CONTROL DATA
CORPORATION

CONTROL DATA®
1700 COMPUTER SYSTEM

1729-2 CARD READER SUBSYSTEM
REFERENCE MANUAL

PREFACE

This manual gives reference information for the CONTROL DATA® 1729-2 Card Reader
Subsystem which may be used in conjunction with the 1705 Interrupt Data Channel of the
1700 Computer. For reference information on 1700 Basic Peripheral Equipments (which
attach directly to the 1704 Basic Computer) see the 1700 Computer System Reference
Manual, Pub. No. 60153100.

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CONTROL DATA 1729-2 CARD READER SUBSYSTEM

1729-2 CARD READER SUBSYSTEM

INTRODUCTION

The CONTROL DATA® 1729-2 Card Reader Subsystem consists of a reader mechanism, power supply, and controller which contains eight 50-PAKs: five for control and interface and three for operating the Card Reader mechanism. The controller interfaces with one 1700 Data Channel, either normal or buffered. Function codes transmitted via the data channel initiate and control the reading of cards and enable the generation of interrupts when the specified conditions exist. The Card Reader mechanism is a non-buffered, column-oriented, punched card, read device, with no code conversion; it contains a hopper, stacker, and power supply.

**FUNCTIONAL
DESCRIPTION**

System Relationship

The controller may interface with the 1706 Data Channel for buffered communication or the 1705 Data Channel for normal (non-buffered) communication. Typical configurations are shown in Figure 1. The interface logic in the controller provides access to the card reader of the selected equipment. Data is transferred to and from the Card Reader in 16-bit computer words with the lower 12 bits containing the information in one card column (data bit 00 corresponds to card row 9). The Q register in the computer designates the use of the A register bits in the 16-line address cable. Bits of the Q register define the equipment number; and with a Read or Write signal, they define incoming A register bits as function codes, status, or data.
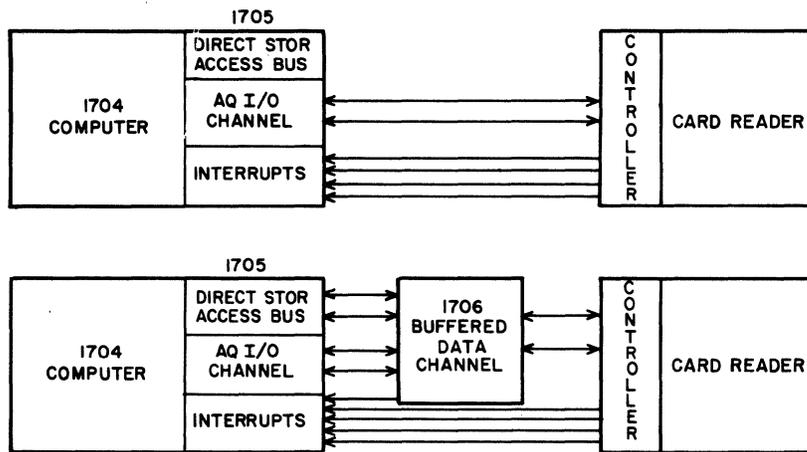
Figure 1. Typical Configurations

Capabilities

The maximum operating rate of the Card Reader is 330 cards per minute. The capacity of the input hopper is 1,200 cards and the capacity of the output stacker is 1,300 cards.

Functional Stations

Refer to Table 1 for a description and to Figure 2 for a diagram of the six functional stations in the Card Reader.

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TABLE 1. DESCRIPTION OF FUNCTIONAL STATIONS

STATION NUMBER	STATION	DESCRIPTION
1	Hopper	Holds a supply of cards and feeds them to the read ready station.
2	Ready	Retains each card as it is fed from the hopper.
3	Read	Examines the cards and presents one column of data on the 12 lines to the logic.
4	Post Read	Holds cards from read station prior to routing.
5	Routing	Receives cards as they leave the reader and enables the 3/8 inch offset if directed by the controller.
6	Stacker	Holds the finished card to maintain original card sequence.
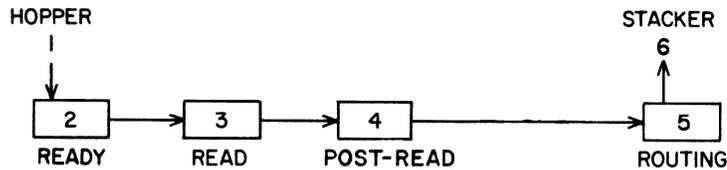
Figure 2. Functional Stations

Timing

Timing intervals for various operations are as follows:

Feed Timing

A card may be fed at intervals of 181 ms for a maximum 330 card-per-minute rate. While operating at this rate, a maximum of 56.5 ms is available after reading card column 80 before the controller need issue its decision to feed the next card.

Read Timing

The read time for card columns 1 through 80 is 86.7 ms. The average time between card columns is 1.08 ms. Column 1 is present for reading approximately 32.6 ms after the initiation of a feed cycle from a static position with the motor running, or 93.5 ms after feed-cycle initiation from a column 80 position.

Offset Timing

A card being read is offset in the stacker if an Offset command is issued any time after reading column 1, and before 15 ms have elapsed of the card cycle in which the card is moving to the routing station.

**Definition of
Conditions and
Operations**

Various conditions and operations in the Card Reader are defined as follows:

Ready

A Ready condition exists when the Card Reader is capable of performing all its functions. Pressing the READY switch causes the equipment to become ready if the power supply is in operation, cards are in the input hopper, the stacker is not full, there is no jam condition, and the top lid interlock is closed.

A Ready ceases to exist when any of the above conditions are not met or when the READY switch is pressed when the Card Reader is in the Ready state.

Reader Busy

The reader becomes busy when a feed cycle is initiated; it remains busy until the completion of a card (81st column time), or until lost data occurs.

NOTE

If the Read operation is terminated before the 81st column time, with a Feed, no End-of-Operation status or interrupt is issued.

Read Operation

A Read operation is in effect between the acceptance of a Feed command to station 1, and the completion of a card (81st column time) or the time lost data occurred.

Alarm

An alarm indicates the presence of an abnormal condition. Two types of abnormal conditions can occur: those which require the Card Reader to go Not Ready and require operator intervention and those which allow the Ready status to remain and do not require operator intervention.

Alarm with Not Ready

This alarm occurs when the Card Reader is affected by a Not Ready condition: hopper empty, stacker full, feed alert, or open interlock on the top lid. The alarm is cleared upon correction of the cause for the Not Ready condition.

Alarm with Ready

This Alarm condition is caused by lost data or a read alert. The alarm is cleared by a Master Clear or a Clear Card Reader director function code.

Error Indications

Not Ready

The absence of any one of the following Ready conditions results in a Not Ready error condition.

    a.   Power supply in operation.

    b.   Cards in the input hopper.

    c.   Card stacker not full.

    d.   No card jam condition.

    e.   Top lid interlock closed.

Pre-read error

This error occurs if all read amplifiers are not on during a light check, or if the amplifiers are not off during a dark check.

Alarm

The presence of any abnormal condition results in an Alarm error. An alarm can cause the equipment to go Not Ready or it can exist and allow the Ready state to remain. Conditions causing a Not Ready are:

    a.   Hopper empty.

    b.   Stacker full.

    c.   FEED ALERT indicator lit.

    d.   Open top lid interlock.

Conditions allowing the Ready state to remain are:

    a.   Lost data.

    b.   READ ALERT indicator lit.

Feed Alert

This error occurs when there has been a failure in the transport of a card which may be due to a card failing to feed, or a jam occurring in the read, post read, or stacker area.

PROGRAMMING

Table 2 and Figures 3 through 8 provide programming information. A description of the codes follows the figures.

TABLE 2. SUMMARY OF Q REGISTER FUNCTIONS

Q REGISTER		DESCRIPTION
FORMAT	SYMBOL	
CONVERTER CODE	(W)	W =0 must be present for all Card Reader operations.
EQUIPMENT CODE	(E)	Set Equipment Select Switches - positions 0 thru F (an Equipment Code setting must be present for all operations).
STATION CODE	(S)	Select station (Q05, Q06). For Status and data, Q05 must be a 1 and Q06 must be a 0 with a Read signal. For functions, Q05 must be a 1 and Q06 must be a 0 with a Write signal.
DIRECTOR CODE	(D)	Defines operation (Q00, Q01). For data, Q00 = 0 with a Read signal. For functions, Q00 = 1 with a Write signal. For status, Q00 = 1, Q01 = 0 with a Read signal. 　　　Level 1, Q01 = 0 　　　Level 2, Q01 = 1

```
  I0                    07

       |      E      |

       Q  REGISTER
```

E (EQUIP CODE) = Q07-Q10 = ANY ONE OF SWITCH NUMBERS 0 - F

					0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A	B	C	D	D	o	–	o	–	o	–	o	–	o	–	o	–	o	–	o	–
				C	o	o	–	–	o	o	–	–	o	o	–	–	o	o	–	–
				B	o	o	o	o	–	–	–	–	o	o	o	o	–	–	–	–
				A	o	o	o	o	o	o	o	o	–	–	–	–	–	–	–	–
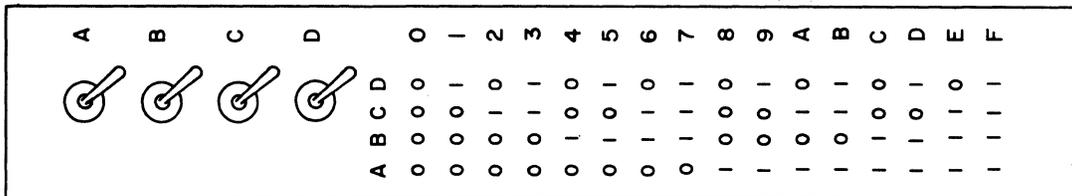
Figure 3. Equipment Select Switches

6

60331100 A
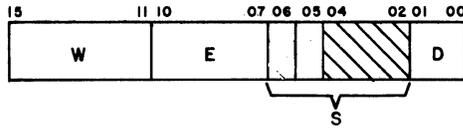
Figure 4. Q Register Format
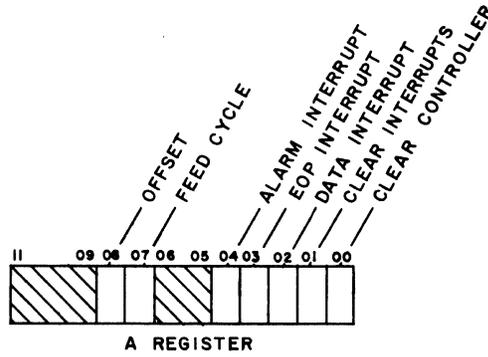
Figure 5. Function Code Format
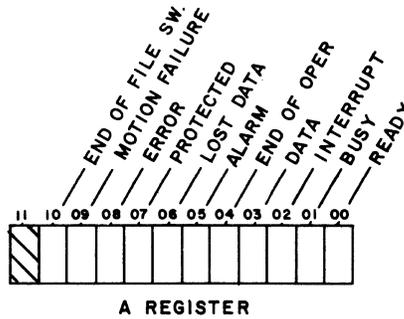
Figure 6. Status Code Format - Level 1
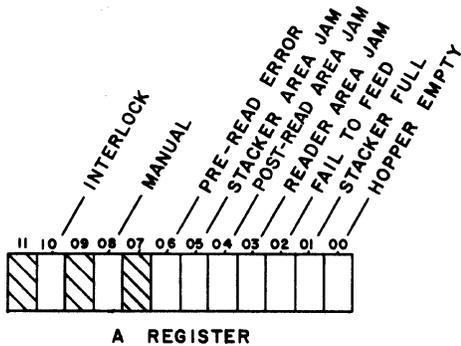
Figure 7. Status Code Format - Level 2
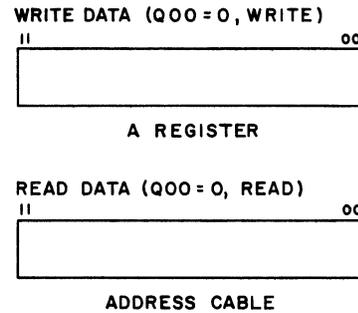
Figure 8. Data Transfer Format

CODES

Converter

The W portion of the Q register (Q11-Q15) must be all 0's for all Card Reader operations.

Equipment

The E portion of the Q register (Q07-Q10) defines the Card Reader equipment code. The code is set up by the switches shown in Figure 3. If the switch settings match bits 07-10 of Q, the equipment responds.

Command

When accompanied by an equipment code and either a Read or Write signal, a command code defines the operation to be performed. The command code consists of a station (S) code and a director (D) code. Bit 05 of the S code and the D portion of Q (Q00 and Q01) define the word being sent as data, or director function or status codes.

DATA TRANSFER

Read Data (Q00 = 0, Q01 = 0, Q05 = 1)

When bits Q00 and Q01 are 0, and Q05 = 1, the 16 lines of the data cable (A) are directed to perform a data transfer as specified by the Read signal. A Reject occurs if there is no data to be transferred. The Card Reader rejects when:

    a.   The Card Reader is not ready.

    b.   The computer attempts to input data at a rate that exceeds the capabilities of the Card Reader.

    c.   The 80th column is read, or a feed command is accepted and a new card is not registered in the read station.

DIRECTOR FUNCTIONS (Q00 = 1, Q01 = 0, Q05 = 1)

When Q00 and Q05 are 1's, and Q01 is a 0, and they are accompanied by an equipment code and a Write signal, the 16 lines of the data cable (A) direct the Card Reader to perform the following operations. Director functions may be stacked (i.e., two or more functions sent simultaneously).

NOTE

The Card Reader executes and replies to the Clear function if it is Not Ready, provided that no other director bit (except A01) is transmitted with it (bits A02 through A08 must be zero). Care should be exercised in using this function while the Card Reader is busy.

Clear Card Reader (A00 = 1)

This function directs the clearing of all interrupt requests and responses, motion requests, errors, and other logic which may be cleared. This bit is subordinate to bits A02 through A08.

The Card Reader will execute and reply to the Clear
Interrupts function if it is Not Ready, provided that
no other director bit (except A00) is transmitted with
it (bits A02 through A08 must be zero).

Clear Interrupts (A01 = 1)

This function directs that all interrupt requests and their responses be
cleared; it is subordinate to the interrupt request bits A02 through A04.

Data Interrupt Request (A02 = 1)

This function sets the Data Interrupt Request FF which causes an interrupt
to be generated when information is available. The interrupt is cleared by
a reply to a data transfer. The interrupt request and response is cleared
by bit A00 or A01. Interrupt Request takes precedence over function clears.

Interrupt on End of Operation (A03 = 1)

The purpose of this interrupt is to notify the computer that the unit is
finished with an operation or that some condition existed at the end of the
last data transfer which prevents any further data transfers. The Interrupt
Request and Response is cleared by bit A00 or A01. Interrupt Request
takes precedence over function clears.

The interrupt may be selected before or during the operation. An interrupt
response does not occur for an operation which terminated before the se-
lection was made.

Alarm Interrupt Request (A04 = 1)

This function enables the generation of an interrupt when an Alarm condition
exists. These conditions are listed in the Alarm section. An Alarm
condition that exists at the time of the interrupt request immediately provides
a response; if the Alarm condition does not exist at the time of the interrupt
request, the interrupt response is provided as soon as the Alarm condition
is detected.

The Alarm Interrupt Request function is cleared by a Master Clear or when
A00 = 1, or A01 = 1 with A04 = 0.

The interrupt response is cleared by a Master Clear or when A00 = 1 or
A01 = 1. When the interrupt response is cleared by Director Function
A00 = 1 or A01 = 1, the interrupt request may be reset with the same
operation if A04 = 1.

Director functions A05 and A06 are not used.

Feed Request (A07 = 1)

This function directs the Card Reader to initiate a feed cycle and to advance
the next card.

- Feed and Read - When a Feed Request is initiated, pre-read
  checks are made on the light detection circuits and lost data is
  detected (if present).

Offset Request (A08 = 1)

This function directs the Card Reader to initiate an Offset operation which causes the existing card to be offset approximately 3/8 inch (column 80 end protruding) from the stacker card deck.

Director functions A09 through A15 are not used.

DIRECTOR STATUS (Q00 =1, Q01 = 0), LEVEL 1

When Q00 is a 1 and Q01 is a 0, and a Read signal is present, the computer is requesting Level 1 status.

Ready (A00 = 1)

This bit indicates that a Ready condition exists. The requirements are as follows:

    a.   Power supply in operation.

    b.   Cards present in input hopper.

    c.   Stacker not full.

    d.   No jam condition present.

    e.   Top lid interlock closed.

A Ready ceases to exist when any of the above conditions are not met or when the Card Reader READY switch is pressed when the Card Reader is in the Ready state.

Busy (A01 = 1)

This bit indicates that the Card Reader is busy. The Card Reader becomes busy when a feed cycle is initiated and remains busy until an End of Operation occurs.

Interrupt (A02 = 1)

This bit indicates that an interrupt response was generated by the Card Reader. The other status bits must be monitored to determine the cause of the interrupt.

Data (A03 = 1)

This bit indicates that a data transfer may occur.

    ●   Reader Data - The Reader register contains information ready for transfer to the computer. The status and interrupt drop upon completion of the transfer.

End of Operation (A04 = 1)

This bit indicates that the Card Reader completed an operation.

Alarm (A05 = 1)

This bit indicates the presence of an alarm condition.

NOTE

When lost data occurs, no further transfers occur from
that card, and an End-of-Operation status is generated.

Lost Data (A06 = 1)

This bit indicates that data was not transferred out of the Read register
before the next column of a card being read appeared. The status drops
when a clear (A00 = 1) is sent to the controller.

Protected (A07 = 1)

This bit indicates that the PROTECT switch on the Card Reader is in the
Protect position. When the switch is in the Protect position, the Card
Reader accepts only those instructions having "1" on the Program Protect
line. All other instructions are rejected. A protected instruction can be
used with either a protected or unprotected Card Reader.

Error (A08 =1)

This bit indicates that a pre-read error has occurred.

Feed Alert (A09 = 1)

This bit indicates that sometime during a card cycle there was a failure
in the transport of the card. This can be caused by:

    a.   Failure to feed the card.

    b.   Read area jam.

    c.   Post-Read area jam.

    d.   Stacker area jam.

End of File (A10 = 1)

This bit indicates that the END OF FILE switch is on and that the End of
File condition is present. This allows reading the remaining cards in the
transport after the hopper is empty.

Bits A11 through A15 are not used.

DIRECTOR STATUS (Q00 = 1, Q01 = 1), LEVEL 2

When Q00 and Q01 are 1's, and a Read signal is present, the computer is
requesting Level 2 status.

Hopper Empty (A00 = 1)

This bit indicates this status is present while the input hopper is out of
cards.

Stacker Full (A01 = 1)

This bit indicates this status is present while the output stacker is filled to capacity.

Fail to Feed (A02 = 1)

This bit indicates this status is present if the Ready area fails to contain a card after a feed cycle occurred, and if the input hopper contains cards.

Read Area Jam (A03 = 1)

This bit indicates that a card transport failure occurred in the Read area.

Post Read Area Jam (A04 = 1)

This bit indicates that a card transport failure occurred when the card left the Read area.

Stacker Area Jam (A05 = 1)

This bit indicates that a card transport failure occurred in the Stacker area.

Pre-Read Error (A06 = 1)

This bit indicates than an amplifier failure in the read-head was detected.

Bit A07 is not used.

Manual (A08 = 1)

This bit indicates that the maintenance panel FEED switch is on, placing the Card Reader under manual control.

Bit A09 is not used.

Interlock (A10 = 1)

This bit indicates the door interlock switch is de-energized. This occurs when the cabinet doors are open.

Bits A11 through A15 are not used.

MANUAL OPERATION

Switches and Indicators

The switches and indicators shown in Figure 9 are located on the main control panel next to the output stacker. They are described as follows:

POWER Switch and Indicator

Pressing this alternate action switch causes power to be applied to or removed from all motors, fans, and power supplies in the proper sequence. The indicator lights to indicate that power is applied to the Card Reader.

READY Switch and Indicator

Pressing this momentary contact switch causes a card to be fed from the hopper to the Ready station if this station is not already holding a card, and if all Not Ready conditions are resolved satisfactorily. Operation of the switch also clears the following indications: fail to feed and read alert.

The READY indicator lights if the Card Reader is ready. When the READY indicator lights, pressing and releasing this switch makes the Card Reader Not Ready and stops any further operations from the computer after the operation in progress is completed.

CAUTION

If the FEED ALERT indicator is lit, make certain the card path is clear of possible jam conditions before pressing the SINGLE CYCLE switch.

SINGLE CYCLE Switch

Pressing this monentary contact switch causes a card cycle to occur only if the Card Reader is in a Not Ready condition. A card cycle occurs regardless of which condition is causing the Not Ready.

POWER	
READY	FEED ALERT
SINGLE CYCLE	INTLK / READ ALERT
END OF FILE	PROTECT
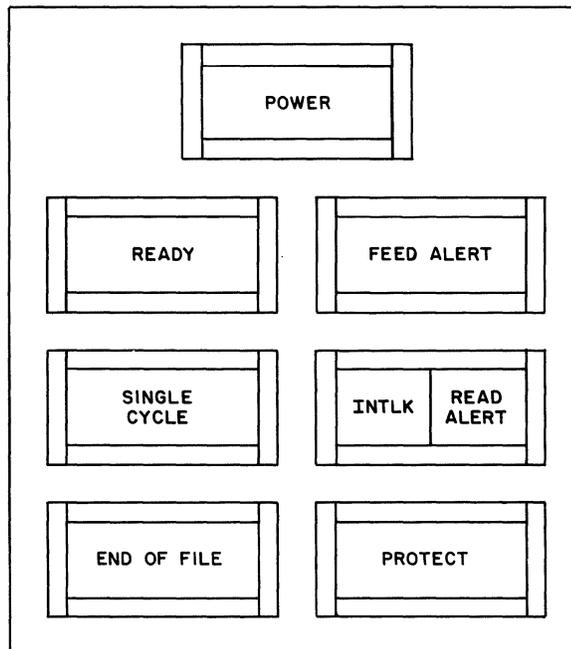
Figure 9. Main Control Panel

END OF FILE Switch and Indicator

Pressing this switch establishes the End of File condition, lights the indicator, and generates an End of File status. Pressing the switch again removes the End of File condition and turns the indicator light off.

The End of File condition allows the Card Reader to remain Ready after the hopper is empty and there are cards remaining in the transport. This allows the last card in the deck to be read.

FEED ALERT Indicator

This indicator lights to indicate that sometime during the card cycle there was a failure in the transport of a card. This may be due to:

    a.   Failure to feed the card.

    b.   Read area jam.

    c.   Post-Read area jam.

    d.   Stacker area jam.

This indicator is cleared by pressing the SINGLE CYCLE or READY switch.

READ ALERT Indicator

If a Read Alert occurs, the READ ALERT indicator lights.

- Read Alert - The read control logic performs a check on the operational capabilities of the read interrogation and amplifier circuits prior to reading each card. This consists of detecting that all amplifiers are on when the light detection circuits are all uncovered (light check) and of detecting that the amplifiers are all off when the light detection circuits are all covered (dark check). Any error found by these checks is a pre-read error and lights the READ ALERT indicator.

INTLK Indicator

If the top lid interlock is open, the INTLK indicator lights.

PROTECT Switch and Indicator

This alternate action switch (when pressed) places the Card Reader in the Protected condition, or it can be used to remove the Protected condition. The indicator lights when the Card Reader is protected. When the switch is on, only protected instructions are accepted from the computer.

Equipment Select Switches

Refer to the Programming section for a description of these switches.

Maintenance Switches

The maintenance switch panel (Figure 10) contains three switches which allow the Card Reader to be adjusted and checked off-line. This switch panel is located on the lower right side of the logic chassis.
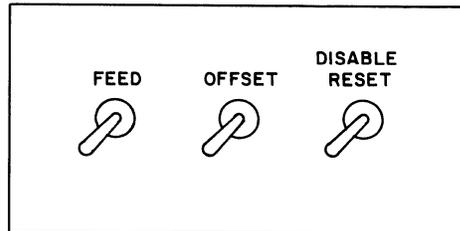
Figure 10. Maintenance Switch Panel

NOTE

The Card Reader must be ready for the FEED switch to operate; therefore, sequence switches as follows: Set the FEED switch to separate the Card Reader from the computer. Use the READY switch on the main control panel to start and stop the feeding of cards.

FEED Switch

This switch feeds cards at a maximum card rate, allowing checks to be made on the reader control logic.

NOTE

Since the OFFSET switch is not controlled by the FEED switch, it must be turned off when the Card Reader is on-line.

OFFSET Switch

This switch allows checking the operation of the offset stacker feature.

NOTE

The FEED switch must be on for the DISABLE RESET switch to operate.

DISABLE RESET Switch

This switch disables the automatic reset feature in the card reader control logic.

Operation   Prepare the Card Reader for operation as follows:

    a.   Turn on power by pressing the POWER switch, Figure 9.

    b.   Load a deck of cards, face down, with the 9 edge toward the inside of the hopper.

    c.   Press the READY switch to single-cycle a card into the Ready area.

COMMENT SHEET

MANUAL TITLE ___1729-2 CARD READER SUBSYSTEM___

___Reference Manual___

PUBLICATION NO. __60331100__   REVISION _____A_____

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