



Systems Reference Library

On-Line Testing IBM 1401, 1440, and 1460

This publication presents on-line testing procedures for a communication-oriented IBM 1401, 1440, or 1460 Data Processing System with a remote IBM 1050 Data Communications System and/or IBM 1030 Data Collection System. Use of these procedures reduces the inconvenience caused by malfunctions external to the data processing system and the IBM 1026 or 1448 Transmission Control Unit.

The IOCS options for on-line testing are discussed, and a typical user's diagnostic routine is described. Also, suggestions are given for: (1) operator testing procedures at the remote terminal; (2) content of a diagnostic test message; and (3) types of off-line performance reports.

The reader should be familiar with the following SRL publications, depending on the system he has installed.

IBM 1050 Data Communications System, Form A24-3020
IBM 1030 Data Collection System, Form A24-3018.

For a data processing system with an IBM 1448:

IBM 1448 Transmission Control Unit, Form A24-3010
IOCS Specifications, IBM 1460 with IBM 1448
(1401/1460 Communications IOCS — 1448/DDC),
Form C24-3047

IOCS Specifications, IBM 1440 with IBM 1448 (1440
Communications IOCS — 1448/DDC), Form C24-3024.

For a data processing system with an IBM 1026:

IBM 1026 Transmission Control Unit, Form A24-3244
Communications IOCS Specifications, IBM 1401, 1440,
and 1460 with IBM 1026 and Direct Data Channel,
Form C24-3241.

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On-Line Testing IBM 1401, 1440, and 1460

Communication-oriented IBM 1401, 1440, and 1460 Data Processing Systems may have large numbers of people in direct contact with the system. Although these people are usually situated at locations remote from the central control of the system, they depend upon timely responses from the system for the efficient performance of their work. They must not be unduly delayed while waiting to communicate with the central files.

However, 1401, 1440 and 1460 systems that receive data from, or send data to, many remote locations are more susceptible to interruptions caused by malfunctions than are those systems that are not communication-oriented. This is primarily due to the fact that more people and equipment are directly concerned with the total system operation. Remote terminals of an IBM 1050 Data Communication System and an IBM 1030 Data Collection System constitute most of the external components of an on-line IBM 1401, 1440, or 1460 system. These terminals, data sets, and lines cause the majority of the interruptions in a communication system.

System interruptions may bring about widely varying degrees of inconvenience due to the type of failure and the component affected. Various levels of degraded system operation may result, for example:

- If one line is malfunctioning, service may be maintained to terminals on other lines.
- If one terminal is malfunctioning, service may be maintained to other terminals on the same line.
- If one disk storage drive is inoperative, the disk pack may be transferred to another drive if information on the alternate drive is not required for the operation.

Interruptions due to malfunctions external to the central system should be carefully considered and planned for during the early phases of system design, so that most of them can be isolated and restricted to the remote system (*station*) or communication line affected.

When the system is in operation, information is provided to the processing system for the detection of malfunctions as they occur. Intermittent malfunctions, such as parity errors, may be limited to momentary operational inconvenience, because machine features and programming systems permit detection and correction of errors and re-execution of operations when these malfunctions occur. However, when a malfunction be-

comes repetitive and jeopardizes performance, corrective measures must be taken. During the servicing of the affected component, the nonaffected parts of the total system should remain operational.

A system plan that provides on-line testing for the isolation and analysis of a faulty line or station-component should be designed by the system analyst and programmer. On-line test procedures can be used with the IOCS program supplied by IBM, or the customer can incorporate them in his own programming for the input and output of data from remote terminals. The on-line test features should be included to:

1. Reduce the inconvenience and time required for the isolation and analysis of malfunctions external to the central processing unit and the IBM 1026 or 1448 Transmission Control Unit. The operator at the remote terminal can perform test functions before calling for customer engineering service, and the customer engineer can use the testing routines in his analysis. Because of the multiplicity of components attached to a single line (a data set at the IBM 1026 or 1448, a data set at the remote station, multiple components at the station, and possibly other stations with a data set and multiple components, as in a multipoint line), the customer engineer must first isolate the part of the system causing the malfunction. This usually necessitates the transmission of test messages from the terminal, and the retransmission of the same message back to the same terminal, or to another terminal located nearby. The customer engineer can analyze the returned message for clues to the cause of the malfunction. He can vary the bit patterns of the test message and observe oscilloscope signals of the data characters. When he isolates the malfunction, he can correct it off-line without interrupting the operation of the nonaffected parts of the system.
2. Verify customer engineering corrective measures. After he has located and corrected, off-line, any line or terminal error condition, the customer engineer can prove that the system is operating correctly. He sends a message, which is recognized as a test by the central processing unit, and receives the retransmitted message on the same or nearby terminal for visual verification of the contents. This verification procedure may require the transmission of several messages.

IOCS Procedures

The IBM IOCS routines provide two options for handling diagnostic messages entered from remote 1050 or 1030 terminals. When an IBM 1030 Data Collection System is on-line, each IBM 1031 Input Station must include a card reader.

In the first option, IOCS completely handles the diagnostic operation: the message is received, recognized as a test message, edited, and transmitted back to the same terminal or another nearby terminal on the same line for visual verification. Whenever this option is used and an IBM 1030 Data Collection System is on-line, each 1030 line must have an IBM 1033 Printer available to print the message that is sent back from the central location.

In the second option, the message is received and recognized as a test message. Then IOCS provides a branch to the *user's diagnostic routine*. In his routine the user may include whatever programming he desires to process and edit the message, record it for future analysis, and transmit it back to a remote terminal.

Both options require the DIOCS entry MPXDIAG. A five-character *flag* must be specified in this entry. During operation IOCS compares this flag with the first five characters of each message *received or transmitted* by the 1026 or 1448. When they are the same, the message is recognized as a diagnostic test message.

The second option requires a second operand in the MPXDIAG entry. This operand is the label of the programmer's diagnostic routine.

The number of core-storage positions needed to handle this on-line diagnostic test function is relatively small, and varies with the IOCS option that is used.

The 1448 IOCS requirements are approximately:

Option 1 170 positions

Option 2 140 positions

The 1026 IOCS requirements are approximately:

Option 1 400 positions

Option 2 140 positions

When Option 2 is selected, additional storage positions are needed for the user's diagnostic routine.

Diagnostic Test Message

For both IOCS options, the recommended format of the diagnostic test message is the same, but the functions performed by IOCS differ. The diagnostic test message (Figure 1) should contain:

Positions	Contents
1-5	Diagnostic flag (Any digits, letters, or special characters except \neq , \approx , $\sqrt{\quad}$, and blank. These characters correspond to 1052 keyboard characters EOB, Delete, EOT, and Space.)
6-8	On input, 3 characters must be received from the terminal. They may be any digits, letters, or special characters except: \neq , \approx , and $\sqrt{\quad}$ for the 1050; \neq , \approx , $\sqrt{\quad}$, and blank for the 1030. For output, IOCS edits line-control codes into these positions.
9-10	Terminal (station-component) address on <i>this line</i> to which the data processing system, with the 1026 or 1448, should transmit this test message for visual verification at the terminal.
11	End-of-address (EOA) character (#).

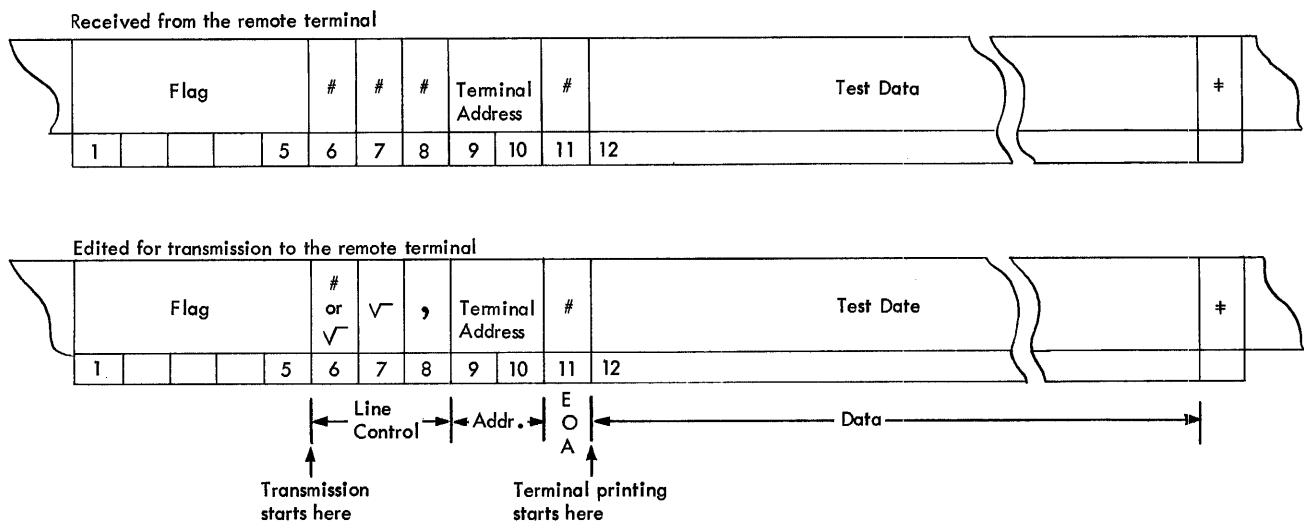


Figure 1. Diagnostic Test Message (for 1050) in Core Storage

<i>Positions</i>	<i>Contents</i>
12-xxx	Test data (Any number of characters up to the number of core-storage positions allotted for this line, minus 12. The complete diagnostic message read into storage from the terminal consists of the first 11 characters, this test data, and the end-of-block character.)
xxx+1	End-of-block (EOB) character (=).

When this message is received, the functions performed by IOCS are:

Option 1 — 1448 IOCS

1. The incoming message is recognized as a diagnostic test message by the flag in positions 1-5. IOCS examines all messages for this flag.
2. IOCS edits the message in the input area in which it was received, as follows:
 - a. Position 6. A positive-response code (# for 1050; ● for 1033) to indicate that the message was received without error; or a negative-response code (√ for 1050; — for 1033) to indicate that an error was detected.
 - b. Position 7. A √ character to place station-components on this line in LINE-CONTROL mode.
 - c. Position 8. An address-select code (,) to place station-components on this line in ADDRESS-SELECT mode.
3. IOCS initiates transmission of the message (starting with position 6) to the terminal specified in positions 9 and 10 of the received message. The diagnostic flag is not transmitted.
4. When this line changes to any END-OF-BLOCK status, IOCS restores it to polling status (RECEIVE-CONTROL).

Option 2 — 1448 IOCS

1. The incoming message is recognized as a diagnostic test message by the flag in positions 1-5. IOCS examines all messages for this flag.
2. IOCS makes the following transmission information available for the user's diagnostic routine:

- Line Number
- Line Status
- Incoming Message (Address)
- Line Control Field (Address)
- Auxiliary Control Field (Address)
- Length of the Message
- Flag to indicate if any outgoing messages are stacked for this line.

This is the same information that is available for any user's routine at an end-of-block (EOB) condition.

3. IOCS transfers control to the user's diagnostic routine by branching to the label specified as the second operand in the DIOCS MPXDIAG entry. In his routine the user usually records the diagnostic test message, edits it, and transmits it back to the terminal.
4. At the end of his routine the user must transfer control back to IOCS, by issuing a RELSE macro.
5. When a message has been transmitted to the terminal (TRANSMIT status) and an EOB condition is detected, IOCS again checks the first five characters of the message. If they contain the flag, control is again transferred to the user's routine. This permits the user to record the message as it was *transmitted*.
6. At the end of his routine, this time, the user should issue a POLL macro before he issues the RELSE macro to return control to IOCS.

Options 1 and 2 — 1026 IOCS

The options are similar for 1026 IOCS, except for acknowledgment procedures on 1030 lines. On these lines the procedures should provide for a GOOD or ERROR macro followed by a PUT macro. The first character of the message being retransmitted should be a √ (EOT).

User's Diagnostic Routine

The second option offered by IOCS has the potential of providing the user with valuable information for immediate diagnostic purposes, for audit-trail records, and for future analyses of component operation. In his own diagnostic routine the user may record at the central location any data that is useful to him, as well as transmitting the message back to the terminal.

A complete printed record of the diagnostic test message aids in the isolation and analysis of the system malfunction. It also assists the operator at the central location in determining whether customer engineering service is required at the central location or at the terminal. For a thorough evaluation of an error condition, the *complete* diagnostic test message should be printed twice at the central location: first, exactly as it is received from the terminal; and second, after it has been transmitted back to the terminal. Along with the message, the printout should include the:

- line number
- line status

- station-component address from which the message was received.
- date and time (if available)

Most on-line systems must provide an audit trail of transactions, to maintain the necessary accounting controls of on-line activities. To make this sequential record complete, diagnostic test messages, as well as regular messages, should be recorded on the medium (tape or disk) established for the audit trail. In addition to fulfilling the accounting requirements, these audit-trail records of the diagnostic test messages can also be used for off-line analyses of malfunctions. They can be selected periodically from the complete set of audit records and used for various reports (see *Off-Line Performance Reports*).

For both the accounting requirements and the performance studies, the tape or disk record should include the same factors that are printed for the immediate evaluation. Therefore, the user's diagnostic routine should provide the programming to record the complete message, line number, line status, station-component address from which the message was received, date, and time.

Whenever the user selects IOCS Option 2 and writes his own routine, he can handle diagnostic test messages from an IBM 1030 Data Collection System even though the system does not include an IBM 1033 Printer. (IOCS Option 1 requires a 1033 to print the message at the terminal location.) Messages received from a terminal can be printed for analysis at the central location, and a signal can be sent back to the remote terminal to indicate that the message was received correctly, or incorrectly. Following the transmission of a *good* or an *error* acknowledgment signal from the central location, the system can be restored to polling status. Normal service is restored to all 1030 terminals on the line.

Suggested Routine

The functions suggested for a comprehensive user's routine are illustrated schematically in a flowchart (Figure 2). IOCS branches to this routine either once or twice for each diagnostic test message: first, when the diagnostic test message has been received from a terminal; and second, after the message has been transmitted back to a 1050 terminal or to a 1030 terminal that has a 1033 on-line. If a 1033 is not available, IOCS branches to this routine only once. The functions included in this routine are:

1. Edit the message (as received or transmitted) with pertinent information, such as line number, line status, terminal address, date, and time; and record it for the audit trail.
2. Edit the message (as received or transmitted) with pertinent factors and print it for immediate analysis.
3. Determine whether the message has just been received or transmitted.
4. Edit the proper acknowledgment (*good* or *error*) and line-control characters into a received message that is to be transmitted back to the terminal. After transmission, these characters are part of the message as it is recorded (1) and printed (2) at that time.
5. Transmit the message.
6. Send an acknowledgment (*good* or *error*) back to the terminal when the received message is not to be transmitted.
7. Return the system to polling status:
 - a. After a *transmitted* message has been recorded and printed.
 - b. After an acknowledgment has been sent for a *received* message that is not to be transmitted.
8. Return control to IOCS.

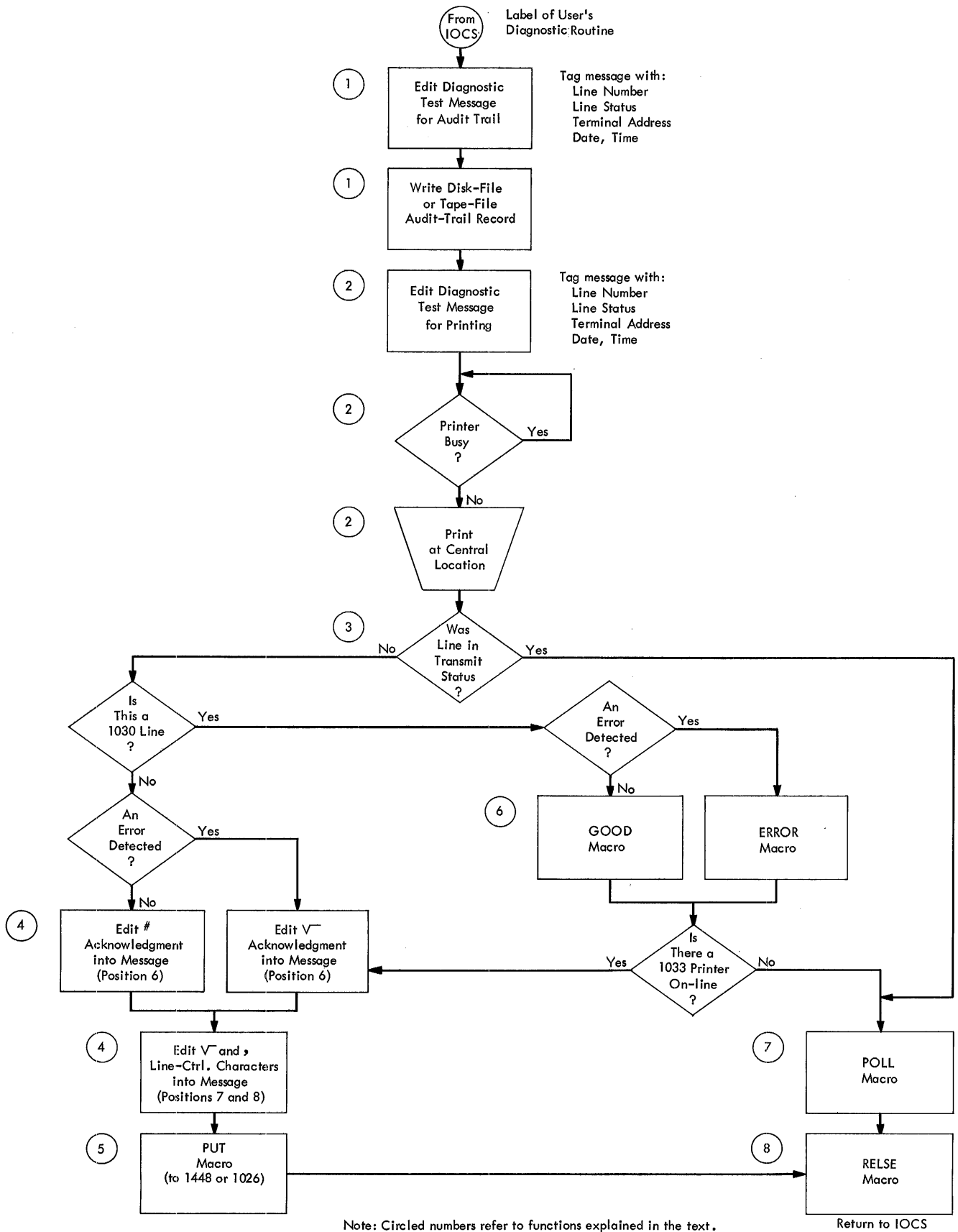


Figure 2. Flowchart of User's Diagnostic Routine

Remote Terminal Test Procedures

Malfunction

The operating procedures to transmit a diagnostic test message from a remote terminal vary with the terminal in use. In an IBM 1050 Data Communication System a message may be sent from a 1052 Keyboard (Figure 3), a 1056 Card Reader (Figure 4), or a 1054 Paper-Tape Reader (Figures 5 and 6). In an IBM 1030 Data Collection System, the message may originate from the card reader at the 1031 Input Station.

A suggested diagnostic test message that can be entered by the keyboard, or prepunched in a card or paper tape is:

	Flag	Any 3 Char.	Term. Addr.	E O A	
	q d i a g	# # #	a l #	#	NL
Test	a b c d e f g h i j k l m n o p q r s t				
Data	u v w x y z 1 2 3 4 5 6 7 8 9 0 +				

qdiag = Recommended flag
 Term Addr. = Address of the terminal to which the central location should send back the message.
 NL = New Line (Carriage Return and Line Feed)

The *error procedures* shown in each illustration apply only if the flag portion of the message contains an error and, therefore, cannot be recognized by the program at the central location.

A paper-tape reader that has the automatic tape reread special feature installed requires a carrier-return character (8-channel punch) at the beginning of each message in the tape. This stops reverse feeding on an error condition. Therefore, the diagnostic test message must contain NL as its first character, and NL must *not* be included elsewhere within the message. Also, the operator must be sure that the *Printer 1* switch is set to *RCV* (Figure 6), and that the printer is positioned so that typing will start at the beginning of the line when the message is sent back from the central location. For this terminal, the diagnostic test message should be:

	Flag	Any 3 Char.	Term. Addr.	E O A	
	NL q d i a	# # #	a l #	#	
Test	a b c d e f g h i j k l m n o p q r s t				
Data	u v w x y z 1 2 3 4 5 6 7 8 9 0 +				

Daily Routine

To minimize the occurrence of error conditions during operation, it is recommended that each morning, be-

fore operation is started, the operator perform the terminal testing provided by the test switch on the IBM 1052 Printer-Keyboards. This feature provides a closed-loop test of the terminal itself and helps the operator establish whether the terminal is operating satisfactorily. The procedure for performing this test is described in the SRL publication *IBM 1050 Data Communications System*, Form A24-3020.

Off-Line Performance Reports

To assist in maintaining continually satisfactory performance by the total system, performance reports should be prepared and analyzed on a regularly scheduled basis. These reports provide valuable planning information about system traffic and system errors. They can be easily prepared, off-line, from the records that are written in the audit-trail file as transactions are processed.

The amount of over-all system traffic can be shown by reports that give traffic volumes by line, by station-component, and/or by time of day. Analysis of these reports provides information vital to effective planning for improvements in general system operation and for future expansion of communication facilities, terminals, and terminal features.

Reports of errors can supply information about human data errors and about errors resulting from system malfunctions. Analyzing the types of *data errors* aids in detecting any procedural shortcomings that may be present at the remote terminals. Reports of *system-malfunction errors* can be obtained from the diagnostic test messages that are included in the complete set of audit-trail records. These reports should be listed by line, by station-component, and/or by time of day. If they are prepared frequently, operating management will become aware of intermittent malfunctions during the early stages of failure. At that time, malfunctions can be corrected with the minimum of inconvenience to the user. The reports provide the IBM customer engineer with valuable information for the isolation and analysis of the error conditions.

For the preparation of various performance reports, as well as for a complete audit, the audit-trail records should contain the:

- complete message
- line number
- line status
- station-component address from which the message was received, or to which the message was transmitted from the central location.
- date and time (if available)
- error codes for data errors

Diagnostic Test Message
 JOB from 1052 Keyboard

SYSTEM		MASTER		PRINTER 1		PRINTER 2		KEYBOARD		RDR 1		RDR 2		PUNCH 1		PUNCH 2	
Attend	X	On		Rec		Rec		Send	X	Send		Send		Rec.		Rec.	
Un-attend		Off	X	Send	X	Send		Off		Off	X	Off	X	Off		Off	
				Home		Home		Home		Home		Home		Home		Home	

STOP CODE		AUTO FILL		PUNCH		SYSTEM		E O B		SYSTEM		TEST		SINGLE CY		RDR STOP	
Sense		On		Normal		Program		Manual				On		Line		Line	
Off	X	Off	X	Bksp		Dup		Auto		Dial Disc		Off	X	Off	X	Off	X
														Home		Home	

- SETUP INSTRUCTIONS
1. Turn Power On.
 2. Set margin and tab stops.
 3. Set switches as indicated above.

OPERATING INSTRUCTIONS

Step	Description	Step	Description
1	Establish data mode Dial - Auto Answer - Auto Call		KEYING-ERROR PROCEDURE, FLAG
2	Press RESET		If a keying error is made in Step 4 in the flag portion (q d i a g):
3	Press REQUEST, if terminal has this special feature	1	Do not perform Step 5
4	When PROCEED light turns on, key-in diagnostic test message: g d i a g # # # a 1 # NL a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0 +	2	Enter a CANCEL code To indicate the error
5	Enter EOB function code	3	Enter an EOB code
		4	Press RESEND and DATA CHECK To turn off their lights
		5	Repeat Step 4 To rekey the message
		6	Perform Step 5 To indicate end of transmission

- Notes: 1. Switches that are not marked may be set in any position.
 2. NL = Return Key

Figure 3. Test Message Sent from an IBM 1052 Keyboard

**OPERATOR INSTRUCTION SHEET**
IBM 1050 DATA COMMUNICATION SYSTEMDiagnostic Test Message
JOB from 1056 Card Reader

SYSTEM		MASTER		PRINTER 1		PRINTER 2		KEYBOARD		RDR 1		RDR 2		PUNCH 1		PUNCH 2	
Attend	X	On		Rec		Rec		Send		Send		Send	X	Rec.		Rec.	
Un-attend		Off	X	Send Rec	X	Send Rec		Off		Off	X	Off		Off		Off	
				Home		Home		Home		Home		Home		Home		Home	
				Send		Send											

STOP CODE		AUTO FILL		PUNCH		SYSTEM		E O B		SYSTEM		TEST		SINGLE CY		RDR STOP	
Sense		On		Normal		Program		Manual				On		Line		Line	
Off	X	Off	X	Bksp		Dup		Auto		Dial Disc		Off	X	Off	X	Off	X
														Home		Home	

- SETUP INSTRUCTIONS
1. Turn Power On.
 2. Set margin and tab stops.
 3. Set switches as indicated above. RDR 2 is a card reader.
 4. Insert 2 cards in hopper: Card 1 has diagnostic test message;
Card 2 has EOT code in Column 1.
 5. Press FEED on the card reader.

OPERATING INSTRUCTIONS

Step	Description	Step	Description
1	Establish data mode: Dial - Auto Dial - Auto Answer	3	Press RESET to turn off RESEND light.
2	Press RESET.	4	Press READER-START-LINE.
3	Press READER-START-LINE (Required only if the keyboard is the only component being polled).	5	When PROCEED light turns on, card reader transmits message.
4	When PROCEED light turns on, card reader transmits message: q d i a g # # # a 1 # NL a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0 #		With Automatic Card Reread Feature:
		1	Reader retransmits message once, or twice if a transmission error is detected again in the flag (q d i a g).
		2	If error occurs a third time, RESEND light turns on.
		3	Press EJECT to stack the 2 cards.
		4	Replace the cards in the hopper.
	ERROR PROCEDURES	5	Press RESET.
	Without Automatic Card Reread Feature:	6	Press READER-START-LINE to try three more
1	RESEND light turns on if transmission error is detected in the flag (q d i a g).		times (Required only if the keyboard is the only component being polled).
2	Replace the 2 cards in the hopper.		

- Notes:
1. Switches that are not marked may be set in any position.
 2. NL = New Line Code (Punched 11-5-9).
 3. The message format illustrated is applicable when polling select code 0 or 7 is transmitted from the 1448 or 1026. If the keyboard (polling select code 5) is being specifically polled, it is recommended that the first 12 characters be keyed from the keyboard as illustrated. At this point, prefix 0 is keyed to cause selection of Reader 2.

Figure 4. Test Message Sent from an IBM 1056 Card Reader



OPERATOR INSTRUCTION SHEET

IBM 1050 DATA COMMUNICATION SYSTEM

Diagnostic Test Message

JOB from 1054 Paper-Tape Reader, without Automatic Tape Reread Feature

SYSTEM		MASTER		PRINTER 1		PRINTER 2		KEYBOARD		RDR 1		RDR 2		PUNCH 1		PUNCH 2	
Attend	X	On		Rec		Rec		Send		Send	X	Send		Rec.		Rec.	
Un-attend		Off	X	Send Rec	X	Send Rec		Off		Off		Off		Off		Off	
				Home		Home		Home		Home		Home		Home		Home	

STOP CODE		AUTO FILL		PUNCH		SYSTEM		E O B		SYSTEM		TEST		SINGLE CY		RDR STOP	
Sense		On		Normal		Program		Manual				On		Line		Line	
Off	X	Off	X	Bksp		Dup		Auto		Dial Disc		Off	X	Off	X	Off	X
														Home		Home	

- SETUP INSTRUCTIONS
1. Turn Power On.
 2. Set margin and tab stops.
 3. Set switches as indicated above. RDR 1 is a paper-tape reader.
 4. Insert tape (punched with the diagnostic test message), align tape, and close tape reader gate.

OPERATING INSTRUCTIONS

Step	Description	Step	Description
1	Establish data mode: Dial - Auto Dial - Auto Answer		ERROR PROCEDURE
2	Press RESET.	1	RESEND light turns on if transmission error is detected in the flag (q d i a g).
3	Press READER-START-LINE (Required only if the keyboard is the only component being polled).	2	Reposition paper tape.
4	When PROCEED light turns on, tape reader transmits message: q d i a g # # # a l # NL a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0 #	3	Press RESET to turn off RESEND light.
		4	Press READER-START-LINE (Required only if the keyboard is the only component being polled).
		5	When PROCEED light turns on, tape reader transmits message.

- Notes:
1. Switches that are not marked may be set in any position.
 2. NL = New Line Code (8-channel punch).

Figure 5. Test Message Sent from an IBM 1054 Paper-Tape Reader, without Automatic Tape Reread Feature

OPERATOR INSTRUCTION SHEET

IBM 1054 DATA COMMUNICATION SYSTEM

Diagnostic Test Message

JOB from 1054 Paper-Tape Reader, with Automatic Tape Reread Feature

SYSTEM		MASTER		PRINTER 1		PRINTER 2		KEYBOARD		RDR 1		RDR 2		PUNCH 1		PUNCH 2	
Attend	X	On		Rec	X	Rec		Send		Send	X	Send		Rec.		Rec.	
Un-attend		Off	X	Send Rec		Send Rec		Off		Off		Off		Off		Off	
				Home		Home		Home		Home		Home		Home		Home	

STOP CODE		AUTO FILL		PUNCH		SYSTEM		E O B		SYSTEM		TEST		SINGLE CY		RDR STOP	
Sense		On		Normal		Program		Manual				On		Line		Line	
Off	X	Off	X	Bksp		Dup		Auto		Dial Disc		Off	X	Off	X	Off	X
														Home		Home	

SETUP INSTRUCTIONS

1. Turn Power On.
2. Set margin and tab stops.
3. Set switches as indicated above. RDR 1 is a paper-tape reader.
4. Insert tape (punched with the diagnostic test message), align tape, and close tape reader gate.

OPERATING INSTRUCTIONS

Step	Description	Step	Description
1	Establish data mode: Dial - Auto Dial - Auto Answer		ERROR PROCEDURE
2	Press RESET.	1	Reader retransmits message once, or twice if a transmission error is detected again in the flag (\overline{NL} g d i a).
3	Press READER-START-LINE (Required only if the keyboard is the only component being polled).	2	If error occurs a third time, RESEND light turns on.
4	When PROCEED light turns on, tape reader transmits message: \overline{NL} q d i a # # # a 1 # a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0 #	3	Reposition paper tape.
		4	Press RESET.
		5	Press READER-START-LINE to try three more times (Required only if the keyboard is the only component being polled).

- Notes: 1. Switches that are not marked may be set in any position.
2. \overline{NL} = New Line Code (8-channel punch).

Figure 6. Test Message Sent from an IBM 1054 Paper-Tape Reader, with Automatic Tape Reread Feature

On-Line Testing--IBM 1401, 1440, and 1460
Form C24-3341-0

- Is the material:

	<i>Yes</i>	<i>Satisfactory</i>	<i>No</i>
Easy to read?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Well organized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fully covered?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clearly explained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Well illustrated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- How did you use this publication?

As an introduction to the subject	<input type="checkbox"/>
For additional knowledge of the subject	<input type="checkbox"/>

- Which of the following terms best describes your job?

<i>Customer Personnel</i>		<i>IBM Personnel</i>	
Manager	<input type="checkbox"/>	Customer Engineer	<input type="checkbox"/>
Systems Analyst	<input type="checkbox"/>	Instructor	<input type="checkbox"/>
Operator	<input type="checkbox"/>	Sales Representative	<input type="checkbox"/>
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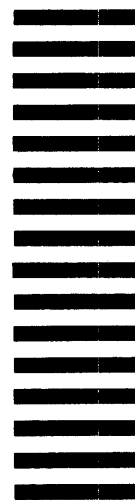
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