CONTROL DATA
CORPORATION

CONTROL DATA®
1700
COMPUTER SYSTEM

1731-A/B MAGNETIC TAPE CONTROLLER
REFERENCE MANUAL

REVISION RECORD

REVISION	DESCRIPTION
A	Manual released; this manual supersedes the 1731-A/B Magnetic Tape Controller section of the
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Arden Hills, Minnesota 55112

or use Comment Sheet in the back of this manual.

PREFACE

This manual gives reference information for the CONTROL DATA® 1731-A/B Magnetic Tape Controller 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 601 TAPE TRANSPORT WITH 1731-A/B MAGNETIC TAPE CONTROLLER

1731-A/B MAGNETIC TAPE CONTROLLER

INTRODUCTION

The CONTROL DATA 1731 Magnetic Tape Controller synchronizes data transfer between a 1700 Computer System and up to eight 601 Tape Transports. This section describes the physical system, the programming information, and the operating procedures for the 1731 and 601.

FUNCTIONAL DESCRIPTION

System Relationship

The 1731 is used with 601 Tape Transports to control data transfer from 7-track tape on which data is recorded at 200 or 556 bits per inch (bpi). The 1731 controller is mounted in the back of one of the tape transports it controls. Figure 1 shows two possible ways the 1731 may be linked to the computer system.

The address of the controller (0 through F) is selected by the Equipment Number switch on the controller. The program protect feature of the 1700 I/O system is enabled for a specific tape transport via the switches on the controller. Any one of the eight possible tape transports connected to the controller may be selected.

Magnetic Tape

Magnetic tape provides a high-speed, nonvolatile storage medium. The tape has a plastic base and is coated on one side with a magnetic oxide. Information is recorded on this coating. Extreme care is taken to eliminate imperfections which could cause errors.

Information is read (detected) or written (stored) by passing the oxide side of the tape over read/write heads. Information may be written on any of seven independent tracks of the tape. During a Read or Write operation, the tape passes over seven evenly aligned heads; therefore, seven bits may be simultaneously recorded, one bit on each track.

A 7-track non-return-to-zero (change-on-ones) recording scheme is used. In this system, magnetic particles on the tape are aligned in either the positive or negative direction. A binary "1" is recorded by reversing the alignment (polarity); no polarity reversal indicates a "0". Thus, each track of the tape is fully magnetized and the polarity is reversed as each "1" bit is recorded.

Tape Format

Table 1 and Figure 2 describe the data format of magnetic tape. A line or frame of tape data consists of a 6-bit character and a parity (check) bit. Tracks 0 through 5 specify the character while track 6 holds the parity.

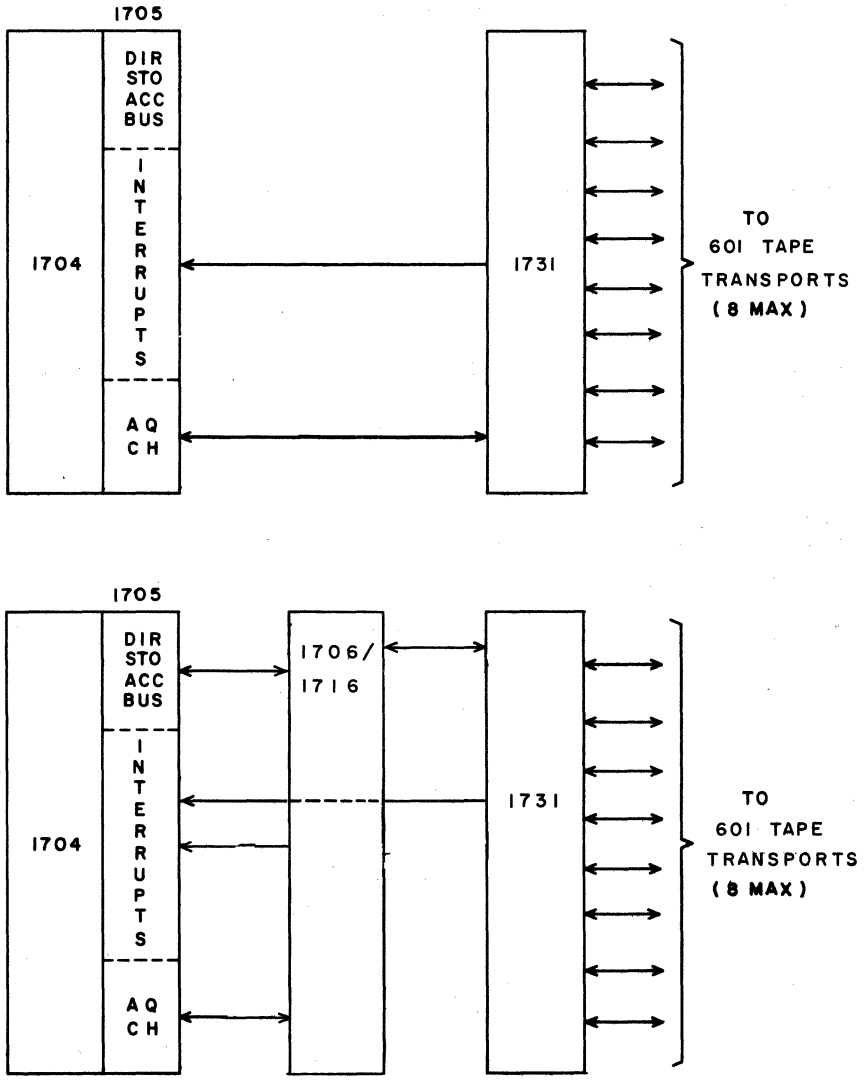

Figure 1. Typical Configurations

Density

The controller may be selected to synchronize data at a rate of 200 or 556 bits per inch on tape moving at 37-1/2 inches per second.

Mode

Data may be recorded in one of two modes, binary or BCD. The lower six bits comprise the data as transmitted from or received by the computer. If the mode is binary, the parity is odd. If the mode is BCD, the parity is even.

TABLE 1. 601 TAPE FORMAT

Tracks	Seven
Tape Speed	37-1/2 inches per second
Density	200 or 556 bpi
Parity	Odd (binary) or even (BCD); placed in seventh track
Longitudinal Parity	Even parity check character spaced 4 frames from last data character.
File Mark	A BCD 17_8 six inches from last record. The file mark is followed by a longitudinal check character of BCD 17_8.
Initial Gap	3.0 inches for write, 0.5 inches for read.
Record Gap	0.687 inches minimum 0.960 inches maximum

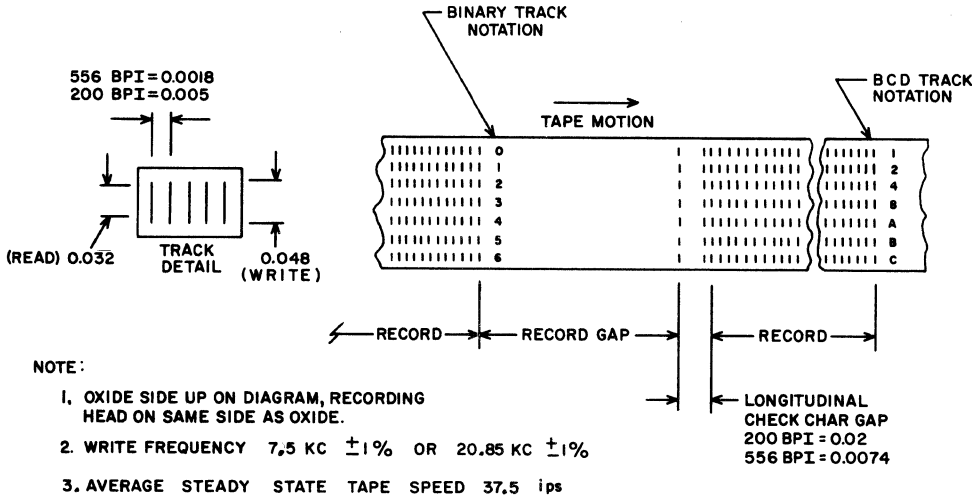

Figure 2. Tape Format

Records and Files

Data recorded on the tape is arranged in groups called records and files. A record consists of consecutive frames of information. A minimum of one frame of information constitutes a record. Adjacent records are separated by a 3/4 inch unrecorded area (record gap). A longitudinal parity check character is recorded at the end of each record; the number of "1's" in each record track is made even. A file consists of a group of records. Adjacent files are separated by recording an end-of-file marker six inches from the last record in the file.

Load Point

The load point is a reflective marker indicating the beginning of the usable portion of the tape. It is located at least 10 feet from the beginning of the tape.

End-of-Tape Marker

The end-of-tape marker is a reflective marker placed not less than 18 feet from the end of the tape. This provides approximately 10 feet of tape trailer and enough tape to hold a record of 96,000 characters after the end-of-tape marker is sensed. See Figure 3.

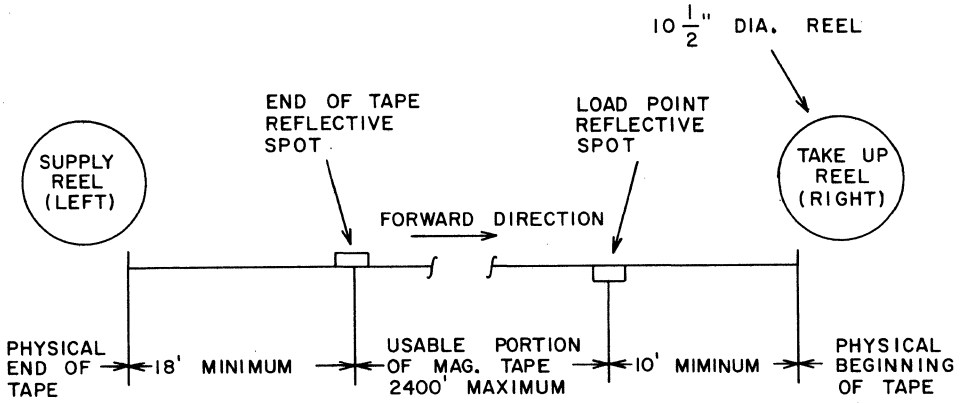

Figure 3. Physical Layout of Tape

Parity

The controller may be selected to operate with even (BCD) vertical parity or with odd (binary) vertical parity. The controller generates an even longitudinal parity check character for each physical record.

During a Write, the read heads of the tape transport transfer the newly written character to the controller. The controller performs a parity check and sets the Parity Error status bit if an error has occurred. If the Alarm interrupt has been selected, an interrupt occurs.

During a Read, the parity bit recorded on the tape is checked against the character. The Parity Error status bit sets if an error occurs. If the Alarm interrupt has been selected, an interrupt occurs.

Master Clear

Pressing the 1704 Computer CLEAR switch clears all interrupt selections and error conditions of a connected 1731. It clears a BCD selection, but does not clear a connection.

Reply/Reject

The Reply signal indicates an operation requested is possible. It is returned to the computer or converter within 4 usec and at least 0.2 usec after the request is initiated. A Reject signal indicates the operation requested cannot or should not be performed at that time. If neither a Reply nor a Reject is received for 4.0 usec, the computer generates an Internal Reject.

File Protection

The back of a tape reel has a slot near the hub for a plastic file protection ring (Figure 4). Writing on a tape is possible only when the reel contains a file protection ring. Reading from the tape is possible with or without the ring. Removal of the file protection ring after writing avoids loss of valuable records due to accidental rewriting.

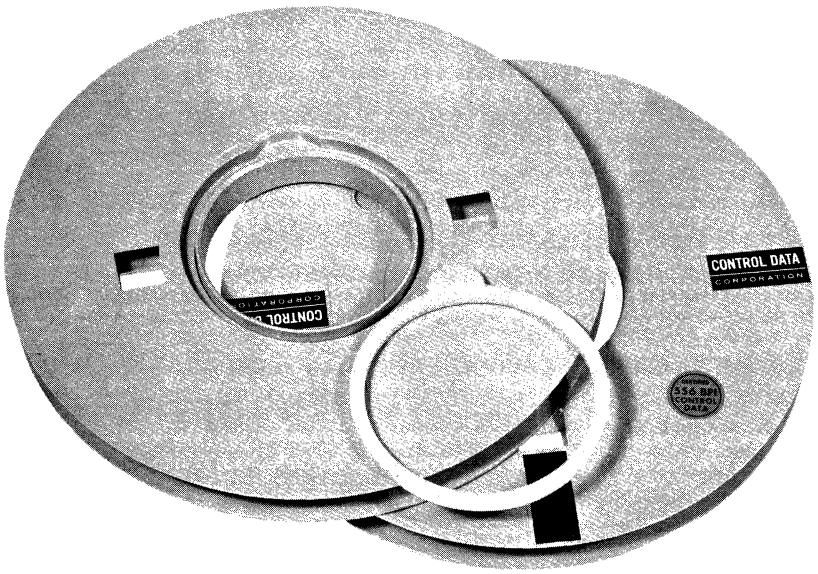

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Figure 4. File Protection Ring

Program Protection

The 1700 I/O System has a program protect feature which reserves protected equipment for use by protected programs. A 601 Tape Transport is protected by setting the PROGRAM PROTECT switch on the 1731 controller chassis which corresponds to the setting of its Unit Select switch. When its PROGRAM PROTECT switch is set, all instructions for that tape transport (except the two status requests) are rejected if their Program Protect bit is not set or the 1704 protect system is not enabled. To explain in more detail:

1) A protected program may select any unit that is physically in the system, loaded, under external control, and Not Busy.

2) An unprotected program cannot select a tape unit whose switch is in the protected position.

After an attempt by an unprotected program to select a protected transport, the status is:

1) Not Ready, Protected - No tape transport is selected and the requested transport is protected. Any previously selected controller is unprotected and is now deselected.

2) Ready, Protected - The previously selected tape transport is still selected. Once selected, a protected transport can be broken only by using an Output from A instruction whose Program Protect bit is set to initiate either a Deselect Tape Unit function or a new Select Tape Unit function.

PROGRAMMING

Summary of Programming Information

Tables 2 through 5 and Figures 5, 6, and 7 provide the experienced programmer with the information necessary to program the 1731. The following paragraphs further define this information.

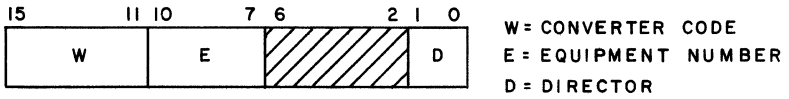

Figure 5. Format of Q Register

TABLE 2. 1731 OPERATIONS

	COMPUTER INSTRUCTION	
D	Output from A	Input to A
00	Write	Read
01	Control Function	Director Status 1
10	Unit Select	Director Status 2

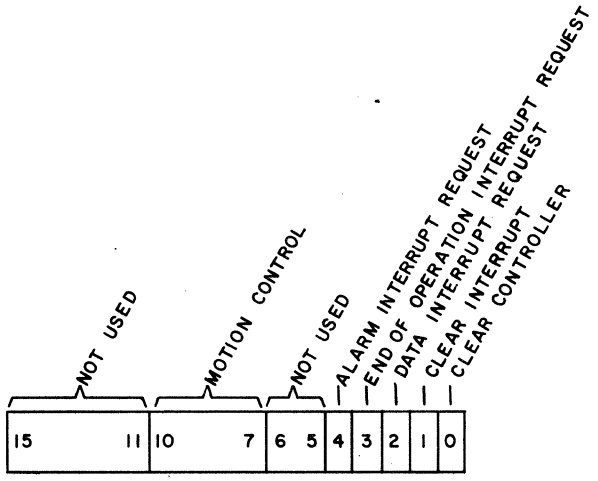

Figure 6. (A) for Control Function

TABLE 3. MOTION CONTROL

Bits 10-7 of A	Motion Function
0001	Write Motion
0010	Read Motion
0011	Backspace
0101	Write File Mark
1000	Rewind Load
1100	Rewind Unload

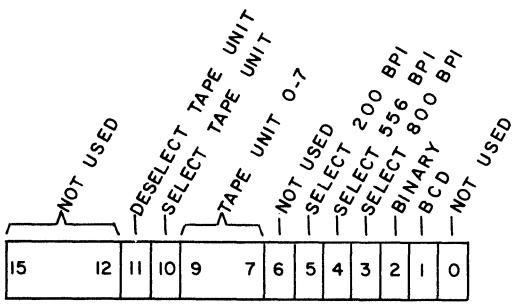

Figure 7. (A) for Unit Select

TABLE 4. DIRECTOR STATUS 1 RESPONSE BITS

BIT SET IN A REGISTER	MEANING
0	Ready
1	Busy
2	Interrupt
3	Data
4	End of Operation
5	Alarm
6	Lost Data
7	Protected
8	Parity Error
9	End of Tape
10	Load Point
11	File Mark
12	Controller Active
13-15	(Not Used)

TABLE 5. DIRECTOR STATUS 2 RESPONSE BITS

BIT SET IN A REGISTER	MEANING
0	556 bpi
1	800 bpi
2	(Not Used)
3	Seven Track
4	Write Enable
5-15	(Not Used)

Addresses

The W = 0 signal plus bits 10-7 of the Q register are used to select the desired 1731. If the 1731 is connected via the A/Q Channel, the W field of Q is always loaded with zeros. If the 1731 is connected to a converter, the converter code is placed in the W field, but the converter supplies the W = 0 signal to the controller. Bits 0-1 of Q are used to specify a command. Figure 5 illustrates the format of the Q register. Table 6 lists the values of E required to select a controller with a given equipment number setting.

TABLE 6. CONTROLLER SELECT CODES

E (BITS 10-7 OF Q)	EQUIPMENT NUMBER	E (BITS 10-7 OF Q)	EQUIPMENT NUMBER
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	1111	F

Bits 10-7 of the A register are used along with the contents of Q and Output from A to select a tape transport. (See Unit Select.)

Operations

The D field of Q is combined with a 1704 Input from A or Output from A instruction to specify an operation (see Table 2). The operations initiated by an Output from A may be further modified by the contents of the A register. See Table 3, Figure 6, and Figure 7. The following paragraphs define these operations.

Operations Defined by Q and Output from A

Write: A Write transfers data from the computer to the controller which generates a parity bit and writes the data plus parity bit on the tape. To perform a Write, load Q with W = 00*, E = equipment number setting of desired 1731 controller and D = 00. An Output from A instruction initiates the transfer of the lower 6 bits of the A register to the tape.** Any number of consecutive characters sent to the tape are written (along with a parity bit) on the tape as a single record. Whenever the computer breaks the continuity of the character outputs, the controller initiates an End of Record sequence. The End of Record sequence leaves three blank character spaces, writes the longitudinal parity check character, and leaves a 3/4-inch gap.

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* W is written as two digits; the left, binary; the right, hexadecimal. If the 1731 is connected to the computer via a converter, W equals the appropriate converter code. See the reference material for that converter.

** If the output is a buffered output via the converter, the Output from A instruction supplies address information to the converter. The converter controls the buffered operation and the lower 6 bits of each word in the buffer area are written on tape.

If no new Control Function is received from the computer, tape motion stops. A Write is rejected if Not Ready or Write Motion has not been initiated.

Control Function: The Control Function operation specifies operating conditions for the selected controller and transport and initiates tape motion. To perform a Control Function, load Q with W = 00, E = equipment number, and D = 01. Load A according to Figure 6 and Table 3. Execute an Output from A. *With the exception of the Clear codes, Control Function is rejected if Not Ready, Busy, or an illegal code exists in bits 7-10 of A. Clear Controller and Clear Interrupt may be executed while the selected tape transport is Not Ready.

Table 3 lists the legal motion control codes. One motion control plus any or all clears and interrupt selections may be selected simultaneously or individually. The requests are honored in this order: clears, interrupt selections, motion control. The following describes these codes:

1) Clear Controller (A0 = 1) - directs the clearing of all interrupts, interrupt selections, errors, and File Mark status. All other select codes coded with it will also be honored. For example, A = 0011 would clear the controller and the select interrupt on end of operation.

2) Clear Interrupt (A1 = 1) - clears all interrupts and interrupt requests. If an interrupt request is coded along with a Clear Interrupt, that selection is honored, but any previous selections are cleared.

3) Data Interrupt Request (A2 = 1) - causes an interrupt to be generated when an information transfer may occur. The interrupt response is cleared by the Reply to the data transfer. The request and response are cleared by a Clear Controller or a Clear Interrupt code.

4) End of Operation Interrupt Request (A3 = 1) - causes an interrupt to be generated at the end of an operation. The request and response are cleared by a Clear Controller or a Clear Interrupt code.

5) Alarm Interrupt Request (A4 = 1) - causes an interrupt to be generated upon a condition which warrants program or operator attention. The Alarm interrupt is generated by any of the following conditions:

    a) End of tape,

    b) Parity error,

    c) Lost data,

    d) File mark, or

    e) When a change in Ready status is sensed at a time other than a Unit Select operation.

6) Write Motion (A10-7 = 0001) - initiates write motion. A direct or buffered output must follow for data transfer to occur. If the tape is at load point, the first word is written 3 inches after load point. All data requests (Write, Read, Write Motion, Read Motion, Backspace, Write File Mark, Rewind, Rewind Unload) are rejected while the unit is Busy and before End of Operation status. A non-stop Write operation may be done by initiating a new Write Motion function or a Write File Mark function within 4 ms after End of Operation status/interrupt.

7) Read Motion (A10-7 = 0010) - initiates read motion. A direct or buffered input must follow for data transfer to occur. If the tape is at load point, data can be read within 0.5 inch. Control Data tape does not have information this close to the load point, but other formats do. All data requests are rejected while the unit is Busy and before End of Operation status. Read motion terminates by absence of data from the data handler for three frames. If the computer (or converter) stops requesting characters, data transfer stops but the tape continues to move to the end of the record. A non-stop Read may be done by initiating a new Read Motion function within 4 ms after End of Operation status/interrupt.

   If a data transfer request is not received by the controller in time to properly complete the transfer, a lockout prevents further transfers from that block and all subsequent data transfer requests are rejected. When data is read but is not accepted by the computer, the Lost Data status bit is set.

8) Backspace (A10-7 = 0011) - moves tape backward one record. Backspace from load point and non-stop backspace are possible.

9) Write File Mark (A10-7 = 0101) - moves tape forward approximately 6 inches and writes a 1-character word of 17_8 with even parity. The normal End of Operation sequence is then performed, writing the longitudinal check character, 17_8. If the controller is in odd parity mode (binary) when a file mark is written or read, a parity error occurs.

10) Rewind Load (A10-7 = 1000) - rewinds tape at high speed to load point. The controller remains Busy until tape is positioned at load point and End of Operation status/interrupt occurs.

11) Rewind Unload (A10-7 = 1100) - rewinds tape to load point. The tape transport becomes Not Ready upon acceptance of the command. Manual intervention is required to reload the tape and place the transport in a Ready condition.

Unit Select: A Unit Select selects a tape transport and its operating conditions or deselects a transport. To perform a Unit Select, load Q with W = 00, E = equipment number, D = 10. Load A according to Figure 7 and Table 7, and do an Output from A. Tape unit, density, and mode (BCD or binary) can be selected simultaneously or individually. Unit Select is rejected if Controller Active or a program protect fault occurs or if an illegal code is selected (for example, two densities chosen).

TABLE 7. TAPE UNIT SELECT CODES

BITS 9-7 OF A	UNIT SELECT SWITCH SETTING
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

1) BCD (A1 = 1) - Data is read or written in even parity.

2) Binary (A2 = 1) - Data is read or written in odd parity.

3) 800 bpi (A3 = 1) - Data is recorded at a density of 800 bits per inch. *

4) Select 556 bpi (A4 = 1) - Data is recorded at a density of 556 bits per inch.

5) Select 200 bpi (A5 = 1) - Data is recorded at a density of 200 bits per inch.

6) Tape Unit 0-7 (A9-7) - This code matches the Unit Select setting of the desired transport.

7) Select Tape Unit (A10 = 1) - This code and bits 9-7 of A select a tape transport.

8) Deselect Tape Unit (A11 = 1) - The purpose of this function is to disconnect a tape transport that is selected and protected, thus allowing an unprotected program access to the controller. Deselect Tape Unit must be a singular type function.

Operations Defined by Q and Input to A

Read: A Read operation transfers data from tape to the computer and checks parity. To perform a Read, load Q with W = 00, E = equipment number, and D = 00. An Input to A initiates the transfer of one 6-bit character to the lower six bits of A.** Bits 6 and 7 of A are cleared. The upper 8 bits are not changed.

The controller transfers characters to the computer until the computer (or converter) stops requesting characters, or until the controller senses the end of a record. If the computer stops requesting characters, data transfer to the computer stops, but tape motion continues until the end of the record. If a new Read Motion function is received by the controller before tape motion stops at the end of a record, motion continues in a non-stop read.

Director Status 1: Director Status 1 is a status request which loads into the A register a status reply word showing the current operating conditions of the 1731. The request is initiated by loading Q with W = 00, E = equipment number, D = 01, and executing an Input to A. Table 4 describes the contents of A register following the execution of this function. The Status Response section defines these bits.

Director Status 2: Director Status 2 is a status request which loads the A register a status reply word showing the static operating conditions of the 1731. The request is initiated by loading Q with W = 00, E = equipment number, D = 10, and executing an Input to A. Table 5 describes the contents of A register following the execution of this function. The Status Response section defines these bits.

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*Not used with 601 Tape Transport.

**If the input is a buffered input via the converter, an Output from A supplies address information to the converter. The converter controls the buffered operation and the lower 6 bits of each word in the buffer area are loaded with the characters from the tape.

Status Response

Director Status 1

Table 4 lists the meaning of bits set in the A register following a status request for operating conditions. These bits are further defined below.

Ready (A0 = 1): The tape transport is connected to the equipment and the tape system can perform on command.

Busy (A1 = 1): Equipment is in operation. The 1731 becomes Busy before a Reply is returned if a function can be performed.

Interrupt (A2 = 1): An interrupt condition exists and interrupt upon this condition has been selected. This bit is cleared when the interrupt is cleared.

Data (A3 = 1): A read/write data transfer can now be performed. It is cleared by a data transfer request.

End of Operation (A4 = 1): A new tape function can now be accepted. This bit sets at the completion of all tape motion functions except Rewind Unload.

Alarm (A5 = 1): This status bit monitors those conditions requiring the attention of the program or the operator. The following conditions set this bit as well as their own status bit:

1) End of tape,
2) Parity error,
3) Lost data,
4) Ready, i.e., change in Ready status is sensed at a time other than a Unit Select operation,or
5) File mark.

Lost Data (A6 = 1): The Data Transfer register was not empty when a new frame of data was received from the tape transport. This status bit sets only during a Read operation. A Lost Data condition causes all further data requests to be rejected and the Data interrupt to be disabled. Parity status is valid at the end of operation. A new Control Function can be used to clear the Lost Data condition.

Protected (A7 = 1): The PROGRAM PROTECT switch of the tape transport is enabled.

Parity Error (A8 = 1): An error was detected during data transfer or the controller has written a file mark or done a Read operation in the wrong mode. The parity check is complete and Parity Error status is valid at end of operation. Parity is not checked on backspace.

End of Tape (A9 = 1): An end of tape marker has been sensed.

Load Point (A10 = 1): A load point marker has been sensed.

File Mark (A11 = 1): A file mark has been sensed.

Controller Active (A12 = 1): Controller is Active controlling tape motion. Controller Active remains set approximately 4 ms after End of Operation following a Write, Write File Mark, or Read operation and approximately 11 ms after End of Operation following a backspace.

Director Status 2

Table 5 lists the meaning of bits set in the A register following a status request for static operating conditions. These bits are further defined below.

556 bpi (A0 = 1): The selected tape unit is set to operate at a density of 556 bits per inch.

800 bpi (A1 = 1): The selected tape unit is set to operate at a density of 800 bits per inch. This status bit should never be set when the 601 Tape Transport is connected to the 1731, but if bits 1 and 2 of A are clear, the tape is selected to operate at a density of 200 bits per inch.

Seven Track (A3 = 1): The selected tape unit is in 7-track mode. This bit should always be set when a 601 is selected.

Write Enable (A4 = 1): The file protect ring is in the supply reel and the tape has been loaded. Write operations may now be performed.

Interrupts

Interrupts are selected by the Control Function. They may be cleared by:

1) Issuing an Interrupt Clear which clears both the interrupt request and the interrupt.
2) Re-issuing the interrupt request except for the Alarm interrupt when the Alarm condition still exists, i.e., end of tape.
3) Issuing a Clear Controller.
4) Transferring data in the case of the Data interrupt.

Programming Example

This sample program performs the following:

1) Connects Equipment 1, Unit 1.
2) Selects Binary mode, 556 bpi.
3) Writes a 200-word record of all "1's".
4) As soon as Busy drops, backspaces one record.
5) Reads the 200-word record and stores the data in 200 successive memory locations.

SAMPLE PROGRAM

Hexa-decimal Address	Machine Code	Assembly Language			Comments	Step
0000 P	E000	A	LDQ	=N$0082	Connect Equipment 1	00001
0001 P	0082					
0002 P	C000		LDA	=N$0494	Select Unit 1, 556 bpi, Binary Mode	00002
0003 P	0494					
0004 P	0302		OUT	A1-*-1		00003
0005 P	1804		JMP*	A2	Reply	00004
0006 P	0000		INTERNAL REJECT		********UNDSYM	00005
0007 P	0000	A1	EXTERNAL REJECT		Connect Reject ********UNDSYM	00006
0008 P	18F7		JMP*	A	Try Again to Connect	00007
0009 P	E000	A2	LDQ	=N$0081	Equipment 1	00008
000A P	0081					
000B P	C000		LDA	=N$0080	Select Write Function	00009
000C P	0080					
000D P	0302		OUT	A3-*-1		00010
000E P	1804		JMP*	A4	Reply	00011
000F P	0000		INTERNAL REJECT		********UNDSYM	00012
0010 P	0000	A3	EXTERNAL REJECT		Function Reject ********UNDSYM	00013
0011 P	18F7		JMP*	A2	Reselect Write Function	00014
0012 P	C000	A4	LDA	=N-200	200-Word Counter	00015
0013 P	FF37					
0014 P	60FF		STA-	I		00016
0015 P	E000	A5	LDQ	=N$0080	Equipment 1	00017
0016 P	0080					
0017 P	C000		LDA	=N$FF	Pattern of All 1's	00018
0018 P	00FF					
0019 P	0305		OUT	A6-*-1	Write 200-Word Record	00019
001A P	D0FF		RAO-	I		00020
001B P	C0FF		LDA-	I	Check Counter	00021
001C P	0104		SAZ	A7-*-1		00022
001D P	18F7		JMP*	A5		00023
001E P	0000		INTERNAL REJECT		********UNDSYM	00024
001F P	0000	A6	EXTERNAL REJECT		********UNDSYM	00025
0020 P	18F4	JMP*	A5			00026
0021 P	E000	A7	LDQ	=N$0081	Equipment 1	00027
0022 P	0081					
0023 P	0205		INP	A8-*-1	Input Status	00028
0024 P	A000		AND	=N$2	Check Busy	00029
0025 P	0002					
0026 P	0104		SAZ	A9-*-1	Not Busy	00030
0027 P	18F9		JMP*	A7	Loop On Busy	00031
0028 P	0000		INTERNAL REJECT		********UNDSYM	00032
0029 P	0000	A8	EXTERNAL REJECT		********UNDSYM	00033

SAMPLE PROGRAM (Cont'd)

Hexa-decimal Address	Machine Code		Assembly Language		Comments	Step
002A P	18F6		JMP*	A7	Re-Status	00034
002B P	E000	A9	LDQ	=N$0081	Equipment 1	00035
002C P	0081					
002D P	C000		LDA	=N$0180	Backspace	00036
002E P	0180					
002F P	0302		OUT	A10-*-1		00037
0030 P	1804		JMP*	A11	Reply	00038
0031 P	0000		INTERNAL REJECT		********UNDSYM	00039
0032 P	0000	A10	EXTERNAL REJECT		********UNDSYM	00040
0033 P	18F7		JMP*	A9	Re-Function	00041
0034 P	E000	A11	LDQ	=N$0081	Equipment 1	00042
0035 P	0081					
0036 P	C000		LDA	=N$0100	Select Read Function	00043
0037 P	O100					
0038 P	0302		OUT	A12-*-1		00044
0039 P	1804		JMP*	A13	Reply	00045
003A P	0000		INTERNAL REJECT		********UNDSYM	00046
003B P	0000	A12	EXTERNAL REJECT		********UNDSYM	00047
003C P	18F7		JMP*	A11	Reselect Read Function	00048
003D P	C000	A13	LDA	=N-200	200-Word Counter	00049
003E P	FF37					
003F P	60FF		STA-	I		00050
0040 P	E000	A14	LDQ	=N$0080	Equipment 1	00051
0041 P	0080					
0042 P	0207		INP	A15-*-1	Input Data to A	00052
0043 P	6900		STA	DATA+200, I	Store Data at Data Block	00053
0044 P	00D1					
0045 P	D0FF		RAO-	I		00054
0046 P	C0FF		LDA-	I	Check Counter	00055
0047 P	0104		SAZ	A16-*-1		00056
0048 P	18F7		JMP*	A14		00057
0049 P	0000		INTERNAL REJECT		********UNDSYM	00058
004A P	0000	A15	EXTERNAL REJECT		********UNDSYM	00059
004B P	18F4		JMP*	A14		00060
004C P	0000	A16	SLS		STOP ********UNDSYM	00061
004D P	00C8		BZS	DATA (200)	Data Block	00062
			END			00063

SYMBOL TABLE

A10	0032 P	A11	0034 P	A12	0038 P	A13	003D P	A14	0040 P	A15	004A P	A16	004C P
A1	0007 P	A2	0009 P	A3	0010 P	A4	0012 P	A5	0015 P	A6	001F P	A7	0021 P
A8	0029 P	A9	002B P	A	0000 P	DATA	004D P	I	00FF				

1731 Switches and Indicators

Equipment Number Switch: This 16-position switch selects the address number of the controller. It is located on the controller chassis and can be found by opening the back door of the tape transport in which the controller is mounted.

PROGRAM PROTECT Switches: These eight toggle switches, one for each tape transport, select the Program Protect condition for that transport.* These switches are located beside the Equipment Number switch.

Controller Power On Switch: This switch, located on the power supply, applies power to the controller power supply and blower.

CONNECT Indicator: This indicator lights when the controller is connected. It is located on the front indicator panel of the tape transport containing the controller.

PROTECT Indicator: This indicator lights when a protected tape transport is selected.

BCD/PE Indicator: The BCD half of this indicator lights when BCD (even parity) is selected. The PE half lights when a parity error occurs.

601 Switches and Indicators

Power On Switch: This switch applies initial energizing power to the tape transport. It is located on the maintenance panel and can be found by opening the lower front door of the tape transport.

POWER/WRITE ENABLE Switch/Indicator: The POWER switch/indicator lights when power is available. Pressing the switch removes power. The WRITE ENABLE indicator lights when the file protection ring is in place in the supply reel.

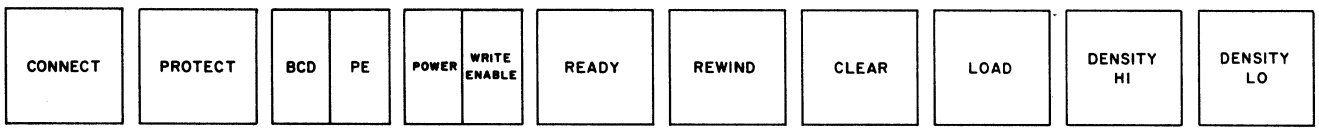

Figure 8. Switches and Indicators

* See Program Protection, page 5.

READY Switch/Indicator: READY switch places the tape transport under program control. The indicator is lighted when the tape transport is under program control.

REWIND Switch/Indicator: REWIND rewinds the tape to load point at high speed. It is lighted during this operation.

CLEAR Switch: This switch Master Clears the tape transport and places it under manual control. It stops tape motion immediately.

LOAD Switch/Indicator: LOAD moves tape forward to load point. It is lighted when the tape is at load point.

DENSITY HI Switch/Indicator: DENSITY HI selects a density rate of 556 bpi and is lit if 556 bpi has been selected.

DENSITY LO Switch/Indicator: DENSITY LO selects a density rate of 200 bpi and is lit if 200 bpi has been selected.

Unit Select Switch: This eight position dial selects the unit number of the tape transport.

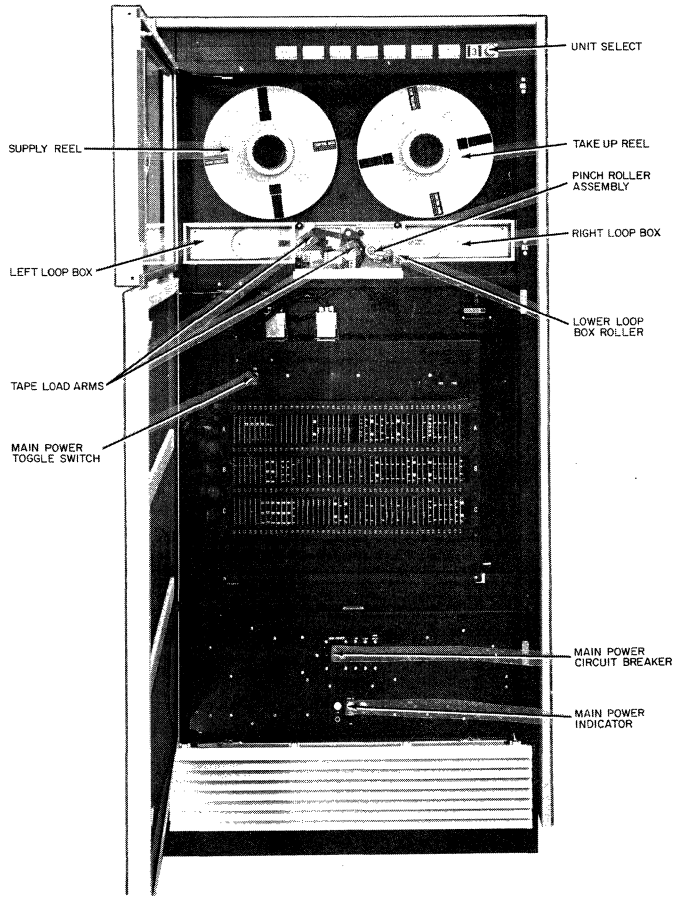

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Figure 9. 601 Tape Transport

Application of Power to Tape Transport

The tape transport is initially energized as follows:

1) Open the lower door on the front of the cabinet (Figure 9).
2) Place the MAIN POWER circuit breaker in the ON position. The MAIN POWER indicator will light.
3) Place the remaining power supply circuit breakers in the ON position.
4) Hold the maintenance panel Power On switch in the ON position for approximately two seconds, then release.
5) Observe illumination of the POWER indicator on the operator panel. If the indicator fails to illuminate, repeat the procedure.
6) Close the lower front door.

The POWER switch on the operator control panel is used only to remove power from the unit. Once this switch is pushed, steps 4 and 5 must be repeated to apply primary power.

When more than one transport is connected to a single tape control unit, do not energize or deenergize a unit while a second unit is performing a Read or Write operation. This action could cause data loss due to extraneous signals on the line.

Tape Load Procedure

The magnetic tape is loaded on the tape transport as follows:

1) Open the observation window.
2) Check that the supply reel has been file-protected if necessary. If the installed supply reel contains a file protection ring, the WRITE ENABLE indicator lights when the tape unit is loaded, indicating that a Write operation may be performed.
3) Mount the tape supply reel on the left-hand hub (Figure 9) and tighten the hub knob.

   For proper alignment, push the reel firmly against the hub stop before tightening the knob.
4) Open the center door which covers the read/write heads and capstan assembly. Open the right loop box door.
5) Pull sufficient tape from the supply reel to reach the take-up (right) reel. Thread the tape under the left load arm roller, between members of the pinch roller assembly, under the lower roller of the right loop box, inside the upper idler roller, and wind on the take-up reel. Provide sufficient tape slack to allow two turns of tape on the take-up reel.
6) Set the Unit Select switch (Figure 9) to one of eight (0-7) positions to assign a logical program selection number.
7) Close the central (head cover) door. Close the right loop box door.
8) Press the LOAD switch on the operator control panel. This causes the tape loops to be pulled into the loop boxes, and the load arms to move down to position the tape over the read/write heads and into the tape guide channels.

9) The magnetic tape moves forward, stopping at the load point marker. If the tape continues to move forward for more than 3 or 4 seconds, no load point marker was placed on the tape leader area or the operator has wound the marker onto the take-up reel while performing step 5. Press the CLEAR switch to stop motion. Press the REWIND switch and wait until the tape has stopped at the load point.

10) If the unit is to be externally controlled, press the READY switch at the upper control panel. If the tape transport is to be manually operated, and the READY switch has been pressed (indicator illuminated), press the CLEAR switch.

11) Close the observation window.

Tape Unload Procedure

1) Press the CLEAR switch on the operator's control panel to remove the Ready condition.

2) Press the REWIND switch on the operator's control panel. The REWIND indicator will light and the tape will be drawn from the loop boxes before the tape transport goes into high speed rewind. Motion stops when the load point is detected.

3) With the transport stopped on the load point, press the REWIND and CLEAR switches. This drops the vacuum in the loop boxes, and the load arm rises to disengage the tape.

4) Open the observation window and manually wind the remaining tape onto the supply reel.

5) Loosen the supply reel hub knob and remove the supply reel.

NOTE

The vacuum may be dropped at any point on the tape by pressing the REWIND and CLEAR switches simultaneously.

6) Close the observation window.

Application of Reflective Marker

Reflective markers are required near the beginning of the tape (load point marker) and near the end of the tape (end-of-tape marker). These markers are plastic strips coated on one side with vaporized aluminum and on the other with adhesive, and should be 1 inch long and 3/16 inch wide. They are placed on the uncoated side of the tape.

Positioning: The load point marker is placed at least 10 feet from the beginning of the tape with the 1-inch dimension parallel to and not more than 1/32 inch from the track 0 edge of the tape (the edge nearer the operator when the reel is mounted).

The end-of-tape marker is placed at least 18 feet from the end of the tape when the tape is on the take-up reel. The 1-inch dimension should be parallel to and not more than 1/32 inch from the track 6 edge of the tape (the edge nearer the unit when the reel is mounted).

Procedure:

1) Avoid tape contamination and/or damage.
2) Perform work on a flat stationary surface.
3) Align marker properly.
4) Remove all air bubbles and excess adhesive.

COMMENT SHEET

MANUAL TITLE 1731-A/B MAGNETIC TAPE CONTROLLER

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