

**IBM**

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1410 DATA PROCESSING SYSTEM BULLETIN

IBM 1014 REMOTE INQUIRY UNIT

Large-capacity, high-speed data processing systems are capable of processing and manipulating large volumes of data in fractions of a second. The IBM 1014 Remote Inquiry Unit (Figure 1) makes use of this data processing system characteristic. By attaching remote inquiry units to a Data Processing System, interrogation by the inquiry units and almost instantaneous replies are available for printing at the remote inquiry unit location.

A maximum of twenty IBM 1014 Remote Inquiry Units can be serviced by one 1410 data transmission channel. The sequence of operations for an IBM 1014 Remote Inquiry Unit are:

1. an inquiry message is sent to the IBM 1410 Data Processing System
2. a 1410 stored program routine processes the inquiry message
3. a printed reply is obtained at the inquiry unit that originated the inquiry message.

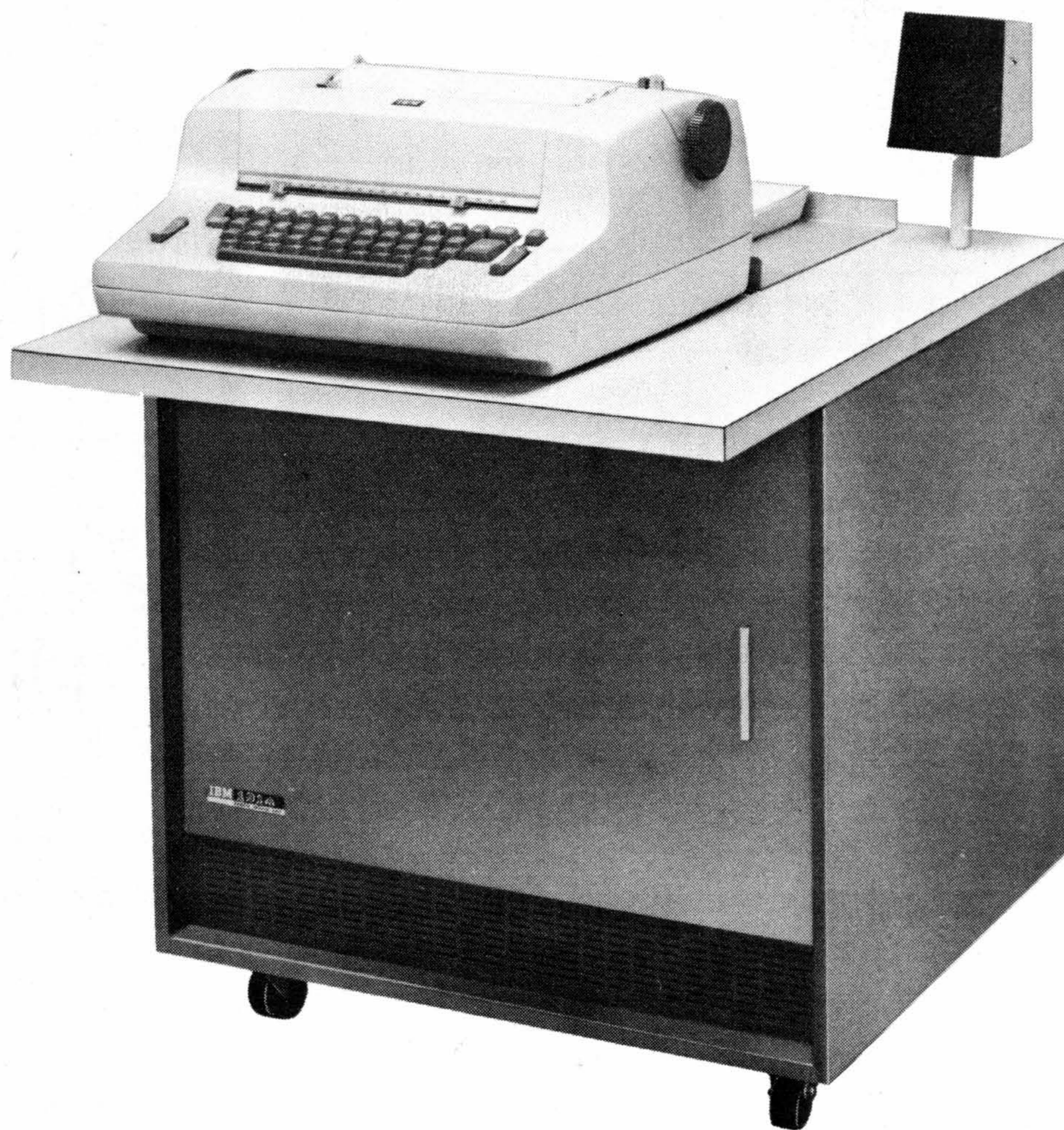


Figure 1. IBM 1014 Remote Inquiry Unit

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Acceptance of inquiry messages by the IBM 1410, when more than one unit is attached to the system, is under control of an automatic sequencing device. This device is part of the controlling circuitry of the Remote Inquiry Unit Adapter, which is installed in the IBM 1414 Input-Output Synchronizer, Model 4. Each one of the two available adapters can control up to 10 inquiry units and contains one 80-position input synchronizer and one 80-position output synchronizer. (On a 1410 system equipped with two adapters, a reply message may be printing at an inquiry station controlled by one adapter while a request message is being sent to the input synchronizer from an inquiry station that is controlled by the other adapter.)

Each IBM 1014 Remote Inquiry Unit must have its own exclusive signal cable, which connects to a wall-mounted terminal box mounted in the 1410 room. The terminal box is connected to the Remote Inquiry Unit Adapter in the 1414, Model 4. Two adapters are possible; each adapter can control up to 10 inquiry units. IBM provides the 4-wire signal cable for installations that require cable lengths of 50 feet or less. For cable lengths over 50 feet, the customer must provide for the necessary installation and maintenance of the 4-wire cable.

NOTE: The maximum cable length that can be installed is 8 wire-miles (a wire-mile is a parallel set of 4 wires one mile in length.)

The inquiry unit is comprised of an input-output (I/O) printer, a control section located on the I/O printer keyboard, and an indicator light panel. The I/O printer is equipped with a 44-character keyboard (26 alphabetic, 10 numerical, and 8 special characters: & . - \$ * , # / (refer to Figure 2). All other special characters are printed as a pound sign (#).

The control section contains the switch and keys needed to operate the unit.

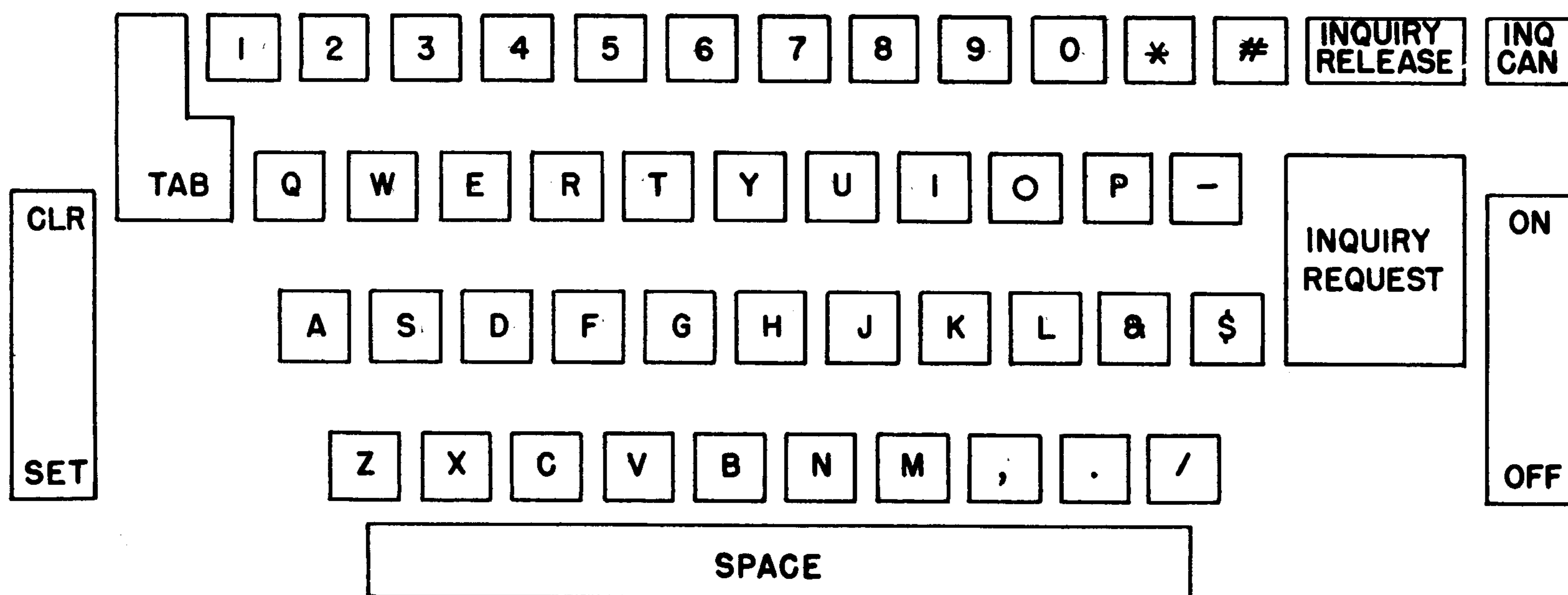


Figure 2. Printer Keyboard and Control Section

SWITCH AND KEYS (FIGURE 2)

Switch

The ON-OFF switch furnishes power to the inquiry unit.

Keys

Inquiry Request--Operating this key signals the inquiry unit adapter that an inquiry unit wants to have an inquiry request message processed. This inquiry request is examined by the adapter.

Inquiry Release--Operating this key:

1. signals the inquiry unit adapter that the sending of the inquiry request message is completed. The adapter acknowledges the message completion by turning OFF the inquiry unit proceed light and initiating an I/O printer carriage-return operation.
2. generates a group mark that is placed in the input synchronizer position adjacent to the last character of the inquiry request message.
3. turns on the inquiry status latch in the 1410.

Inquiry Cancel (Inq Can)--Operating this key during an inquiry request operation releases the inquiry unit, turns OFF the request light, and ends the inquiry request routine in the inquiry unit adapter. The adapter acknowledges the inquiry routine cancellation by turning off the inquiry unit proceed light and initiating an I/O printer carriage-return operation.

The key is also used during inquiry operations to turn OFF the inquiry-unit check light and/or the exceed speed light.

Indicator Light Panel

The indicator light panel (located to the right of the I/O printer) contains the lights needed by the operator for properly operating the unit. The lights on this panel are:

Request--Operating the inquiry request key turns ON the white request light. Pressing the inquiry release key turns it OFF. Operating the inquiry cancel key can also turn OFF the request light.

Proceed--This green light turns ON when the input synchronizer is free and can accept the inquiry request message. The light turns OFF when either the release or the cancel key is operated.

Check--This red light indicates the detection of a parity error in the inquiry unit, during an inquiry request or inquiry reply operation. Operating the cancel key on the inquiry unit turns OFF this light.

Exceed Speed--This red light turns ON when the maximum inquiry request keying rate (about 12-1/2 characters per second) is exceeded. Operating the cancel key on the inquiry unit turns OFF this light.

Forms--This red light, when lit, indicates that the inquiry unit is out of forms; however, several more lines can be printed before the forms clear the platen. Inserting more forms turns the light OFF.

INQUIRY REQUEST OPERATION

Sending an inquiry request message to the IBM 1410 is accomplished in three steps:

1. Pressing the inquiry request key turns ON the request light and signals the inquiry unit adapter that an inquiry unit is waiting to make an inquiry request. The proceed light is turned ON if the unit is ready (power on) and the inquiry channel is not busy with another inquiry unit operation. If the channel is busy, the automatic sequencing will make the channel available in a minimum amount of time. The I/O printer keyboard is also unlocked at this time.
2. The inquiry unit station number (0-9) is automatically entered into input synchronizer position number 1. An inquiry request message of up to 78 characters is keyed and transmitted to the input synchronizer. (An inquiry request keying rate in excess of 12-1/2 characters per second turns ON the exceed speed light). There is also an automatic timing feature that is active during an inquiry request operation. The inquiry request operation is terminated if 20 seconds elapse between:
 - a. The illumination of the proceed light and the first key stroke; or,
 - b. two successive key strokes.

The automatic timing feature duplicates the function of the cancel key and terminates the inquiry request operation. The inquiry request must be re-initiated by operating the request key.

3. If the message is completed correctly, the release key is operated. This signals the inquiry unit adapter that the message transmission is complete and a group mark is placed in the input synchronizer position adjacent to the last character of the inquiry request message. The adapter acknowledges the message completion by turning OFF the inquiry unit proceed light and initiating an I/O printer carriage-return operation. In addition, the inquiry status latch in the 1410 is set ON.

If the inquiry request message was 79 characters in length (station number plus a 78-character inquiry), a group mark is automatically inserted in the 80th position of the input synchronizer. If the message was less than 79 characters, the group mark is automatically inserted in the input synchronizer position following the last character of the message, and the rest of the synchronizer is filled with coded blanks.

Inquiry Message Processing

The 1410 program branches to the inquiry subroutine as soon as the inquiry status latch is found to be ON by testing with a \checkmark (I) Q instruction. If the 1410 system has the Priority Feature installed and is operating in the Priority Alert Mode, the 1410 program automatically branches to the inquiry subroutine as soon as the input synchronizer is filled. In the subroutine is a READ INQUIRY instruction-- \checkmark or \checkmark (%Qn) (B) R. It is suggested that only the MOVE instruction be used, because there are no word marks transmitted, and a LOAD instruction erases all word marks from the core storage area that accepts the inquiry message.

The hundreds position of the x-control field specifies the channel. In this instance, only channel 1 can be used, and it is represented as a per cent sign (%). The tens position of the x-control field specifies the I/O device being used. The character Q specifies the IBM 1014 Remote Inquiry Unit. The units position of the x-control field specifies which group of ten inquiry units is being used. The characters zero and one are used.

The B-address specifies the storage position that receives the first character (in this case, the inquiry unit station number) from the input synchronizer. The d-character R designates the operation as a read operation.

The READ INQUIRY instruction initiates the transfer of the input synchronizer contents into the specified core-storage area. The transfer is terminated when the group mark with a word mark in the 81st position of the specified core-storage area is sensed.

The message is then processed by the 1410 system according to the inquiry subroutine.

Inquiry Request Message Error

If a keying error occurs during an inquiry request, the operation can be terminated by pressing the cancel key. This key operation initiates a carriage-return operation, turns off the proceed light, and drops the inquiry busy line. The input synchronizer is then free to accept another inquiry request. The inquiry request key must be pressed to start over again the request just terminated.

If a parity error is detected in the inquiry unit during the data transfer from the inquiry unit to the input synchronizer, the check light turns ON. Pressing the cancel key turns OFF the check light and terminates the operation. To restart the terminated request operation, the normal inquiry request procedure must be accomplished.

The exceed speed light turns ON if the maximum inquiry request keying rate of 12-1/2 characters per second is exceeded.

Indicators

Certain conditions that arise before, during, or after a data transfer set specific I/O channel status indicators ON. These indicators are tested by an \check{R} (I) d instruction and are turned OFF by the next I/O operation. The indicators, the d-character bits that test the indicators, and the conditions that set them ON are:

Not Ready (1)—The status of this indicator is internally checked during a move or load operation but before any data transfer takes place. If the indicator is set ON, it indicates that the input synchronizer is either operating off-line or that the power is OFF in the synchronizer. The operation is terminated, and no data are transferred. The indicator is tested again by the \check{R} (I) \neq instruction that must follow the MOVE or LOAD instruction. If the indicator is set ON, the program branches to the specified I-address.

Data Check (4)—The status of this indicator is checked by the \check{R} (I) \neq instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates that a parity error was detected during the data transfer between the input synchronizer and core storage. The program branches to the specified I-address.

Condition (8)—The status of this indicator is internally checked during a move or load operation but before any data transfer takes place. If the indicator is set ON, it indicates that a character received from the inquiry unit was not stored in the input synchronizer. The operation is terminated, and no data are transferred. The indicator is tested again by the \check{R} (I) \neq instruction that must follow the MOVE or LOAD instruction. If the indicator is set ON, the program branches to the specified I-address.

Wrong Length Record (B)—The status of this indicator is checked by the \check{R} (I) \neq instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates the incorrect placement of the group mark with a word mark in core storage. (This group mark with a word mark should be in the 81st position of the core-storage area used in the data transfer.) The program branches to the specified I-address.

No Transfer (A)—The status of this indicator is checked by the \check{R} (I) \neq instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates that there was no inquiry message requested by the inquiry subroutine. The program branches to the specified I-address.

INQUIRY REPLY OPERATION

The inquiry subroutine specifies where the inquiry reply will be stored in core storage before its transfer to the output synchronizer. The actual transfer from core storage to the output synchronizer is initiated by a WRITE INQUIRY instruction— \check{M} or \check{L} (%Qn) (B) W. With the exception of the d-character, this instruction is the same as the READ INQUIRY instruction. The d-character W signifies that the operation will be an output or write operation. It is suggested that only the MOVE instruction be used. Any word mark transmitted from core storage is printed as a pound sign (#) by the inquiry unit I/O printer when the load instruction is used. The B-address in the WRITE INQUIRY

instruction specifies the core-storage position that contains the first character of the inquiry reply message. The core-storage area used must be 80 positions in length, followed by a group mark with a word mark in the 81st position. Even if the reply message does not fill the specified core-storage area, the 80 positions are still transferred to the output synchronizer. Any positions that do not contain characters are sent to the output synchronizer as valid blanks. The reply message can contain up to 78 characters. The first character of the reply message must be the station number of the inquiry unit that will receive the message; however, the station number character is not printed as part of the reply message. The last character in the reply message must be followed by a group mark. This group mark terminates the reply message transfer and will initiate an I/O printer carriage-return operation.

Before the inquiry subroutine ends, the success of the data transfer is checked. This is done by executing a TEST AND BRANCH IF I/O CHANNEL STATUS INDICATOR ON instruction--R (I) d. If the transfer was successfully completed, the IBM 1410 system starts performing other programmed operations while data transfer from the output synchronizer to the inquiry unit takes place.

The data transfer from the output synchronizer takes place at the speed of the inquiry-unit I/O printer. For forms control, these characters control the I/O printer space, carriage-return, and tabulate operations:

Check Bit	Space operation
□ (CBA84)	Carriage-return operation
Record Mark † (A82)	Tabulate operation

Inquiry Reply Message Error

If a parity error is detected during the data transfer from the output synchronizer to the inquiry unit, the check light turns ON. Pressing the cancel key after the reply message transmission is completed turns OFF the light. The parity error detection is preserved for later correct operation testing by setting the I/O channel status condition indicator ON. When the R (I) † instruction is given following the operation, the setting of this indicator causes a branch to the specified I-address. (This parity error is also visually indicated on the inquiry reply message. An automatic backspace occurs, and the character in error has a # symbol printed over it.)

Indicators

Certain conditions that arise before, during, or after a data transfer set specified I/O channel status indicators ON. These indicators are tested by an R (I) d instruction and are turned OFF by the next I/O operation. The indicators, the d-character bits that test the indicators, and the conditions that set them are:

Not Ready (1)—The status of this indicator is internally checked during a move or load operation, but before any data transfer takes place. If the indicator is set ON, it indicates that the output synchronizer is either operating off-line or that the power

is OFF in the synchronizer. The operation is terminated and no data are transferred. The indicator is tested again by the $\check{R} (I) \neq$ instruction that must follow the MOVE or LOAD instruction. If the indicator is set ON, the program branches to the specified I-address.

Busy (2)—The status of this indicator is internally checked during a move or load operation, but before any data transfer takes place. If the indicator is set ON, it indicates that the output synchronizer is already transferring data to an inquiry unit. This data transfer was initiated by a previous MOVE or LOAD instruction. No new data transfer results from encountering the MOVE or LOAD instruction. The indicator is tested again by the $\check{R} (I) \neq$ instruction that must follow the MOVE or LOAD instruction. If the indicator is set ON, the program branches to the specified I-address.

Data Check (4)—The status of this indicator is checked by the $\check{R} (I) \neq$ instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates that a parity error was detected during the data transfer from core storage to the output synchronizer. The data transfer to the synchronizer is completed, but the data transfer from the synchronizer to the inquiry unit is not initiated. The program branches to the specified I-address.

Condition (8)—The status of this indicator is internally checked during a move or load operation, but before any data transfer takes place. If the indicator is set ON, it indicates that a parity error was detected during the previous data transfer from the output synchronizer to an inquiry unit. No new data transfer results from encountering the MOVE or LOAD instruction. The indicator is tested again by the $\check{R} (I) \neq$ instruction that must follow the MOVE or LOAD instruction. If the indicator is set ON, the program branches to the specified I-address.

Wrong Length Record (B)—The status of this indicator is checked by the $\check{R} (I) \neq$ instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates the incorrect placement of the group mark with a word mark in core storage. (This group mark with a word mark should be in the 81st position of the core-storage area used in the data transfer.) The program branches to the specified I-address.

No Transfer (A)—The status of this indicator is checked by the $\check{R} (I) \neq$ instruction that follows the MOVE or LOAD instruction. If the indicator is set ON, it indicates that an incorrect condition occurred during the previous write operation. The conditions that could set the indicator ON are:

1. A non-existent inquiry unit was selected to receive the inquiry reply message.
2. The inquiry unit power was OFF.
3. The selected inquiry unit was out of forms.
4. The selected inquiry unit did not acknowledge the ~~previous end-of-message signal~~. The program branches to the specified I-address.

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