will be provided on machines with serial numbers 2xxxx and higher.

On initial Model 1 and 3 machines, the column indicator shows 00 for the preceding situation. *All operations are the same for all machines*; only the indication on the column indicator is different.

OPERATOR

Skill in operating the card data recorder (as with any machine) requires practical experience. But experience alone is not enough. An operator can become skilled only with a combination of personal instruction, practice, and study of the manual.

The purpose of this manual is to help the user understand how the IBM 129 Card Data Recorder operates, and, more importantly, how the user operates it. The first reading of this manual should be for *overview*, to show what the manual contains, and where to find it.

See the Contents for the organization of this manual. Each section is titled and numbered.
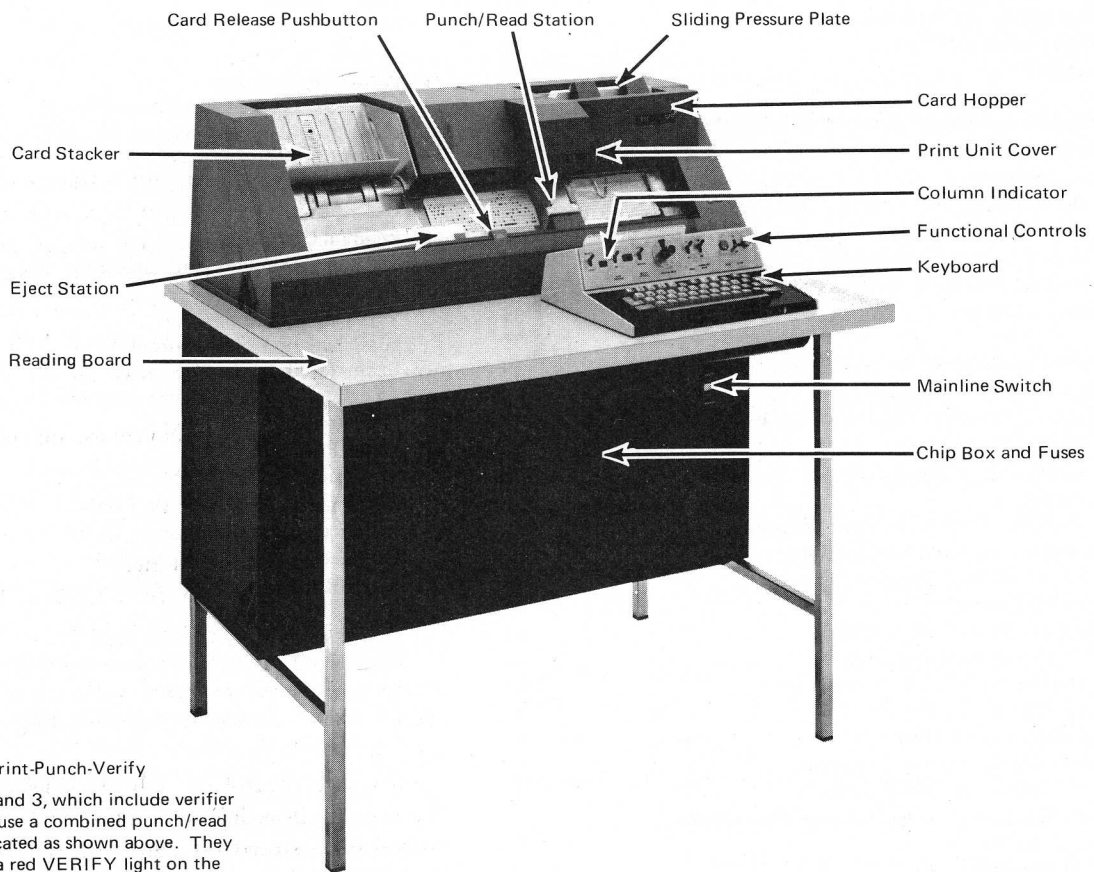
MACHINE

One of the first operations in maintaining reports for accounting is transcribing written records to punched cards, and checking or verifying these cards. Punched cards are the most efficient kind to be read automatically by machines. Such records are sorted and summarized by machines in larger volume, at higher speed, and with greater accuracy than is possible by any manual process. The punched, verified card is the basis for many printed reports. This manual deals with the machine that prepares the card: the IBM 129 Card Data Recorder.

Contents

Card Release Pushbutton   Punch/Read Station   Sliding Pressure Plate

Card Stacker

Card Hopper

Print Unit Cover

Column Indicator

Functional Controls

Keyboard

Eject Station

Reading Board

Mainline Switch

Chip Box and Fuses

Model 3 Print-Punch-Verify

Models 1 and 3, which include verifier function, use a combined punch/read station located as shown above. They also have a red VERIFY light on the keyboard to the right of AUTO/SKIP/-DUP switch, and PUNCH/VERIFY switch at left side of keyboard console.
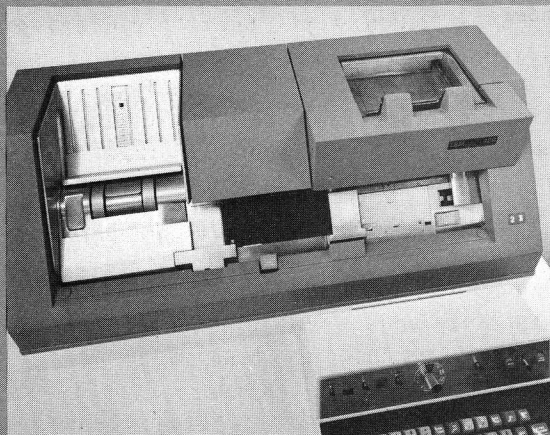
Model 1 Punch-Verify (nonprint)

Note that this model has no cover projection for print unit as have Models 2 and 3, and has no PRINT switch on the keyboard.
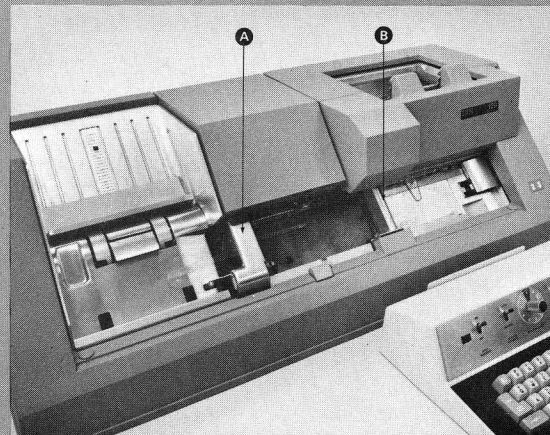
Model 2 Print-Punch (nonverify)

Initial models have a separate read unit and punch unit, as shown. Machines with serial number 2XXXX and higher have a combined punch/read station, and an eject unit, similar to Models 1 and 3. Also, Model 2 has no VERIFY light on the keyboard, and has no PUNCH/VERIFY switch.

Legend: Ⓐ Read Unit, Ⓑ Punch Unit

IBM 129 Card Data Recorder

The IBM 129 Card Data Recorder is a programmed, data-storage, key-entry, card-punching and verifying machine used to punch 80-column cards for data processing. Similar in operation and appearance to the IBM 29 Card Punch and IBM 59 Card Verifier, the IBM 129 offers the following special advantages:

- Keyed input data simultaneous with automatic functions.

- Keyed input error correction before punching.

- Card read-in for verification at speeds of 80 columns/second.

- Immediate error correction during verification, including repunching to provide a correct card.

- Six program levels plus a "no-format" program.

- An improved column indicator located on the keyboard panel.

- New special features for greater function and flexibility: the production statistics and accumulate, and the direct punch control and verify read control.

- Left-zero or left-blank insertion is standard in all models.

- A 48/64-character keyboard mode switch.

- An IBM 29-type interlocked keyboard.

The IBM 129 Card Data Recorder is available in three models:

    Model 1: Punch-Verify (nonprint)
    Model 2: Print-Punch (nonverify)
    Model 3: Print-Punch-Verify.

The Model 3 (print-punch-verify) is shown as the large illustration on the Frontispiece. The smaller illustrations show Models 1 and 2.

Verify models use a combined punch/read station. (With verify models, any mention to a station refers to the combination punch/read station.) The Model 1 has no punch/verify switch; when using this model, ignore references to that switch.

A general description of the operation (data flow) of the card data recorder follows—in turn followed by a detailed description of the component functions. For this simplified general description, assume the card punch is the Model 3 (punch-print-verify). (The punching operation is the same in verify models.) Assume further that the function controls (to be described later) are set to the punch mode and use program level 0, which provides 80 single-position fields, alphabetic in keyboard shift (equivalent to "starwheels raised" on the IBM 29).

DATA FLOW

Blank cards, placed in the card hopper, are fed (one at a time) into the card bed, which transports each card to the punch station. The operator keys in each character, and the information is saved in input storage until the 80-column (maximum) record is completed. When keying is completed, the data in storage is automatically punched into the card at the punch/read station. Storage is immediately available for keying the next record, while the previous record is being punched.

The punching process continues, independent of operator keying. At the next punching all cards move up; thus they are transported through the recorder and out into the card stacker. The punched cards can be removed from the card stacker for further processing.

Keyed data is stored in electronic form before it is punched into a card. This allows an operator the capability to easily rekey data before it is punched into the card. The column indicator, provided with the data recorder, is a visual display device that shows the operator the next column to be keyed.

Automatic control of such functions as data formatting, duplicating, inserting left zeros, and skipping is accomplished by a stored program with six program levels (plus level 0). Before the card punching operation begins, individual program cards for the six program levels are punched and may be read into program control storage, one at a time. Any of these programs may be selected to control the keying format, as required. See Figure 1.

Keyed corrections may be made via *input storage* before the record is completed. The completed record is stored in *output storage* ready to be punched, and available for duplication of data into the next record fed into input storage. Among the capabilities of the 129 Card Data Recorder are the following:

1. Input data may be keyed while the machine performs automatic functions: card feed, register, left-zero operations, skip, and punch and/or verifier duplication. This provides complete overlap, so that keying may continue while the previous card is being punched.
2. Erroneous keystrokes can be corrected on a character, word, field, or record basis in storage before automatic punching for that card begins. (Thus, an error need never be punched.)
3. Nonsignificant left zeros (or blanks) may be entered automatically, for a maximum 79-character field size.
4. A master card may be read into storage for automatic duplication or automatic verification in the following

cards. Up to six different program (master) cards may be read into program storage, and be automatically or manually selected during keying.

5. During verification, cards are read into storage at 80 columns/second. Key verification can start as soon as the first manual character has been read into storage. Immediate correction of any error is made in storage, during verification.

6. Correction cards may be immediately punched during the verification process by manually inserting a blank card at the punch station.

7. Storage is divided into two sections. Input is that area of storage that is ready to receive data from the keyboard when the operator is punching, or receives data from a card read when verifying, and compares input against the keyboard verify keystrokes. Output is that area of storage that stores the last record for punching or duplicating.

8. Machine rate speeds are:

Function	Speed
Punching	Model 1 = 20 cols/sec
	Models 2 and 3 = 18 cols/sec
Card skipping	80 cols/sec
Verify reading	
Data read	
Program load	
Automatic operations in storage:	
Skip	13,900 cols/sec (electronic
Dup	speed)
Release	
Any backspace	
Left-zero	
Interval between cards in	
punching:	Models 1 and 3 — .12 sec.
(keying continues un-	Model 2 — (initial) .25 sec.
interrupted into storage)	Model 2 — (serial number
	2xxxx and higher) .12 sec.
Interval between cards in verifying:	0.60 sec until column 01 is
(keying is interrupted until the	read
first manual verify column is	
read)	
Manual duplicating in P/V mode	
(repetitive action when DUP	Program 0 = 10 cols/sec
is held pressed)	Programs 1-6 = 10 fields/sec

OPERATING FEATURES

Combination Keyboard

The combination keyboard (similar to the IBM 29 keyboard) contains character keys, function keys, and control switches for punching and verifying. The keyboard permits keying of data into storage for card punching or verifying, and provides operator control of the necessary accompanying functions. The keyboard can be switched to either a 48- or 64-character set. The alphabetic keys allow use of the standard typewriter touch system, while the numeric keys are placed so that a rapid three-finger touch system can be used. A group of dual-purpose keys at the right serves for numeric keying. (These keys also serve for some alphabetic characters.) This permits numeric keying with the right hand from the normal "home" position used in alphabetic keying.

The keying of a digit or a letter with any of the combination keys depends on the shift of the keyboard. For example, pressing the 4-J key with the card data recorder in numeric shift keys in a 4; pressing the key while the machine is in alpha shift keys in a J. This shifting is similar to uppercase or lowercase shifting on a standard typewriter, and may be controlled automatically by the program, or manually by pressing either key. When either shift key is manually operated, care should be taken to ensure that the shift key is fully pressed before data keying starts.

A light touch on a key writes a character in storage. If the operation is punching, the input storage saves the keyed characters until all 80 columns of the record are accounted for, then the data recorder automatically punches the card. If the operation is verifying, the input storage compares the keyed characters with those read from the previously punched card. If the comparison verifies the entire card as correct, a coded punch is entered in column 81 of the card. If not, the operator can correct the faulty card in the input storage unit, and immediately punch a corrected card.
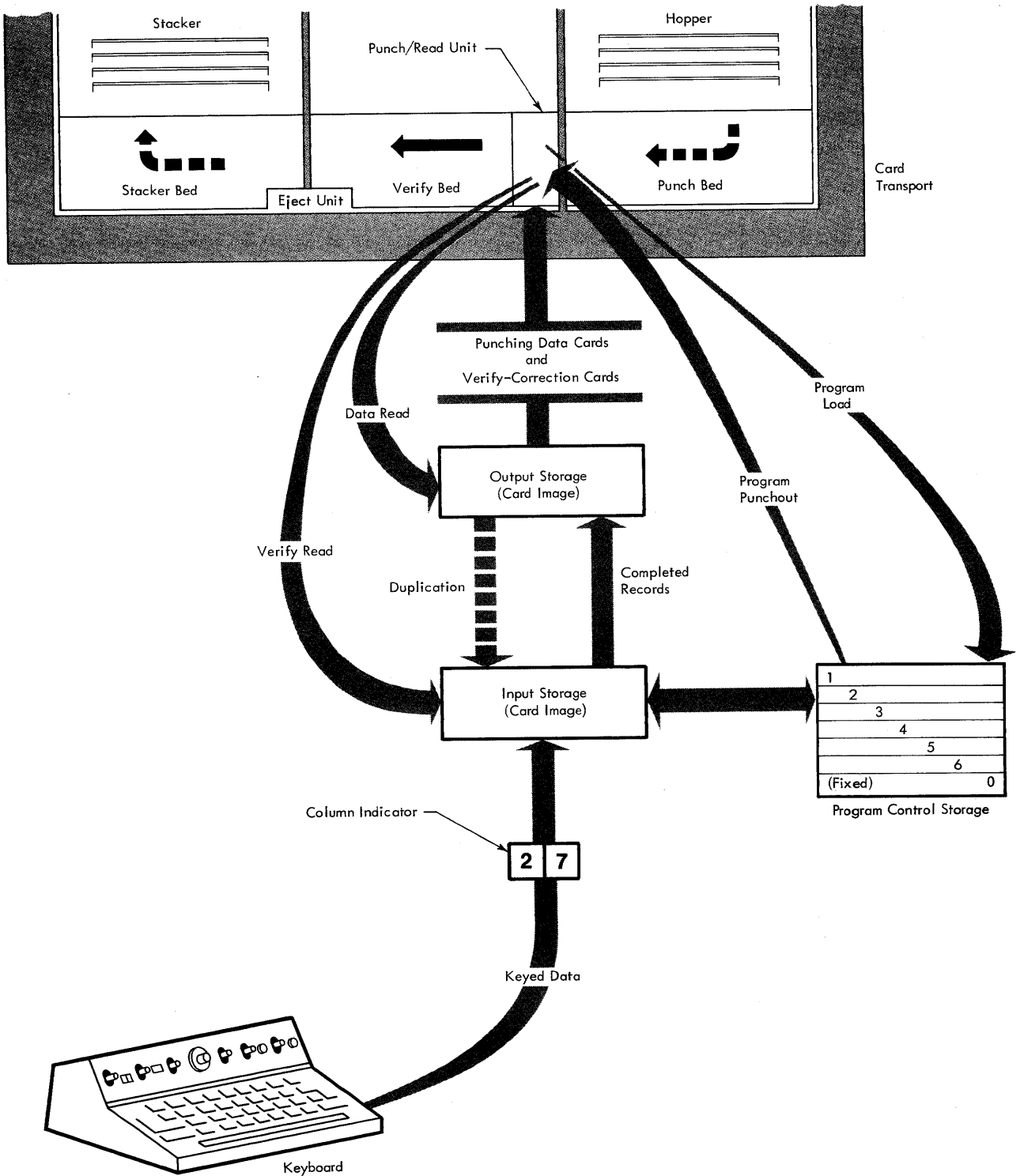
Figure 1. IBM 129 Storage and Data Flow

Program Control
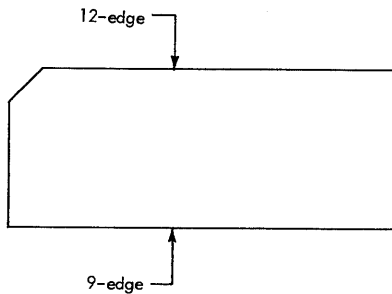
The program controls the field size and the automatic functions of skipping, duplicating, and shifting from numeric to alphabetic mode, and the operation of special features. Each of the operations performed under control of the program is defined by a specific code recorded in a program card. The program card is punched with the program card codes to fit the application desired. The program card is then stored (read) into the program control storage. Six program levels (1-6), plus a 0 (no-program) level provides exceptional flexibility to the program operation. Any of these stored programs may be selected by the operator.

Program codes for the basic functions of field definition, auto skip, auto dup, and alpha are identical to those used on the IBM 29 Card Punch program level 1 (that is, 12-11-0-1-punches are used).

Card Hopper

The card hopper, which holds approximately 500 cards, is located at the upper right of the IBM 129. The cards are placed in the hopper, face forward, with the 9-edge down, and are fed front card first. (See the card-edge illustration under "Program Control.") A sliding pressure plate assures uniform feeding. Press FEED until two cards are fed down from the hopper (punch mode). Pressing FEED feeds and reads a single card (verify mode). Thereafter (both modes), card feeding is automatic, under REC ADV/CARD FEED control.

Punch/Read Unit

Punching

Punching is performed at this station in punch mode; two cards are fed into the card bed. The first card is positioned at the punch station and automatically registered for punching. The second card (in back of the first) is at the pre-register position. When column 80 of the first card passes the punch station, that card is transported out, the second card is registered, and the next card in the hopper is fed down to the card bed into the pre-register position. Punching from one card to another can be program controlled in program control storage, field by field, so that only the desired information is duplicated.

A single card can be placed in the card bed and registered at the punch station by pressing REG. (See "Inserting Cards Manually" in Section 4.) Cards with lower left-corner cuts cannot be fed through the card bed because they do not register properly.

Reading

At the read portion of the punch/read unit, electronic pulses read punched cards via fiber optics. These cards could be program cards read into storage to provide program control, or data (master) cards read into storage for data duplication. In verify models this is the station where the card to be verified is read.

CAUTION
Never use any unauthorized tool to clear a card jam from the punch/read unit; it could damage the optical system. Use only a blank card or the special IBM 129 card saw that is included with every machine.

Card Stacker

The card stacker, which holds approximately 500 cards, is located at the upper left of the IBM 129. After each card passes the read station, it is automatically fed through the eject unit into the stacker. Cards are stacked 12-edge to the rear, face up. (See the card-edge illustration under "Program Control.")

A pressure plate holds the cards in position. When the cards are removed from the stacker, they are in their original sequence. (See "Stacker Switch.")

A scale is provided in the stacker, so that an estimate can be made of the total number of cards processed before the cards are removed from the stacker. (A precise count can be obtained with the production statistics special feature.)

Stacker Switch

The card stacker contains a spring-loaded switch which operates to inhibit card feeding when the stacker capacity has been reached. Removing the cards from the stacker returns the card punch operation to normal. Power is not interrupted by the operation of this switch. A new card must be fed before the operation can be continued.

Column Indicator

The column indicator, located at the left of the keyboard switch plate, shows the next column to be keyed. During automatic programmed operations, the column indicator moves so rapidly it may appear to be omitting columns; the significant aspect to the operator is that the column indicator shows the next column requiring operator action.

The column indicator normally indicates columns 01-80. However, when operator intervention may be required, it also indicates other settings. The 00 setting is used to show

that the machine has completed the input operation of the preceding card record, but has not advanced to the point of punching operation for that card. For example, with REC ADV/CARD FEED set to MANUAL, the column indicator advances to 00 on completion of the record in input storage, thus allowing return to that record for a correction, or, if there are no errors, allowing an operator decision as to which program level is required for the next card record. Operator action in such cases is given in the specific operations described in this manual.

With the machine in verify mode, the column indicator does not advance beyond the end of a record after any verify correction has been accomplished, unless the verify error correction procedures are followed. If forced reverification of a field or record is required, the column indicator shows 88; if blank card insertion is required for punching a correction card, the column indicator shows CC. For additional details on the column indicator, see "Column Indicator," "VER RES," and "VER RES," and VER CORR" in Section 2.

Chip Box and Fuses

Card chips from the punched cards accumulate in the chip box located in the cabinet under the keyboard. When this box is removed, the fuses are accessible. (Empty the chip box frequently to prevent overflow.)

Prestacked Position

A prestacked position is provided in the card stacker of all models having the punch/read unit. In this position, the last card processed in the punch mode pauses before being stacked. When a correction card is being punched in the verify mode, this position facilitates manual retrieval of cards, such as an error card in verify, that is to be discarded. An OK-verify card does not pause before being stacked.

Reading Board Desk

The desk area provides ample work space for the source documents from which the cards are punched. The keyboard can be rotated on the desk to provide the greatest convenience and comfort for the operator.

Mainline Switch

The mainline switch is located on the front, right side of the cabinet under the keyboard. When the mainline switch is turned on, the IBM 129 is ready for immediate use. *Stored information, including program data and any accumulate or statistics totals, is lost when this switch is turned off.*

Card Release Pushbutton

Pressing the card release pushbutton (see Frontispiece) permits removal of a card at any station. Normally, a card can be removed in one piece if it is pulled out with care.

If torn card pieces are caught in either the punch or read station, they can be pushed out with another card while this pushbutton is held down.

CAUTION
Metal blades should not be used to clear a card jam. Damage to reading optics may result. Use only a blank card, or the specially designed IBM 129 card saw for jam removal. For detailed card jam removal procedures, see "Card Jam Removal" in Section 6.

Acoustic Cover

An acoustic cover for the card transport of the IBM 129 is available to further noise reduction, in addition to the noise reduction resulting from the use of fiber optics sensing, electronic storage, and sound-reduced mechanical components. The cover is similar to the acoustic cover for the IBM 29/59 machines; it may be field installed.

PROGRAM CARD CHARACTERS AND VISIBILITY

The program card contains 80 vertical columns numbered from 1 through 80. (See Figure 2.) Each column has 12 punching positions: one each for the digits 0 to 9, and one each for the zones 0, 11, and 12. (Note that 0 is both a digit and a zone.) As shown in Figure 2, digits are recorded by punching a single hole in the corresponding digit or zero position of the desired column.

A *letter* is a combination of a zone-punch and a digit-punch in the same column. For example, A is the 12-zone and digit-1 punches, N is the 11-zone and digit-5 punches; Z is the 0-zone and digit-9 punches.

A *special character* is one, two, or three holes in the same column. Punching of two or three holes in one column for a letter or character is done automatically by the card data recorder.

The card in Figure 2 shows, in addition to the 10 numerics and 26 alphabetics, the 11 special characters available in the 48-character data set, and the 16 special characters used in the 64-character data set.

Card Visibility

During punching or verifying, the major portion of the card is visible. The shaded bands on the card (Figure 2) indicate areas obscured in a specific mode.

Numeric Punching

Punching numeric information is simply punching holes representing particular digits (0-9) in predetermined rows of the card. For example, if a 3 and a 7 are punched in two successive columns, the number 37 is recorded for use in such operations as printing, accumulating, classifying, and filing when that card is fed through other IBM machines. Numeric characters are those shown on the upper portion of each key.

Figure 2. Program Card Characters and Visibility

Field

The term field is used to describe a column or group of columns set aside, often by vertical lines on the card, for a particular item of information. Thus, the number 37 may represent a location, warehouse, or quantity, etc. If a serial number should appear in the first eight columns of the card and read 30210861, the 3 would be punched in the first column, the 0 in the second, and so on. A field may consist of one column, or up to a maximum of 80 columns. Field size is determined by the program cards that are prepared and read into program control storage.

Zone

In addition to digits 0-9, holes may be punched above row 1. These are the zone punches. If the zero is considered a number 10, then the unnumbered spaces above it can be considered as zone 11 and zone 12. Zone 11 is keyed with the dash (−) in alphabetic shift; zone 12 is keyed with ampersand (&) in numeric shift.

Note: The dash key has a special left-zero (minus) function in numeric shift. See "BLANK COLUMNS/LEFT ZERO CTRL" in Section 2.

Alphabetic Punching

Alphabetic characters are those shown on the lower portion of each key. To write or verify alphabetic characters, press ALPHA on the keyboard, or code the alpha function in the program card. The alphabetic characters are shown in Figure 2.

Operator's Notes:

Operator's Notes:

12

KEYBOARD CONSOLE

The function controls are located on the panel above the keyboard (Figure 3).

Punch/Verify

This mode switch makes the IBM 129 operate in either punch mode or verify mode. A change in the setting of this switch is effective only if the column indicator reads 01, and the card bed is clear. (This switch is not installed in the Model 2 print-punch.)

Column Indicator

The column indicator shows the position of input storage that receives the next character. The column indicator shows 00 when REC ADV/CARD FEED is set to MANUAL and input storage is complete; it shows 88 when a field or record must be reverified in verify mode; it shows CC when a correction card should be punched in verify mode; and the column indicator advances to 01 of the next record when REC ADV/CARD FEED is set to AUTO, or when the column indicator is at 00 and manual program selection is made.

AUTO SKIP/DUP

When this switch is ON, any field in the input storage unit programmed for auto skip or auto dup (auto verify) is performed at electronic speed. When the switch is OFF, these functions are not operative, and information from the keyboard can be recorded or verified in these fields. If dup or ver-dup is attempted in the first record after a power-on operation or a clear operation, before valid information has been keyed or read into output storage, the keyboard locks. In verify mode, a red verify light also turns on if a compare error exists. In these cases the keyboard may be unlocked by switching AUTO SKIP/DUP to OFF, then pressing CHAR BKSP.

VERIFY

This light indicates errors during verify and self-check operations. See "VER RES" and "VER CORR" in Section 2 and "Self-checking Number Feature" in Section 7. This light is labeled VERIFY, SC, or SC/VER depending on the model and feature combination.

REC ADV/CARD FEED

This switch provides automatic program selection and automatic card feed with these positions:

AUTO: As soon as column 80 is keyed, the machine proceeds to column 01 of the next record, under control of PROGRAM MODE. (Correction in punch mode of the last manually keyed column is not possible when REC ADV/CARD FEED is set to AUTO.) Both automatic program selection and card feeding occur during the change from column 80 to 01.

MANUAL: After column 80 is keyed, the machine stops at column 00; the operator must either set REC ADV/CARD FEED to AUTO, or press PROG SEL, then press a valid program number (0-6) to advance the column indicator to 01 for the next record. The preceding card is not punched until the column indicator advances to 01. With REC ADV/CARD FEED set to MANUAL, correction of the last manually keyed column of the record is possible. Press FEED if a card feed is desired.

PROGRAM MODE (Rotary Dial)

This dial switch can suspend programming (level), select data read, select statistics punch, select program punchout, or make program levels 1-6 effective. The switch must be set to a program level (1-6) during a program load operation. Switch position 0 is for 80 single-position alpha fields; at that setting manual skip action advances the column indicator one column each time SKIP is pressed.
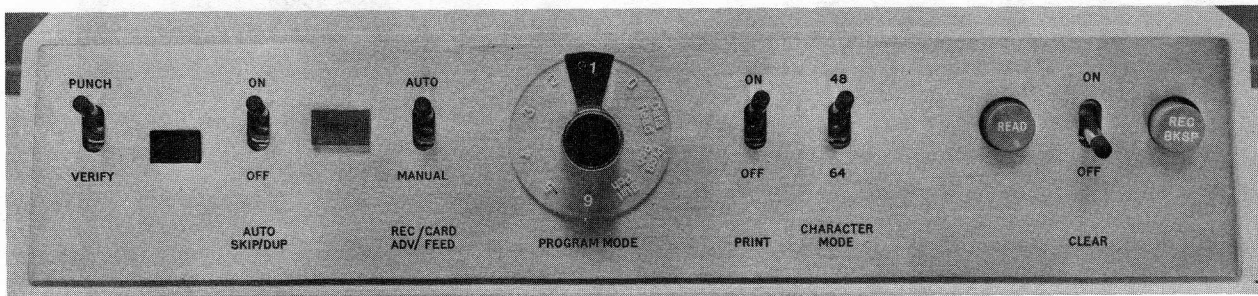
Figure 3. Function Controls

Manual duplication advances continuously at 10 columns/second as long as VER DUP (DUP) is held pressed, and a previous card has been keyed or read with valid information in output storage.

The normal program for a given application is selected by the setting of PROGRAM MODE. This is a program to which the IBM 129 returns after column 80 is keyed, with REC ADV/CARD FEED set to AUTO. During the keying operation, it is possible to shift between programs any number of times through the use of PROG SEL, followed by data key(s) 0-6 to select the desired program level. The PROGRAM MODE switch setting may be changed at any time during a record, but it is not effective until column 01 of the next record. (For a detailed description of all dial settings, see "PROGRAM MODE" in Section 4.)

PRINT

This switch is standard on Models 2 and 3; it is not installed on the Model 1 (punch-verify). It is effective during keying of the record into storage; that is, if the switch is OFF during keying, no printing occurs when that record is punched into the card. If it is ON during keying, all characters (those manually entered from the keyboard and those duplicated within the standard 64-character set) are printed at the top edge of the card, above the punches in the column, when the record is punched. Printing occurs at 18 cycles per second. Any character not in the standard 64-character set is not printed. No printing occurs during normal verify operations; however, to print on a verify-correction card that is punched during verification, leave this switch ON during the verify mode operation. If a field has all zeros, the zeros (although punched) are not printed, except a single zero in the units position. High-order zeros in a

programmed field are print-suppressed. If selective printing is desired during punching, set the switch ON or OFF when keying into input storage to produce the desired print control.

CHARACTER MODE

This switch determines whether the keyboard is active for a 48- or 64-character set. (See Figure 4.)

READ

This pushbutton is used to read a program card into program control storage, or a data card into output storage. For a detailed description, see "Store a Program," and "Data Read for New Master Card Information" in Section 3.

CLEAR

When this spring-loaded switch is raised, the multiple cycles necessary to move all cards out of the card transport into the stacker are initiated, and the column indicator returns to 01. No additional cards are fed from the card hopper. Duplication is suspended following a clear operation until one card is keyed or read into output storage.

REC BKSP

Pressing the REC BKSP pushbutton returns the column indicator to 01 of input storage without changing the current program level, erases the record in storage, and suspends any automatic skip or dup function that is programmed in column 01. All other programmed functions remain active. (The automatic skip or dup function in column 01 can be reinitiated by pressing SKIP or DUP).
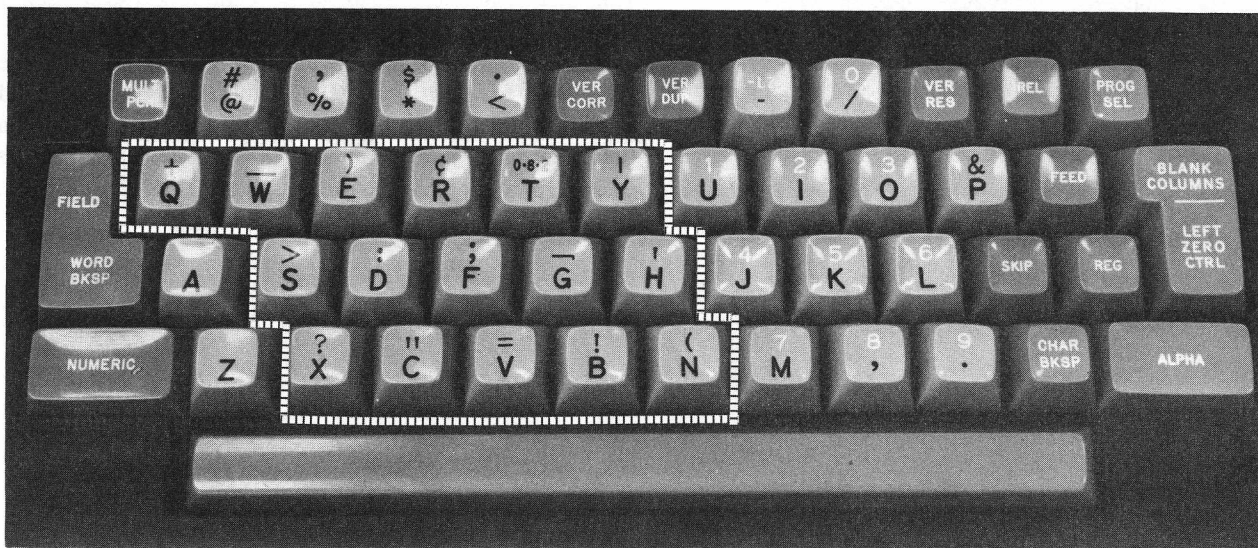
Figure 4. Keyboard

KEYBOARD KEYS
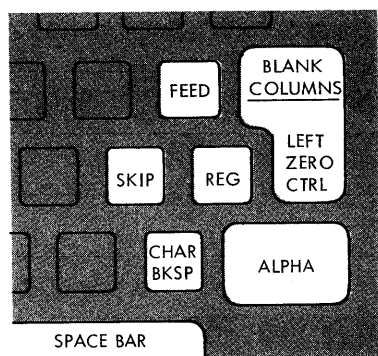
In addition to the usual alphabetic (letter) and numeric (digit) keys and symbols, the keyboard contains detailed function keys. See the accompanying keyboard illustration.

Note: In numeric shift, the keyboard locks if A or Z is keyed in the 64-character mode; or A, Z, or any key in the outlined area (Figure 4) is keyed in the 48-character mode. See "CHARACTER MODE" in this section.

Spacebar

The spacebar can be pressed at any time in a manual field to cause punching or verifying of a single space in the record.

CHAR BKSP

Pressing the CHAR BSKP key causes unlocking of the keyboard (if it is locked due to an invalid keystroke), or causes a backspace of one column. Program-controlled auto functions with AUTO SKIP/DUP set to ON are bypassed. In column 00, with REC ADV/CARD FEED set to MANUAL, pressing CHAR BKSP causes a backspace to the last manually entered column. If this key is used immediately after a rewrite correction in verify mode to reverify the correction, normal verification can proceed without a keyboard lock at the end of the field. In verify mode, a character backspace issued after an error (before rewrite) resets the error condition and allows additional verify attempts of the character in question.

Character backspace is also used to unlock the keyboard if an invalid keystroke is made, such as striking letter A when in numeric shift, or striking a 64-character set special character when in 48-character set mode.

ALPHA

Pressing this key converts the keyboard to alpha mode for the duration of time that the key is held pressed. When the key is released, the card punch returns to the shift indicated by the program.

SKIP

Pressing this key initiates a skip to the end of the field definition in punch mode, or verifies that the column in which it was pressed is blank, and initiates a skip in verify mode (numeric or alpha shift) at electronic speed. If field definition is not present or if operation is under program level 0, the skip action provides a single space.

REG

If a card is pre-registered or manually inserted, the REG key registers the card at the punch/read station. See "Inserting Cards Manually" in Section 4. Pressing this key registers the card (aligns the card) for punching, but no card feed occurs.

FEED

Pressing this key feeds a card from the hopper to the card bed. The exact operation depends on the operating mode, and is specified for each:

Punch Mode: With FEED held pressed, two cards feed, the first is registered, and the punch is ready for keying. When cards are present at the punch station, FEED is deactivated. If cards have not been brought into the punch station due to an empty hopper, keying may continue until two records are stored (if REC ADV/CARD FEED is set to AUTO, or one record is stored if REC ADV/CARD FEED is set to MANUAL). At this time, the keyboard locks. Placing cards into the hopper and operating FEED initiates feeding and punching, and restores the keyboard to normal.

Verify Mode: A card feed cycle occurs, followed by a card read cycle. No cards are in the pre-register station, allowing easy insertion of a blank card for an immediate correction of error cards during a verify-correction sequence.

BLANK COLUMNS/LEFT ZERO CTRL

Pressing this bar (key) causes shifting of keyed data to the right (to the limit established by field definition) and inserts zeros to the left for the remaining positions in the field. (A left-zero field does not need program coding for left-zero punching; any defined field can be a left-zero field in card punching on the IBM 129; program coding is necessary for the verify mode only.) See "Left-zero Insertion" in Section 4. This bar is not active in the high-order position of the field. To obtain leading blanks (such as in a name field) place the machine in alphabetic shift by program or manual operation, and press the left zero (LZ) bar.

The −LZ key in numeric shift provides an 11-punch over the units position and initiates the LZ function, except on full-field conditions. To overpunch the 11-zone on full

fields, use the MULT PCH key procedure or appropriate alphabetic character.

Note: In alphabetic shift, or when the MULT PCH key is held pressed, the –LZ bar causes a "dash" 11-punch (–).

In verify mode, the LZ bar functions as a blank columns verify key in any position of a field, except in the units position of a programmed verify LZ control field. When pressed (in any position except LZ units), it verifies blanks until a character or end of field is reached. In a blank LZ field, it verifies blanks until the units position is reached, then the spacebar must be used to verify the units position, and LEFT ZERO CTRL must be pressed to continue verification. In the units position of LZ, it must be pressed after verification of the units position to allow verification to continue. For a minus (11-punch) over the units in verify mode, use the –LZ key for both verification of the minus (11-punch) and LZ control.

PROG SEL
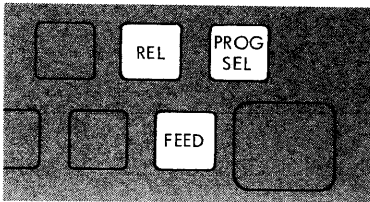
Pressing this key while keying, followed by selecting an associated data key (0-6) causes a shift to the program level selected. This key can be operated any number of times during the keying of a record. With REC ADV/CARD FEED set to AUTO, the program remains in the last selected program level until the record presently being entered is completed. On advancing to column 01 of the next record, the program reverts to the level indicated by the setting of PROGRAM MODE. With REC ADV/CARD FEED set to MANUAL, following the keying of column 80, the column indicator shows 00, and PROG SEL (followed by a data key) must be pressed to select the new program level, or REC ADV/CARD FEED may be set to AUTO.

Any backspace has no effect on the program level, even if the backspace operation moves the column indicator before the point where a new program level was selected. PROG SEL must be followed by a valid data key (0-6), or the keyboard locks. If a lock occurs, pressing CHAR BKSP restores the keyboard, but does not reset the program-select condition, and the next keystroke must be a program-level-selection keystroke. If a program selection is not desired after pressing PROG SEL, either select the same level presently in use, or press the FIELD BKSP key to reset the program-select condition.

REL

This key may be pressed at any column of the card. Operation of this key generally releases the card being punched. The operation depends on the operation mode.

Punch Mode: REL writes spaces in storage and moves the column indicator through column 80 to the next record (column 01) and feeds another card if REC ADV/CARD FEED is set to AUTO, or moves the column indicator to column 00 if REC ADV/CARD FEED is set to MANUAL. If AUTO SKIP/DUP is ON, any auto dup information present in the card beyond the release point is retained in storage. If AUTO SKIP/DUP is OFF, any dup information in the record beyond the release point is skipped over and replaced with spaces during the release operation.

Verify Mode: REL causes the card to be released without an OK-punch and the card is stacked on the next cycle. Fields programmed for automatic verification beyond the point of release are auto-verified if AUTO SKIP/DUP is ON. The next card is fed and read if REC ADV/CARD FEED is ON; the IBM 129 stops in column 00 if REC ADV/CARD FEED is OFF. Use manual program selection and FEED, or set REC ADV/CARD FEED to AUTO, or use CLEAR to continue verify operation. The data in the released card becomes new dup data. Once released, a card cannot be OK-punched (2-punch and 3-punch) in column 81 unless it is again fed from the hopper and reverified.

NUMERIC

This key must be held pressed when operating in program level 0 and numeric keying is required. It can also be used to override alpha programming when under program control. If both ALPHA and NUMERIC shift keys are held pressed, numeric shift takes precedence.

MULT PCH
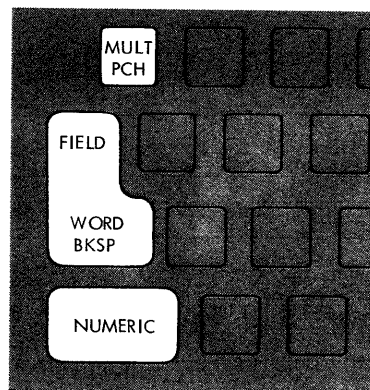
When this key is held pressed, the column indicator does not advance, so more than one punch can be entered in a single column. This key can be used to prepare program

cards or to enter special codes. When the card is punched, the multiple punches entered, punch out simultaneously. If the multipunch special character is not one of the standard 64 characters, printing is inhibited.

This key places the keyboard in numeric shift, and overrides alpha shift key action or alpha programming. One application of multipunching is the "credit" punch. Where a numeric quantity (for example, balance due) should indicate credit due, the quantity is marked while punching. Hold down MULT PCH at the desired column of the field, key in the numeric digit, press the dash (–) key, then release MULT PCH. This provides a credit punch in that position of the field.

CAUTION

Cards multipunched on this machine should not be duplicated on the IBM 26 or 29 Card Punch, since characters considered valid in this model exceed the printing capabilities of Models 26 and 29 and can cause damage to their print units.

DUP

Pressing this key (called VER DUP in verify models; see Figure 4) duplicates common information from any card into the following card in a gangpunch operation. Manual operations are at 10 columns/second when DUP is held pressed in program level 0, or at 10 fields/second when DUP is held pressed in program levels 1-6.

In verify mode, in a LZ programmed field, the DUP key is active only in the high-order position of the field. For detailed information, see "Punch a Record/Card" in Section 3.

FIELD/WORD BKSP

This two-function key is described by each function.

Field Backspace

FIELD/WORD BKSP returns the column indicator to the first column of the field being keyed when under program control. When a keying error is sensed in the last column of a normal field and this field is followed by auto skip or auto dup, the automatic function is performed before FIELD/WORD BKSP can be pressed; however, when FIELD/WORD BKSP is operated, the column indicator backspaces over the automatic fields to the first column of the manual field in which the error occurred. The column indicator returns to 01 if no manual fields have been encountered and any automatic function in column 01 is reinitiated.

When operating in program level 0, a field definition is ineffective; the FIELD/WORD BKSP performs a single column backspace each time it is operated. With REC ADV/CARD FEED set to AUTO, a keying error in the last column of the last manual field of the record cannot be corrected (punch mode). In other words, FIELD/WORD BKSP cannot return the column indicator to the previous record once it has passed from column 80 to column 01 of the next record. With REC ADV/CARD FEED set to MANUAL, the column indicator does not progress beyond 00, and correction is possible before proceeding to the next record.

Word Backspace

The FIELD/WORD BKSP key operates as a word backspace key when used with the ALPHA shift key. Pressing and holding ALPHA, then pressing FIELD BKSP, returns the column indicator to the column following the last manually-keyed space, or the first column of a manual field, whichever occurs first. This is especially useful in text processing jobs, or in alpha name fields, where only the last word keyed needs correction rather than the complete field. Note that an alphabetic programmed field does not cause word backspace; it requires depression of ALPHA and WORD BKSP together.

If a manual skip, dup, or auto function is employed after the last alpha word is keyed, and correcting that word is desirable, press and hold ALPHA, then press FIELD/WORD BKSP; the skipped or duplicated columns are passed over and the machine returns to the start of the last word.

Note: Any backspace operation (character, field, word, or record) does not change the operating program level.

VER RES

Verify Mode Only: Pressing VER RES resets a verify error condition and allows a second verify attempt. If a verify error is signaled again, reset is performed, and the third keystroke rewrites storage with the new character. After the rewrite, perform a character backspace and reverify; otherwise, the machine locks at the end of the field (column indicator shows 88); now the procedure requires field backspace and reverification. (Character backspace may be used to interrupt the error routine and to allow additional verify attempts before rewrite.)

VER CORR

Verify Mode Only: Pressing VER CORR in any field allows a rewrite of the balance of the field; pressing this key after a record backspace operation allows rewrite of the complete record. The keyboard then locks (column indicator shows 88) and the field or record must be reverified.

If at the completion of the record verify operation any rewrite correction has been made using the VER RES procedure or VER CORR procedure, the machine locks, with the column indicator showing CC. Note that CC indicates a correction card should be punched. Manually insert a blank card in the punch station and press VER CORR to punch out the corrected card.

Operator's Notes:

POWER ON

The IBM 129 is powered on by the mainline switch, located under the reading board at the right side of the lower cabinet. Flip up the mainline switch to turn power on. The machine is automatically set to program level 0 when powered on, regardless of the dial setting of PROGRAM MODE.

The same mainline switch flips down to turn off power. All programs and data are reset to blanks when power is turned off.

Program level 0 control is 80 single-position fields (alphabetic shift). Program levels 1-6, at this time, are controlled as 80 single-position fields (numeric shift). Program selection is possible, although program levels 1-6 are identical, until programs are stored into program storage.

Punching and verifying can be done under program level 0 or under program level 1-6 control. However, the first operation normally performed, after power is turned on, is to store the programs desired in program levels 1-6.

New program cards may be punched, before any programs have been stored, by using the "Punch a Record/Card" procedure in this section.

STORE A PROGRAM (PROGRAM LOAD)

The desired program cards must be read into program storage to allow program control to be active during keying:
1. Operate CLEAR switch if card bed is not clear.
2. Set AUTO SKIP/DUP to OFF.
3. Set PROGRAM MODE to desired program level (1-6).
4. Manually insert program card at punch/read station (punch or verify mode), or feed one card from the hopper to the pre-register position (punch mode). Card must *not* be registered.
5. Press READ.

Repeat steps 3 through 5 for each program card to be stored. Each program load operation reads program card data into the selected program storage level, stacks the card in the stacker, and sets the machine to column 01 of that program level. Programs remain in storage until a new program is read into a program level or until a power off/on operation resets them.

Note: A blank card may be read into any program level to replace the original program; the resulting program provides 80 single-position fields in the numeric shift. In punch mode, up to six program cards may be placed in the hopper, fed singly, and program loaded by repeating steps 3 through 5.

PUNCHOUT (STORED PROGRAM)

To check that a particular program has been stored at a specific level, punch out the program on a blank card:
1. Operate CLEAR switch if the card bed is not clear.
2. Set PUNCH/VERIFY switch to PUNCH.
3. Set AUTO SKIP/DUP to OFF.
4. Set REC ADV/CARD FEED to MANUAL.
5. Set PROGRAM MODE to PROG PCH.
6. Insert a blank card at the punch station, or feed a blank card from the hopper.
7. Press REG (to register a card).
8. Press REL (sets column indicator to 00).
9. Press PROG SEL followed by a data key (1-6) for program level desired.

Punchout follows, and the card is ejected. The machine is set in that program level at the conclusion of program punchout. Repeat steps 6 through 9 for each program to be punched.

Notes:

1. This procedure could be used, if necessary, to provide a set of program cards for another operator, if the originals are not available for duplication.
2. In checking a program, sight-check the cards by viewing a light source through the holes when the two cards are held together. In this way the cards are physically checked for accuracy.
3. All program cards are automatically printed (Models 2 and 3) during a program punchout operation regardless of the PRINT switch setting.
4. If data key 0 is pressed after PROG SEL, a blank card results.
5. Program punchout may be done at any time.
6. If data cards are punched with PROGRAM MODE set at PROG PCH (not a normal procedure), and REC ADV/CARD FEED is set to AUTO, the machine is in program level 0 after the first card is punched.

PUNCH A RECORD/CARD

Note: This procedure applies to punching data cards or program cards (before programs have been stored), using either program level 0 (80 single-position fields in alphabetic shift) or levels 1-6 (80 single-position fields in numeric shift).

When programs have been read into storage (stored), card punching can begin under program format control:

1. Place blank cards in hopper.
2. Operate CLEAR switch if card bed is not clear.
3. Set PUNCH/VERIFY switch to PUNCH.
4. Set AUTO SKIP/DUP to OFF.
5. Set REC ADV/CARD FEED to AUTO.
6. Set PRINT to ON/OFF, as desired.
7. Set CHARACTER MODE to 48/64, as desired.
8. Press FEED (feeds two cards).
9. Set PROGRAM MODE to desired program level (0-6). Manually select the desired program level by pressing PROG SEL followed by a data key 0-6 (first record only).
10. Key the first card record manually. Duplicating is not active, and skipping is under manual control for the first card. After the first record has been keyed:
11. Set AUTO SKIP/DUP to ON.

On the following records, programmed duplicating and skipping are performed automatically, and program level selection at the start of each record is automatic, under control of PROGRAM MODE. Any field programmed for manual entry may be manually keyed, duplicated from the last record, or skipped by manual operation. If an error is made in keying, a backspace-rewrite operation is required.

DATA READ FOR NEW MASTER CARD INFORMATION

In this operation, a data card is read into output storage, to be used as new *master* card data for duplication into the following records. (Distinguish this operation from *storing* a program into program storage):

1. Operate CLEAR switch if the card bed is not clear.
2. Set PROGRAM MODE to DATA READ.
3. Insert data card at punch/read station (punch or verify mode) or feed the card one cycle from the hopper to the pre-register position (punch mode). Card must *not* be registered.
4. Press READ.

The machine is automatically set to program level 0 (alphabetic shift), and the card is stacked. Continue desired operation after setting PROGRAM MODE and manually selecting the desired program level. Data from the data read operation cannot be punched out from output storage, except by duplication into the next record.

VERIFY

Verification procedures are normally performed under program control:

1. Place cards to be verified in the card hopper.
2. Operate CLEAR switch if the card bed is not clear.
3. Set PUNCH/VERIFY switch to VERIFY.
4. Set AUTO SKIP/DUP to OFF.
5. Set REC ADV/CARD FEED to AUTO.
6. Set PRINT to ON/OFF (affects correction-punched cards only).
7. Set CHARACTER MODE to 48/64, as desired.
8. Press FEED (feeds one card). The first card is read into input storage.
9. Set PROGRAM MODE to the desired program level (0-6). Manually select the desired program level by pressing PROG SEL followed by data key 0-6 (first record only).

   Begin the verify operation by keying the first record from the source document. Duplicating is not active, and skipping is under manual control for the first record only. After the first record has been verified:
10. Set AUTO SKIP/DUP to ON.

On the following records, programmed verify duplicating and skipping are performed automatically, and program level selection at the start of each record is automatic under PROGRAM MODE control.

At the completion of keying, if no errors exist, a 2-punch and 3-punch are punched into column 81 of the original card, to signify an OK-verify without errors. If the column indicator shows 88, a field (or record) must be reverified. If the column indicator shows CC, a correction card should be punched. See "VER RES" and "VER CORR" descriptions in the preceding section, and the verify operations in Section 4, for error-correction routines.

PUNCH A VERIFY-CORRECTION CARD

Use this procedure during the verify mode operation to punch a verify-correction card after a verify record has been corrected in input storage. The column indicator shows CC for card correction:

1. Insert a blank card at the punch station. (Card must *not* be registered.)
2. Press VER CORR.

The card is registered and punched with corrected data. A single 2-punch is punched in column 81 to signify that a correction was made during the verify operation. The original (error) card has no punches in column 81, and it may be discarded. The following card is fed and read if REC ADV/CARD FEED is set to AUTO; verification continues.

Note: If correction-card punching is not desired, use FEED or CLEAR, and continue the verify operation. The FEED key allows manual or auto dup in the following record. The CLEAR key prevents dup in the following record. The error card is stacked with no punches in column 81.

When a rewrite has been completed in verify mode, or the record has been released, column 81 is not punched in the original card. If punching in column 81 is desirable (because of verify-operator error, and the card is correct as originally punched), the card must be inserted in the hopper, fed, and then verified without error.

ADD A PUNCH

To add a punch to an existing punched card because repunching (make over) of the original card is not desirable:
1. Operate CLEAR switch if card bed is not clear.
2. Set AUTO SKIP/DUP to OFF.
3. Set REC ADV/CARD FEED to MANUAL.
4. Set PRINT to ON/OFF, as desired.
5. Space or manually skip to the desired column.
6. Key only added character(s). Use manual alpha or numeric shift if the shift of the program level is not known.

Operator's Notes:

7. Press REL (column indicator advances to 00).
8. Register the existing punched card at the punch station.
9. Set REC ADV/CARD FEED to AUTO.

The punched card is "overpunched" with spaces in all columns; the added punch(es) is punched in the column(s) in which it was keyed. An alternate procedure would be to data read a blank card, manually dup to the desired column, key the data, release, and proceed to step 8.

REPUNCH (MAKE OVER) A CARD

Repunching a card that must be altered or corrected by changing existing punches is done as follows:
1. Perform data read procedure with the punched card. (Machine is automatically in program level 0, alphabetic shift).
2. Set REC ADV/CARD FEED to AUTO.
3. Set PRINT to ON/OFF, as desired.
4. Manually dup up to the column(s) requiring a change or correction, key the correction, then manually dup the balance of the card.
5. Register a blank card at the punch station; the card is then punched with the original and the corrected data.

Operator's Notes:

22

The operations involving the IBM 129 may be generally classified as:

Programs
Punching
Verifying
Use of PROGRAM MODE Dial

PROGRAMS

The IBM 129 operates under program control with up to six different programs, readily selected by the operator. The preparation of these programs, the use of the program card, the programming codes, and the associated techniques are described in the first part of this section.

Program Card

A program card is normally prepared for each punching or verifying application, and can be used repeatedly. Codes punched in this program card control the automatic operations and field sizes for the corresponding columns of the cards being punched or verified. Each row in the program card governs a specific function. Program planning forms, useful in planning a program before punching, are described in Section 8.

The assignment of a program level is arbitrarily made by the operator. Generally, the operator assigns program level 1 to the first program stored, continuing the numbering through the last (level 6) program. Program level 0 (no-program) is forced by the system during data read, or may be a normal PROGRAM MODE setting for operating in punch or verify mode without program control.

When a program card is to be prepared for a particular punching application, the card design should be carefully analyzed to code the program card for maximum punching efficiency. Proper use of the various features of the card punch reduces operator time and effort to a minimum. Greater programming flexibility is gained by using all six of the program levels provided.

Program Code Table

Six program levels (plus no-program) are provided. The standard program codes (field definition, skip, dup, and alpha, (see Figures 5 and 6) are similar to the IBM 29 Card Punch program 1. Left-zero (verify) and the special feature codes are different. (Special feature program codes are

described in Section 7.) The program is read into program control storage at the start of a particular application by inserting the prepunched program card at the read (or punch/read) station, and by pressing READ. The PROGRAM MODE dial must be in the desired program level setting for proper program load operation.

Field Definition (Code: &)

The 12-punch is the field definition punch. (The numeric "&" provides the manual 12-punch.) A field definition punch for the program level being used must appear in every column, except the first, (left-hand position) of every field to be automatically skipped, duplicated, or manually punched.

The field definition punch causes any skip or dup operation started within a defined field to continue to the end of that field. Several consecutive fields to be automatically skipped or duplicated as one field can be programmed as a single field. Do not program a single-column field with a field definition punch.

Field definition codes punched in the program card for manually punched fields permit occasional skipping, left-zero inserting, or duplicating. This skipping, LZ inserting, or duplicating is started by keyboard control keys.

Automatic Skip (Code: —)

The 11-punch is the auto-skip start code. The dash ("—" in alphabetic shift) provides the manual 11-punch. Punching the auto-skip start code in the first column of the field to be skipped starts an automatic skip, which continues to the end of the field defined by the field definition punches.

This operation is also under control of the functional control switch, AUTO SKIP/DUP. If this switch is OFF, the program card codes for auto-skip start are not recognized.

Automatic Duplication (Code: 0)

The 0-punch is the start of the auto-dup code. Punching the start-auto-dup code in the first column of the field to be duplicated starts automatic duplication, which continues to the end of the field defined by the field definition punches. The 0-punch also identifies the first column of an automatic verify field.

This operation is also under control of the functional control switch, AUTO SKIP/DUP. If this switch is OFF, the program card codes for start-auto-dup are not recognized.

Function	Punch Code	Field Location
Standard Codes		
Field Definition (FD)	12	All columns, except first column
Auto Skip Field	11	First column
Auto Dup/Auto Ver Field	0	First column
Alpha Shift (Programmed)	1	Each column for alpha shift
Left-zero Control Field (Verify Only)	3	First and last columns
Special Feature Codes		
Self-check Field	2	First and last columns
Add Accumulator A	5	First column
Add Accumulator B	6	First column
Add Accumulator C	7	First column
Punch Accumulator A, B, or C	4 + (5 or 6 or 7)	First column
Punch and Reset Accumulator A, B, or C	4 + 8 +(5 or 6 or 7)	First column
Direct Punch Control for "Buffered" Field	3	First column for direct punch mode only
Verify Read Control to Stop Verify Read Operation	11-0	Column desired to stop card

Figure 5. Program Codes

Notes:

1. Program codes apply in program levels 1-6. Program level 0 is 80 single-position fields, alpha shift.

2. If LZ control in units position verify is not desired, do not use 3-punch in units position.

3. Only field definition is required for LZ punching. Program cards coded for LZ in verify mode (3-punches) may be used in punch mode without alteration because machine ignores 3-codes in punch mode, unless direct punch control feature is used (see chart).

4. Minimum field size is two columns for accumulate, self check, and LZ.

5. Maximum field size is 79 columns for self check and LZ.

6. Maximum input field size for accumulate is 14 columns; maximum punchout field size is 19 columns.

7. A field may be programmed to add into any or all accumulators; punchout is limited to one accumulator per field.

8. Self-check fields may be adjacent. Self-check and accumulate operate in both punch and verify mode. However, self-check cannot be programmed in the same field as accumulate or left zero.

9. Verify read control (11-0 code) must not be programmed in same column as auto skip (11) or auto dup (0) codes, nor in any self-check programmed field.

10. Programs remain in storage until another program is read in to replace the original program, or until mainline switch is turned off. This resets programs 1-6 to blanks (equivalent to 80 single-position fields, numeric shift).
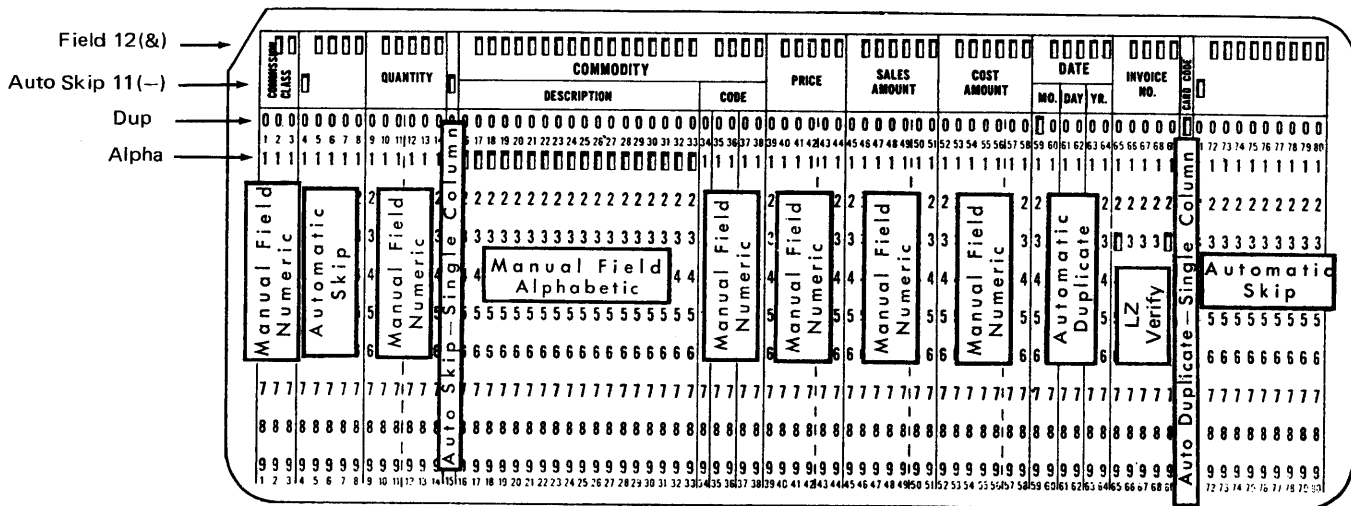

Figure 6. Program Card, Program Levels 1-6

Alphabetic Shift (Code: 1)

The 1-punch is the alpha-shift code. When the machine is operating in program levels 1-6, the combination keyboard is normally in numeric shift. Therefore, to punch any alphabetic characters or special characters that are part of the alphabetic shift, the keyboard functions must be shifted to the correct mode. The shifting is accomplished by punching the alpha-shift code, for the program level being used, into *each* column of the program card that corresponds to the column of the card being punched with the alphabetic information. Every column to be punched as alphabetic must contain an alpha-shift code in the program card, or ALPHA must be manually held pressed for that column. Field definition does not extend alphabetic shift.

Left-zero Insertion (Code: 3)

Punch Mode: No program code is needed, except normal field definition.

Verify Mode: To program a field for left-zero insertion, punch a 3 into the first (high-order) column and in the last (low-order) column of the left-zero field. Punch the remaining columns of the field with field definition punches (numeric 12), including the units position.

For a detailed description of program codes 2 and 4 through 8, see Section 7, "Special Features." Program code 9 is not used.

Program Card Preparation

Program cards are initially prepared by punching them as data cards, using program level 0 (80 single-position fields, alphabetic shift) or program levels 1-6 (80 single-position fields, numeric shift). See "Punch a Record/Card" in Section 3. Note that an 11-punch (dash) is an alphabetic character on the IBM 129. (The numeric position of the key is —LZ.) After punching, the card is stored in the appropriate program storage level via a store program operation. After being stored, the program can be repeatedly punched out into additional cards by a program punchout operation. See "Punchout (Stored Program)" in Section 3.

Inserting Cards Manually

In certain circumstances, it is desirable to insert cards manually, one at a time, to make over a damaged card, or to correct an error. Also, when an individual card accompanies each original document, manual insertion may be necessary. A single card may be inserted in the hopper, or may be manually inserted directly in the card bed (through the upper and lower card guides) at the punch station or the read station as follows:

Read Station (Print-Punch Model): Insert the card under the appropriate guides until the left card edge is halfway between the card roller and the case, as shown in Figure 7. This is the pre-register position for that station.
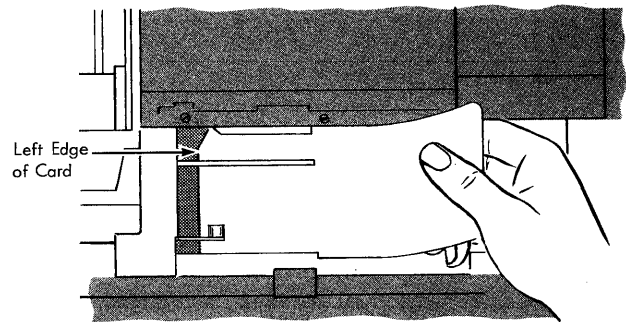
Figure 7. Manual Insertion of Card at Read Station
(Model 2, Print-Punch)

Punch Station (Combined Punch/Read Station, for Verify Models 1-3): Insert the card under the appropriate guides until the entire card is flat within the card bed opening; slide the card under the pusher guide to the right as far as it will go. This is the pre-register position for that station.

Note: Data or program cards to be read in may be manually inserted at the master station, as shown in Figure 7, or they may be inserted at the punch station. Pressing READ causes correct read-in from either location.

Program cards and data cards may also be placed in the hopper, in punch mode, and fed one cycle to the pre-register position, at which time the desired read-in or store program procedure may be done.

PUNCHING

The IBM 129 was designed to provide the ease and feel of the IBM 29, but with the marked improvement of storing data for possible correction before punching. Normal keying provides the data for punching. The standard features of left zero and left blanks are additionally described in this section, as is the standard feature of program level changing.

Left-zero Insertion

Digital fields are frequently right-justified (rightmost digit in the rightmost column). When the system right-justifies a field it must be instructed what to enter in the remaining columns. The fill field is always zeros or blanks. If the significant data is 888, and is to be entered in a field of 10 columns, the IBM 129 would left-zero insert seven zeros; final data punched is then: 0000000888. The zero/blank insertion varies depending on the mode:

Left-zero Punching: Any field with field definition (12-punch) punches in every column, except the first, is correctly programmed for left-zero punching. Thus, assume

a field has been programmed for numeric punching by having a blank in the first column and 12-punches in all other columns of that field. The first field can be used as a left-zero field. Key all significant digits, then press the LZ bar. The digits are right-justified, and leading zeros are automatically punched. (When the LZ bar is pressed, the system notes that the shift in this case was numeric; thus, the left-field fill is made zeros.) Note that leading zeros are automatically print-suppressed. For an all-zero field, key one zero, then press the LZ bar.

Note that because left blanks are obtained via alphabetic shift, there cannot be a minus over the units in a left-blank field via a single-key depression (minus over units in a left-zero field is with the −LZ key, which is numeric shift). To obtain a minus over the units and the left-blank fill, first key the digits, multipunch the minus and units-position digit, and then use the ALPHA manual shift key and the LZ bar. This results in a minus over the units and a left-blank field.

Duplicating or Skipping LZ Fields

Because program coding is not needed for LZ punching, the machine considers the field as a manual field until the LZ bar is pressed. Therefore there are no restrictions to skipping or duplicating a field that is normally punched by a manual LZ operation. Skipping or duplicating occurs normally (LZ bar not used). Duplicating or skipping should be from the start of the field, to ensure data validity, proper data alignment or a completely blank field.

Alphabetic Shift in LZ Fields

Alphabetic or numeric data is valid in an LZ field, and the shifting of significant data and zero fill occurs whether the data is alphabetic, numeric, or special characters. Pressing the LZ bar (or −LZ key) in numeric shift (manual or program) results in a left-zero, or minus left-zero operation, respectively. Pressing the LZ bar in alphabetic shift (manual or programmed) results in a left-blank fill operation; that is, data is shifted, and blanks are inserted to the left. Because the −LZ key is a numeric shift key only, a "minus left-blank" field cannot be obtained by a single keystroke. If desired, key the last significant digit, and the minus, with a MULT PCH operation; then use the ALPHA shift key and the LZ bar to cause a regular left-blank fill operation, in which (because of the MULT PCH operation) the units position has a minus over the digit.

Minus Printing

The IBM 129 Models 2 and 3 print only those characters that are in the 64-character set. Combinations of punches that are not a part of the 64-character set have printing suppressed during a punch-print operation. When a minus over a digit 1 through 9 is used to denote a minus column or field, that punch combination (11 and 1 through 9)

prints as the alphabetic characters J through R, because there is no way to distinguish them from those alphabetic characters. However, the combination 11-0, which would represent a minus over a zero, is not one of the valid 64 characters; therefore, an 11-0 combination of punches does not print (even if keyed via a MULT PCH operation).

Use of REL in Punching

The REL key is used in punching when there is no further keying necessary in a record; it writes spaces into input storage, and eliminates the need to manually skip several individual fields. When REL is pressed, any fields following, that are programmed for automatic dup, perform the auto-dup operation if AUTO SKIP/DUP is ON. Thus the data is duplicated from record to record. If AUTO SKIP/DUP is OFF, the field has spaces. If the dup data must be recreated, use a data read operation, or manually key the data into the next record with AUTO SKIP/DUP turned OFF, and set the switch ON for the records that follow.

Backspace and Error Correction

Because the IBM 129 has an input storage for keying in data, an error keystroke in punching does not immediately punch (hence spoil) the card. Errors detected by the operator during punching operations may quickly and easily be corrected by a backspace and rewrite operation. For maximum operator ease and convenience, four backspace operations are provided for error correction: character, word, field, or record. Each has its optimum use; choose the one which best serves your individual condition or preference.

Remember that a backspace operation does not change the program level in which you are operating. If you start a record in program level 1, shift to program level 2, and key several more fields, and you then record backspace, the machine remains in program level 2. To return to program level 1, perform a manual program selection.

To correct the last manual column of a record (before it punches into the card) set REC ADV/CARD FEED to MANUAL. When the last manual column has been keyed, the column indicator shows 00; CHAR BKSP (or any other backspace) may be used to return to any position of input storage. If no correction is necessary, set REC ADV/CARD FEED to AUTO, or perform a manual program selection, and press FEED to continue operation.

Because of fast and easy error correction (using any of the four types of backspace), keying is faster, more rhythmical and more continual because an error keystroke does not spoil a card. Simply backspace and rekey. Therefore, production can increase since storage-error correction has made keying easier and faster, and has eliminated "error cards" from the work.

Use of MULT PCH Key

Any of the 64 characters on the keyboard can be written with a single keystroke, using either numeric or alpha shift. When a combination of punches not represented on the keytop identifications is desired, hold MULT PCH pressed while keying the necessary punches (12 through 9) to compose the special character. Pressing MULT PCH places the keyboard in numeric shift, and suspends column advance until MULT PCH is released. Depression of the −LZ key when MULT PCH is held causes an 11-punch.

Note that if the special character composed by use of the MULT PCH procedure is not in the 64-character set, that printing is suppressed when that character is punched.

VERIFYING

The basic verify procedure is given in Section 3; see "Verify." That procedure is amplified in this section with the following operations:

> Manual Verifying
> Duplicating or Skipping
> Left Zero
> −LZ
> Left Blank
> Left-zero Control
> Blank Columns Verifying
> Two-try Error Correction
> VER CORR for Field Error Correction
> Data Change during Verification
> MULT PCH
> REL
> Backspace and Rekey

Manual Verifying

Manual verifying is the process of rekeying from source documents, and comparing the data punched into the card during keypunching with that keyed by the verify operator. This ensures accuracy and validity of data for all following operations that use the punched card.

The punched cards are read into input storage by the IBM 129, one at a time, in the same sequence as keyed, so the original source documents may be used. The IBM 129 stores the "image" of the card, then, as the operator keys each column, compares the keystroke with the column of the card. Automatic functions of skipping or duplicating may be done under program control.

If the keyed character and the card column compare, the operation continues. If there are no errors corrected in the card, a 2-punch and 3-punch are entered in column 81 at the completion of verify,- to signify that no errors were found in that card during verify. Error routines and correction procedures are explained in this section.

The keyboard is controlled for manual or alpha shift either by program control, or use of the manual shift key and, normally, shifting is the same as in punch mode. The basic functions of field definition, duplicating, skipping, and alpha program shift use the same program codes for the verify mode as for the punch mode. In the high- and low-order columns of a field (in addition to field definition), LZ programming is necessary in verify mode. In contrast, only field definition is necessary for LZ punching (punch mode).

Note: The keyboard locks momentarily between cards, but is automatically unlocked as soon as the first manual-verify column of the next card is read.

Duplicating or Skipping

In a punching operation, duplicating or skipping punches the same data as the previous card, or punches spaces in the card, respectively.

In verifying, manual or auto-verify duplicating compares the columns or fields of the present record in input storage with the data from the previously verified card, which is in output storage. If the data compares, the operation continues; if it does not compare, an error is signaled by the VERIFY light.

In a manual verify-skip operation, the machine verifies that the column in which the skip key is pressed is blank, and then ignores the data for the balance of the field, if under program control. In an auto-verify skip operation, the machine ignores that field of data completely, and does not verify or check it at all. Note that although a field may be auto-skipped during verify, if there is an error elsewhere in that record that requires a correction card, the original data of the auto-verify-skipped field is punched into the correction card, even though it was skipped during the verify process itself.

Manual or auto-verify duplicating is not active in the first record after a clear operation, or until a record has been keyed or read into output storage. This is similar to the duplicating operation during punching.

Left Zero

Code the program with a 3-punch in the high-order and low-order positions of the field. The field also gets normal field definition (12-punches). The verify-keying procedure is the same as the punch-keying procedure for this field; key all significant digits, then press the LZ bar. If the source data indicates all zeros, key one significant zero, then press the LZ bar.

In LZ punching, zeros were added to the field after the digits were punched, by using the LZ bar. In LZ verifying, the first digit keystroke does two things: it causes the zeros to be automatically verified, and it verifies the first significant digit of the field. The automatic verification of zeros is at electronic speed in input storage, and there is no delay. If there is an error in the significant digits, check both the digit itself and the column; if there is one extra (or one less) zero than there should be, both a digit error and column-position error may exist.

If there are no errors in the field after verifying the units position character, press the LZ CTRL bar. Depression of this bar after units-position verify in an LZ-verify programmed field compares with the units-position programming and verifies that the correct number of zeros and digits are in the field.

If there are extra or missing zeros in the field (or, conversely, missing or extra digits in the field), the keyboard locks and any following procedure is halted because the LZ CTRL circuitry has detected an error.

Check the complete field, either visually in the card, or by manual verification of all positions using a different program level, if necessary, to ensure correction of all errors in the LZ field.

−LZ

In a field with a minus over the units position, verify procedures are the same as for LZ verifying, except that the −LZ key (above the alpha dash) is used after the units-position character has been verified. This procedure verifies that an 11-overpunch exists, and performs the LZ CTRL function. If −LZ is not used, the keyboard locks. Verifying the units position by use of the MULT PCH key procedure allows use of the regular LZ CTRL because the necessary units verification has been accomplished.

Left Blank

In verifying both the −LZ key and the LZ bar operate as an LZ control only in the units position of a programmed LZ field. In any other position, both the −LZ key and the LZ bar operate as a blank-columns verify key. Blanks (spaces) are verified until: a character is reached, the units position of an LZ field is reached, the start of the next field is reached, or end of the record (if in program level 0) is reached. The next column to be verified is then shown in the column indicator. When verifying a programmed LZ field that is all blanks, an additional step is necessary at the units position; key the character (space) in the units position, then press the LZ bar. (It is necessary to verify the units position manually, in this special case.)

If the LZ bar in any of the verify operations described previously is pressed too early, the verify procedure may operate as blank-columns verify, or result in keyboard lockup, with the column indicator showing the units column of the field. In that case, backspace to release the keyboard. Automatic skip or automatic dup in a programmed LZ field overrides LZ, and performs the appropriate function. Manual skip or manual dup is active only as the first keystroke in a programmed LZ field, and does not require the LZ bar, and stops at the following manual field if there are no errors. Any backspace into a programmed LZ field requires reverification, and use of the LZ bar. Any change of program level within the LZ programmed field

assumes the programming of the resulting program level, with the appropriate verify procedure necessary. Multi-punching is permitted during the verify procedure, using the MULT PCH key or the appropriate shift key, if applicable.

Left-zero Control (Verify Mode)

Normal LZ programming uses a 3-punch in both high- and low-order positions of a field, in addition to normal field definition. The high-order 3-punch signals "start of LZ" and the low-order 3-punch signals "LZ control." If LZ control is not used, errors pertaining to missing digits, or too few or too many left zeros may not be detected.

LZ control should be used so that punch and verify procedures are similar (that is, key the digits and press the LZ bar) and to ensure correct verification of adjacent LZ fields, or fields containing all zeros. LZ control must be used if the field ends in column 80. If LZ control is not used, the field should be verified as a manual field to ensure accuracy.

Blank Columns, Verifying

The SKIP key in punching is like a repeating spacebar; it punches spaces for a field, or the remainder of a partially filled field. Similarly, in verifying, the BLANK COLUMNS key verifies spaces repetitively for a portion of the field, or for the remainder of the field. This is in addition to its dual function as an LZ CTRL key in verifying, or LZ fill in punching.

The BLANK COLUMNS portion of the BLANK COLUMNS/LEFT ZERO CTRL bar has no function in punch mode. In verify mode, the bar is always a blank columns verify key except in the units position of a programmed LZ verify field, where it is an LZ CTRL bar only.

Use the BLANK COLUMNS bar in verify mode to verify leading blanks (such as in a numeric field), or to verify remaining blanks (such as in a name field where the remainder was skipped in punching). This gives added accuracy in verifying and does not require any additional keystrokes.

Two-try Error Correction

If a keyed character does not compare properly with the punched character in storage, the VERIFY light is turned on, and the keyboard locks. To free the keyboard, press the VER RES key. This restores the keyboard, and turns off the VERIFY light.

You now have a second try at the problem character. (It is unnecessary to backspace; the column indicator remains at the faulty character.) If the compare does not verify at the second try, the VERIFY light turns on and the keyboard locks again, as in the first try. Press VER RES.

The third try is an automatic overwrite; the character now keyed is accepted by the system as the correct character, and that character is written into storage. You should now character backspace, and reverify the character just entered. (Any backspace key may be used at this time; CHAR BKSP is most appropriate.) If a backspace is not used as the next key depression following the overwrite, then the keyboard locks at the end of that field, and the column indicator shows 88 to indicate *forced reverification of the field* is necessary. A field backspace operation must be used now to return to the beginning of that field; the entire field must then be reverified.

Note: If the units position of a field is corrected, the column indicator immediately shows 88, for forced reverification. However, if the units position is the only correction in the field, or all previous corrections in the field have already been reverified, then character backspace may be used for the units position reverification. If other corrections in the field were not reverified, field backspace and reverify must be done.

Assume (for this discussion), no other errors are found. At the completion of the record, no character is punched into column 81; no procedure so far has changed the error punch in the card, only in the input storage. Moreover, the next card fed into the punch/read station is suppressed; the column indicator shows CC to indicate operator action (blank card insertion) is required. The error card will be transported through to the stacker, where it may be removed readily because of prestacking. (The error card may be destroyed or saved, depending on customer procedures.)

Insert a new (blank) card from the front at the punch station, then press the VER CORR key. The error card is automatically prestacked and may be removed, and the blank card is automatically punched according to the corrected data in storage, and marked with a single 2-punch in column 81 as correctly repunched. (To bear the 2- and 3-punch, that card would have to follow the regular procedure of the rest of the deck; that is, verify without any error corrections.) The next card is automatically fed, registered, and read (if REC ADV/CARD FEED is set at AUTO), and verifying continues.

Note: No printing occurs during verification of cards without errors. Correction-punched cards are printed if the PRINT switch is ON during verification and correction of the original record in input storage. Therefore, set the PRINT switch accordingly.

VER CORR for Field Error Correction

The two-try method is most efficient for single errors. Where multiple errors are found, an alternate technique is recommended. *The VER CORR key may be pressed at any time within a field, suspending verification and allowing*

rewrite until the end of that field, or until a backspace operation returns the column indicator to the beginning of the field. During the rewrite, character backspace may be used after VER CORR, but it does not reset the rewrite. Field backspace or record backspace resets the field rewrite. The column indicator shows the column to which you have returned.

As with the regular two-try procedure, if no backspacing follows the pressing of VER CORR and rewrite of one or more characters, then the keyboard locks at the end of that field. The condition is identified by the column indicator showing 88 to indicate forced reverification. A field backspace operation and reverification of the entire field is then required. If field backspace had been activated to the start of the field before the end of the field was reached, forced reverification would not have occurred.

After a record backspace action, pressing VER CORR allows the rekeying of the entire record, and causes a keyboard lock at the end of that record; the column indicator shows 88 to indicate forced reverification of the entire record. Press REC BKSP. Reverify the record. If less than the complete record must be rekeyed, a record-backspace suspends the rewrite operation and allows reverification of the record.

As with the two-try method, at the completion of the record, no character is punched into column 81 of the error card. The column indicator shows CC to indicate blank card insertion. The faulty card is transported to the card stacker. Follow the last paragraph of "Two-try Error Correction" for punching the new card.

Note: When the VER CORR procedure is used, it is not possible to change the program level until the verify correction has been reverified.

Data Change during Verification

There are two methods of procedure after a data change during verification. Recall that at the time of data change (in storage) the punched card still retains the incorrect punching. The corrected data may be punched into a blank card (see "Two-try Error Correction") in which case the corrected card carries a 2-punch in column 81. (Compare this with a verified-correct card carrying a 2-punch and a 3-punch in column 81.) FEED or CLEAR may be activated to bypass the normal correction procedure; not to punch a correction card, but to move the error card through to the stacker. A peripheral effect is: use of CLEAR inhibits VER DUP or manual dup for the next record; FEED does not.

If VER CORR is pressed before inserting a blank card, the error card stacks, but no correction punching or card feed occurs. A blank card can be inserted, VER CORR can be pressed, and correction card punching occurs. If the next

verify card has been fed, correction card punching cannot be done; however, the corrected data is in output storage, to be used if there is a verify-duplicate operation in the next verify card.

MULT PCH

Similar to its use in punching, MULT PCH may be used in verifying to verify a combination of holes that are not represented by a single alphabetic or numeric key on the keyboard. Press and hold MULT PCH, and key the necessary keys (normally digits 12-9) to verify the MULT PCH character. When MULT PCH is released, verification occurs. If it compares, the operation continues; if it does not compare, an error is signaled by the VERIFY light.

Note that pressing MULT PCH places the keyboard in numeric shift; also, with MULT PCH held down, the –LZ key verifies an 11-punch (via input storage) in the card.

REL

Use of the REL key in verifying is an interruption of the verify process, and the card cannot be OK-punched with a 2-punch and a 3-punch in column 81, except by refeeding and reverification. REL is used to interrupt verification when there are numerous errors in the card, or when a correction is improperly made, and the complete correction card punching routine is not necessary.

Pressing REL causes the IBM 129 to ignore all following data in the record in input storage, except that programmed automatic ver-dup fields are verify-duplicated, if AUTO SKIP/DUP is ON. After a card has been released, use FEED or CLEAR to continue the operation. (FEED allows verify duplication in the next record; CLEAR does not.) The VER CORR key does not cause a correction card to be punched, because a released card is an incomplete, interrupted-verify condition.

Backspace and Rekey

The normal verify procedure is to use VER RES and the two-try-verify procedure for verify corrections. If you do not want to make the correction (third) keystroke, using a character/field/record backspace to reset the error condition allows you to retry the field or position again, with a new error retry sequence. Thus, by character backspacing after each second attempt, endless attempts to verify a character can be made.

Frequently an error is keyed incorrectly by the operator, and neither a correction-card nor a correction-verify is desired. In this case, character backspace *before* a rewrite, make the correct verification, and continue.

PROGRAM MODE

The program card is loaded into storage by a program load operation, described in Section 3. A single program at a time is loaded. The program remains in storage until the mainline switch is turned off or until another program load operation takes place for that dial setting of PROGRAM MODE.

The operator can shift between program levels any number of times while entering data, through the use of PROG SEL, followed by the appropriate data key (0-6). The card punch returns to the program level indicated by PROGRAM MODE on advancing from card columns 00-01, except when REC ADV/CARD FEED is set to MANUAL, and PROG SEL is used to set the program level for column 01 of the next record.

The PROGRAM MODE switch positions (other than 0-6) are:

STAT PCH: This function provides for punching out production statistics data. See "Special Features" in Section 7.

PROG PCH: Pressing REL, with REC ADV/CARD FEED set to MANUAL, followed by pressing PROG SEL, and pressing appropriate data keys 1-6, with a blank card registered at the punch station, causes punchout of the appropriate program level from storage. See "Punchout (Stored Program)" in Section 3.

DATA READ: When READ is pressed, a register cycle and a card read cycle occur. This causes a data transfer from a card at the read station to output storage. The program is automatically set to program level 0, so this data can be manually duplicated and new data keyed in on a selected column basis. (This allows easy card makeover.) This dial setting selects program level 0 operation for the next card in the data card recorder. If a card is registered at either station when READ is pressed, the read cycle does not occur.

Selecting a Stored Program

If the power has not been turned off since the program was stored, that program is available by switch selection. Assume you wish to select program level 1, at the start of a new job. (See Figure 8.)

1. Raise CLEAR to clear the card bed. Set PUNCH/VERIFY switch to PUNCH.
2. Set PROGRAM MODE to desired home program level for start of next record.
3. Press PROG SEL key. Press numeric 1 key (to select program level 1).

Program level 1 has been selected; the card punch is ready for the cards. To verify, set PUNCH/VERIFY switch to VERIFY, and start the operation.

Note that program selection at any position within a record may be done by performing step 3 in the preceding procedure. The machine stays in that program level until another manual selection is made, or until the column indicator goes from 00 to 01, at which time the program level set by PROGRAM MODE is effective.

Normally, program selection is done on field boundary columns, usually the first (high-order) position of a field. If a program selection is done in the middle of a field (LZ field in verify, self-check field, accumulate, etc.), the machine changes the program level, but combines the original program with the newly selected level, possibly providing incorrect results. Therefore, make a manual selection only when in the first position of a field, before any keystroke has been made, to prevent invalid combination programs from occurring.

Once PROG SEL has been pressed, the next keystroke is limited to data keys 0-6; the keyboard locks if any other key is pressed. If you do not want to change the program level after you have pressed PROG SEL, then either select the level you are in, or field backspace to cancel the program-select condition, and continue.
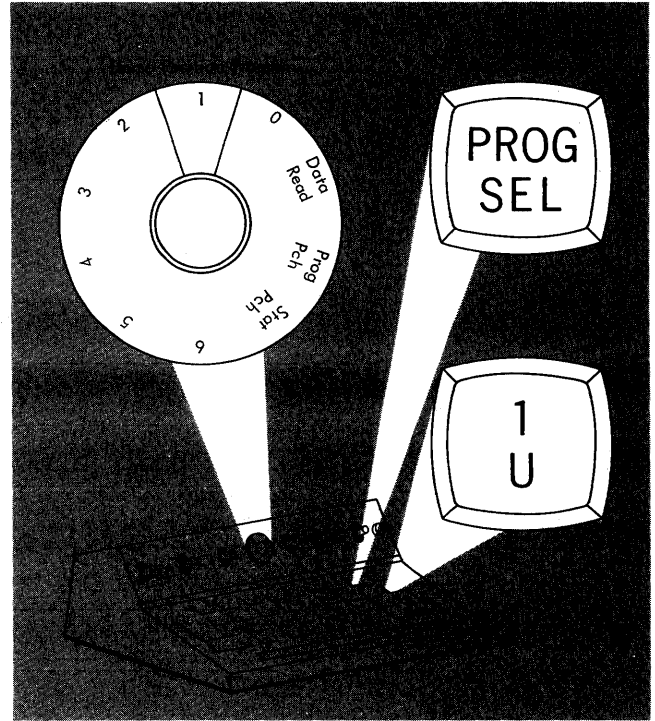
Figure 8. Selecting the Stored Program

If the column indicator is in column 00, and you press PROG SEL, then set REC ADV/CARD FEED to AUTO (not a normal sequence); the column indicator advances to column 01. The next keystroke is a program-selection keystroke; therefore, if it is not a 0-6 key, the keyboard locks. If it is a 0-6 key, the program changes to that program level, and the column indicator remains at column 01.

Operator's Notes:

32

In this section, specific functions are broken down into
small individual operations. Some operations are common
to several functions; for example, backspacing is used for
punching, verifying, and practically every other operation.
These operations are defined, and references are supplied to
amplified procedures elsewhere in the manual.

Operation	*Procedure and Result*	*Reference*
Alphabetic Shift	This is the keyboard setting when operating in program level 0. (Equivalent to "starwheels raised" on the IBM 29.) It can be performed automatically under program control by a 1-punch in the program card, or manually at any time by use of the ALPHA shift key. Be sure the key is pressed before the data key, to ensure desired shift. Alphabetic characters are the lower characters on each key.	Section 1, "Alphabetic Punching" and Section 2, "ALPHA"
Backspace a Character	Check column indicator; press CHAR BKSP. This operation backs up one character, or unlocks the keyboard if an invalid keystroke has caused a lockup.	Section 2, "CHAR BKSP" and "VER RES" and Section 4, "Two-try Error Correction"
Backspace a Field	Check column indicator; press FIELD/WORD BKSP. This backs the card to the beginning of the field. Pressing any backspace key restores a locked keyboard (caused by an invalid operation). When used at the beginning of a field, this key causes backspace to the start of the previous manual field; it passes over auto skip/dup programmed fields if AUTO SKIP/DUP is ON. If the column indicator shows 88, it is an indication that the field must be reverified because of an error correction in verify.	Section 2, "Field Backspace" and "VER RES" and Section 4, "Two-try Error Correction" and "Using VER CORR for Field Error Correction"
Backspace a Record	Check column indicator; press REC BKSP. The column indicator returns to 01. Auto skip/dup program control of the first field is temporarily suppressed; the old record is erased. Press manual SKIP or DUP to restart the automatic function.	Section 2, "REC BKSP" and "VER CORR". Section 4, "Using VER CORR for Error Field Correction"
Backspace a Word	Check column indicator; hold down ALPHA, then press FIELD/WORD BKSP. The record backs up to the character following the last manually entered space or the beginning of the field, whichever occurs first.	Section 2, "Word Backspace"
Blank Columns	In verify mode, the BLANK COLUMNS/LEFT ZERO CTRL bar operates as a blank columns verify key in all positions except the units position of a programmed LZ verify field. By pressing BLANK COLUMNS/LEFT ZERO CTRL, blank columns are automatically verified until a character is reached, unit position of a left-zero field is reached, start of next programmed field is reached, or end of record (if in program level 0) is reached. The next column to be verified is then shown in the column indicator. (If a field being verified is a left-zero field, an additional step is necessary at the units position.) Key the character in the units position, then press BLANK COLUMNS/LEFT ZERO CTRL or –LZ key if a minus over the units position is to be verified. (It is necessary to verify the units position manually, in these special cases.) In punch mode, the BLANK COLUMNS portion of the key has no function; it operates as an LZ fill key only. Use the spacebar or SKIP key to write blanks in punch mode.	Section 2, "BLANK COLUMNS/LEFT ZERO CTRL" and Section 4, "Blank Columns, Verifying"
Card Feed (Manual)	Either insert card manually (see Section 4, "Inserting Cards Manually") or let next card feed from hopper. Press FEED. In punch mode two cards feed from the hopper: the first is registered, the second is pre-registered. In verify mode one card feeds through and is automatically read into input storage.	Section 2, "FEED"

Operation	Procedure and Result	Reference
Clear the Card Bed	Raise CLEAR (normally done at end of job or batch). Automatic (or manual) duplication in the following record is inhibited unless data is read into output storage or a record has been keyed.	Section 2, "CLEAR" and Section 6, "Clearing the Card Bed"
Correct a Keying Error (Punch)	Check column indicator; decide what type of backspacing (character, field, word, or record) is required to correct the error. Then backspace accordingly, and rekey the data. (All keying is done in erasable storage, before automatic punching.)	This section: any backspace operation
Correct a Keying Error (Column 80)	If column 80 is keyed with REC ADV/CARD FEED set to AUTO, the card is punched immediately after keying column 80 before the error is noted; therefore, the card must be repunched. Press (VER) DUP until the column indicator shows the start of the last field. Rekey the last field. This punches a new card. (Dispose of error card in stacker.) Note: For control of column 80, set REC ADV/CARD FEED to MANUAL; the column indicator stops at 00. Operator may character (or other) backspace into the record if a correction is necessary, or program select to cause punchout, or set REC ADV/CARD FEED to AUTO.	Section 4, "Backspace and Error Correction"
Correct a Keying Error (Verify)	If red VERIFY light is turned on and the keyboard locks, press VER RES. The light is turned off and the keyboard is unlocked. Rekey the doubtful character. If verify error again is indicated, press VER RES, and the next rekey automatically rewrites the error character. Now, character backspace and reverify that character. At completion of record, the column indicator shows CC for operation intervention. Manually insert a blank card at the punch station and press VER CORR. The card is automatically punched with corrected data, and punched with a 2-punch in column 81, to indicate it is a "correction" card.	Section 2, "VER RES" and "VER CORR" and Section 4, "Two-try Error Correction" and "VER CORR for Field Error Correction"
Dup (Automatic)	Specific field(s) coded for auto dup, operating under program control, with AUTO SKIP/DUP set to ON. Punch Mode: Writes the same data as in the previous record. Note: Auto-dup operates over blank columns in numeric fields. Verify Mode: Compares data in present record with the previous record data, and signals an error if the result is a no-compare, then reverts to a manual field. Note: Auto dup is not active after a clear operation, or on the first record of a job, until master data has been read in or keyed into output storage.	Section 2, "AUTO SKIP/DUP" and "DUP"
Dup Card, Manual (Make over Card)	Following procedure in "Dup Field, Punch (Manual)", duplicate all columns that are correct, up to column(s) to be changed (if any). Key changed data; manually duplicate the remainder of the card.	Section 3, "Repunch (Make Over) a Card"
Dup Field, Punch (Manual)	Pressing DUP causes data duplication from the last card (whose data still remains in output storage) to this card. Under program control the entire current field is duplicated; without program control one column is duplicated. The DUP key has a repetitive action and operates at 10 columns/second in program level 0, or 10 fields/second in program levels 1-6.	Section 2, "DUP"
Dup Field, Verify (Manual)	The procedure is generally the same as in punch mode (see "Dup (Automatic)", except that, in an LZ programmed field, DUP is active in the high-order position of the field only.	Section 2, "DUP"
Left-blank Field (Punch)	If the field has been programmed for alphabetic punching, such as a name field, key the alphabetic entry, press BLANK COLUMNS/LEFT ZERO CTRL. This right-justifies all field entries for that alphabetic field, and inserts leading blanks to the left of the data. If the field is programmed numeric, and left blanks are desired, hold down ALPHA while you press the LZ bar.	Section 4, "Left Blank, Punching"

Operation	Procedure and Result	Reference
Left-blank Field (Verify)	In this case the LZ bar operates as an LZ control in the units position of a programmed LZ field only. Otherwise, it operates as a blank columns key. See "Blank Columns" (verify mode) in this section.	Section 4, "Left Blank"
Left-zero Field	Same procedure for punch/verify: key in all significant digits in the field (if none, key a 0), then press BLANK COLUMNS/LEFT ZERO CTRL or −LZ key if a minus over the units is desired. Only field definition coding is necessary in punch mode; in verify mode, LZ program code is necessary. (This is: 3-punch in the first and last positions of the field, plus field definition.)	Section 4, "LEFT ZERO"
Multipunch (Punch or Verify)	Overpunching any character with another in the same column is possible by holding down MULT PCH while keying any character keys. This is used when a combination of punches (not available on keyboard) is necessary.	Section 2, "MULT PCH" and Section 6, "Multipunching"
Numeric (Shift)	Numeric shift is the normal setting of the keyboard when operating in program levels 1-6. In program level 0, use NUMERIC shift key to key numeric characters. If NUMERIC and ALPHA shift are held pressed simultaneously, NUMERIC shift takes precedence. Be sure the key is pressed before the data key, to ensure desired shift. Numeric characters are the upper characters on each key.	Section 1, "Numeric Punching" and Section 2, "NUMERIC"
Print	Printing is controlled by the setting of PRINT during keying into input storage in punch mode. (Printing cannot be done in verify mode except on correction-punched cards, if PRINT is ON.) To control printing by field, turn PRINT to ON or OFF by field for the desired operation.	Section 2, "PRINT"
Program Select (Automatic)	With REC ADV/CARD FEED set to AUTO, the next record starts in the program level shown on the PROGRAM MODE dial (home program). Changing PROGRAM MODE to select a new home program is not effective until the column indicator goes from 00 to 01. Therefore, changing PROGRAM MODE in columns 01-80 is not effective until column 01 of the next record.	Section 4, "PROGRAM MODE"
Program Select (Manual)	With REC ADV/CARD FEED set to MANUAL, each record stops with column indicator at 00, and the operator makes a manual program selection, and presses FEED to continue the operation. This allows the next record to start in a different level than the PROGRAM MODE dial setting. Manual program selection can be done at any time within a record; it is normally done at field boundaries.	Section 2, "REC ADV/CARD FEED" and "PROGRAM MODE" (Rotary Dial) and Section 6, "Program Selection"
Punch OK-corrected Card (Column 81)	If a correction was keyed in while verifying a record, the correction card is automatically punched with a 2-punch in column 81.	Section 3, "Punch a Verify-Correction Card" and Section 4, "Two-try Error Correction"
Punch OK-verify Card (Column 81)	If the record is verified as correct without any error conditions, a 2-punch and a 3-punch is automatically punched in column 81 of the verified card.	Section 3, "Verify" and Section 4, "Manual Verifying"
Release a Record (Punch)	Press REL; this performs a programmed automatic duplication for dup fields and spaces the balance of the record if AUTO SKIP/DUP is ON. If AUTO SKIP/DUP is OFF, the balance of the record is spaced (blank). Operation after column 80 depends on the setting of REC ADV/CARD FEED.	Section 2, "REL"
Release a Record (Verify)	Press REL; this releases the card, performs programmed automatic verify if AUTO SKIP/DUP is ON. The card does not receive any punches in column 81.	Section 2, "REL"
Restore Locked Keyboard	If in verify mode, press VER RES or any BKSP key—if in punch mode, press any BKSP key. If problem is not resolved, see Section 6.	Section 6, "Keyboard Lockup Recovery Procedures"

Operation	*Procedure and Result*	*Reference*
Skip (Automatic)	Specific fields(s) is coded for automatic skip, when operating under program control and AUTO SKIP/DUP is set to ON.	Section 2, "AUTO SKIP/DUP" and "SKIP"
	Punch Mode: Write blanks.	
	Verify Mode: Ignores all data in the field; does *not* do a compare.	
Skip Field, Punch (Manual)	Writes spaces under control of field definition for the balance of a field if partially keyed, or for the complete field if pressed in the first position of a field. In program level 0, this writes one space, because program level 0 provides 80 single-position fields.	Section 2, "SKIP"
Skip Field, Verify (Manual)	Verifies that the column in which it was pressed is blank, and ignores all following data for the remainder of the field.	Section 2, "SKIP"
	Note: If verification that every position is blank is desired, use spacebar, or BLANK COLUMNS bar.	
Verify a Manual Field	Verify compares keyboard keystrokes and operations with the data in input storage. If they compare, the column indicator advances, and operation continues. If they do not compare, an error is signaled, and the operator then makes the appropriate correction.	Section 3, "Verify"
Verify Error	The red VERIFY light turns on; the keyboard locks. A backspace or VER RES is required to unlock the keyboard; additional procedures are required. See "Correct a Keying Error (Verify)," in this section.	Section 2, "VER RES" and "VER CORR"

Operator's Notes:

In any operation a body of information accumulates which can aid the operator in achieving excellence with the equipment. This section contains such information.

When a machine is not functioning correctly, the problem should be identified, corrected, or explained to someone who can correct it. In every case described in this section, the first approach is for the operator to identify and correct the problem without assistance. If a problem occurs continually, ask your supervisor for assistance.

KEYBOARD LOCKUP RECOVERY PROCEDURES

The 129 has keyboard interlocks to prevent invalid operations and to ensure accurate data during punch or verify operations. The general recovery procedure is as follows:

Punch Mode:

1. Backspace (character, field, or record).
2. Rekey correctly.

Verify Mode (VERIFY light on):

1. Press VER RES.
2. Rekey correctly.

A summary of individual recovery procedures follows:

Condition	*Checks*	*Recovery*

Individual key locks keyboard (any column 01-80).	1. Invalid character for 48-character keyboard mode.
	2. Invalid function key:
	  a. Using manual duplication in first record after clear operation.
	  b. Do manual program select without data key (0-6).
	3. Keystroke made during verify feed cycle, before the first manual verify column of card has been read; keyboard does not accept keystroke.
	4. Left-zero control key not pressed (after units position verify of programmed left-zero field) before verifying next data character.
		Character, field, or record backspace, and rekey.

Column indicator at 00.	REC ADV/CARD FEED set to MANUAL.	Set REC ADV/CARD FEED to AUTO.
Column indicator at 00, or first manual column; REC ADV/CARD FEED is set to AUTO.	1. Stacker full and stacker switch operated. 2. Hopper empty.	1. Remove cards from stacker and feed next card. 2. Add cards to hopper and feed cards.
Manual or auto dup field in first record after a clear operation.	Data must be read or keyed into output storage after a clear or power-on operation, for auto/manual dup to be operative.	Turn AUTO SKIP/DUP to OFF; do character backspace; manually key the field.
VERIFY light on (Verify mode only).	Keying error in record being verified.	1. Press VER RES. then retry the character. (Complete error-correction routine.) 2. Press CHAR BKSP; retry without the error routine.
Column indicator at 88 (verify mode only).	Failure to reverify correction made in that field.	Field backspace; then verify the field. *Note:* If VER CORR method was used, press Fld Bksp or Rec Bksp and reverify field or record.
Column indicator at CC (verify mode only).	Corrections made during verify require correction card to be punched.	Insert blank card; press VER CORR for correction card (2-punch in column 81). *Note:* If punchout is not desired, press FEED/CLEAR to continue; no punches in column 81.

Note: If lockup continues, ask supervisor for assistance.

CARD HANDLING HINTS

Card Handling

The following applies to punched cards in the keypunch room, regardless of the particular type of punch or verifier being used. Data processing cards can be affected by heat, cold, and (most significantly) by humidity. For example; cards transferred from a cold room to a warm room will collect moisture. Variations in humidity will alter a card's size and weight by changing its moisture content and may cause the card to warp. This is a frequent cause of card feeding trouble in a data processing installation.

Before use, cards should be given ample time to achieve a moisture balance with the machine room atmosphere.

Where space permits, facilities can be set up in the working area for a five to ten days' supply of cards, in which time they can become acclimated.

It is advisable that care be exercised in regulating thermostats and in opening or closing windows in working areas. In winter, a favorable relative humidity in the machine room is more easily maintained at lower temperatures. Continuously high temperatures dry the air and may cause a drop in recommended humidity levels. Hot, humid weather can be offset by the use of dehumidifiers in the working areas.

For best machine performance, cards should be perfectly flat for machine feeding. The following are considered good card handling practices and are recommended to be used where applicable:

1. If cards exhibit a slight distortion due to warping, the machine operator can generally eliminate this condition by gently bending (fanning) the cards back and forth a few times.
2. When cards are removed for use from storage trays or cartons, a light fanning action on each handful of cards, prior to placement in the card hopper will help to remove card lint, etc., and facilitate alignment in the hopper.
3. Cards stored in trays for later use should be kept under pressure to reduce the possibility of warping.

For additional information concerning proper card storage criteria, please contact your local IBM branch office.

Checking Registration

The punching registration of the machine should be checked regularly, to ensure optimum performance during verification and reading of the cards in other machines. Punch a card in all 80 columns and check the registrations with a card gage. (See Figure 9.) Off-gage punching causes difficulty when the cards pass through other types of machines.
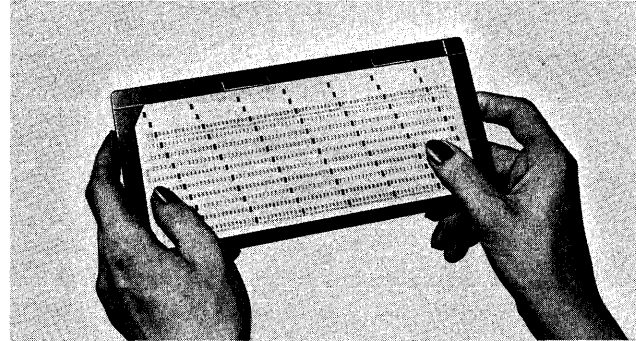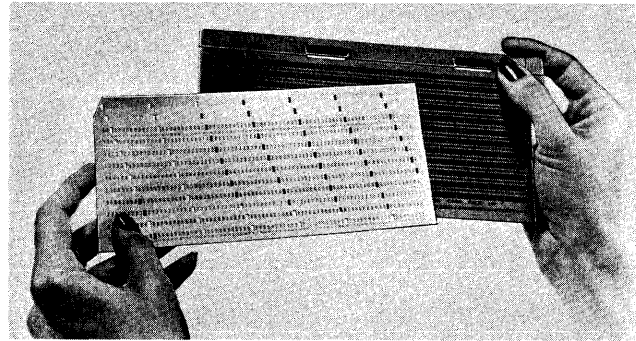

Figure 9. Using Card Gage

False "Errors" (Verify Mode)

Checks:

1. Registration of punched cards.
2. Proper keyboard shift (programmed or manual).
3. Warped or damaged cards that may feed and/or read improperly.
4. "Transparent" spots on the cards that result in "reading through" where no punched hole exists.

Checking Reading Accuracy—False "Errors"

To check any case of suspected false errors or off-punched cards:

1. Perform data read operation, by feeding a card from the hopper, so that manual insertion will not affect registration. See "Data Read for New Master Card Information" in Section 3.
2. Duplicate the record into a blank card, and compare the punched card with the original card to determine any differences caused by improper reading by the machine, or improper punch-registration of the original card.

To check suspected false errors or off-punched cards in verify mode:

1. Use a program card that has column 01 as a single-position manual field, and columns 02-80 as an auto-skip field.
2. Read the card for normal verification.
3. Make a correction in column 01 of the record. Then columns 02-80 are automatically skipped, and the machine waits for a correction card to be punched.
4. The correction card has the correction in column 01, and the original data, as read by the machine, in columns 02-80.
5. Compare the correction card with the original card to determine any differences.

In either of the preceding check cases, check the registration of the original cards to determine if off-punching is the cause of the false errors.

Feeding Failures

Checks:

1. Cover over feed knives for proper positioning.
2. Foreign objects in the feed or transport.
3. Small pieces of card from a previous card jam.
4. Card damage (in feed knife area) of 12-edge or (throat area) of 9-edge of cards.
5. Proper ribbon alignment on print models.

Corner Cuts

Cards with lower left-corner cuts cannot be used because they do not feed through the card bed. This should be kept in mind, especially when designing random (tumble) cards, because an upper right-corner cut becomes a lower left-corner cut when the card is tumbled. Exceptions: lower-left corners cut C-3, 30-degree, 0.130-inch base measurement can be fed. Round-corner cut cards are acceptable.

Card Jam Removal

The IBM 129 uses fiber optics in the read mechanism, to provide high reliability and quiet operation. Card jams can normally be removed by pressing the card release pushbutton, and pulling the jammed card gently, or pushing pieces of the jammed card with another card.

Try to assemble the jammed card pieces together to be sure all pieces have been removed, and to facilitate remake of the card. If all pieces cannot be removed, try the following procedure in punch mode:

1. Set PRINT and AUTO SKIP/DUP to OFF.
2. Set REC ADV/CARD FEED to MANUAL.
3. Remove any loose cards from the card bed.
4. Manually select program 0. (Keyboard is in alphabetic shift.)

5. Key in all 80 columns, with &, –, digits 0-9, sequentially.
6. Manually insert a card at the punch station.
7. Press REG.
8. Press the card release pushbutton; hold it down through step 9.
9. Manually select program 0. (Press PROG SEL, then data key 0.) Punchout follows, however, the card does not move while you press the card release pushbutton.
10. Tear a strip of card about 1-inch wide and use it (or the special "IBM 129 card saw") to push out pieces of card which may still be under the punch.
11. Repeat this entire procedure, using the DUP key for step 5. Do the procedure several times if pieces of card are still jammed.

Note: If it is necessary to use a card saw, be sure to use *only* the special "IBM 129 card saw" that is included with every machine.

Inserting Cards Manually

Punch or Punch/Read Station: Insert the card until it is flat on the bed, then slide it back under the shield to the right, as far as it goes.

Read Station (Model 2 Only): Insert the card about 1/2 inch beyond the pressure roll so that the card is machine-registered.

Cards being read in a data read or store a program operation may be hopper-fed (in punch mode) or manually inserted (in punch or verify mode) at the punch/read station (or punch station on Model 2), as long as the card bed is clear, and the card is *not* registered prior to pressing READ.

Cards to be verified *must* be hopper-fed; they cannot be manually inserted in the card bed.

Remove (Release) a Card from the Bed

A card can be removed from the card bed, automatically moving up all cards, and feeding a new one, by pressing REL while REC ADV/CARD FEED is set to AUTO. Fields beyond the release point are programmed for auto dup or auto-ver dup if AUTO SKIP/DUP is set to ON. In verify mode, the "release" card receives no punches in column 81.

If REC ADV/CARD FEED is set to MANUAL, the column indicator stops at 00, and operator action is necessary to continue (program select, and FEED, or set REC ADV/CARD FEED to AUTO).

Clearing the Card Bed

Raise CLEAR when the card bed is to be completely cleared at the end of (or to interrupt) a punching or verifying operation, without feeding more cards from the hopper. All cards in the card bed are transported to the stacker. (This procedure is recommended before turning off the power.)

CAUTION

At the conclusion of a job or batch (punching), if a blank card is still not registered at the punch station, then you should feed and register one or two cards to ensure that all stored data has been punched. If the first registered card does not punch out, no further action is required, as all stored data has been punched. Raise CLEAR to clear the transport area.

Auto or manual dup does not operate on the first record following a CLEAR, unless valid data has been read into output storage.

Running Out of Blank Cards

The operator's keying and input storage are always from one to two records ahead of the unpunched cards. Accordingly, the operator is cautioned to ascertain that an adequate supply of blank cards is in the hopper during a production run. If the machine runs completely out of cards, and the operator is unaware of this, up to two entire records may already be in output and input storage, awaiting availability of blank cards. In such a case, the correct procedure is to obtain at least two blank cards, insert them in the hopper, press FEED until the cards are registered and automatic punching starts. To avoid losing data in input or output storage, do not shut off power before the cards are punched. (See "Data Security" for procedure to eliminate data loss.)

Data Security

To avoid the possibility of missing data (which would show up on any verify check) observe this rule:

If, at the conclusion of punching a job or batch (with REC ADV/CARD FEED set to AUTO), a card is not registered at the punch station, feed and register two cards to ensure that all stored data has been punched. If the first registered card does not punch out, no further action is needed. All stored data has been punched.

If REC ADV/CARD FEED is set to MANUAL at the conclusion of punching, the procedure is the same, except that a program must be manually selected (see "Selecting a Stored Program") or REC ADV/CARD FEED set to AUTO.

Operation of CLEAR, after partially keying in a record, moves the card out of the card bed, but also clears the partial record by resetting input storage to column 01. Be aware of this action: it may cause loss of data needed for the next record. CLEAR also prevents manual or auto dup in the next record, unless new master data is entered by a data read operation.

In applications where sensitive data is being processed, and data security is of concern, follow the preceding rule to ensure that valid data is not left unpunched. If sensitive data is to be erased after punchout, but counter totals and programs are to be preserved, release two blank cards in punch mode with AUTO SKIP/DUP set to OFF. This inserts spaces in both input and output storage.

CAUTION

Turning the power switch off automatically destroys any information remaining in storage. It also destroys all programs and all totals in the machine.

Power Off (Cards in the Card Transport)

If the mainline switch is turned off while a card is registered, and then the switch is turned on, a card jam may occur when the next card feed occurs. Always clear the card bed before turning power off. Remember that power off sets all totals to zero (in the production statistics and accumulate counters) and also resets all programs to zero.

PROGRAMMING AND FIELD FORMAT HINTS

Failure to Follow Program Format

Checks:

1. PROGRAM MODE dial setting is correct.
2. Correct manual program selection is performed.
3. AUTO SKIP/DUP, REC ADV/CARD FEED, and CHARACTER MODE switch settings are correct.

A program punchout procedure may be followed to check stored program in any level (1-6). Re-enter correct program, if necessary.

Program Selection

In selecting a program, PROG SEL is pressed, then the appropriate data key (0-6) is pressed. If any key other than the appropriate data key is pressed, the keyboard locks. In that case, select again after pressing CHAR BKSP to release the keyboard lock.

If a program selection is not desired after pressing PROG SEL, either select the same program level you are presently in, or press FIELD/WORD BKSP or REC BKSP to reset the program select condition.

Getting Ahead of the Machine

Under certain conditions, if the program is mostly automatic duplication and/or skipping, the card punch could be punching the first card, the operator could have keyed the manual parts of the second record, and is now ready to key data into input storage for a third record. If the operator presses a key under these conditions, the keyboard locks, and the column indicator points to 00, indicating operator intervention is required. Press the CHAR BKSP key to release the keyboard. Operation may resume when the column indicator shows 01, or the first manual column to be keyed.

Column Indicator Troubles

The column indicator always shows the "next" column to be processed. If a record is programmed for a skip/dup in the first column, rapid change in the column indication from 01 to the new setting is not seen. This operation is automatic and high-speed. It seems that the new record begins at other than column 01.

If a key for skip/dup is pressed, the column indicator seems to "jump" to the new value; it moves at electronic speed to the next manual column. A column indication of 88 means "forced reverification". A column indication of CC means "punch a correction card (verify mode)". (See Section 2 "VER RES" and "VER CORR" for examples.) A column indication of 00 means "operator intervention required" (add or remove cards, set REC ADV/CARD FEED to AUTO, or make a manual program selection). If you believe the column indicator is wrong, check your program. See Section 3, "Punchout (Stored Program)."

Two Program Formats in One Card

Each program level (1-6) uses 12-11-0-1-3-punches for field definition, skip, dup, alpha, and LZ verify, respectively. To reduce the number of program cards, two programs may be put in one card if only 12-3-punches (upper half of program card) are used, as follows:

1. Punch the first program in 12-3-punches, right side up.
2. Rotate the card so that the 12-edge is on the bottom, and column 80 is at the left.
3. Punch the second program in locations 9-4 (lower half of card); their location is equivalent to 12-3-punches for this card orientation.
4. Read in the first program into the desired level of storage by feeding the card 12-edge up, column 01 at the left.
5. Read in the second program into the desired level by feeding the card 12-edge down, column 80 at the left.

Programming for self-checking number feature, 2-punch, is also satisfactory for the preceding situation. If the accumulate feature is programmed (4-5-6-7-8-punches), the preceding procedure cannot be used.

Note: Upper-right corner cuts become lower-left corner cuts when the preceding procedure is used. Only a C-3, lower-left corner cut is acceptable for double-program formats.

LZ Fields (Punching)

If the left-zero/blank insertion field is keyed in all columns with significant figures, it is unnecessary to press the LZ CTRL bar while punching. The program automatically proceeds to the next field. If no data is to be keyed in a left-zero/blank field, either:

1. Key 0, followed by pressing LZ CTRL (which causes all zeros to fill the field), or
2. Press SKIP until the field is passed (causing a blank field).

If the *filled* field requires a *minus* (11-punch) over the units position, use the MULT PCH key and key both digit and minus into the units position.

LZ Duplicating (Punching)

Left-zero/blank fields of identical data can be duplicated from one card to the next by pressing DUP in the high-order position of the field.

First Field Correction (Punching)

Operating under program control, the column indicator would normally point to the beginning of the second field before any manual keying could take place, if column 01 is under automatic dup or skip. To manually enter data in column 01 under these conditions, press REC BKSP before keying. The column indicator returns to column 01, and any automatic programmed function is temporarily suspended for the first field. Rekey the first field. All other programmed functions remain active. Automatic programming for the first field resumes on the next record.

Last Field Correction (Punching)

If an error occurs in column 80, and the card is punched before the error is noted, redo the record by pressing DUP until the column indicator shows the start of the last field. Rekey the last field. This punches a new card. (Dispose of the error card found in the stacker.)

To correct the last column/field, set REC ADV/CARD FEED to MANUAL. Then, at the completion of keying column 80, the column indicator shows 00; backspacing and rekeying of that record is now possible. If rekeying is not necessary, set REC ADV/CARD FEED to AUTO, or leave that switch at MANUAL, and make a manual program selection to start the next record. In this latter case, it is also necessary to press FEED to feed another card, because REC ADV/CARD FEED is set to MANUAL.

Duplicating Over Blank Columns (Punching)

The DUP key can be used to duplicate, or verify-duplicate blank columns, *if the same columns are blank in the preceding card*. If there is no card immediately ahead (for example, after a CLEAR operation), dup operation is inhibited. When DUP is used, the action is faster than using the spacebar. This action duplicates the data from output to input storage.

Verify Blanks

BLANK COLUMNS/LEFT ZERO CTRL may be pressed to space over *and verify blank columns*. Verifying in this manner is much faster than using the spacebar. Every column is verified as a blank; the first punched column stops the operation. (In the units position of a programmed LZ verify field, the bar operates as LZ CTRL only.)

Multipunching

Two or more digits, or any combination not represented by a key on the keyboard, can be punched in one column by holding down MULT PCH while the digit keys are pressed, one at a time; release MULT PCH. The keyboard is automatically shifted to numeric when MULT PCH is pressed.

Note: The dash key provides an 11-punch when MULT PCH is used.

Alternate Methods for Providing 11-punch Characters

Note: On the IBM 129, the numeric 11-punch (dash) on the keyboard has been replaced by the —LZ function; the 11-dash is therefore available in alpha shift only. Listed below are other methods to obtain the 11-dash, or a substitute punch and graphic to serve the same purpose:

1. Use manual or programmed alpha shift and the dash key to obtain an 11-dash in any position.
2. Press the MP (multipunch) key and the dash key to obtain an 11-dash in any position.
3. Change to program level 0, which is alpha, and the dash key will provide the 11-dash.
4. Use any of the following numeric special characters as a substitute for the 11-dash.

Graphic		Card Code	Character Mode
Ampersand	(&)	12-punch	48
Period	(.)	12-8-3	48
Comma	(,)	0-8-3	48
Plus	(+)	12-8-6	64
Underscore	(—)	0-8-5	64
Colon	(:)	8-2	64
Semicolon	(;)	11-8-6	64
Logical Not	(¬)	11-8-7	64
Apostrophe	(')	8-5	64
Quote	(")	8-7	64
Equal	(=)	8-6	64

PRINTING HINTS

Print Switch

Remember that the setting of PRINT in punch mode controls printing for the record being keyed into input storage. The PRINT switch setting does not affect output storage. If you want to print on correction-punched cards in verify mode, leave PRINT switch ON. Printing cannot be done on cards verified without errors—only on correction-punched cards. Also remember that all program punchout cards are printed, regardless of the switch setting. If a program card *without* printing is desired, either key it from the keyboard, or duplicate it (with PRINT turned OFF).

Card Codes and Key Graphics

The expanded 64-character set keyboard is System/360 and System/370 compatible. All the characters are shown in Figure 10. (Keyboard is shown in Figure 4.)

Alpha Shift		Numeric Shift	
Graphic	Card Code	Graphic	Card Code
A	12-1	0	0
B	12-2	1	1
C	12-3	2	2
D	12-4	3	3
E	12-5	4	4
F	12-6	5	5
G	12-7	6	6
H	12-8	7	7
I	12-9	8	8
J	11-1	9	9
K	11-2		
L	11-3	¢	12-8-2 †
M	11-4	.	12-8-3
N	11-5	(	12-8-5 †
O	11-6	+	12-8-6 †
P	11-7	|	12-8-7 †
Q	11-8	!	11-8-2 †
R	11-9	$	11-8-3
S	0-2	)	11-8-5 †
T	0-3	;	11-8-6 †
U	0-4	¬	11-8-7 †
V	0-5	0-8-2 (keytop only)	0-8-2 †
W	0-6		
X	0-7	,	0-8-3
Y	0-8	—	0-8-5 †
Z	0-9	>	0-8-6 †
/	0-1	?	0-8-7 †
.	12-8-3	:	8-2 †
<	12-8-4	#	8-3
*	11-8-4	'	8-5 †
,	0-8-3	=	8-6 †
%	0-8-4	"	8-7 †
@	8-4	&	12
—	11		

Notes:

1. Dagger (†) denotes 16 additional special characters that are only in 64-character set.

2. ASCII graphics are the same as the 64-character set, except:

   12-8-2 is [
   11-8-2 is]
   0-8-2 is \

3. Squared alphabetic letter ⬚ is standard, to distinguish it from numeric 0.

4. The 11-0 combination (minus over 0) does not print. The 11-1 through 11-9 (minus over digit) prints letters J-R.

5. Space is a blank column in both alpha and numeric shift.

6. Dash (—) 11-punch is available only in alpha shift.

Figure 10. Card Codes and Graphics

42

Poor Printing or Not Printing

Checks:

1. Broken, worn, or dry ribbon.
2. Failure of ribbon to reverse (small eyelet should be above the reversing arm).
3. PRINT must be set to ON during keying of input storage.

**Ribbon Replacement (Models 2 and 3)**

The print ribbon feeds between ❶ ⓭ two spools, through ❹ ❽ ribbon guides, and under the ❼ punch/read station as shown in Figure 11. The old ribbon is removed and a new one is installed as follows:

1. Turn off the mainline switch.

    CAUTION

    Punch out any production statistics or accumulate total(s) information before you turn power off, since power off resets all totals to zero, and sets all programs and data to blanks.

2. Remove the cover over the print unit.
3. Remove the ⓮ ribbon-spool-retaining clamp.
4. Cut or break the ❾ old ribbon, then remove both ❶ ⓭ spools from their ❷ spindles and pull out the two pieces of ribbon. Empty one of the spools.
5. Place the spool of new ribbon on the ❷ right-hand spindle; position it so that the ribbon feeds from the top of the spool toward the front of the machine. Lift up the right end of the ❿ ribbon-reversing arm, if it is not already up, and unroll about 18 inches of ribbon; then push down the right end of the ribbon-reversing arm to hold the spool steady.
6. Feed the metal leading-end of the ribbon between the ❼ punch/read station and the card bed, sliding it through the groove in the center of the ❻ card bed (betweeen the 3- and 4-punching positions). The groove permits the extra thickness of the metal end and the ⓬ reversing eyelet to pass between the punch die and the card bed. Be sure to keep the ribbon straight, with the top side up at all times.
7. Hook the metal leading-end of the ribbon in the slot in the center of the empty spool and wind the ribbon onto the spool until the ⓬ reversing eyelet is on the spool.
8. Place the spool on the left spindle; position it so that the ribbon feeds onto the spool over the top. Be sure that the ribbon is not twisted and that the top side of the ribbon is still up.
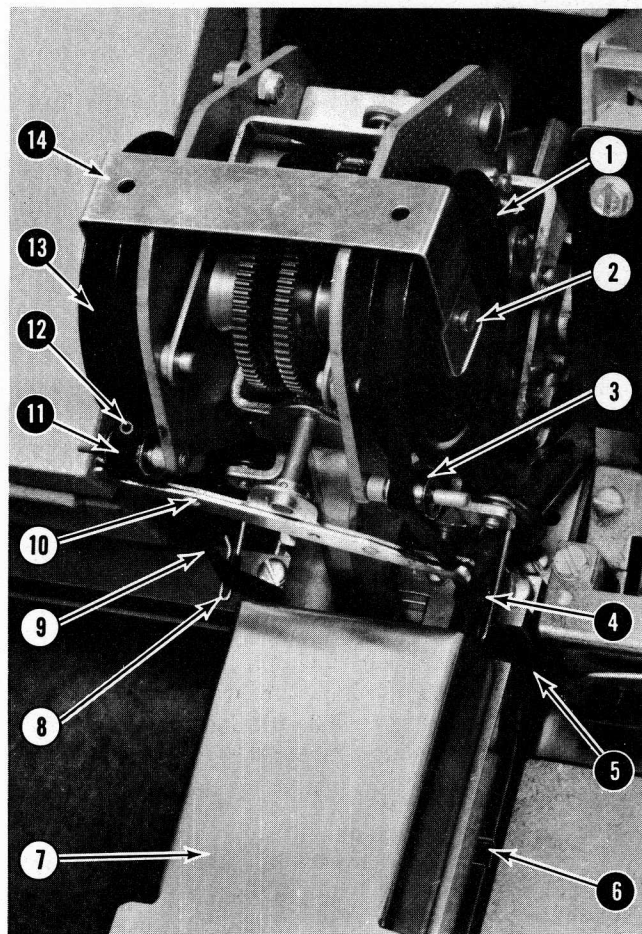
①	Ribbon Spool	⑧	Wire Ribbon Guide
②	Spindle	⑨	Ribbon
③	Roller	⑩	Ribbon-reversing Arm
④	Wire Ribbon Guide	⑪	Roller
⑤	Upper Groove	⑫	Reversing Eyelet
⑥	Center Groove	⑬	Ribbon Spool
⑦	Punch/Read Unit	⑭	Ribbon-spool Retaining Clamp

Figure 11. Ribbon Replacement

9. Hook the ribbon around the ❹ right and ❽ left wire ribbon guides, and slide it through the right and left ends of the ❿ reversing arm and over the ❸ right and ⓫ left rollers in front of the ribbon spools.
10. Slide the ribbon up under the punch/read station so that it is in the ❺ upper groove provided for it in card printing position (above the 12-punching position), and take up the slack.
11. Replace the ⓮ ribbon-spool-retaining clamp.
12. Replace the cover on the print unit.
13. Turn the mainline switch on and resume operation. (See Section 3.)

Operator's Notes:

44

The special features available to the 129 include:

Special Feature	Field Installable
Production Statistics	Yes
Accumulate	Not recommended
Additional Accumulate Program Levels	Yes
Self-checking Number	Not recommended
Direct Punch Control	Yes
Verify Read Control	Yes
Extended Reading Board	Yes
Expansion	Not recommended

PRODUCTION STATISTICS

The production statistics feature provides statistics on card punch/verifier production for use in measurement of work load, analysis of errors, and job accounting. This feature provides a combination electronic counter package.

Keystroke Counter

This six-position counter (000,000 to 999,999) counts every data keystroke in punch and verify mode, and all functional keystrokes except: alpha, numeric, multipunch, feed, register, program select, dup, verify correction, and verify reset. It does not decrement; overflow rolls from 999,999 to 000,000 with no indication or operator action necessary.

Card Counter

This four-position counter (0000 to 9999) counts every output record in punch mode and every verify-correct or correction-punched card in verify mode. It does not count error cards in verify mode, program cards read in, and data cards read in. It counts program cards or accumulator total cards that are punched out. The counter does not decrement; overflow rolls from 9999 to 0000 with no indication or operator action necessary.

Verify Correction Keystroke Counter

This four-position counter (0000 to 9999) counts each verify-correction-rewrite keystroke in verify mode. It does not count the verify-reset keystroke, nor the retry keystroke(s) prior to the actual rewrite keystroke. It counts only the actual rewrite strokes. If VER CORR is used to rewrite a field or record, every data keystroke is a rewrite, and is therefore counted. Reverification keystrokes after a rewrite correction has been made are not counted. The counter does not decrement; overflow rolls from 9999 to 0000 with no indication or operator action necessary.

Operation

All counting is done automatically under machine control, not under operator or program control. All counters may be punched out, or punched out and reset, under operator-keyboard control. Selective counter punchout is not possible.

Indicative data (operator number, machine number, date, job, etc.) may be manually punched in columns 01-66 of the total card. These keystrokes are counted in the keystroke counter, but the total card is not counted in the card counter.

Totals may be punched by batch, job, or day, etc. All counters are reset to 0 when machine power is turned on. This feature may be field installed.

Note: In verify mode, error cards, which are not counted in the card counter, may be collected and counted separately and the number punched with other indicative data in the total card to provide additional data on errors per card, etc.

Punchout Procedure

Production statistics are punched into columns 67-80, under control of PROGRAM MODE and REL. Punchout is done by the operator as follows:

1. Set machine in punch mode: PRINT set to ON, if desired.
2. Register a card; set REC ADV/CARD FEED to AUTO.
3. Key indicative information, as desired, in columns 01-66, using any desired program level (0-6).
4. In column 67, or prior:
   a). Turn PROGRAM MODE to STAT PCH.
   b). Press REL to cause punchout *without* reset to statistics counters.
   c). Press and hold NUMERIC shift and REL to cause punchout *with* reset of statistics counters.
5. If a keystroke, other than REL, is made in column 67, production statistics does not punchout when REL is pressed (although card does punch) unless appropriate backspace recovery to column 67 or prior is made before REL is pressed.
6. Punchout occurs as follows:

Card Columns	Information Punches
01-66	Indicative data or spaces
67-72	Keystroke counter total
73-76	Card counter total
77-80	Verify-correction keystroke total

7. Machine is in program level 0 at conclusion of punchout. Set PROGRAM MODE dial to desired home position, and manually program select desired level to continue operations.

Cumulative or Extended Period Totals

If desired, statistic cards can be punched out for each batch, application, operator, machine, or day, as applicable. Normal totals are by batch; however, totals by day, or other cumulative segment are possible. The user is responsible for handling any overflow situations that may result in his totaling procedures.

Note: Totals are reset to zeros when power is turned off, therefore, totals should be punched out before turning power off.

Miscellaneous Considerations for the Production Statistics Feature

Punchout column assignments 67-80 cannot be altered. Totals are not identified as punch or verify mode. User may include this in his indicative data, if desired.

If punchout *without reset* is done, two or more total cards could be punched. The only difference is that indicative data keystrokes in columns 01-66 continue to count in the keystroke counter. Thus, one total card could be sent with the data cards to the next operation, and one retained by the operator, or the total card could be given to the supervisor, etc.

When a noncumulative batch total is desired, perform punchout *with reset* before starting the batch.

A group of statistics total cards may be totaled by day, by operator, by week, by job, etc., by using the accumulate feature to add the appropriate information during a separate accumulate operation.

ACCUMULATE FEATURE

(This feature requires the expansion feature as a prerequisite.) The ability to accumulate allows users to balance to a predetermined total, or to create a hash total for a group of cards, or batch of work. This eliminates secondary operations that were previously required, and gives real-time accuracy control in the entering of data. The accumulator increases the functional capability of the data recorder, thereby producing more results than just keyed data in the punched card; for example, new or expanded applications are combined with card punching and verifying.

Description

The accumulate feature has three 14-position, individual accumulators that add (under program control) any manually keyed, manual or auto-duplicated numeric fields into any assigned accumulator. The maximum size of the input field is 14 positions; the minimum size is 2 positions; the input field may be a left-zero or left-blank field, or an automatic or manual dup field. The field should be

programmed numeric, because the accumulator recognizes only the lowest value digit of the numeric portion (0-9) of any data keyed. A minus accumulate occurs if an 11-punch is multipunched in the units position, or if the –LZ key is used for a field with at least one leading zero. A minus accumulate also occurs if duplication is done from a previous record that had a minus field. Any total carryover beyond position 14 maintains a valid total up to a maximum of 19 positions, and a maximum of 19 positions may be punched out.

Accumulate arithmetic occurs only after the entire record has been keyed in and transferred to output storage; therefore, there are no restrictions in the use of any backspace functions.

Punchout, or punchout and reset, of individual accumulators at the end of a group or batch is under program control in punch mode, and may be done selectively. Group totals are normally punched out via a different program level than the accumulating program level. Credit totals are punched out with an 11-punch over the units position. (Note that 11-0 does not print, as it is not a part of the 64-character set; 11-1 through 11-9 prints as J through R, respectively.)

Accumulating data operates the same in verify mode as in punch mode. This allows only verified data, or verify-corrected data to be accumulated, and thus gives a higher accuracy of results. In verify mode, automatic verification of total fields is under machine-program control.

Programming of accumulate is standard in program levels 1 and 2 only. Program levels 3, 4, 5, and 6 can be added as an additional-capacity special feature.

Program Control

The accumulators operate under program card control at all times. Three accumulators are designated as A, B, and C. To add into accumualator A, program a 5-punch in the first position of the field, followed by a normal field definition; to add into accumulator B, use a 6-punch; to add into accumulator C, use a 7-punch. Any field can be programmed to add into any, or all, accumulators by combining the 5- 6-, and 7-punch in the first position of the field.

When the field is manually keyed or manually duplicated, and the record is completed and transferred to output storage, the programmed accumulation occurs. Fields programmed for accumulate may also be programmed for auto duplication, if the data is a duplication from record to record. Simply add the 0-punch to the program card, and set the AUTO SKIP/DUP switch accordingly.

In punch mode a field programmed for auto skip and accumulate, accumulates zeros. When programmed for auto skip and accumulate in verify mode, the data in the field adds into the accumulator during the auto-skip operation.

Any accumulator can be punched out by program control, in any available field of a card. Only the first column of a field must be coded in the program card, in addition to normal field definition coding. Program card coding for assigning a field for an accumulator punchout *with* or *without* reset is:

Punch Without Reset	Accumulator	Punch With Reset
4-5	Punchout A	4-5-8
4-6	Punchout B	4-6-8
4-7	Punchout C	4-7-8

Punchout fields *must* follow all input factor fields if punchout is done in the same card; otherwise, the input factors for that card are *not* included in the total. If punchout is in a separate total card that uses a separate program level, the punchout field may be in any location.

Punchout is active in punch mode only. Data is always right-justified in punchout, and a minus total is indicated by an 11-punch over the units position, showing that the field is minus. If the total in the accumulator is larger than the field size programmed for punchout, the low-order positions punch and the high-order positions are dropped.

Do not program accumulate and self check in the same field.

ADDITIONAL ACCUMULATE PROGRAM LEVELS (SPECIAL FEATURE)

The accumulate feature is active in program levels 1 and 2 only. Program levels 1, 2, 3, 4, 5, and 6 (and 0) remain normal and active in the basic machine. For additional program capacity to accumulate, this feature may be added to provide programming in levels 3, 4, 5, and 6. This allows more flexibility and combinations of accumulating and total punching. Normal switching between programs is permissible, between or within records.

Punching Operations

Any manual numeric field can be programmed for accumulate. Skipping is valid and causes zeros to be accumulated. LZ fields are valid for accumulate. In numeric shift, the −LZ key causes a left-zero operation with the 11-punch over the last digit keyed, resulting in a minus accumulation (that is, subtraction). For full-field conditions (no leading zeros), the MULT PCH key must be used to minus overpunch the units position. Manual or automatic duplication is valid for an accumulate field entry.

An input field size larger than 14 positions drops the high-order input digits. The minimum field size for accumulator entry or total punchout is two positions. Operation is normal if a counter goes from plus to zero or minus, or vice versa. If a counter overflows beyond position 14 the overflow maintains a valid total up to a maximum of 19 positions; a maximum of 19 positions may be punched out.

The dash (−) key in alpha shift (except in the units position) causes zero accumulate and an 11-punch in the card. Use of the dash (11) key only in the units position of accumulate causes an 11-punch in the card and a *minus field*, and a zero in that position of the accumulator.

The MULT PCH of an overpunch 11 for a minus field is valid only in the units position; in any other position, an 11 and multipunch digit adds the digit but does not cause minus accumulation. (*Note:* If more than a single digit, 0-9, is keyed using multipunch, only the lowest value digit enters the accumulator.)

Amounts cannot be entered in an accumulator via a data read operation, but only by a keying or duplicating operation. If pre-amounts are entered into the accumulators, these amounts should be keyed in the first card or duplicated from a previous record; then keying of the regular batch or group follows.

During keying, fields programmed for total punchout are skipped automatically in input storage. If a total punchout is programmed in the first column of a record, and a record backspace is done, the total punchout auto skip in storage occurs. If the first column is programmed with regular auto dup or auto skip, and a record backspace is done, the column indicator stops in column 01, and the auto skip or auto dup does not occur.

Totals cannot be transferred directly from one accumulator to another. A single field can be added to any or all accumulators during input, but only a single accumulator may be punched into a field. Minus totals are identified by an 11-punch over the units position digit.

Verifying Operations

All accumulate operations are the same in the verify and punch modes, except that only verify-correct fields are accumulated. If a card is not verified properly, or bypassed, no accumulate occurs.

During verification, those fields on a completed card that are programmed for punchout, or punchout and reset, automatically compare to the existing contents of the appropriate accumulators. Manual verification of that total is not possible if the field is programmed for total punchout. If manual verify is desired, do not program for punchout.

If there is no difference between the read-in totals and verify accumulated totals, operation continues, and the totals card is OK-verify punched (2-punch and 3-punch) in column 81. If there is a discrepancy between any read-in totals and the verify accumulated totals, a keyboard lockup occurs in column 81, and the column indicator displays AC, denoting an accumulator correction is necessary. The normal verify-correct procedure of inserting a blank card and pressing VER CORR causes the current verify accumulator totals to be punched in the correction card. The new totals card has the normal verify-correction punch

(2-punch) in column 81. The error card may be discarded, or retained, at the discretion of the user, for error analysis, audit trail, etc.

On completion of verification, if punchout, or punchout and reset, is desired for an additional total card, clear the card bed, change to punch mode, select the program level for the desired result, and register a card. Skip through the record in storage (or key desired indicative data); the data (or spaces) and the total is punched out into the blank card.

In verify mode, fields programmed for automatic skip *and* accumulate (with the AUTO SKIP/DUP switch ON) accumulate in the programmed accumulator. This could occur during manual verifying, or (if each individual field is programmed for auto skip) in a semi-automatic mode. Production statistics cards, for example, could be accumulated at the end of the day, using a suitable program card, to obtain a daily total of cards processed by operators or for all machines.

Miscellaneous Considerations

The user is responsible for controls and checks on his procedures, for reconciliation of balance totals and for adjustments by debit or credit procedures. This ensures batch integrity and validity of accumulated data.

Power-on reset causes all accumulators to reset to zeros; therefore, be sure to punch out any desired totals before turning power off for any reason.

At the conclusion of a program load or program punchout operation, the machine is placed in column 01 of the program level loaded or punched, even if column 01 is programmed for auto skip or auto dup. If column 01 is programmed for an accumulator total punchout, the machine is set to the first column after the punchout field, when the program load or program punchout operation is completed. Accumulate total fields are always processed automatically in input storage, and the operator cannot do any operation in the programmed total field. If it is necessary to operate on those columns for any reason, change to a program level that does not have an accumulate total programmed in those columns.

Figure 12 shows the effect of combinations of accumulate and automatic skip or dup programs, and use of REL, for accumulator operations in both punch and verify modes.

	Automatic Skip				Automatic Verify–duplicate			
	ON	REL Pressed	OFF	REL Pressed	ON	REL Pressed	OFF	REL Pressed
Punch Mode:								
Manual Entry Accumulator	Add 0's	Add 0's	Manual entry and accumulate	Add 0's	Add dup data	Add dup data	Manual entry and accumulate	Add 0's
Total Punch Accumulator			Punch total	Punch total			Punch total	Punch total
Verify Mode:								
Manual Entry Accumulator	Auto accumulate	Invalid record; no accumulate	Manual verify plus accumulate	Invalid record; no accumulate	VER DUP and accumulate	Invalid record; VER DUP but no accumulate	Manual verify and accumulate	Invalid record; no accumulate
Total Verify Accumulator			Total verify	Invalid record; no total verify			Total verify	Invalid record; no total verify

Note: For accumulate entry, manual or auto skip or dup operates as shown. For accumulate total fields, auto skip or dup operations are invalid, and should not be done. Operator keying cannot be done in any accumulate total field.

Figure 12. Effect of Combinations: Automatic Skip and Verify-duplicate

Examples of Accumulate Usage

1. Sum of individual fields.

   > Program field 1 used for manual entry into accumulator A (5-punch plus field definition 12's)
   > Program field 2 used for manual entry into accumulator B (6-punch plus field definition 12's)
   > Program field 3 used for manual entry into accumulator C (7-punch plus field definition 12's)

   Punch out any or all accumulators into a separate total card. This provides the totals of field 1 in accumulator A, field 2 in accumulator B, and field 3 in accumulator C. For punchout without reset, use 4-punch + (5- or 6- or 7-punch) plus field definition 12's. Add 8-punch to the high-order position for punchout with reset.

2. Sum of X + Y = Total.

   > Program field X used for manual entry into accumulator A (5-punch plus field definition 12's)
   > Program field Y used for manual entry into accumulator A (5-punch plus field definition 12's)

   Punch out total of accumulator A; X + Y = Total. This can be done per card, or per batch. (See example 1 for punchout program coding.) The total field must follow the accumulate field in the same record.

3. Batch or hash total.

   > Field X of every card is added to accumulator A.

   Punch out total at end of batch; compare with known total, or establish as new control total.

   Note: For examples 1, 2, and 3, manual dup may be done or auto dup may be programmed for *entry* to the accumulators, if the data is duplicate data in successive records.

4. Zero balance.

   Key predetermined total into an accumulator as a *minus* accumulate amount (11-punch over the units position). Add individual amounts into the same accumulator during keying. At the end of the batch, punch out the total. If it is not all zeros (00000000), then the batch is out of balance. Check the amount(s) printed on each card, for reconciliation and error correction, or key verify the cards to determine the error condition.

5. Minor/intermediate/major totals.

   > Program field X to add into accumulators A, B, and C.
   >   For minor control, punchout and reset accumulator A.
   >   For intermediate control, punchout and reset accumulators A and B.
   >   For major control, punchout and reset accumulators A, B, and C.

Normally a separate program level would be used for each level of total.

6. Aux dup operation (numeric only).

   Key numeric data into any available accumulator. In a separate program level, program that accumulator for punchout in the desired field location. When aux dup data is desired, switch to the program level that provides punchout of that accumulator in the desired field location.

7. Consecutive number punching (minimum two positions).

   In the first record, at the beginning of the card, key 01 into any accumulator. In a later field, program that accumulator to punchout into the desired *consecutive-number* location.

   On each succeeding record, either key 01, manually dup it, or automatically dup it into the same accumulator, and punchout the *new* total in the *consecutive number* field.

   If automatic dup is used for entry of the 01 (and use is made of automatic totaling) you can consecutive-number-punch the cards in the deck, in punch mode. Note that 01 is also punched into every card.

8. Auto-punching stub card or card consisting of two parts.

   When a card requires the same information in the beginning of the card and in the end of the card (such as a stub card which is later separated), key the information into the first field and any accumulator, followed by punchout and reset of the accumulator in the later field that requires the same information.

9. Casual totals.

   When totals for a group of work are needed, but an adding machine is not available, key the information and accumulate it. Put as many individual items (fields) into each card as space permits, adding the items into the same accumulator, and punch out a total at the end of the batch. Thus, the punched cards are equivalent to the adding machine tape. (If the cards are not needed, they may be discarded.)

   If prepunched cards require a total, use verify mode, program the field(s) for automatic skip and accumulate, [11-punch + (5- or 6- or 7-punch)], and the field(s) will accumulate automatically. The balance of the card must be key-verified, or auto-skipped; every card receives a 2-3-punch in column 81, since a verify operation did occur.

   At the end of the batch, change to punch mode, change program levels, and punch out the total card. This procedure may be used for totaling production statistics cards by day, week, or group, etc.

SELF-CHECKING NUMBER FEATURE
(MODULUS 10 AND 11)

(This feature requires the expansion feature as a prerequisite.) The self-checking number feature provides a means of verifying precoded numeric information at the same time as it is keyed. A precomputed self-check character (digit) is added at the low-order end of the field before the data-recording operator receives the job. This means the source document requires one more column than the original data. To the operator, the field appears as simple numeric data; the self-check digit cannot be told from any other digit, except that it is always the last (units position) digit of the complete number.

Indicator Light and Reset Key

The self-check light is labeled SC on Model 2, and SC/VER on Models 1 and 3. (See Figure 13.) The verify/self-checking-number reset key (VER RES on Models 1 and 3) is labeled VER SC on the Model 1 and 3 machines with this feature. It is labeled SC RES on the nonverifying Model 2 machines with this feature.

Punch Procedure

If the card-punch operator is not involved in coding the self-check digit (ordinarily done before the source document is handed to the card-punch operator), then it is sufficient that the card-punch operator knows that a certain field has been self-check-digit coded. The keying of the numeric data in the field is the same as for any other numeric field; the appearance on the source document and on the punched card is no different. It is only when the self-check option is in use, and the particular field has been programmed for self-check that the system responds differently for that field. Detailed coding information, and the differences between modulus 10 and modulus 11 (not significant in punch operation) are described later in this section.

The operator keys the numeric data as it appears on the source document. Assuming the self-check digit (previously computed on the source document) is correct and the numeric data is keyed correctly, the keying operation is not interrupted. If no errors are detected throughout the keying of all the self-check fields in the card, an 11-punch is automatically entered in column 81.

If the self-checking number field is keyed incorrectly, when the self-check digit in the units position of the number is keyed, the keyboard locks and the self-check
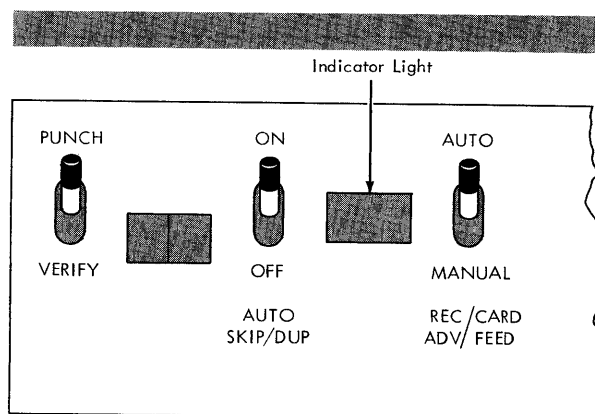
	Without Self-check	With Self-check
Models 1 and 3	Verify	SC/VER
Model 2	Not Installed	SC
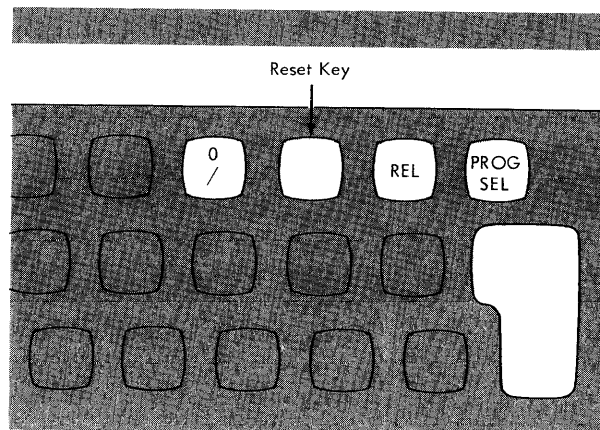
	Without Self-check	With Self-check
Models 1 and 3	VER RES	VER SC
Model 2	blank	SC RES

Figure 13. Indicator Light and Reset Key

light turns on. To correct this condition, the operator presses FIELD/WORD BKSP. Pressing this key unlocks the keyboard, turns off the self-check light, and returns the column indicator to the first column of the self-check field. In this way, the operator can again key the self-checking numeric field. If the next keying of the same field checks OK, normal operation continues.

Note: Character backspace does not reset this type of error condition.

If the self-checking digit is recorded incorrectly on the source document, the keying of the self-check field always results in an error condition indicated in the units position of the field. Since the operator cannot make the necessary correction in this case, a means must be provided to allow her to proceed over this field of the card. When the operator encounters the condition of an incorrectly recorded self-checking digit on the source document, the procedure is either of the following:

Procedure A: With the error condition encountered in the units position of the self-checking number, the operator must press FIELD/WORD BKSP. This unlocks the keyboard, turns off the error light, and returns the column indicator to the first column of the self-check field. At this point, pressing SKIP advances the column indicator through the self-check field and into the first column of the next manually keyed field. Under these conditions, the punched card contains no information punched in the field that had the self-checking digit recorded incorrectly on the source document. This card does not contain an 11-punch in column 81. No 11-punch signifies that there is an invalid self-check condition within the card (either an error, or no self-check number), unless this card contains another self-check field that was keyed correctly.

Under this condition, once the error is corrected on the source document, only the self-checking number field has to be rekeyed for the card. Once the SKIP key is used to skip a complete self-check field (denoting a single self-check error), the only way the error condition can be superseded is by keying a later SC field correctly, or by pressing REC BKSP. This returns the column indicator to the first manually keyed column of the card, allowing complete rekeying of the card. If the self-check field is keyed correctly, the 11-punch is entered in column 81.

Procedure B: With the error condition encountered in the units position of the self-checking number, the operator must hold down VER SC while keying the 12 (&) or the 11 (−) key, which causes the units position of the self-check number to be overpunched with either a 12- or 11-punch, respectively. This procedure resets the self-check light and allows the operator to continue keying the next manual position of the record. Note that the 11-punch in column 81 is not entered after this type of self-check bypass has occurred, regardless of the other correct SC fields. Record backspace and rekeying of the record without use of procedure B is necessary if a valid 11-punch in column 81 is desired.

Self-check Characteristics

The self-checking number can include alphabetic letters, numeric digits, and spaces, but only the numbers 0-9 and the digit portion of the alphabetic characters 1-9 are used in checking or verification. Special characters cannot be checked. Alphabetic characters, spaces, and zero-punched columns can intervene only if they were considered part of the basic code number when the check digit was established.

Columns may be auto-skipped within a self-check field. However, they do not calculate in the checking operation, if auto-skipped. If a self-check number was calculated using spaces, it must be keyed using spaces, or an error occurs. Auto skip may not be used in place of a space that was in the original calculation. If the number was calculated *without* spaces (all digits) then auto skip of a single position on the IBM 129 may be used to create a visual space in the number, for convenience in reading, and the calculation checks OK.

If the self-check field is the last manual field in the card, an error condition prevents the column indicator from advancing beyond the error column. In this way, operation of procedure A or B can be applied to the last self-check field.

More than one self-checking field may be checked per card. The self-checking fields may be adjacent fields. If an error condition requires the use of procedure A for single fields or the use of procedure B, the 11-punch in column 81 does not occur. Program-level changes during keying do not alter the condition required for the 11-punch in column 81; that is, all self-check fields encountered must be correctly keyed, or duplicated under program control, and no invalid SC field that prevents the 11-punch in column 81 can be in the record.

If a valid SC field has been correctly keyed in punch mode, then backspaced over, then skipped forward, an 11-punch in column 81 occurs (if not inhibited by any other invalid SC field).

If the REL key is pressed after the correct keying of a self-check field, the 11-punch is entered in column 81. If the following section of the card should have contained a second self-check field, that area of the card is not punched, and the machine stops in the units position of the SC field. The operator may then either backspace and key the SC field, or use procedure A or B. If procedure A is used, the 11-punch indicates that the first SC field punched is correct.

When the first column of a self-check field is reached and the machine has automatically switched to self-check mode, if the operator decides to change the program level, the shift in program negates the previous condition and the new program is in effect.

Manual or automatic duplication of an SC field performs the SC calculation. Partial automatic or manual duplication of the high-order position of an SC field may be done by programming. Manual duplication from the first manual column is permitted. Partial automatic duplication programming operates for the high-order positions only.

Manual or automatic skip of an SC field in punch mode supersedes the self-check, and no calculation occurs.

In verify mode, manual keying also performs the SC function, if programmed. Fields programmed for both automatic skip and self-check, with AUTO SKIP/DUP set to ON, perform the SC calculation during the skip operation. If an error exists, the machine stops in the units position; operator intervention is required for a continuation of verify by the use of normal verify procedures. An all-blank field results in an SC error. With AUTO SKIP/DUP set to OFF, normal key verification is required.

Figure 14 summarizes self-check punching operations in skip or dup fields, and for release operations before or after a self-check field.

Programming for Self-check Fields

Programming for both modulus 10 and modulus 11 is identical. The self-check field is coded:

```
  2 = High-order position.
 12 = Field definition in all positions (except the first position of
      the field, and the first manual position of partial auto dup
      fields).
12,  2 = Low-order position.
12, 11 = Auto-skip position within a self-check field. (Not for high-
         or low-order position use. Do not use if spaces were used to
         calculate the original check digit, because skip column does
         not calculate, therefore, check digit is incorrect.)
```

On encountering the first self-check program code, the circuitry looks ahead to determine the field size and then applies the correct starting factor to the first digit keyed. The other weighting factors then follow in sequence as the rest of the field is keyed. (See "Technical Description" at end of this section.) Any programmed column with an 11-punch (other than the high or low position) within a self-check field is bypassed in determining the field size and is considered as an auto-skip column within a self-check field, regardless of the setting of AUTO SKIP/DUP. Character backspace passes over this column to the previous position.

If a self-check field is programmed for partial auto dup (see examples on page 59), field backspace into the field operates:

AUTO SKIP/DUP switch ON—backspaces to high-order position, reinitiates auto dup, and stops on first manual column.

AUTO SKIP/DUP switch OFF—backspaces to the high-order position, and is ready for manual keying. If manual DUP is pressed, the first portion alone is duplicated, and the column indicator stops on the first manual column.

	Automatic Skip				Automatic Dup			
Condition when REL is pressed	ON	REL Pressed	OFF	REL Pressed	ON	REL Pressed	OFF	REL Pressed
1. Before SC field is keyed, or 2. In high-order position of SC field.	No SC action ——— No punch in column 81	No SC action ——— No punch in column 81	Manual SC field performs SC calculation and punches 11-punch in column 81	No SC action ——— Stops in units position with SC error indicated	Performs DUP and SC calculation and punches 11-punch in column 81	Performs DUP and SC calculation and punches 11-punch in column 81	Manual SC field performs SC calculation and punches 11-punch in column 81	No SC action ——— Stops in units position with SC error indicated
3. After a valid SC number has been keyed and there is a following SC field that has not been keyed.	No SC action in following field ——— An 11 is punched in column 81 from valid field	No SC action in following field ——— An 11 is punched in column 81 from valid field	Manual SC field performs SC calculation and punches 11 in column 81	No SC action ——— Stops in units position with SC error indicated ——— Allows 11-punch in column 81 from valid field if procedure A is used	Performs DUP and SC calculation and punches 11 in column 81	Performs DUP and SC calculation and punches 11 in column 81	Manual SC field performs SC calculation and punches 11 in column 81	No SC action ——— Stops in units position with SC error indicated ——— Allows 11-punch in column 81 from valid field if procedure A is used

Note: REL key operation after an SC field, with no following SC fields, has no effect on the column 81 indication of 11 or no-11 that was set by the SC field.

Figure 14. Punch Mode Self-check Operations Summary

Rules:

1. A column to be auto-skipped must have an 11-punch; auto skip should not be used if original number used spaces to calculate the check digit.
2. Single column skip must not be programmed in the high- or low-order columns of the field.
3. The maximum field length is 79 columns (01-79 or 02-80).
4. Fields may be adjacent.

The self-check card indicator is defined as an 11-punch (−) in card column 81, or an absence of this punch. The requirements to obtain the 11-punch in column 81 are:

1. There must be at least one correct self-check field in the card.
2. There must be no error self-check fields in the card; for example, fields overpunched with either a 12- or 11-punch in the units position of the self-check field after having used procedure B.

Note: Blank fields are not considered as error fields for the 11-punch in the column 81 requirement, in punch mode. (In auto-verify self check, an all-blank field results in an SC error. See "Verify" in Section 3.)

Self-check Limitations

The following limitations apply to both modulus 10 and modulus 11, unless otherwise indicated:

1. Left-based numbers cannot be used.
2. Self-checking generate is not available.
3. Self-checking punch elimination is not available.
4. BLANK COLUMNS/LEFT ZERO CTRL is inoperable in self-check fields in punch mode; left-zero control must not be programmed in an SC field in verify.
5. A self-check field must not be programmed for accumulate, or for verify read control.
6. CHAR BKSP and WORD BKSP are inoperable in the first manual column following a self-check field.
7. Word backspace within an SC field becomes a field backspace.

Self Check—Restricted Operations

The following are operator actions which are considered invalid in a self-check field, and result in keyboard lockup. The recovery procedure for these lockup conditions is a field or record backspace operation. The restricted operations are:

1. Pressing REL within a self-check field, in any position other than the high-order position.
2. Pressing BLANK COLUMNS/LEFT ZERO CTRL bar within a self-check field in any position other than the high-order position. (In the high-order position of any field, the LZ bar is inoperable.)

3. Pressing the dash (−) key within an SC field in any position other than the high-order position. *Note:* One exception is units position only after a reset of an SC error using VER SC reset key. (See procedure B.)
4. Pressing SKIP within an SC field in any position other than the high-order position.
5. Pressing VER/DUP or DUP within an SC field in any position other than the high-order position, or the first manual position of a partial auto dup SC field.
6. Pressing PROG SEL within an SC field in any position other than the high-order position.
7. The pressing of other than the 11 or 12 key in procedure B (punch mode) or procedure 4 (verify mode) in this section.

SC/VER Indicator Light in Self-check Verify Operations

To avoid ambiguity in the use of the same red indicator light in verify mode and in self-check mode, the following conditions should be considered where the self-check option is in use:

1. Self-check fields ordinarily do not require verification. Thus, if the self-check option is in use in punching, the self-check field may be programmed for automatic skip without self-check in the verify procedure. (This does not preclude verification; if desired, any field may be verified.)
2. Self-check cards with no 11-punch in column 81 introduce possible ambiguity in verify mode. The error light may turn on because of verify error, or possible self-check error (if column is in a self-check field). If the light turns on in any column except the units position of a self-check field, (as during manual verification), it is a verify error. If the light turns on in the units position of a self-check field (verify mode), it is a self-check error, signifying that the check digit in the card (and input storage) does not agree with the check digit calculated by the machine.
3. An alternate procedure is possible: program the verify mode to automatically skip and self-check the self-check field(s). Note that there is no loss in verification as in condition 1. Under these conditions, the error light means a self-check error, since the self-check calculation is automatically performed.
4. If it is necessary to include known incorrectly coded self-check digits in any record, then the operator must be aware that the error light, under these conditions, may represent either a self-check error or a verify error. In any position of a field other than the units position of a self-check field, the error light designates a verify error. In the units position of a self-check field, it always designates a self-check error.

Verify Mode

Key verification of self-check fields is not normally done. Verification of self-check fields can be accomplished for cards not originally punched on a machine with the self-check feature, thereby assuring both the verification and self-check digit validity. A card OK-verified without errors overpunches the 11-punch in column 81 in addition to the normal (2- and 3-) punches in column 81.

In verify mode, fields programmed for both automatic skip and SC, with the AUTO SKIP/DUP switch ON, perform the self-check calculation during the skip operation. If an error exists, the IBM 129 stops in the units position, and operator intervention is required for continuation of verify by use of normal verify self-check procedures. An all-blank field results in a self-check error. With AUTO SKIP/DUP turned OFF, normal key verification is required.

If a VER CORR key rewrite is done in a self-check field, the SC calculation is not performed during the rewrite operation; it is done only during reverification of the corrected number.

During verify mode, a self-check error occurs when the machine-calculated self-check digit does not agree with the check digit read into input storage from the card. Note that the keyed units position digit is not used by the machine for comparison. However, it must be keyed to initiate the comparison of the check digit in the card and input storage, (or in input storage alone, if a correction was made in input storage) and the machine-calculated check digit. The machine-calculated check digit is based on the verified digits in input storage.

All errors identified in high-order positions of a self-check field are verify errors and must be handled accordingly; all errors in the units position of a self-check field are self-check errors and may be handled by one of the following procedures. (Note that the SC error indicator turns on, and the keyboard locks when the units position is keyed.)

Procedure 1—Blank Out the Field

1. Press FIELD BKSP.
2. Press VER CORR.
3. Press SKIP (inserting blanks in buffer; keyboard locks for reverification).
4. Press FIELD BKSP.
5. Press SKIP (reverification operation).
6. Continue normal operation.

The machine is set for a verify-correction-card punchout at the end of this card. Appropriate escape procedure can override the correction punchout.

Column 81 Status, Procedure 1:

1. Error Card: No punching occurs.
2. Correction Card: Verify-correction identifier 2-punch occurs. The 11-punch is prevented, unless another valid SC field permits it.

Procedure 2—Verify an Overpunched Error Field, Exactly as Keyed

1. Press VER SC (unlocking the keyboard).
2. Hold down MULT PCH (which rests the self-check condition and allows normal verification of the units position of the field), and
3. Press 12 (&) or 11 (−) key and the appropriate digit key.
4. Continue normal verify operation.

Unless storage was changed via some other correction, a verify-correction-card punchout is not set.

Column 81 Status, Procedure 2:

1. Error Card: Condition not set; if set, no punching occurs.
2. Current Card: Receives OK-verify identifier (2- and 3-punch); 11-punch is prevented even if there are other valid SC fields.
3. Correction Card: If condition is set, receives verify-correction identifier 2-punch; 11-punch is prevented, even if there are other valid SC fields.

Procedure 3—Correct the Self-check Field

Note that high-order positions are corrected by normal verify-correction procedures prior to reaching the units position error indication.

Procedure 3 may also be used to correct the entire field or add the number to the record, if procedure A was used in punching, and the field in the card is blank. In this case, press VER CORR at the start of the field, and perform a normal verify correct, and reverify procedure. Note that during the VER CORR rewrite of the field, the SC calculation is not performed; it is only performed during the reverification of the field.

To correct the units position:

1. Press VER SC (restoring keyboard; light remains on).
2. Press VER CORR (resetting self-check condition).
3. Key the self-check digit (units position). Keyboard locks; light is turned off; column indicator shows 88; reverification is required. Since this was a VER CORR rewrite, no SC calculation occurred; it is necessary to reverify for the SC calculation to be performed.
4. Press FIELD/WORD BKSP key.
5. Reverify the field.
6. Continue normal operation.

The machine is set for a verify-correction punchout at the end of this card. Appropriate escape procedures can override the correction punchout.

Column 81 Status, Procedure 3:

1. Error Card: No punching occurs.
2. Correction Card: Verify-correction identifier 2-punch occurs. An 11-punch occurs unless prevented by an invalid SC field.

Procedure 4—Overpunch an Error Field

(Use this procedure if cards were punched on a non-SC machine, and require validation or error identification of the SC field in the verify operation.)

1. Hold down VER SC, and
2. Press 12 (&) or 11 (−) key; release VER SC.
3. Continue normal operation.

The machine is set for a verify-correction punchout at the end of this card. Appropriate escape procedures can override the correction punchout.

Column 81 Status, Procedure 4:

1. Error Card: No punching occurs.
2. Correction Card: Verify-correction identifier 2-punch occurs. The 11-punch is prevented regardless of the status of other self-check fields.

Notes:

1. If procedure A were used in punching, procedure 1 would be the similar procedure during verify. However, procedure 3 could also be used.
2. If procedure B were used in punching, procedure 2 would be the similar procedure during verify. However, procedure 1 or 3 could also be used. Note that if a self-check error field were overpunched with a 12- or an 11-punch during procedure B in punching, procedure 4 in verify could also be used. If during procedure 4 the operator made the "opposite" overpunch from that made in punch procedure B (12-punch in place of 11-punch, or vice-versa), then the correction card would contain both the 12- and 11-overpunch. Since procedure 4 only adds the overpunch, it does not change existing punches in the units position of the SC field.
3. If the cards were punched on a non-self-check machine, procedure 1, 3, or 4 could be used.
4. During verify operation, in self-check fields, the units position overpunch of an 11 or a 12 is automatically removed whenever any position in that field has been replaced by any form of verify-correction procedures.
5. To insert a correct self-check number in a previously skipped blank field in the original punched card, perform a data read operation with the original card. Then, in punch mode, manually skip to the blank field, and key the self-check number, and manually skip (or release) the balance of the input storage. (Be sure REC ADV/CARD FEED is set to MANUAL.) Then insert and register the original punched card, and set REC ADV/CARD FEED to AUTO, or make a manual program selection. The original card has only the self-check field punched, since all other columns were keyed as spaces, because the original punches should not be overpunched.

If the SC identifier 11-punch is desired in column 81, key the record using a program card coded for SC in the desired field. If the verify-OK identifier 2- and 3-punches are also desired, verify the card using normal procedures; if the verify is done using a self-check programmed field, the SC identifier 11-punch also punches in column 81.

6. If procedure B were used in punching (overpunch a 12 or an 11), the field could be auto-skipped and not verified and not self-checked, and a correction could be made at a later time; or, if the verify operator had the responsibility for correction of the incorrect self-check numbers, she could use procedure 3.
7. The choice of the procedures in both punching and verifying is left to the discretion of the user, selecting that one which best serves his present or planned operating procedures.

Figure 15 summarizes self-check verifying operations in skip or dup fields, and for release operations before or after a self-check field.

Self-checking Number Feature (Technical Description)

This special feature is available in two forms. The first, modulus 10, is primarily designed to detect the most common type of errors—the incorrect keying of a single digit, and a single transposition. The second, modulus 11, is designed to detect single digit mispunches, single transpositions, and double transpositions.

No special knowledge is required by code clerks who record these numbers on the original document, or by operators who punch the data into cards. In keying, the operator keys in the field, through the check-digit (lowest-order) position, as it appears on the source document. Internal calculations (in the machine) verify the accuracy of the keying or the validity of the self-check digit. When the data on the source document is correct, and the data has been keyed correctly, the punching operation is not interrupted. Procedures for this keying operation are found starting under "Punch Procedure" in this section.

The coding of the self-check digit on the source document is generally considered a procedure separate from the keying of the data onto punched cards. In the following coding procedures, note that the basic code number is the data *before* coding. The coding process adds one column digit (lowest-order), so that the resultant self-checking *number* is an entire field, containing one digit more than the original basic code number.

Modulus 10

1. The units position and every alternate position of the basic code number are multiplied by 2.
2. The digits in the product and the digits in the basic code number that are not multiplied by 2 are crossfooted.
3. The crossfooted total is subtracted from the next higher number ending in zero.
4. The difference is the check digit.

Condition when REL is pressed	Automatic Skip				Automatic Verify-duplicate			
	ON	REL Pressed	OFF	REL Pressed	ON	REL Pressed	OFF	REL Pressed
1. Before SC field is keyed, or 2. In high-order position of SC field, or 3. After a valid SC number has been keyed, and there is a following SC field that has not been keyed.	Performs SC calculation and punches 11-2-3 in column 81	Invalid record ———— Performs SC calculation ———— No punches in column 81	Manual SC field performs SC calculation and punches 11-2-3 in column 81	Invalid record ———— No SC action ———— No punches in column 81	Performs DUP and SC calculation and punches 11-2-3 in column 81	Invalid record ———— Performs DUP and SC calculation ———— No punches in column 81	Manual SC field performs SC calculation and punches 11-2-3 in column 81	Invalid record ———— No SC action ———— No punches in column 81

Note: REL key operation results in an invalid verify condition; therefore, an 11-punch in column 81 is not punched, regardless of correctly verified SC fields before REL was pressed. However, cards originally punched on an SC machine have the appropriate 11-punch in column 81, based on the punching operation. Thus the 11-punch in column 81 is overpunched in normal verification, when a verify-OK 2-3-punch is made in column 81. The 11-punch in column 81 is punched in a verify-correction card (if appropriate) when the verify-correction identifier 2-punch is made in column 81 of the correction card.

Figure 15. Verify Mode Self-check Operations Summary

During the self-check operation, the same calculation is performed automatically; the total is added to the check digit; and the sum is divided by 10. A remainder other than zero indicates a self-check error.

The weighting factors (X2, X1 applied to alternate positions), and the arithmetic computations performed in arriving at the check for modulus 10 are shown in the following example:

Basic code number		6	1 2	4	8
Units and every alternate position of basic code number		6	2		8
Multiply by 2					x2
Product	1	2	5		6
Digits not multiplied by 2			1	4	
Cross add		1 +2 +1 +5 +4 +6			=19
Next higher number ending in zero					20
Subtract crossfooted total					− 19
Check digit					1
Self-checking number		6 1	2	4 8	1

Other Examples:

	Self-checking Number	
Basic Code Number	*Basic Code*	*Check Digit*
45626	45626	9
30759	30759	5
73074	73074	7

In modulus 10 self-checking, the space and zero have the same numeric value; therefore, spaces can be substituted for nonsignificant leading zeros. The use of spaces is valid only when they are keyed.

Modulus 11

Modulus 11 is designed to detect single digit mispunches, single transpositions, and double transpositions. The main feature of this system, distinguishing it from other self-checking number systems, is that it is based on a weighted checking factor for each digit in the basic number being tested. Regardless of how the self-check digit is generated, the following arithmetic process is used:

1. Each digit position of any basic number is assigned a weight (checking factor). These factors are: 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, . . . starting with the units position of the number and progressing toward the high-order digit.
2. In Figure 16, write the number as illustrated, leaving space between the digits.
3. Below each digit, starting at the right and working left, place the corresponding checking (weighting) factor.
4. Multiply each digit by its checking factor and add the products.
5. Because this is a modulus 11 operation, divide the sum of the products by 11, and subtract the remainder from 11. The result is the check digit.

In the modulus 11 operation, basic numbers that require a check digit of 10 cannot be used as self-checking numbers. The accounting system must be adjusted to eliminate such numbers from codes that are to be self-checked. If an operator is punching or verifying check digits and uses a basic number requiring a check digit of 10, the machine indicates an error condition.

```
Basic number:  943457842

Write digits of basic number:    9   4   3   4   5   7   8   4   2

From right to left, write
checking factors:                4   3   2   7   6   5   4   3   2

Add the products:        36 + 12 + 6 + 28 + 30 + 35 + 32 + 12 + 4 =
                                            Total 195

Divide:  195 divided by 11 = 17 plus a remainder of 8

Subtract:  8 subtracted from 11 = 3 (the check digit)

The new self-checking number is:  9434578423
```

Figure 16. Example: Modulus 11

Figure 17. Direct Punch Switch Panel Markings

When the calculations on the basic number result in a check digit of 11, the digit 0 can be substituted and appended to the basic number to make a valid self-checking number. Eleven and zero have the same value in this part of the calculation. The weighting factors (X7, X6, X5, X4, X3, X2) and the arithmetic process utilized in calculating the check digit for modulus 11 are shown in Figure 16.

DIRECT PUNCH CONTROL AND VERIFY READ CONTROL

These features, available on machines with serial numbers 2xxxx and higher, allow the customer to control card motion through programming, so that source document card visibility similar to that of the IBM 29/59 may be obtained. This allows source document punching and verifying on the IBM 129 without the need to redesign the source cards from those used on the IBM 29/59.

The direct punch feature also allows the casual user of the IBM 129 to operate in a direct punch mode without programming, or with programmed buffer action, if desired.

Feature Description

Two features are available:
1. Direct punch control, which operates under switch and optional program control on Models 1, 2, and 3, in punch mode.
2. Verify read control, which operates under program control only, on Models 1 and 3, in verify mode.

The two features are independent of each other, and may be installed separately, or together, without limitation. There are no installation limitations with any other features, although there are operating limitations for self-checking number and accumulate when direct punch control is used.

Direct Punch Control Operation

On Models 1 and 3, the PUNCH/VERIFY switch is a three-position switch, labeled PUNCH–DIR PCH-VERIFY. When the switch is set to PUNCH or VERIFY, operation is normal; when the switch is set to DIR PCH, each keystroke causes direct punching and/or card motion. (See Figure 17.)

On Model 2, the unused PUNCH/VERIFY switch location has a switch labeled PUNCH–DIR PCH. When the switch is set to PUNCH, operation is normal; when the switch is set to DIR PCH; each keystroke causes direct punching and/or card motion.

For operator's convenience, the switch should be set to DIR PCH only in column 01, after a card has been registered. However, machine operation responds to the switch at any time.

Card motion can be controlled by a 3-punch in the program card, which is recognized only in punch mode during a direct-punch operation. The customer is responsible for program card handling to prevent the 3-punch for LZ verify from interfering with punch-direct operation. Note that a programmed LZ verify field causes "buffering" in direct punch, due to the 3-punch in the high-order position. The 3-punch in the units position is ignored.

A 3-punch in the first column of a field inhibits card motion and causes that field to operate as a "buffered" field; that is, each keystroke enters the buffer, and, at the conclusion of the field when the first following non-buffered keystroke is made, the "buffered" field then punches into the card. Keying of the nonbuffered field can continue, in a "pseudo-buffer" mode, until the punching of the card catches up to the keying, at which time direct-punch action again occurs. The "pseudo-buffer" mode occurs within a card only; it does not occur between consecutive cards.

Adjacent fields may have a program code three in the first column to cause continuation of the buffer action, according to the program card.

All keys are active in direct punch mode, *except* record backspace, which is inactive after any keystrokes in the direct punch mode.

Field, word, or character backspace are operative in a buffered field, but do not allow backspace beyond the column following the last punched column of the card in process. If keying is done when a card is not registered, backspace into column 01 is prevented, even though the column is not punched.

The LZ operation is not functional in a direct punch field, but does operate in a buffered field.

The production statistics feature normally counts all strokes and cards in direct punch mode.

Fields programmed for accumulate are automatically buffered in the direct punch mode, regardless of the direct punch programming. Fields programmed for total punchout punch out directly when in direct punch mode, regardless of other programming.

Fields programmed for self-checking number are automatically buffered in direct punch mode, regardless of the direct punch programming.

When in program level 0, direct punch is operative, but cannot be controlled by a 3-punch.

After any keystroke in the direct punch mode (whether buffered or not) CLEAR is inoperative for that card.

Do not perform data read, program load, program punchout, or production statistics punchout in direct punch mode; use regular punch mode.

Verify Read Control Operation

On Models 1 and 3, verify read control is programmed in verify mode by an 11-0-punch in a card column of the program card. During the normal verify-read operation, the machine reads the card into input storage, and stops the reading and the card motion on the column with the 11-0-punch, without reading that column. The column indicator shows the next column to be verified, regardless of the card position in the bed.

The customer must choose appropriate columns for noninteraction with normal 11 or 0 program codes. (Note that 11-0 is invalid in column 01, because no reading has occurred. 11-0 is also invalid in column 80, or in any self-check programmed field. In an LZ field, it must only be used in the high-order position.

Normal verification occurs against input storage until the column prior to the 11-0 in the program card has been verified, at which time that card again starts to read additional columns into input storage until the next column programmed 11-0, or until column 80 has been read.

All normal verification occurs against input storage, therefore, all normal functions, including all backspaces, are available. Accumulate, self-check, and production statistics features all operate normally.

Verify read control cannot be programmed in program level 0. However, if a customer switches to program level 0, and column 35 (for example) has previously been programmed for verify read control, then, on completing column 34 (verify), the balance of the card is read, and verification may continue.

CLEAR is inoperative until column 80 has been read, for any card in which verify read control is used.

Miscellaneous Data on These Features

1. Program level changing may be done normally, and the customer is responsible for accuracy and logical-system control when so doing.
2. Power down in the middle of a direct-punch operation may result in a punch in column 00 of the next card registered. The operator is responsible for procedure in this situation.
3. When column 35 is to be punched, or when the verify card is stopped on column 35, then columns 01-28 may be read on the left side of the punch/read station, or columns 43-80 may be seen on the right side of the station, depending on operator position at the keyboard.

EXTENDED READING BOARD FEATURE

The working area of the reading board may be increased by adding an extension measuring 11-1/2" x 12" to the front edge, left side, of the standard reading board. This extension may be field installed.

EXPANSION FEATURE

The expansion feature does not provide a function by itself, but is necessary to provide additional capacity in the machine to allow the installation of the accumulate or self-checking number feature. Only one feature is needed, even if both the accumulate and the self-checking number are installed. (Not recommended for field installation.)

Examples:

	12	12	12	12	
					= Manual SC Field
2				2	

	12	12	12	12	
0					= Auto Dup SC Field
2				2	

	12		12	12	
0					= Partial Auto Dup SC Field (Manual keying starts on the column with no 12-punch)
2				2	

	12	12	12	12	
11					
					= Auto Skip SC Field
2				2	

	12	12	12	12	
		11			= Manual with One Column Auto Skip (Skip column does not calculate and skip cannot be substituted for space in original number)
2				2	

	12	12	12	12	
		11			
0					= Auto Dup with One Column Auto Skip
2				2	

	12	12 ·		12	
		11			
0					= Partial Auto Dup with One Column Auto Skip
2				2	

	12	12	12	12	= Auto Skip with One Column Auto Skip
11		11			
2				2	

Operator's Notes:

60

SAMPLE PLANNING FORM

A planning form, usable as an aid in the preparation of job formats and program cards, is available, image-imprinted on the reverse side of the IBM 129 Card Punching or Verifying Instructions, GX22-6977, as shown (in part) in Figure 18.

The form has a card layout which has 12 rows of column numbers, each row located in a punching position. The program codes are detailed in the chart on the reverse side of the form.

After laying out the job format on the front of the form, according to desired field sizes, functions, and special instructions, etc., mark the planning card for the program codes necessary to perform the functions in each column. For example: if columns 1-10 are a field representing "account number" draw a line through the 12-punches in columns 2-10, because the first column of a field does not have a 12-punch. If the account number is to be punched as a self-checking number, mark the 2-punch in columns 01 and 10, which is the program coding for a self-checking number field.

If columns 11-35 are a name field, draw a line through the 12-punches in columns 12-35, for field definition. Then draw a line through the 1-punches for columns 11-35, because alpha-program coding is necessary for every column in the alpha field.

All the program codes are shown in Figure 18, with notes concerning their use. When the program card is completed on the planning form, check your work, then punch the necessary codes in the appropriate card columns of a blank card, using the IBM 129 in punch mode. Use the MULT PCH key procedure for combinations of punches not represented by a single key.

After the program card is punched, check it by laying it over the planning card. The markings on the planning card should be visible through the holes in the punched program card. Additional copies of the program card may be made by a normal card-duplication operation. Note that any codes not in the 64-character set do not print.

IBM

IBM 129 CARD PUNCHING OR VERIFYING INSTRUCTIONS

JOB NAME		JOB NO.	OPERATION NAME	OP CODE	MACH MODEL
					☐ 1. Punch-Verify
					☐ 2. Print-Pch
					☐ 3. Print-Pch-Ver

FREQUENCY		DUE IN		DUE OUT		ESTIMATED VOLUME	EST TIME	
☐ Daily ☐ Monthly		TIME	DATE	TIME	DATE		HOURS	TENTHS
☐ Weekly ☐ Quarterly								
☐ Bi-weekly ☐ Annual								
☐ Semi-weekly ☐ Other								

PROGRAM CARD NO. _____ CARD ELECTRO (FORM) NO. _____

SWITCH	SETTING		SPECIAL FEATURES USED	
PUNCH/VERIFY	P	V	☐ SELF CHECK NO. (MOD 10)	☐ ADNL ACC PROG LEVELS
AUTO SKIP/DUP	ON	OFF		
REC ADV/CARD FEED	AUTO	MANUAL	☐ SELF CHECK NO. (MOD 11)	☐ DIRECT PUNCH CTRL
PROGRAM MODE (0-6)			☐ PRODUCTION STATISTICS	☐ VERIFY READ CTRL
PRINT	ON	OFF		
CHARACTER MODE	48	64	☐ ACCUMULATE	☐

SOURCE DOCUMENTS USED:

DISPOSITION OF CARDS:

RECEIVED FROM:

DOCUMENTS

CARD FIELD	COLUMNS		FUNCTION*	REMARKS
	FROM	TO		
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
TOTAL KEY STROKES PER CARD —				

FUNCTION*	SYMBOL
ACCUMULATE	ACC
ACCUMULATE TOTAL PCH	AT
ACCUMULATE TOTAL PCH & RESET	ATR
DUPLICATE	D
LEFT ZERO	LZ
PUNCH	P
SELF CK NO.	CK
SKIP	S
VERIFY	V

Date: _____

Section _____ Page _____

Figure 18. IBM 129 Card Punching or Verifying Instructions (Pad) (Part 1 of 2)

PROGRAM CODES

Function	Punch Code	Field Location
Standard Codes		
Field Definition (FD)	12	All columns, except first column
Auto Skip Field	11	First column
Auto Dup/Auto Ver Field	0	First column
Alpha Shift (Programmed)	1	Each column for alpha shift
Left-zero Control Field (Verify Only)	3	First and last columns
Special Feature Codes		
Self-check Field	2	First and last columns
Add Accumulator A	5	First column
Add Accumulator B	6	First column
Add Accumulator C	7	First column
Punch Accumulator A, B, or C	4 + (5 or 6 or 7)	First column
Punch and Reset Accumulator A, B, or C	4 + 8 + (5 or 6 or 7)	First column
Direct Punch Control for Buffered Field	3	First column for direct punch mode only
Verify Read Control to Stop Verify Read Operation	11-0	Column desired to stop card

Notes for Program Codes:

1. Program codes apply in program levels 1-6. Program level 0 is 80 single-position fields, alpha shift.

2. If LZ control is in units position verification is not desired; do not use 3-punch in units position.

3. Only field definition is required for LZ punching. Program cards coded for LZ in verify mode (3-punches) may be used in punch mode without alteration because machine ignores 3-codes in punch mode, unless direct punch control feature is used. (See "Program Codes.")

4. Minimum field size is two columns for accumulate, self-check, and LZ.

5. Maximum field size is 79 columns for self-check and LZ.

6. Maximum input field size for accumulate is 14 columns; maximum punchout field size is 19 columns.

7. A field may be programmed to add into any or all accumulators; punchout is limited to one accumulator per field.

8. Self-check fields may be adjacent. Self-check and accumulate operate in both punch and verify mode. However, self-check cannot be programmed in the same field as accumulate or left zero.

9. Verify read control (11-0 code) must not be programmed in same column as auto skip (11) or auto dup (0) codes, nor in any self-check programmed field.

10. Programs remain in storage until another program is read in to replace the original program, or until mainline switch is turned off, which resets programs 1-6 to blanks (equivalent to 80 single-position fields, numeric shift).

Figure 18. IBM 129 Card Punching or Verifying Instructions (Pad) (Part 2 of 2)

Operator's Notes:

64

READER'S COMMENT FORM

IBM 129 Card Data Recorder, Operator's Reference Manual GA22-6968-0

Your comments about this publication may be helpful to us. If you wish to comment, please use the space provided below, giving specific page and paragraph references.

Please do not use this form to ask technical questions about the system or equipment or to make requests for copies of publications; this only delays the response. Instead, make such inquiries or requests to your IBM representative or to the IBM Branch Office serving your locality.

Reply requested   Name _____

Yes ☐   Job Title _____

No ☐   Address _____

_____ Zip _____

WTC users must add postage.

YOUR COMMENTS, PLEASE . . . .

This manual is a reference source for systems analysts, programmers and operators of IBM
systems. Your comments will help us produce better publications for your use. Each reply
will be carefully reviewed by the persons responsible for writing and publishing this material.
All comments and suggestions become the property of IBM.

Note: Please direct any requests for copies of publications, or for assistance in using your
IBM system, to your IBM representative or to the IBM branch office serving your locality.

IBM

International Business Machines Corporation
Data Processing Division
1133 Westchester Avenue, White Plains, New York 10604
(U.S.A. only)

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
(International)