
CONTROL DATA[®]
1784 COMPUTER SYSTEM

1742-30 AND 1742-120
LINE PRINTER CONTROLLER
REFERENCE MANUAL

PRELIMINARY

PREFACE

This manual gives reference information for the CONTROL DATA[®] 1742-30 and 1742-120 Line Printers which may be used in conjunction with the Interrupt Data Channel of the 1784 Computer. For reference information on the 1784 computer and peripheral equipment (which attach directly to the 1784 Computer) see the 1784 Computer System Reference Manual, Publication No. 89633400.

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INTRODUCTION

The CONTROL DATA[®] 1742-20 and 1742-120 Line Printers each consist of a controller and a printer. The model 1742-30 prints at 300 lines-per-minute (LPM), the model 1742-120 at 1200 LPM.

The controller consists of a single 50-PAK. It interfaces with the AQ data channel of the 1784 computer. The controller receives and interprets function codes from this channel to initiate the print cycle, control paper motion, and enable interrupts when specified conditions arise. The controller includes a buffer memory that is capable of storing one character. The Line Printer includes a buffer capable of storing a complete line of print.

FUNCTIONAL DESCRIPTION

System

Relationships

The controller interfaces the printer with the lower eight bits of the Computer A register (A00 through A07) through the AQ channel.

Typical configuration is shown in Figure 1.

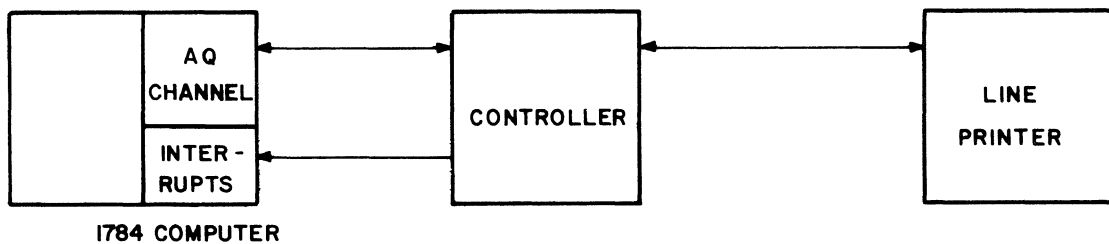


Figure 1. Typical Configuration

The controller may be accommodated in the 1784 Computer main enclosure or in the 1783-1 Expansion Enclosure.

The address of the printer and controller is selected by inserting jumper plugs in positions Q1 through Q4 (location 56) on the controller circuit card (Figure 2). The jumper plugs are stored on the circuit card in location 15. Any of 16 different equipment codes may be set up by these plugs.

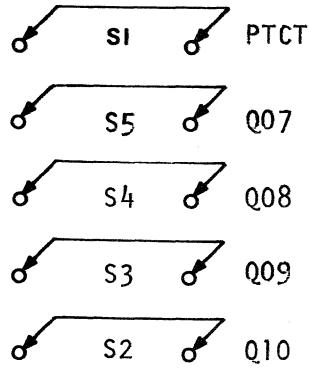


Figure 2. Equipment Select and Protect Bit Jumper Plugs

TABLE 1. HEXADECIMAL CODE FOR EQUIPMENT SELECTION CODE

Links		Q10	Q09	Q08	Q07
Hexadecimal					
Code	0	0	0	0	0
	1	0	0	0	1
	2	0	0	1	0
	3	0	0	1	1
	4	0	1	0	0
	5	0	1	0	1
	6	0	1	1	0
	7	0	1	1	1
	8	1	0	0	0
	9	1	0	0	1
	A	1	0	1	0
	B	1	0	1	1
	C	1	1	0	0
	D	1	1	0	1
	E	1	1	1	0
	F	1	1	1	1

Note:

A '0' in the binary code indicates the presence of a jumper plug for the setting of the equipment code; a '1' its absence.

Data Word
Format

A single data word which occupies the A register lower eight bits (A00 through A07) consists of a single 8-bit character code.

Alarm

An alarm indicates the presence of an abnormal condition. The abnormal conditions are divided into two types.

1. Those which cause the Printer to go Not Ready, requiring operator intervention. These conditions are paper out, paper tear, fuse alarm, and an open interlock. The alarm is cleared upon correction of the cause for the Not Ready.
2. A condition allowing Ready status to remain. This condition occurs when ERROR occurred. For definition of ERROR director status see Director Functions.

Program
Protection

When the Protect jumper plug is not set, input-output instructions not having the protect bit set are rejected. Director Status requests are not rejected. To set the Protect jumper plug, see Operation.

Reply/Reject

Within 800 nanoseconds, the Line Printer always responds to an Input-to-A or an Output-from-A instruction with either a Reply or a Reject signal.

A Reject signal is sent by the printer if it cannot perform the function of transfer instruction. Four conditions that will cause this Reject signal to be returned are:

1. The printer is Busy.
2. A program-protection fault occurs.
3. The printer is Not Ready.
4. Data Status is false.

Interrupt

Four interrupt lines are available between the Controller and the Computer. They are designated:

Data, EOP, Alarm, Common

and are defined under the Director Status.

**Control
Character**

Each print line is prefaced by a Control Character. It controls the paper vertical motion and will not be printed.

The printer operates in 'pre-print' mode, that is paper motion is performed before printing. The printer executes the Control Character immediately upon reception and does not set Busy Status. The Busy Status will be set after reception of a Print Directive.

NOTE: If a Control Character is issued, which performs a vertical paper motion and CLRP Directive is issued immediately thereafter, the Busy Status will be set until paper motion stops.

PROGRAMMING

Table 2 and Figures 2 through 6 provide programming information. A description of the codes follows the figures.

TABLE 2. ADDRESSING CODES

COMMAND CODE	Input-to-A	Output-from-A
Q00 = 0	Illegal	Data transfer
Q00 = 1	Director Status	Director Function

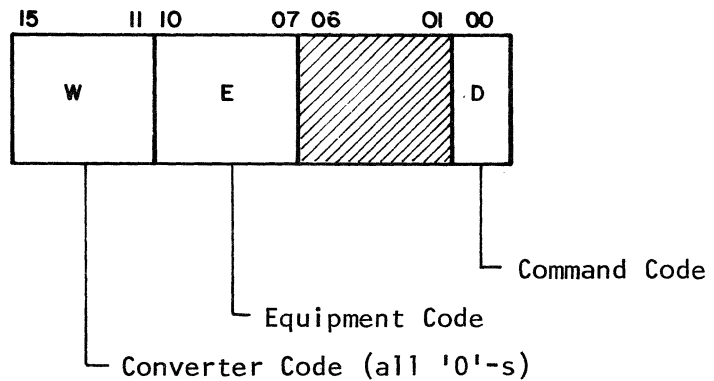


Figure 3. Q Register Format

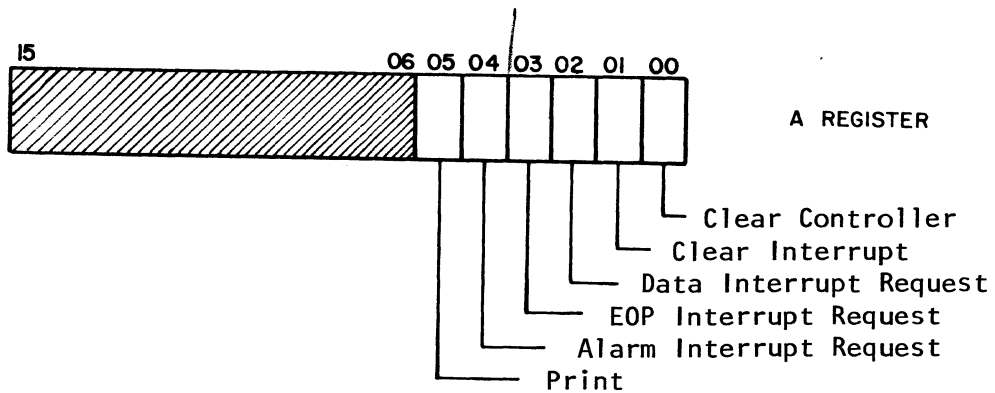


Figure 4. Function Code Format

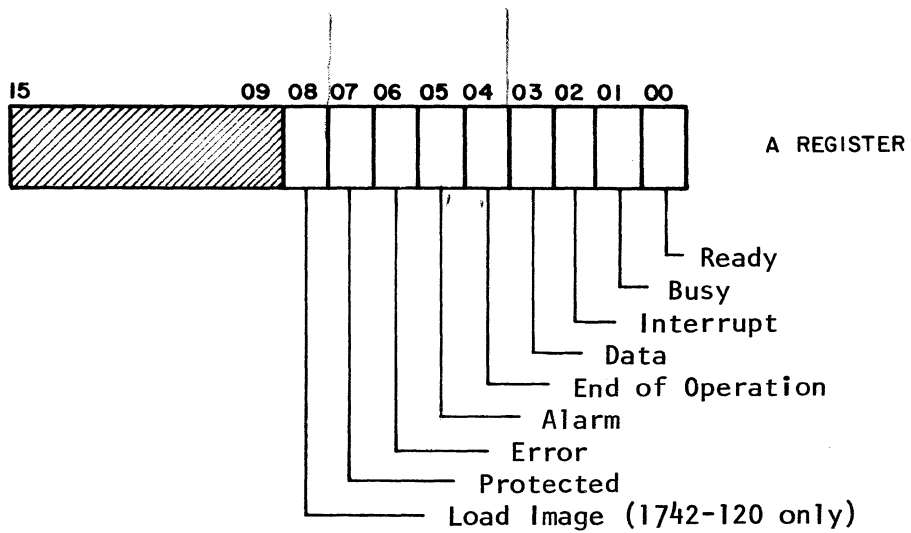


Figure 5. Status Code Format

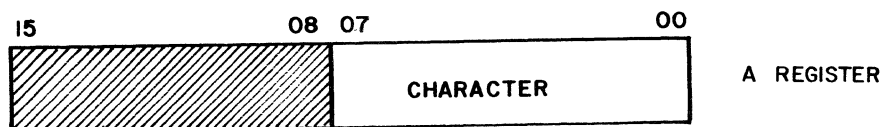


Figure 6. Data Transfer Format.

CODES	Equipment Codes and Command Codes are described in the following.
Converter	The W portion of the Q register (Q11 through Q15) must be all zeros for all Line Printer operations.
Equipment	The E portion of the Q register (Q07 through Q10) defines the Line Printer equipment code. This code should match the set-up of the four Equipment Select jumper plugs shown in Figure 2.
Command	The Command Code (bit 00 of the Q register) defines the operation to be performed by the Line Printer. It must be accompanied by an Equipment Code and either a Read or a Write signal. Table 2 gives the Command Code functions.

DATA TRANSFER (Q00 = 0)

Write Data

When bit Q00 is zero and an Output-from-A instruction is executed the Controller is directed to perform a data transfer. Data will be accepted unless one or more of the following reject conditions is present:

The Line Printer is Not Ready, the Line Printer is Busy with a Print operation, Data status is false or a Protect Violation exists.

Bits 00 through 07 of the A register contain the character bits to be transmitted with leading zeros (A08 through A15 are zero). The first character of a line is identified as the Control Character and is not printed.

When 6-bit characters are transmitted bits 06, 07 of A should be zeros.

The Data Transfer command clears EOP and ERROR status.

DIRECTOR FUNCTIONS (Q00 = 1)

When Q00 is a one and it is accompanied by both an Equipment Code and Output-from-A instruction, the Controller is directed to perform a Director Function. Director Functions are accepted if no Protect Violation occurs; with the following constraints: Print Directive is accepted if Controller is Ready, Not Busy and Data Status is true (bit A03 = 1).

Director Functions, except Print directive may be stacked, that is two or more functions may be issued at the same time.

Clear Printer (A00 = 1)

This function clears the Controller logic, clears EOP status and generates the Buffer Clear signal to the Line Printer. It generates Clear Interrupt functions. It is subordinate to all other bits in this group except Print (A05).

Clear Interrupt (A01 = 1)

This function clears all interrupt requests and interrupt responses. It is subordinate to all interrupt requests.

Data Interrupt Request (A02 = 1)

This function sets the Data Interrupt Request flag. This in turn enables the generation of an interrupt when Data status flag is true indicating that data transfer to the Line Printer is permitted. The Interrupt Request is cleared by Clear Printer or Clear Interrupt.

The interrupt response may be cleared by clearing the interrupt request as stated above, or by Data Transfer or Print functions. Before Data Transfer to the printer, Data Interrupt may be requested and the response will signal the computer that the printer is ready to receive another data transfer. Without reselecting or clearing this interrupt response, the data transfer can take place. During this data transfer, interrupt response will be removed until the printer is ready to receive another data transfer.

End-of-Operation Interrupt Request (EOP) (A03 = 1)

This function enables the generation of an interrupt on completion of an operation, when EOP occurs. The interrupt may be selected before or during the operation. An interrupt response will not occur for an operation which was ended before the selection was made. The interrupt request may be cleared by Clear Controller or Clear Interrupt.

The interrupt response may be cleared by clearing the Request or by Data Transfer or Print functions.

Alarm Interrupt Request (A04 = 1)

This function enables the generation of an interrupt when an Alarm condition exists. An Alarm condition that exists at the time this interrupt request is made will immediately provide a response. If the Alarm condition does not exist at the time of the interrupt request, the interrupt response will be provided as soon as an Alarm condition is detected. These conditions are listed in the Alarm section. The interrupt request may be cleared by Master Clear or by either A00 = 1 or A01 = 1 with A04 = 0.

The interrupt response may be cleared by clearing the Request or by Data Transfer or Print Function.

Print Function (A05 = 1)

This function directs the Line Printer to initiate a Print operation. A print operation lasts between the acceptance of a Print Function and completion of a line of print.

The A register bits 06 through 15 in this group are not used.

DIRECTOR STATUS

The Line Printer always replies to a status request. It therefore replies when Q00 = 1 and it is accompanied by an equipment code and a Read signal. The status responses are described below.

Ready (A00 = 1)

Indicates that a Ready condition exists. The Ready condition must be existing before the printer can operate, and the absence of any one of several requirements can prevent this.

Busy (A01 = 1)

Indicates that the Line Printer is Busy. The Line Printer becomes Busy -

1. After the initiation of a print cycle and until the characters have been printed.
2. If Clear Printer (A00 = 1) directive was issued directly after the Control Character has been issued.

Interrupt (A02 = 1)

This signal indicates that an interrupt occurred. The other status bits must be monitored to determine the cause of the interrupt: bits A03 - A05 define which interrupt occurred. This status is cleared by either the Clear Printer (A00 = 1) or Clear Interrupt (A01 = 1).

Data (A03 = 1)

This signal indicates that the Line Printer is ready to receive a character. If Interrupt on Data has been selected, this status will also indicate that this interrupt has occurred. The status is cleared by Clear Printer (A00 = 1) and by either Data Transfer or Print directive.

End-of-Operation (EOP) (A04 = 1)

Indicates that the Line Printer has completed an operation. If Interrupt on End-of-Operation has been selected, this status bit will also indicate that this interrupt has occurred. This status is true whenever the Line Ready signal goes high. The status is cleared by Clear Printer, Data Transfer, Print.

Alarm (A05 = 1)

Indicates that an Alarm condition is present, that is, an Error or Printer Malfunction occurred. The status is cleared by Clear Printer (A00 = 1), Data Transfer or Print directive provided that the cause of the alarm has been corrected.

Error (A06 = 1)

- a. For the 1742-30 Line Printer this signal indicates that data transfer parity error occurred. The Parity Error occurs when an incorrect character code is received by the Line Printer. The incorrect character code is printed as blank if it is a data character and ignored if a control character, i.e., it is performed as if "Suppress Space" was issued. The Line Printer stays Ready when this condition occurs. The status is cleared by Clear Printer (A00 = 1) or either Data Transfer or Print directive.

- b. For the 1742-120 Line Printer this signal indicates that any one or any combination of Parity Error, Synchronization Error or Compare Error (indicated on the Printer console) occurred. In case of Parity Error the Line Printer stays Ready. The condition is cleared by Clear Printer (A00 = 1) or either Data Transfer or Print directive.

In case of Synchronization Error or Compare Error the Line Printer becomes Busy. The condition is cleared by Clear Printer (A00 = 1) only.

Protected (A07 = 1)

This bit indicates that the Controller is in the protect state, that is, the protect jumper plug is in the Protect position (see Operation). In this position the Controller accepts only instructions having a 1 on the Program Protect line. All other instructions except Director Status will be rejected. The Program Protect bit is ignored when the Controller is not in the Protect state.

Load Image (A08 = 1)

In the 1742-120 Line Printer this bit indicates that the next 288 characters will be transferred to the Line Printer Image Memory. If Parity Error occurs no further transmission takes place until Clear Printer (A00 = 1) is issued. Load Image status is not applicable to the 1742-30.

Bits A09 through A15 are not used.

OPERATION

Controller

Prepare the Controller for operation as follows:

- a. Set the Equipment Code as required according to Table 1 by inserting the appropriate jumper plugs in position (Figure 2).
- b. Set the Protect Bit as required by inserting the protect bit jumper plug (PTCT) in position (Figure 2).
- c. Connect the Device Cable to the proper connector on the back panel of the 1784 Computer.
- d. Insert the Controller card in its place according to the system configuration.

COMMENT SHEET

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