

*Reference Manual*

**CONTROL DATA<sup>®</sup>  
162 (S) TAPE  
SYNCHRONIZER**



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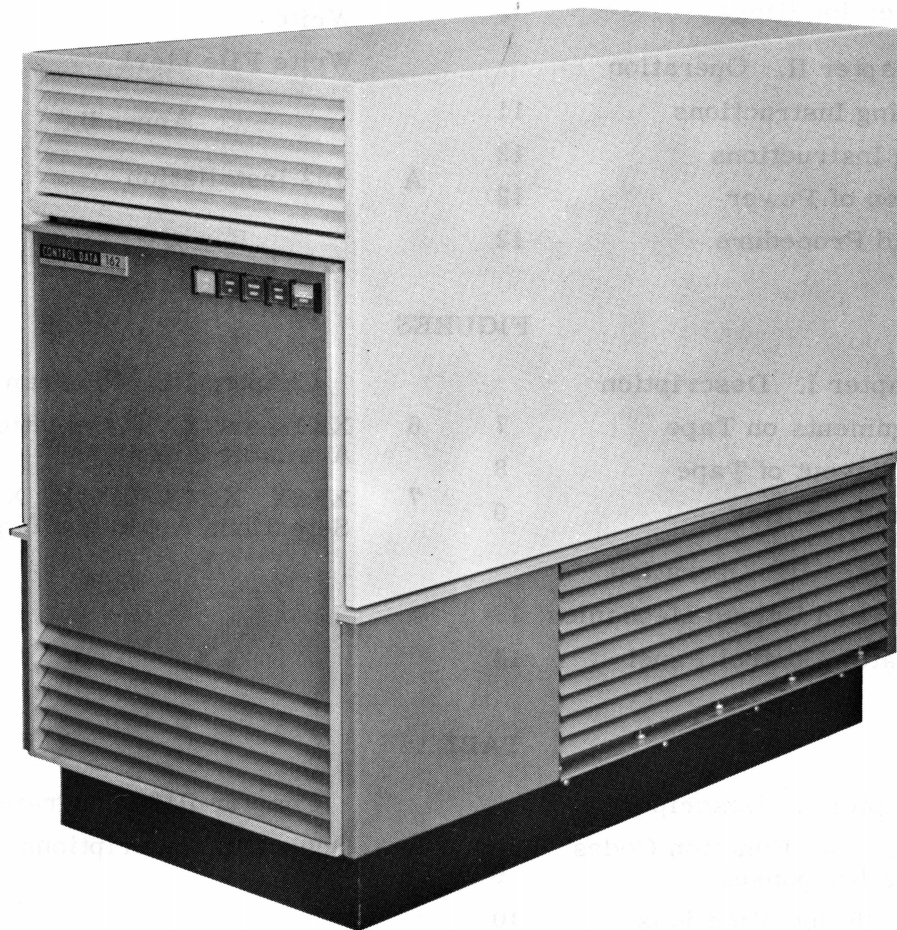
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## CHAPTER I DESCRIPTION

The CONTROL DATA\* 162(S) Magnetic Tape Synchronizer is an input/output device for the CONTROL DATA 160 or 160-A Computer System. The 162(S) allows the computer to communicate with up to four CONTROL DATA 605 Magnetic Tape Handlers.

Computer-tape handler operation is selected by computer EF codes. The EF codes control the following functions:

- 1) Preliminary selection
  - system
  - tape handler
  - word length
  - parity
- 2) Motion control
  - backspace one record
  - search backward to file mark
  - search forward to file mark
  - rewind
  - rewind unload
- 3) Information transfer
  - write
  - write file mark
  - read
  - status

### PHYSICAL DESCRIPTION

The 162(S) is constructed of standard Control Data logic cards mounted on three hinged chassis. The chassis and the independent power supply are mounted in a cabinet 18 inches wide, 30 inches deep, and 28 inches high. The unit weighs 350 pounds and generates 4200 BTUs. Connectors are available for the following cables:

- 4 on-line logic cables\*\*
- 8 logic cables for the tape handlers
- 1 power cable
- 10 spare

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\*\* Two connectors are available for input, two for output. This permits other equipment to be connected within the system.

FUNCTIONAL DESCRIPTION

PRELIMINARY SELECTIONS

SYSTEM, TAPE HANDLER, WORD LENGTH	Selected by the initial EF code Y1nX (Y1 = system, Y = word length, X = tape handler) (Y = 1 or 2, X = 0 through 7). (See table 1 and chapter 3).
PARITY	Selected by a Y17X code (Y = 1 or 2, X = parity [1 - odd, 2 - even] ).

MOTION CONTROL

BACKSPACE ONE RECORD	Initiated by the select code Y12X (Y = word length, X = tape handler) and an INA instruction.  The 162(S) signals the tape handler to start reverse tape motion. Motion continues automatically until the tape handler recognizes an end of record gap. Motion then stops and the tape handler and the 162(S) are cleared for future operation.
SEARCH BACKWARD TO FILE MARK	Initiated by the select code Y12X (Y = word length, X = tape handler) and no INA instruction.  The 162(S) signals the tape handler to start reverse tape motion and to ignore end of record gaps. Tape motion continues automatically until a file mark (17 <sub>8</sub> BCD) is sensed. Once the 162(S) has signalled the tape handler, it is available for operation with other tape handlers. When the initial tape handler has sensed the file mark, it is available for other operation.
SEARCH FORWARD TO FILE MARK	Initiated by the select code Y13X (Y = word length, X = tape handler) and no INP instruction.  Same as search backward except for tape motion direction.
REWIND	Initiated by the select code Y16X (Y = word length, X = tape handler).

MOTION CONTROL (Cont'd)

<p>REWIND (Cont'd)</p>	<p>The 162(S) sends the rewind signal to the tape handler which starts high speed reverse tape motion. The 162(S) is then available for other operation with other tape handlers. Motion continues in the initial tape handler until the load point is sensed. The tape handler is then available for new operation using forward motion.</p>
<p>REWIND UNLOAD</p>	<p>Initiated by the select code Y15X (Y = word length, X = tape handler).</p> <p>Similar to a rewind operation except that the tape does not stop at load point but is completely unloaded from the reel. Further operation necessitates manual reloading.</p>

INFORMATION TRANSFER

<p>WRITE</p>	<p>Initiated by the select code Y11X (Y = word length, X = tape handler) and an OUT instruction.</p> <p>The 162(S) signals the tape handler to start forward tape motion. After a delay equal to the time required to move the tape 3/4 of an inch (record gap), the 162(S) receives a 12-bit computer output word.</p> <p>If the assembly mode (12-bit word length) is selected, the 162(S) disassembles the computer word into two 6-bit words, generates a parity bit for each word, and passes them (highest order word first) to the tape handler.</p> <p>If the character mode (6-bit word length) is selected, the 162(S) takes the lowest order 6 bits of the computer word, generates a parity bit, and passes the 7 bits to the tape handler.</p> <p>The tape handler writes each word it receives from the 162(S) as a 7 channel frame.</p>
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INFORMATION TRANSFER (Cont' d)

<p>WRITE (Cont'd)</p>	<p>Operation continues as long as the computer sends output words to the 162(S). When output ceases the 162(S) generates the following:</p> <ol style="list-style-type: none"><li>1) check character gap (space equivalent to three frames).</li><li>2) check character (longitudinal parity bit for each channel). The check character is passed to the tape handler to be recorded.</li></ol> <p>Each recorded frame is read back to the 162(S) and checked for horizontal parity error. These read back circuits (write reply) activate the end of record circuits when they sense an end of record gap. At that time a check is made on the write reply longitudinal parity character and record length. The end of record circuits terminate operation and clear the tape handler and the 162(S) for future operation.</p>
<p>WRITE FILE MARK</p>	<p>Initiated by the select code Y11X (Y = word length, X = tape handler and no OUT instruction).</p> <p>The 162(S) signals the tape handler to start tape motion and, after a delay equal to the time required to move the tape 6 inches, sends the file mark to the handler. The file mark (17<sub>8</sub>) is written as if it were a one frame record of BCD information; i.e., data is recorded, a check character gap is left on the tape, and the check character is recorded. When the end of record gap is sensed by the write reply circuit, operation is terminated and the units are cleared for future operation.</p>
<p>READ</p>	<p>Initiated by the select code Y12X (Y = word length, X = tape handler) and an INP instruction.</p> <p>The 162(S) signals the tape handler to start tape motion. The tape handler read heads sense each frame of recorded data and transfer the frame (7 bits) to the 162(S).</p>



INFORMATION TRANSFER (Cont'd)

<p>READ (Cont'd)</p>	<p>If the assembly mode (12-bit word length) is selected, the 162(S) assembles each two successive 6-bit words into a 12-bit input word (first word - highest order).</p> <p>If the character mode (6-bit word length) is selected, the 162(S) assembles each 6-bit tape handler word into the lowest order of a 12-bit input word (upper 6 bits all "0's").</p> <p>As each tape handler word passes through the 162(S), a new parity bit is generated for each 6 bits of data and compared to the recorded parity bit. If they differ, an indicator lights.</p> <p>When the end of record is sensed, the longitudinal parity check character is inspected for error, the operation is terminated, and the units are cleared for future operation.</p> <p>Tape motion continues until the end of record is sensed, even if the computer stops requesting input. Data, however, is not passed to the computer.</p>
<p>STATUS</p>	<p>Initiated by the select code Y14X (Y = word length, X = tape handler). Completed at any later time by a INA instruction.</p> <p>Circuits are enabled in the 162(S) that generate a pseudo input word. The word reflects conditions existing in the tape handler and the 162(S). The computer receives the input word when an INA instruction is sent to the 162(S). Translation of the status response word is shown in table 1.</p>

TABLE 1. 162(S) EXTERNAL FUNCTION CODES AND STATUS RESPONSES

162(S) EXTERNAL FUNCTION CODES		
CODE	COMPUTER INSTRUCTION	FUNCTION
Y11X	OUT	Write
Y11X	(no OUT)	Write end of file mark
Y12X	INA	Backspace tape one record
Y12X	(no INA)	Search backward to file mark
Y13X	INP	Read
Y13X	(no INP)	Search forward to file mark
Y14X		Status request
Y15X		Rewind unload
Y16X		Rewind load
Y171		Odd parity (binary)
Y172		Even parity (binary coded decimal)
Y = 1: 6-bit mode Y = 2: 12-bit mode X = (0 to 7): designates one of the four 605's		

162(S) STATUS RESPONSE

0000	Odd parity selected - no errors
0001	Even parity selected - no errors
0002	Selected 605 not ready
0004	Parity error
0015	Illegal BCD detected on Write
0020	End of file read
0040	End of tape or load point sensed
0200	Selected 605 busy

NOTE: Master bits 12, 13 or 22, 23 are used for second and third 162's.

## 605 FUNCTIONAL CHARACTERISTICS

### TAPE FORMAT

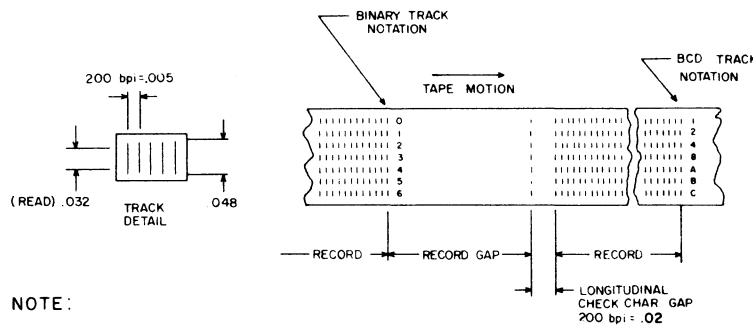
Magnetic tape provides a high speed, non-volatile storage medium for recording information. The tape has a plastic base, coated on one side with a magnetic oxide which consists of minute particles of iron oxide mixed with a binding agent.

Information is read (detected) or written (stored) by passing the oxide side of the tape over read/write heads. Information is written or read on independent tracks on the tape by seven recording heads placed vertically across the tape.

A 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 results in a "0". Thus, each track of the tape is fully magnetized and the polarity is reversed as each "1" bit is recorded.

A line of tape data consists of a 6-bit character and a parity (check) bit. Tracks 0 through 5 specify the character; track 6 holds the parity bit (figure 1).

In Control Data systems, data is recorded in: binary or binary coded decimal (BCD) format. Tape is binary if data is recorded as it is represented in core storage. In BCD format, digits, characters and special symbols are represented in core storage by 6-bit binary numbers.



**NOTE:**

1. OXIDE SIDE UP ON DIAGRAM, RECORDING HEAD ON SAME SIDE AS OXIDE.
2. WRITE FREQUENCY  $30 \text{ KC} \pm 1\%$
3. AVERAGE STEADY STATE TAPE SPEED  $150 \text{ in/sec} \pm 1\%$

Figure 1. Bit Assignments on Tape

The formats also differ in selection of parity bits. In binary format the parity bit is chosen so that the total number of "1" bits in any line is odd. In BCD format the total number of "1" bits is even. The format is selected by the synchronizer.

Recorded data on the tape is arranged in groups called records and files. A minimum of one line of information constitutes a record. Adjacent records are separated by a 3/4 inch unrecorded area (record gap). A longitudinal parity bit is recorded in coded format 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 mark six inches from the last record in the file. The file mark consists of an octal 17 (BCD) and its check character.

### REFLECTIVE SPOTS

Reflective spots are placed on the tape to determine the beginning and end of the usable portion of the magnetic tape. The reflective spots are plastic, 1 inch long by 3/16 inch wide, coated on one side with adhesive strips and on the other with vaporized aluminum. They are placed on the base or uncoated side of the tape and detected by photosensing circuits.

The load point marker must be placed at least 10 feet from the beginning of the tape on the supply reel (figure 2). This marker is placed with its 1-inch dimension parallel to, and not more than 1/32 inch from the edge of the tape nearest the operator when the file reel is mounted.

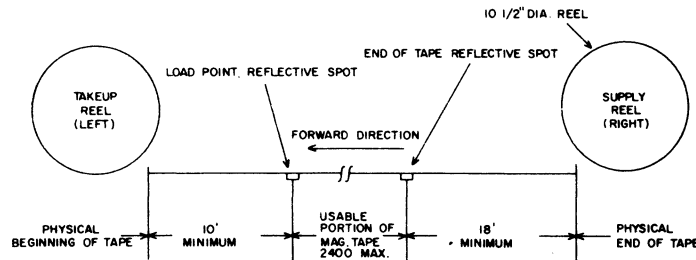


Figure 2. Physical Layout of Tape

The end of tape marker should be placed not less than 18 feet from the end of the tape attached to the takeup reel hub. This space includes approximately 10 feet of tape trailer and enough tape to hold a record of 20,000 characters after the end of tape marker is sensed. The marker is placed with its 1-inch dimension parallel to, and not more than 1/32 inch from the edge of the tape nearest the tape unit (when reel is mounted).

Markers are applied while the reel is removed from the tape unit and must be properly aligned and firmly attached to the tape. Use care to avoid dust accumulating on the tape while attaching markers.

#### FILE PROTECTION RINGS

The back of the file reel has a slot near the hub which accepts a plastic file protection ring (figure 3). Writing on a tape is possible only when the reel contains this ring but tape may be read with or without the ring. Presence of a ring on a reel of tape is signaled by the overhead lights which turn on immediately after the tape load procedure is executed. The lights remain on until the ring is removed or the tape unit is placed in the unload status. The ring should be removed from the file reel after writing to avoid loss of records through accidental rewriting.

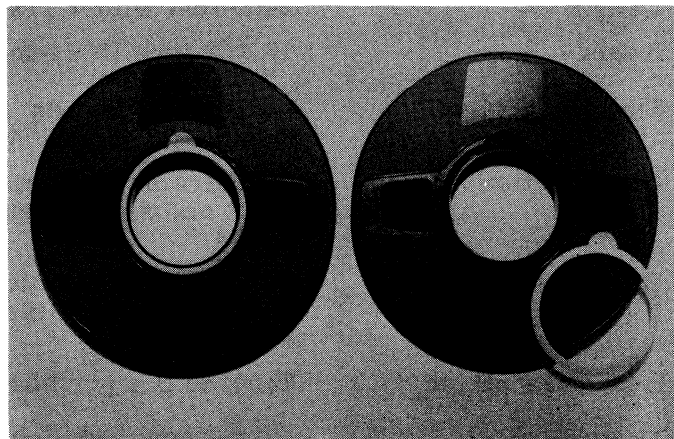


Figure 3. File Protection Ring

TABLE 2. DETAILED 605 SPECIFICATIONS

RECORDING FORMAT	Method	NRZ1 (non-return-to-zero - change-on-ones)
	Seven Track Recording	Data 6 bits, parity 1 bit, self clocking
	Inter-Record Gap	3/4 inch
	Tape Markers	End of tape and load point reflective spot
	Recording Density	200 frames per inch
	Compatibility	Compatible with IBM 727 and 729 I, II, III and IV Tape Unit's recording modes
TAPE SPEED	Read/Write	150 inches per second $\pm 1\%$
	Reverse Search	150 inches per second $\pm 1\%$
	Rewind and Unload	Over 320 inches per second
	Start Time	3 ms (2.75 ms $\pm 0.5$ ms)
	Stop Time	2 ms (1.75 ms $\pm 0.5$ ms)
	Start Distance	0.100 inch $\pm 30\%$
	Stop Distance	0.225 inch $\pm 30\%$
CHARACTER RATE		30,000 per second
TAPE	Width	1/2 inch
	Length	2400 feet with 1 1/2 mil base Mylar tape
	Reels	10 1/2 inch IBM hub with file protect ring
PHYSICAL	Size and Weight	Height - 72 inches Width - 28 inches Depth - 33 inches Weight - 800 pounds
	Construction	Steel frame on casters with removable front and side panels and hinged rear doors.
	Environment	60° to 90° F, humidity 10° above dew point, dust free (typical computer room environment)
	Heat Dissipation	7500 BTU's per hour
ELECTRICAL	Power Source (single phase)	115v $\pm 10\%$ , 60 cycle, single phase, 30 amp circuit. Average load at 120v; 25 amps and 2.2 KW.
	(three phase)	208v $\pm 10\%$ , 60 cycle, three phase, 15 amp circuit. Average load at 208v. Unloaded - 1 amp Loaded/Ready - 8 amps Operation - 11 amps

CHAPTER II  
OPERATION

162(S) OPERATING INSTRUCTIONS

Make certain that necessary cables are connected:

- 2 cables to the computer
- 2 cables to each tape handler
- 1 power cable

Press Power On switch (table 3).

TABLE 3. 162(S) CONTROLS

Name		Function
Binary/Coded	S/I-I*	Press to change parity mode. If the Binary indicator lights, binary mode (odd parity) is selected; if the Coded indicator lights, coded mode (even parity) is selected.
Parity Error	I	Indicates that the 162(S) has sensed an illegal BCD or a parity error.
Program Error	I	Indicates that the 162(S) has sensed an illegal BCD or that a backspace selection was made while the tape was at load point.
Power On	S/I	Press to supply power - lights when power is on.
Power Off	I	Press to turn off power.

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\*S = Switch

I = Indicator

## 605 OPERATING INSTRUCTIONS

### APPLICATION OF POWER

To initially energize the tape unit:

- 1) Open doors at back of cabinet.
- 2) Push the two line circuit breakers (on power supply) to the Up position. The neon indicator should light.
- 3) Push the two reel power circuit breakers (on power supply) to the Up position.
- 4) Hold the Power On switch on the maintenance panel in the Up position for about two seconds. The pump motor should start.
- 5) The Power On indicator on the front panel should turn on. If not, repeat the procedure.
- 6) Close the back doors.

The Power switch on the front control panel is used only to remove power from the unit. Once this switch is pushed, the above procedure must be repeated in order to apply power to the unit.

### TAPE LOAD PROCEDURE

- 1) Slide front door down to lowest position (figure 4).
- 2) Check that supply reel has been file protected as necessary.
- 3) Mount reel on supply reel hub and tighten hub knob.
- 4) Make sure that tape load arms are in Up position.
- 5) Pull tape from supply reel to reach takeup reel. Thread tape on the outside of the supply tape load arm, over the head assembly, around the outside of the takeup load arm and over the top of the takeup reel. Release tape and spin the takeup reel hub two or three times.
- 6) Slide tape under head assembly.
- 7) Snap tape load arms down.
- 8) Set Unit Selection switch (0-7 or standby) to desired program selection number.
- 9) Press Clear switch.
- 10) Press Load Point switch. Tape will drop in columns, move forward, and stop on load point marker. Load Point light will turn on. If tape continues moving forward for more than 3 or 4 seconds, either no load point marker was placed on the tape or the operator manually wound the marker onto the takeup reel during step 5.
- 11) If the unit is to be controlled by the synchronizer, press the Ready switch. If it is to be manually operated and the Ready switch has been pushed, press the Clear switch.
- 12) Push up door.



If the supply reel contains a file protection ring, the overhead lights should be on, indicating that a Write operation may be performed.

#### TAPE UNLOAD PROCEDURE

- 1) Press Clear switch.
- 2) Press Unload switch. All tape will automatically be drawn from the takeup reel and wound on the supply reel. The Unload indicator will light.
- 3) Slide down front door.
- 4) Loosen supply reel hub knob and remove supply reel.
- 5) Check if reel needs to be file protected and if it is labeled adequately prior to storage.

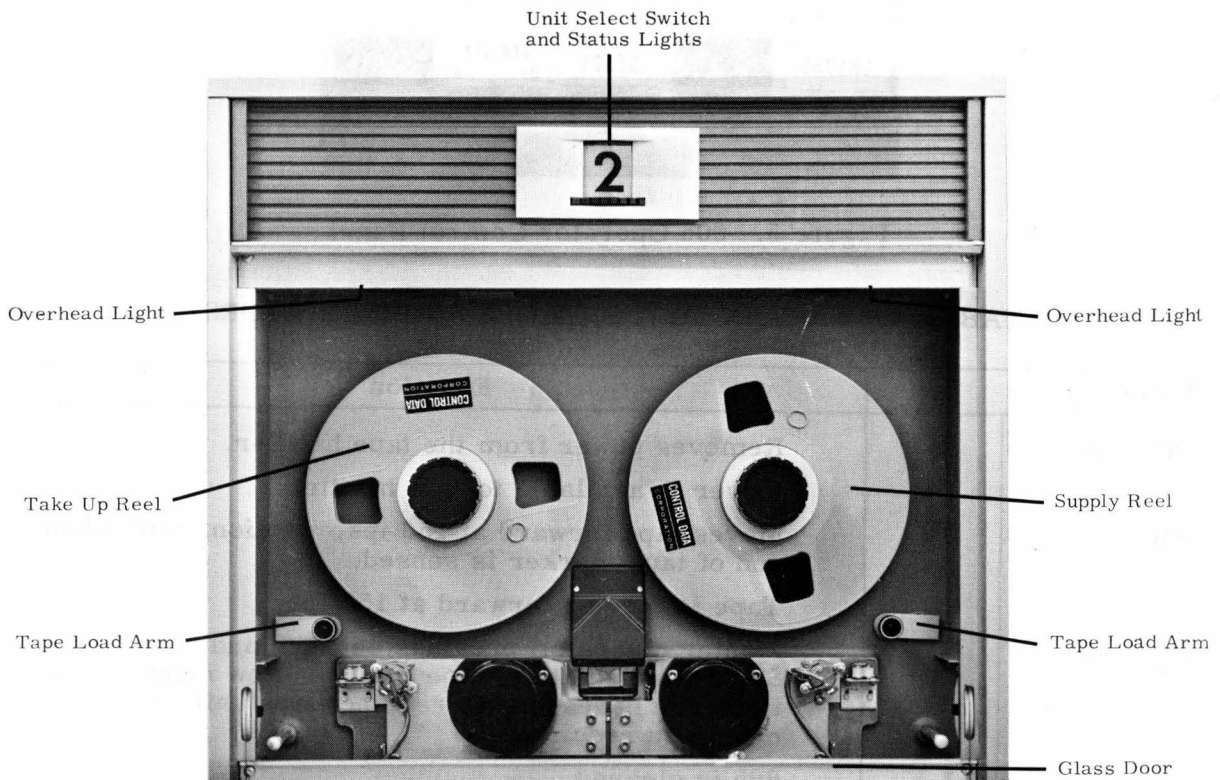


Figure 4. Tape Load and Unload Mechanics

## MANUAL OPERATION

The manual controls and indicators for operating each tape unit are mounted on a panel located below the front door of the unit (figure 5). The functions of the controls are described in table 4.

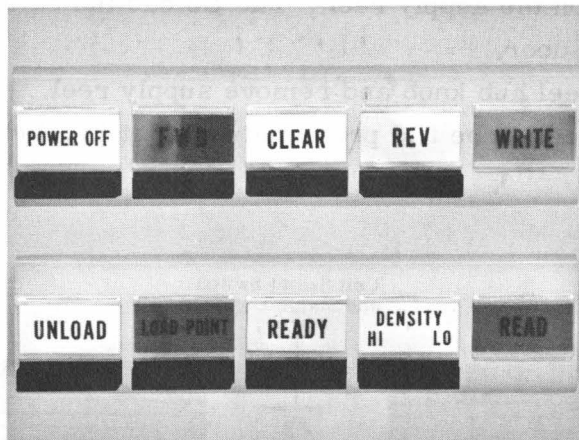


Figure 5. 605 Operator Control Panel

TABLE 4. 605 MANUAL CONTROLS AND INDICATORS

Name		Function
POWER	S*	Removes power from the tape handler.
	I**	Power is available to tape handler.
FWD	S	Moves tape forward at 150 ips. Motion stops when end of tape marker is sensed.
CLEAR	I	Tape is moving forward at 150 ips.
	S	Master clears all previous settings and conditions. Stops (immediately) tape motion. New manual selections are necessary to reselect tape unit and/or operation required.
REV	I	605 is cleared.
	S	Rewinds tape at 320 ips. Motion stops when load point marker is sensed.
WRITE	I	Tape is moving in reverse direction at 150 or 320 ips.
	I	Write operation is in progress.

\* Switch

\*\* Indicator

TABLE 4. (Cont'd)

Name		Function
UNLOAD	S	Moves tape at 320 ips to unload position (all tape on supply reel). Tape load procedure must be performed to resume operation.
	I	Tape is in unload status.
LOAD POINT	S	Moves tape forward at 150 ips to load point marker. Motion stops when marker is sensed.
	I	Tape is at load point marker.
READY	S	Places 605 under external control.
	I	Unit is under external control.
READ	I	Read operation is in progress (not write reply).
UNIT SELECTION	S	10-position switch; 0-7 provide input designation and two standby positions disconnect unit from external control.
	I (White)	Unit select light #1.
	I (Red)	Unit select light #2.
OVERHEAD LIGHTS	I	File protection ring is on reel (unit can write) and tape unit is not in the unload position.

#### SPECIAL INSTRUCTIONS

To simulate an unload condition without removing all tape from the takeup reel, simultaneously press the Clear and Unload switches. The unload condition will be simulated but tape will not move. To place the unit in operational status, remove all tape from the vacuum columns by revolving the takeup reel clockwise and the supply reel counterclockwise. Snap the tape load arms down and press the Load Point switch. The tape will move forward and stop on the nearest load point marker. The Load Point indicator will be turned on.

If all tape is unwound from the supply reel:

- 1) Snap tape load arms up, if necessary.
- 2) Guide tape around the tape load arms, over the head assembly, and wrap approximately ten turns around the supply reel.
- 3) Slide tape under head assembly.
- 4) Press the Load Point switch.
- 5) As soon as the Forward light turns on, press the Clear switch and then the Reverse switch. Tape will rewind on the nearest load point marker.

The following information is applicable when a number of load point or end of tape markers are used on a single tape.

To move forward from a reflective marker and stop at nearest end of tape marker, press the Forward switch.

To move forward off a reflective marker and stop at nearest load point or end of tape marker, press the Forward and then the Load Point switch. Load Point indicator will light if motion stops at load point marker.

To reverse from a reflective marker and stop at nearest load point marker, press the Unload, Clear, and Reverse switches in that order.

Tape motion may be stopped at any time by pressing the Clear switch. An unload operation may be performed by pressing the Unload switch.

## CHAPTER III PROGRAMMING

The 160-A input/output capabilities are activated by an External Function code:

- 75XX - The code is at the address found by adding the contents of the P register to XX. The next instruction is found at contents of P + 1.
- 7500 - The code is at the address found by adding the contents of the P register to 1. The next instruction is found at contents of P + 2.

The 160-A has two modes of input/output operation, buffered and normal.

### Buffered

- 7200 - Initiates the buffered input circuits, is followed by the next location if the buffer is busy. The next location will hold the address for the alternate control. If the buffer is not busy, the next instruction is found at the contents of P + 2.
- 7300 - Initiates the buffered output circuits, is followed by the next location if the buffer is busy. The next location will hold the address for the alternate control. If the buffer is not busy, the next instruction is found at the contents of P + 2.

Prior to either of these instructions, circuits must be enabled to transfer information internally. This is accomplished by the following instructions:

- 0105 - (A) to Buffer Entry register. The next instruction is found at the contents of P + 2. If the buffer is busy, at P + 1.
- 0106 - (A) to Buffer Exit register. The next instruction is found at the contents of P + 2. If the buffer is busy, at P + 1.
- 0107 - Buffer Entry register to the A register.
- 016X - Store the contents of the Buffer Entry register at location 6X. Transfer the A register to the Buffer Entry register.

### Normal

- 72XX - Initiates the normal input circuits. The address of the first input word is to be P + 00XX. The last word + 1 is found at the location referred to by P + 1.

- 73XX - Initiates the normal output circuits. The address of the first output word is to be P + 00XX. The last word + 1 is found at the location referred to by P + 1.
- 7600 - Input one word to the A register. Next instruction P + 1.
- 7677 - Output the contents of the A register. Next instruction P + 1.
- 74XX - Output XX. Next instruction P + 1.

TABLE 5. OPERATION DESCRIPTIONS

WRITE	Y11X starts forward tape motion. Output instruction triggers sprocket signal to tape handler and gates output word to the tape to be written.
WRITE FILE MARK	Y11X starts forward tape motion. After 6 inches of tape, file mark (17 <sub>g</sub> ) and check character are written.
BACKSPACE ONE RECORD	Y12X starts reverse tape motion. Input instruction triggers signal to tape unit that enables the tape unit to recognize the end of record gap.
BACKSPACE TO FILE MARK	Y12X starts reverse tape motion. Without input instruction the tape unit recognizes only the file mark gap (not the record gap). Once selection is made, the 162(S) is free to communicate with other tape units.
READ	Y13X starts forward tape motion. Input instruction allows information to be read from tape.
SEARCH FILE MARK	Y13X starts forward tape motion. Without input instruction the tape unit recognizes only the file mark gap (not the record gap). Once selection is made, the 162(S) is free to communicate with other tape units.
STATUS REQUEST	Y14X enables circuits that permit the computer to input the status response. The status response "busy" will be returned during a rewind or a search operation.
REWIND UNLOAD	Y15X starts reverse tape motion at high speed. Motion continues until tape has completely rewound off reel. 162(S) is free for other operation after initial selection.
REWIND LOAD	Y16X starts reverse tape motion at high speed. Motion continues until load point reflective spot is sensed. 162(S) is free for other operation after initial selection.

## 162(S) PROGRAM EXAMPLE

Write 500 words stored in locations 2000 through 2500.

ADDRESS	INSTRUCTION		DESCRIPTION
7000	7500	EXC	External Function code
7001	2171	select binary format for the 162	
7002	7500	EXC	
7003	2141	status request	
7004	7600	INA	Normal input to A
7005	0202	LPN	Logical product no address
7006	6002	ZJF	Condition met jump 02 locations Condition not met go to present loca- tion + 1
7007	7702	SLS	Halt (if switch #2 is set)
7010	7500	EXC	
7011	2111	select 12-bit Write	
7012	7315	OUT	Address of the first word found 15 locations forward. Address of the last word found at location after this one (7013). Continue program at location 2 - this one (7014).
7013	2501	terminating address +1	
7014	7500	EXC	
7015	2141	status request	
7016	7600	INA	Normal input to A
7017	0204	LPN	Logical product no address
7020	6002	ZJF	Condition met jump 02 locations Condition not met go to present location +1
7021	7704	SLS	Halt (if switch #4 is set)
7022	2200	LDC	Load to A (constant)
7023	0001	variable determines non-stop or non-start	
7024	0701	SBN	Subtract 1 from operand
7025	6501	NZB	Not zero jump back one location Zero continue
7026	6416	ZJB	Zero jump back 16 locations Not zero continue
7027	2000	starting address	

## PROGRAMMING TIME CONSIDERATIONS

Certain durations occur in a 162(S) operation that may be used for other computer operations. These durations are shown in figures 6 and 7. This information is intended only as a guide to more efficient programming; the times are approximate, dependent on differences in variable delay settings and circuit responses.

Also shown in figures 6 and 7 are the approximate times that the 162(S) is available for selection.

An explanation of these durations for a 605 Write and a Write File Mark selection is outlined below. For a more precise understanding of these considerations, see the 162(S) Customer Engineering Manual.

### WRITE

The XX1X select code enables the write circuits and initiates tape motion. Other operations may be performed in the time after the computer has received the Output Resume signal from the 162(S) (indicating that the selection has been accepted) and before it is necessary for the computer to issue its first output word. During this 4 ms period the tape attains operating speed and the tape moves forward 3/4 inches to assure a clean record gap.

Once output is started, the computer is not available for other operation until a record of information is processed.\* Upon reception of the Output Resume signal from the 162(S) (indicating the acceptance of the last word in the record), the computer is again available for other operations.

In a start-stop operation the 162(S) is not available for additional selection from the time it is selected until 6 ms after it accepts the last output word in the record. This 6 ms delay is necessary so that the tape can move from the write heads to the read heads, the end of record condition can be sensed by the read heads, and the end of record condition can terminate the write and the motion circuits.

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\* This statement does not apply if the 160-A buffer channel is used. However, because of relatively small percentage of computation time available when using buffered I/O, particularly in character mode, this statement is essentially correct.



In a non-stop operation (another record to follow immediately) reselection is possible during the last 400 usec of the 2.5 ms period after the computer has received the last Output Resume signal in the previous record. Reselection during this period permits initiation of the new operation without stopping the tape motion. The computer is available for other operations during the first 2.1 ms after the Output Resume and for 3 ms after the Output Resume signal for the new select code. The 3 ms duration assures the 3/4 inch record gap.

During a non-stop write operation, the 162(S) is available for selection only during the 400 usec mentioned above. It is available at this time for any selection that uses the same tape motion.

#### WRITE FILE MARK

The computer is available for other operations after it has received the Output Resume signal for the select code.

The 162(S) is available for other selections 45 ms after the initial selection. This 45 ms period allows time for write tape motion initiation, tape to move 6 inches for the file mark gap, and write circuit termination.

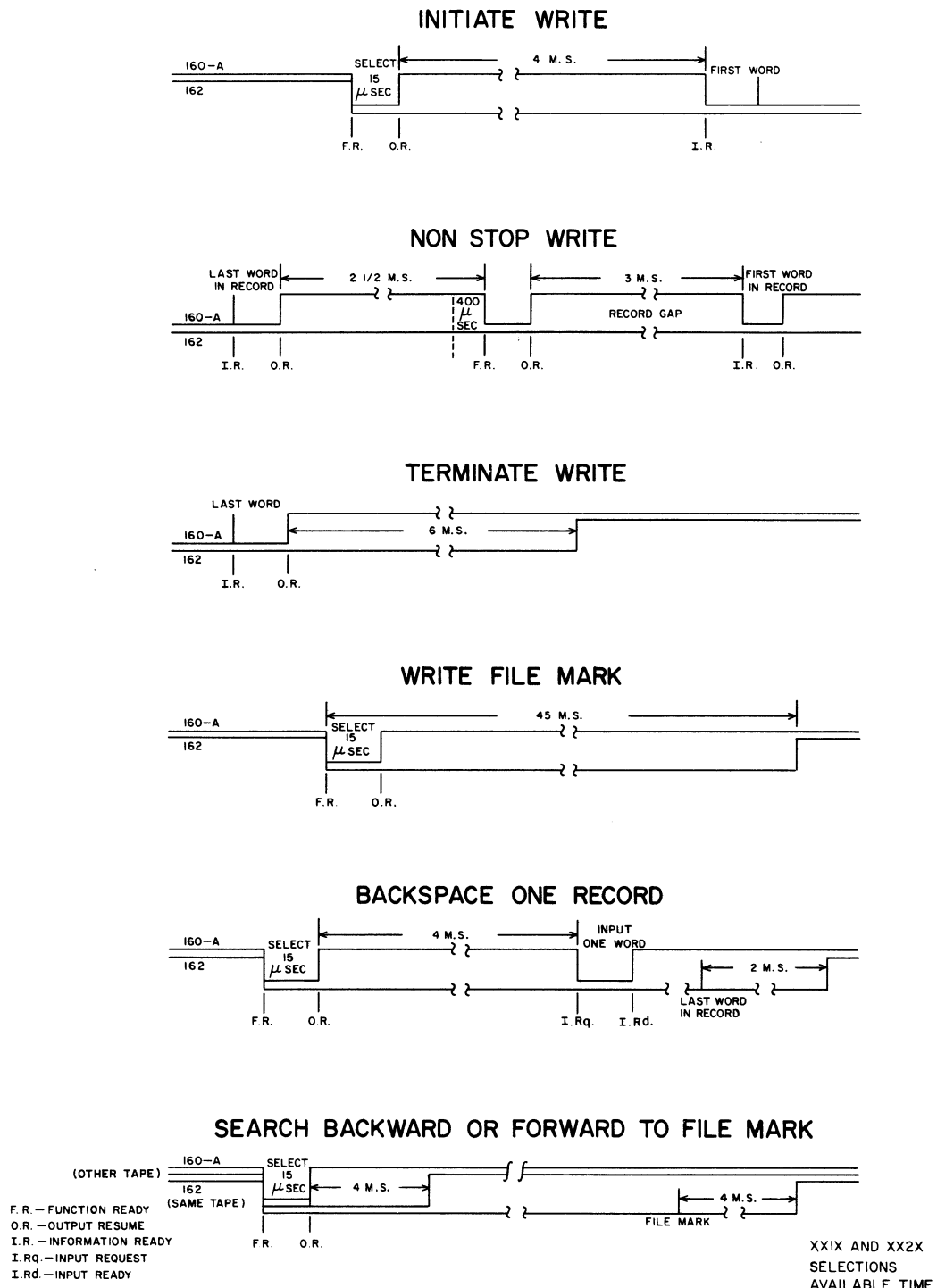
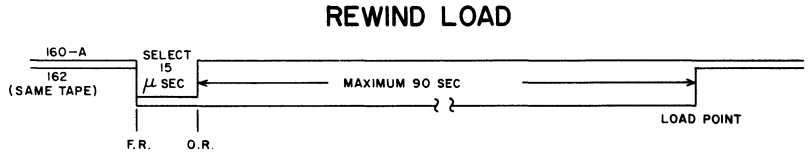
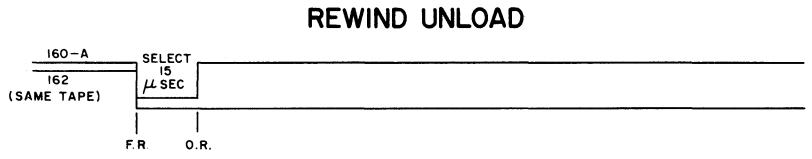
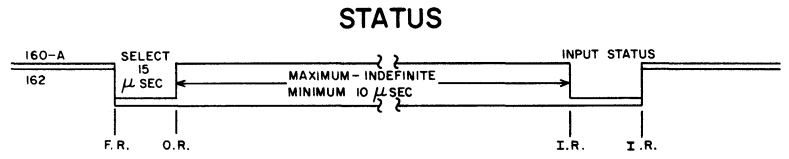
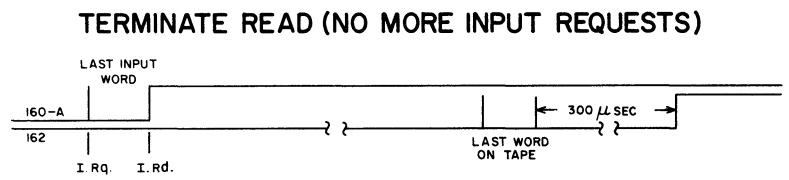
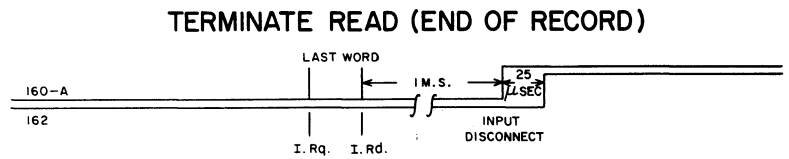
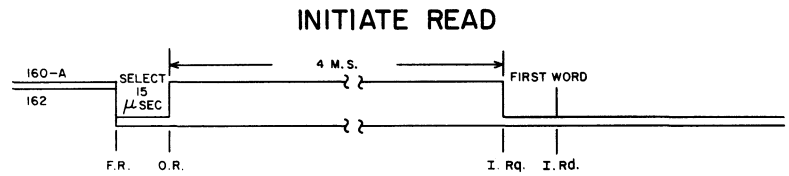


Figure 6. XX1X and XX2X Selections Available Time



F.R. - FUNCTION READY  
 O.R. - OUTPUT RESUME  
 I.R. - INFORMATION READY  
 I.Rq. - INPUT REQUEST  
 I.Rd. - INPUT READY

XX3X  
 XX4X  
 XX5X  
 XX6X  
 SELECTION  
 AVAILABLE TIME

Figure 7. XX3X, XX4X, XX5X, XX6X Selections Available Time

APPENDIX A  
162 INSTALLATION

The CONTROL DATA 162(S) Magnetic Tape Synchronizer controls up to four CONTROL DATA 605 Magnetic Tape Handlers. The 162(S) is connected to a CONTROL DATA 160-A Computer's input/output lines as a peripheral equipment. The unit is constructed of standard Control Data components. Cooling requirements are identical to those for the computer. The unit generates 4200 BTUs and is powered by an independent supply which uses 15 amp, 120v, 60 cycle power.

The cabinet is 29 inches high, 18 inches wide, and 30 inches deep. There must be enough clearance to allow the top of the cabinet and the chassis to be opened (figures A-1 and A-2). Weight of the 162(S) is 350 pounds.

Logic cables enter the unit through the cable openings near the bottom of chassis 220100. Cable connections are made to the connector panels on chassis 220100 (figure A-3).

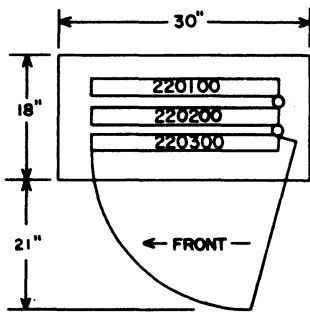


Figure A-1. Top View

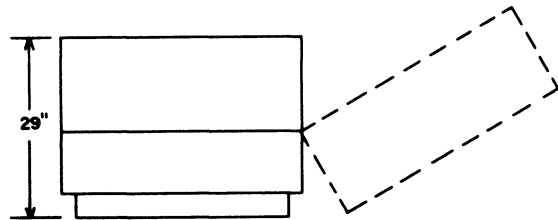
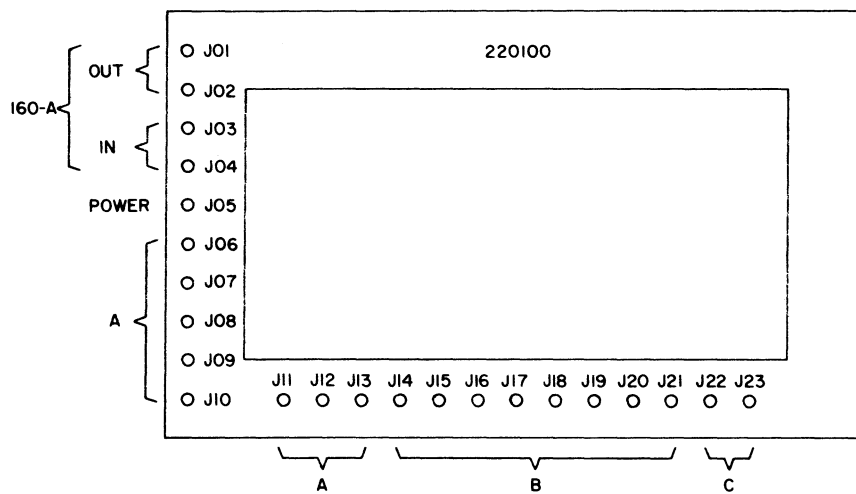


Figure A-2. Side View



I/O Connectors for Tape Handlers

162(S)	A
162-1	A and C
162-2	A, B, and C

Figure A-3. Cable Connections - Chassis 220100

# COMMENT SHEET

MANUAL TITLE CONTROL DATA® 162(S) TAPE SYNCHRONIZER

Reference Manual

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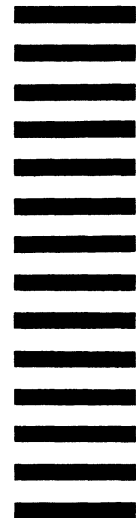
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