CONTROL DATA®
MAGNETIC TAPE CONTROLLER

1732-A/B, FA413-A/B

DIAGRAMS AND
CIRCUIT DESCRIPTION
MAINTENANCE
PARTS DATA
CARD PLACEMENT
EQUATION SUMMARY
WIRE LISTS

CONTROL DATA
CORPORATION

CUSTOMER ENGINEERING MANUAL

REVISION RECORD

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MANUAL TO EQUIPMENT LEVEL CORRELATION SHEET

SHEET 1 OF 1

		EQUIPMENTS					
MANUAL REV	FCO OR ECO	1732-A	1732-B	FA413-A	FA413-B		
K	FCO26689	A05	B05	A05	B05		

FOREWORD

This manual contains customer engineering information for the CONTROL DATA® 1732-A/B Magnetic Tape Controller. The controller synchronizes data transfer between the 1700 Computer System and up to eight 608 or 609 tape transports. These transports can be intermixed in any combination on the system, but the total number of transports cannot exceed eight.

Related reference material follows:

1700 Site Preparation Manual
1700 Computer Reference Manual
1700 I/O Specification Manual

Publication numbers for these manuals can be found in the Literature Distribution Center Catalog.

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KEY TO LOGIC SYMBOLS

(STANDARD 1604 OR 3600 CARD TYPES)$_B$

Logic diagrams represent a symbolic approach to electronic schematics. By using symbols to represent building block circuits, the schematic becomes easy to read if the reader understands the function of the symbols. In CONTROL DATA® Corporation logic, two signals, a logical "0" and a logical "1", are the possible input or output conditions of a circuit. A circuit with an output of "1" is "up" and a circuit with an output of "0" is "down". Detailed descriptions of logic symbols and their associated building block circuit cards are contained in the Printed Circuit Manual (Pub. No. 60042900, Vols. 1 and 2).

STANDARD LOGIC SYMBOLS

Standard logic diagram symbols for Control Data equipment using 1604- or 3600-type cards are inverters, flip-flops, control delays, and capacitive and inductive delays.

Inverters

An inverter is a logic element which provides an output that is an inversion of its input. When more than one input is provided to an inverter, "1's" take precedence over "0's" and drive the output of the inverter to "0". Because any "1" input of several inputs drives the output to a "0", an inverter may be considered an inverting OR (or NOR) gate when more than one input is present.

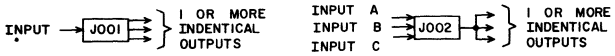


Figure 1. Inverter Symbols

Acceptable conventions for showing multiple OR inputs are given in Figure 2.

Figure 2. OR Circuit Conventions

Flip-Flops (FF)

The flip-flop (FF) is a storage device with two stable states - designated as Set and Clear - and is composed of two or more inverters. The logic symbols (Figure 3) are formed by the combination of inverter symbols. By convention, Set inputs and outputs are shown in the upper part of the symbol and Clear inputs and outputs are shown in the lower part of the symbol.

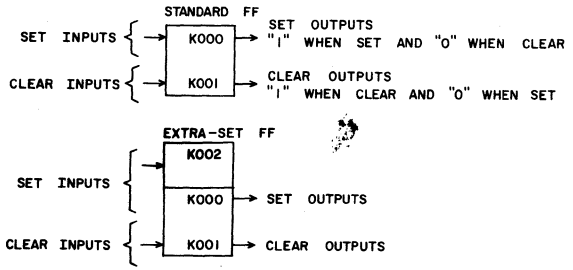


Figure 3. Flip-Flop Symbols

Figure 4 illustrates the interconnection of inverter symbols to form a flip-flop symbol. The term numbers assigned to each flip-flop are the term numbers of the internal inverters as seen by comparing the terms in Figure 3 with those in Figure 4. Notice that the Set output is the output of inverter K001, and the Clear output is the output of inverters K000 and K002.

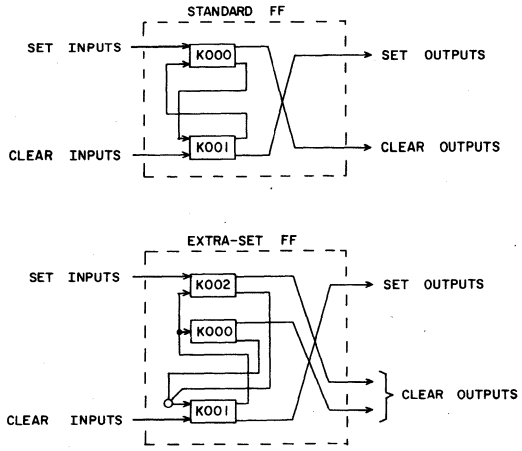


Figure 4. Internal Inverter Connections for a Flip-Flop

AND Gate

An AND gate requires that all its inputs be "1's" in order that its output be a "1". If one or more of the inputs to an AND gate are "0", the output is a "0". Figure 5 illustrates conventions for showing AND gates feeding an inverter.

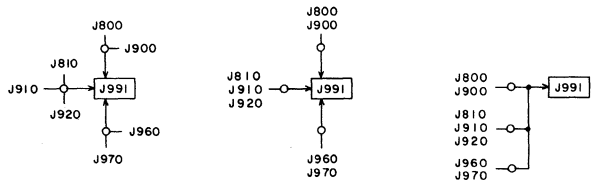


Figure 5. AND Circuit Conventions

Control Delay

A control delay is a timing device consisting of an H term which receives the input and one or more V, Y, or N terms to provide the outputs. The H term is essentially a flip-flop with controlled feedback and occupies an entire printed circuit card. The output term(s) are inverter(s) located elsewhere on the logic chassis. The "1" outputs from a control delay are clocked pulses which are delayed one phase time from the "1" inputs. Clock inputs are not shown on the logic diagrams for any H, V, Y, or N terms; these terms, which control the start and duration of the delayed output pulses, may be found in the Equation Summary. Figure 6 illustrates two representative forms of the control delay symbol, with possible inputs and outputs labelled. Figure 7 shows the electrical connections for the two forms.

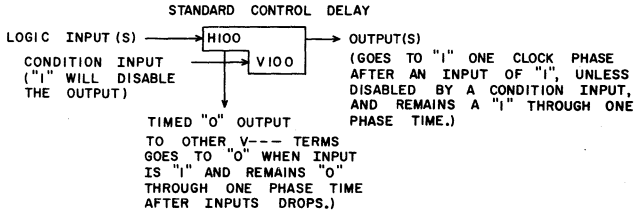


Figure 6. Control Delay Symbols

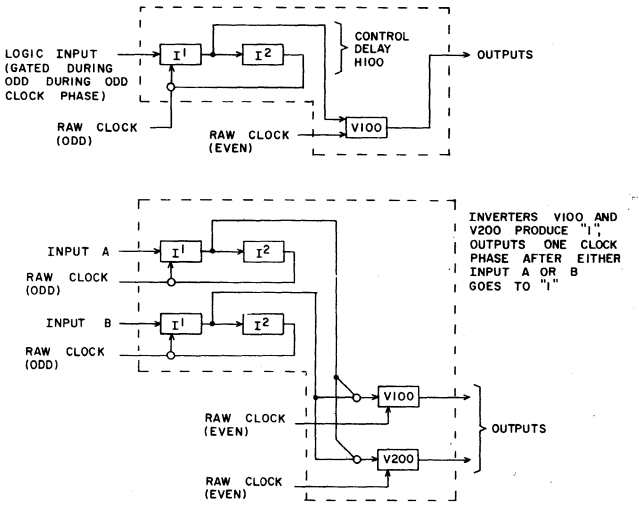


Figure 7. Electrical Connections for Control Delay

Control delays may have multiple inputs and/or multiple outputs. When a control delay has multiple output terms (i.e., more than one V, Y, or N term) each output term may have a separate conditioning input.

Capacitive Delays

A capacitive delay is used to delay the input to a logic element. Capacitive delays may be active or passive, depending upon whether or not transistors are used as part of the delaying circuit. Delay periods are checked by using a dual-trace scope connected to the input and output of the delay producing element. The actual connection points for the scope and probes vary for different cards and should be determined by referring to the Printed Circuit Manual, Pub. No. 60042900 (Volume 2).

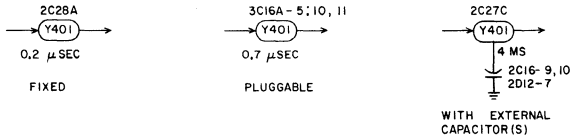


Figure 8. Active Capacitive Delays

Active delays may be recognized by the circuit letter always present as part of the card location. Pin numbers are also shown when external wiring is needed to connect the proper capacitance. In Figure 8, the pluggable delay uses this wiring to connect to capacitors on the same card. In the third example, this wiring connects to capacitors located on two separate capacitor cards.

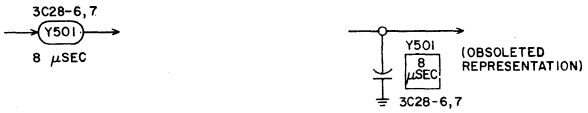


Figure 9. Passive Capacitive Delays

All passive capacitive delays (Figure 9) are formed by wiring grounded capacitors, located on one or more capacitor cards, as an AND input to the affected logic element. For this reason, all passive delays show pin numbers to provide this external wiring data.

Figure 10. Adjustable Capacitive Delays

Capacitive delays may be adjustable or nonadjustable, depending on the card type and/or the external wiring connections on the card. When it is necessary to adjust the delay period in order to obtain specified circuit operation (usually done by varying a potentiometer in the RC network), a diagonal arrow is added to the delay symbol as shown in Figure 10.

Inductive Delays

An inductive delay is used to delay the input to a logic element or as a tapped delay line for timing of operations. The symbol for this delay is an elongated oval with a double vertical line just within the input end of the oval. When used as a tapped delay line, the inductive delay is terminated in its characteristic impedance. Inductive delays are identified in the same manner as capacitive delays (except for the vertical lines) unless they are used as delay lines. On multi-section cards where no identifying circuit letters are present, pin numbers are shown adjacent to the input and output arrows. Figure 11 shows both kinds of inductive delays.

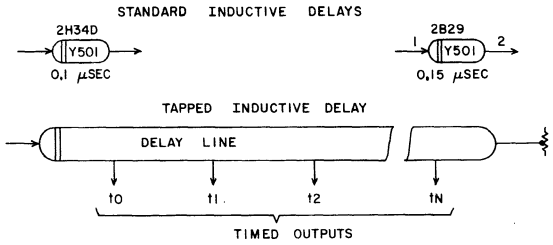


Figure 11. Inductive Delays

Line Drivers/Receivers

Voltage levels used to represent "1's" and "0's" on cables are different from those used for internal logic. The level shift to and from internal logic is made by line drivers and line receivers. These cards may be considered as inverting the signal electrically, but not logically. The letters commonly associated with these cards are L & M (1604) and R & T (3000 Series). A 3000 Series Receiver may also be used to perform a logical inversion by swapping the twisted pair wires. This usage is indicated by a circle on the input side of the symbol. In Figure 12, "1's" and "0's" have been added to clarify the logic states; they are not part of the symbol.

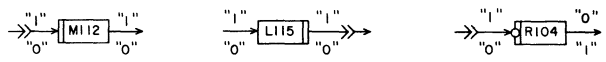


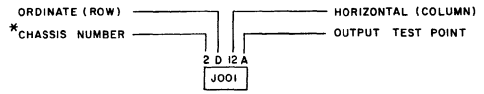
Figure 12. Typical Line Driver/Receiver Symbols

NON-LOGIC CONVENTION

The use of the double vertical bar, as shown in Figure 12, denotes a shift in signal voltage level from that used in internal logic. The double bar appears on the input or output side of the symbol, depending on which side connects to the non-logic-level signal. No particular voltage level is implied by the double bar - only that it is non-logic.

JACK ASSIGNMENTS

Each numbered term in the logic diagrams contains a jack assignment showing the physical location of that hardware element and the test point (circuit section) associated with it. For some card types, the test point letter is replaced by a pin number. For these cases, a card extender must be used in order to test that section of the card. Also, some symbols show no test point. This is because the entire card is used for one purpose (e.g. a single inverter, FF, or control delay). Figure 13 illustrates the inverter J001, with 2D12A representing its jack assignment.

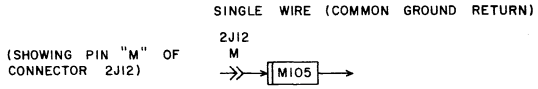


*When most or all jack assignments are located on one chassis, the chassis numbers for that chassis are omitted. All multi-chassis devices include a chassis number as part of each jack assignment.

Figure 13. Jack Assignment Scheme

CABLE IDENTIFICATION

Cable connections are represented by the MIL-STD-15 symbol and identified as to connector location and pins used, as shown in Figure 14.



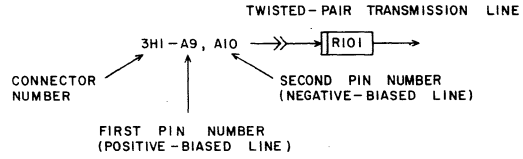


Figure 14. Cable Connections

INTRODUCTION

The controller contains the necessary logic for control of the 7-track 608 tape transport with the recording densities of 200, 556, and 800 bits per inch (bpi) and the 9-track 609 tape transport with a recording density of 800 bpi. When Assembly/Disassembly mode is selected, the controller is able to disassemble 12- or 16-bit computer words into two 6- or 8-bit tape words during a Write operation, and assemble 6- or 8-bit tape words into one 12- or 16-bit computer word during a Read operation.

The controller checks tape parity horizontally and longitudinally, and also contains hardware to check errors via the Cyclic Redundancy Character. All three error checking methods respond via the tape PARITY ERROR indicator and status bit if an error is detected.

For a description of tape format programming and other 1732 information, refer to the Foreword for related publications.

UNIT SELECT AND CONTROL FUNCTIONS

Unit select initiates parity, density, and tape handler selection. Control functions initiate clearing, interrupts, motion directives, and data transfers.

To perform a unit select or a control function, the following requirements must be met:

1. The address cable must contain the address of the controller (bits 7-10).
2. The address cable bits 0 and 1 must equal 10 (unit select) or 01 (control function).
3. The address cable bits 11 through 15 must be equal to zero (W = 0).
4. The data cable must contain the control function or unit select codes that are desired. The logical sum of more than one code at a time is permissable if reasonable (BCD and binary not selected at the same time).
5. Initiating the Write signal.

Upon receipt of the Write signal, the controller responds with either a Reject signal (selection not possible) or a Reply signal. Either signal drops the computer Write signal which causes the controller Reply or Reject signal to drop.

PARITY

The controller may be selected to operate with vertical even (BCD) parity or with odd parity (binary). However, BCD can not be used on the 609 transport.

DENSITY

With the 608 tape transport the controller may be selected to synchronize data at a rate equal to 200, 556, or 800 bpi on the tape moving at 37-1/2 inches per second. The 609 can synchronize data at a rate of 800 bpi only.

TAPE TRANSPORT SELECTION

Any one of the eight possible tape transports connected to the controller may be selected. The eight tape transports can be either 608 or 609 models and can be intermixed in the system.

CLEAR

All previous selections, error indications, interrupts, and status designations may be cleared. The interrupts may also be cleared independently.

MOTION DIRECTIVES

The selected tape handler may be instructed to move tape backward one record, rewind the tape to load point (a reflective spot near the beginning of the tape), to rewind the tape to the load point and disable the tape handler Ready condition (to re-enable the Ready, manual intervention is necessary) or to search file marks/tape mark forward or reverse.

DATA TRANSFER

WRITE

Any number of consecutive characters to the controller are written (along with a parity bit) on the tape as one record. Each character transfer necessitates the Write/Reply exchange of signals. Whenever the computer breaks the continuity of the character outputs, the controller initiates an End of Record sequence

When the controller is connected to a 608 tape transport, the End of Record sequence leaves three blank character spaces, writes the longitudinal parity check character, and leaves a 3/4-inch gap. When the controller is connected to a 609 tape transport, the End of Record sequence leaves three blank character spaces, writes the Cyclic Redundancy Character, leaves three more blank spaces, writes the longitudinal parity check character and leaves a 0.6-inch record gap. If no new control function is received from the computer, tape motion stops. Actually, the tape stops before traveling the full 0.6 inch, but the proper gap will be left when the next Write is initiated. If a new control function for a Write or a Write File Mark is received before tape motion stops, a Nonstop Write is performed. The 0.6-inch gap is left, but tape motion never slows.

If a Write is selected while the tape is at load point, a delay is initiated that leaves a 3-inch gap before the writing is started. At any other position on the tape, a delay long enough to allow full tape speed is initiated before the writing begins.

During a Write, the read heads of the tape handler transfer the newly written characters to the controller. The controller performs a parity check on these and status will indicate the presence of an error if an error is present. The normal procedure is to program a rewrite of any record with a parity error.

READ

The controller inputs to the computer the characters written on the tape until the computer stops requesting new characters or until the controller senses the end of a record. If the computer stops requesting characters, data transfer to the computer will stop, but the tape will continue to move until the end of record. If a new Read control function is received by the controller before tape motion stops at the end of a record, motion will continue in a nonstop Read. Each character transfer between the computer and the controller necessitates a Read/Reply exchange of signals. During a Read, the parity bit recorded on the tape is checked against the character. A parity error will be indicated on status if one exists.

If the tape is at load point when a Read is requested, data will be read within 0.5 inch if present. Control Data tapes will not have information this close to the load point, but other formats do.

WRITE FILE MARK/TAPE MARK

The Write File Mark/Tape Mark control function causes the controller to move the tape approximately 6 inches forward and then write a one-character record. In the 7-track 608 tape transport this character, called File Mark, is a 17_8, and in the 9-track 609 tape transport this character, called Tape Mark, is a 23_8. The File-mark is written with even parity, causing a parity error condition in the 608 when odd parity is selected. Following the File Mark or Tape Mark, the End of Record sequence is performed, writing the longitudinal check character which is identical to the Tape Mark or File Mark.

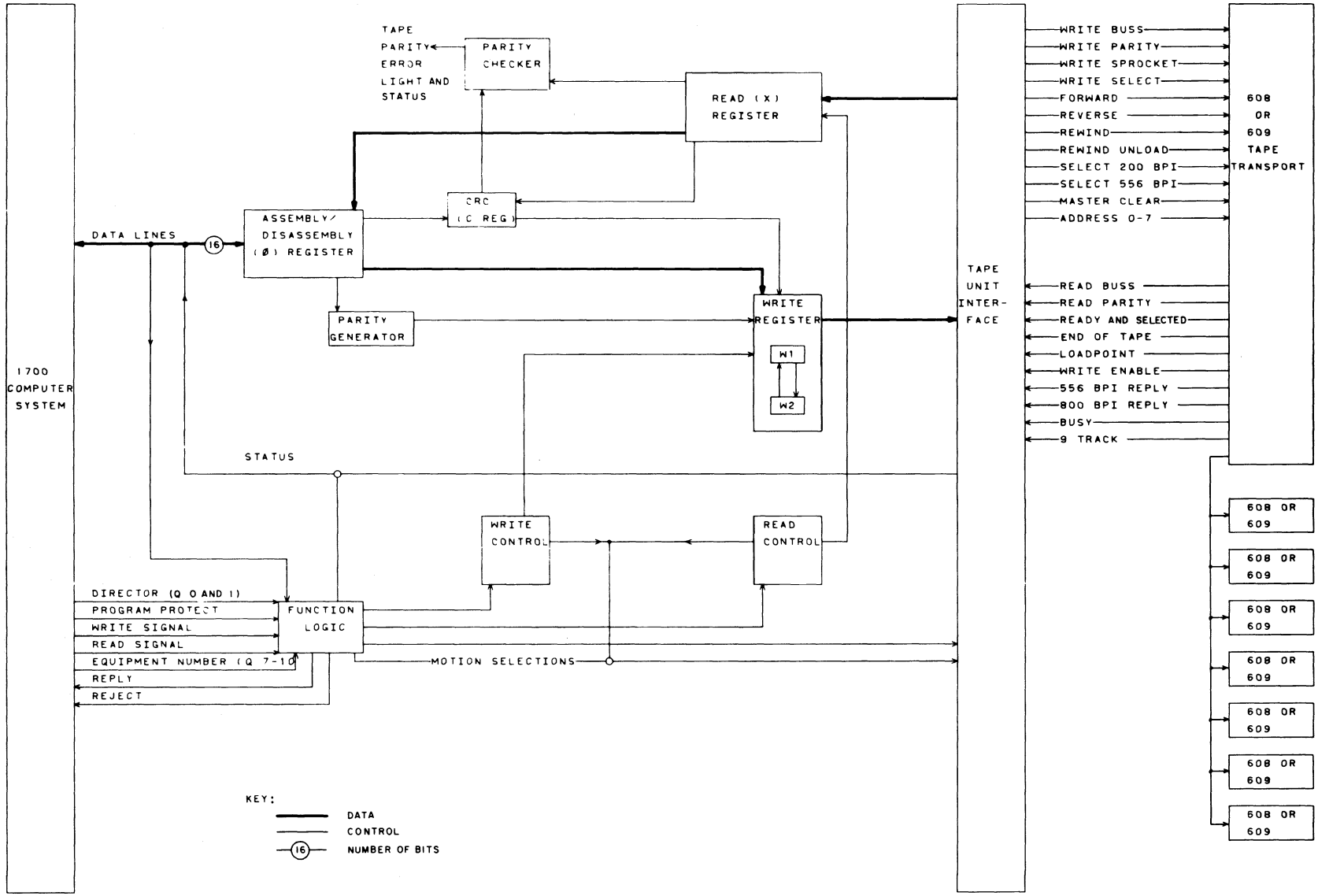
Whenever the controller reads or backspaces over a File Mark or Tape Mark, the File Mark/Tape Mark status condition responds with a "1". To search for a File Mark or a Tape Mark, the Search File Mark/Tape Mark Forward or Search File Mark/Tape Mark Backward function must be used.

STATUS INDICATIONS

Director Status 1 and Director Status 2 are the two types of status which may be requested by the computer. Director Status 1 provides indications of the activities of operation, while Director Status 2 provides indications of the static conditions of the tape transport. The computer requests status by issuing the following:

1. Controller address on address cable.
2. Address cable bits 0 and 1 equal 01 for director status 1.
   Address cable bits 0 and 1 equal 10 for director status 2.
3. An Input instruction (initiating the Read signal).

Upon receipt of the Read signal, the controller sends the Reply signal and places the status information on the data lines.



CONTROL DATA DEVELOPMENT DIVISION	TITLE BLOCK DIAGRAM	PRODUCT 1732-A/B	
		SIZE C	DRAWING NO. 60208200 REV. A
		SHEET 1	PAGE 1-1

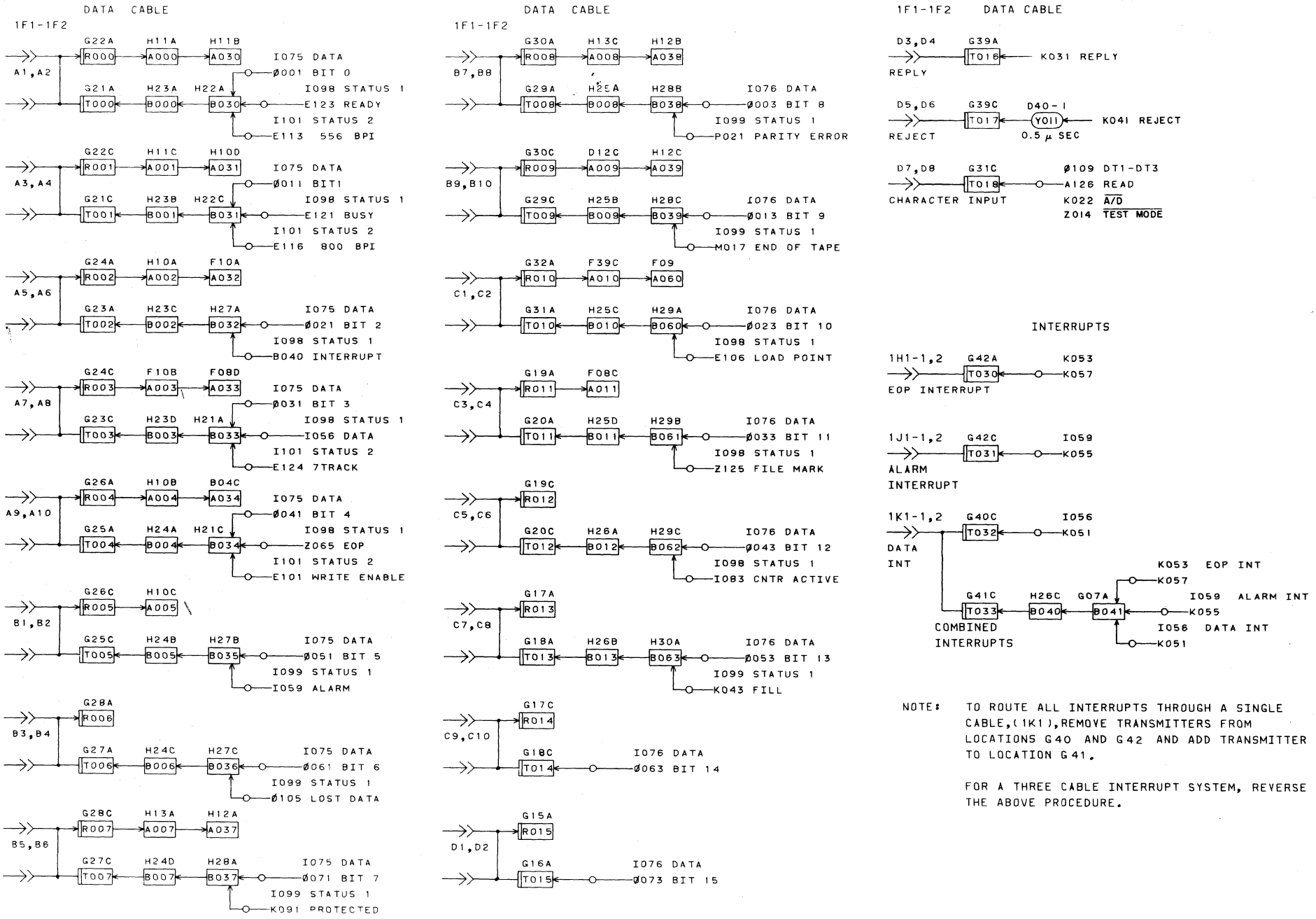
TERM	LOCATION	PAGE
A126	H20C	1-5
E101	D29D	1-21
E106	D36A	1-21
E119	D31A	1-21
E116	D31C	1-21
E121	E40A	1-21
E124	D30B	1-21
E129	D33C	1-21
I056	D08C	1-9
I059	D08B	1-9
I075	G10	1-9
I076	G12	1-9
I085	H32B	1-7
I090	G13	1-5
I099	G09	1-5
I101	H20A	1-5
K022	E12A	1-7
K031	D09C	1-9
K041	D10C	1-9
K046	B09C	1-9
K051	H31C	1-7
K052	E11C	1-7
K055	H31D	1-7
K057	D06D	1-9
K091	B07B	1-7
M017	B39A	1-21
Q001	C18C	1-15
Q005	C29C	1-15
Q011	C19C	1-15
Q015	C30C	1-15
Q022	C20C	1-15
Q025	C31C	1-15
Q034	C21C	1-15
Q035	C32C	1-15
Q041	C22C	1-15
Q045	C33C	1-15
Q051	C23C	1-15
Q055	C34C	1-15
Q061	C24C	1-15
Q065	C35C	1-15
Q071	C25C	1-15
Q075	C36C	1-15
Q105	B09B	1-9
Q109	B02C	1-9
R021	B22C	1-19
Z010	E16C	1-7
Z062	E32C	1-13
Z225	C11C	1-19

DATA CABLE

The bidirectional data cable connects to the computer A register and is of a standard 1700 Series configuration. The A0 and A15 designations on the data cable lines correspond to the bit positions of the computer A register to which they connect. The cable transfers data between the controller and the computer during Read and Write operations. Unit select codes, control function codes, Director Status 1 codes, and Director Status 2 codes are also carried by the data cable as specified by the 0 and 1 bits of the address cable on diagram 1-5.

INTERRUPTS

The three interrupt conditions, End of Operation, Alarm, and Data, can send responses to the computer on three independent lines, or on one line which carries the responses from all three conditions. In a controller providing an interrupt line for each condition, the transmitter card at location G41 is removed. A controller providing one line to carry all interrupt responses does not contain the transmitter cards at locations G40 and G42.



CONTROL DATA CORPORATION
DEVELOPMENT DIVISION

TITLE
I/O CHANNEL INTERFACE
DATA CABLE AND INTERRUPTS

PRODUCT 1732-A/B
SIZE C | DRAWING NO. 60208200 | REV. K
SHEET 2 | PAGE 1-3

TERM	LOCATION	PAGE
A007	H13A	1-3
A008	H13C	1-3
A009	D12C	1-3
A010	F39C	1-3
A011	F08C	1-3
A037	H12A	1-3
A038	H12B	1-3
A039	H12C	1-3
I005	D19A	1-7
I006	D24B	1-7
I011	D17A	1-7
I012	D18C	1-7
I015	D17C	1-7
I112	D24D	1-7
R007	G28C	1-3
R008	G30A	1-3
R009	G30C	1-3
R010	G32A	1-3

TRANSLATIONS

The translation inverters translate bits A7 through A9 of the unit select code on the data cable. Their outputs are applied to the Unit Select FF's. This translation results in the selection of one of the eight tape transports synchronized by the controller. Bit 10 from the data cable enables the unit selection.

ADDRESS CABLE

The address cable connects to the computer Q register and is of a standard 1700 Series configuration; bits 2 through 6 are not used. Bits 0 and 1 identify the contents of the data cable on diagram 1-3 as follows:

1. If the bits equal 01 and the Write signal is present, the code on the data cable is a control function code.
2. If the bits equal 10 and the Write signal is present, the code on the data cable is a unit select code.
3. If the bits equal 01 and the Read signal is present, the data cable contains director status 1 information.
4. If the bits equal 10 and the Read signal is present, the data cable contains director status 2 information.

Bits 7 through 10 contain the controller Equipment Number Selection code. This code is valid when the W = 0 signal is a "1".

Five lines contain control signals from the computer to the controller and are defined as follows:

1. Read - This line is a "1" whenever the computer requests data or status information.
2. Write - This line is a "1" whenever a unit select code or a control function code is available to the controller on the data cable or whenever an output word is present on the data cable during a Write operation.
3. Master Clear (MC) - This line is a "1" whenever the computer clears the controller.
4. Protected - This line is a "1" whenever the program in operation is protected. It allows program selection of a protected tape transport.
5. W = 0 - This line is a "1" when bits 11 through 15 (W) are "0's". This signal enables the controller selection logic.

STATUS GATES

The two types of status information (Director Status 1 and Director Status 2) are enabled to the data cable and the computer by the outputs of the Q = 01 and the Q = 10 inverters in the Function Translations circuits on diagram 1-7. The outputs of these inverters are "1" as determined by the 0 and 1 bits and the Read line of the address cable.

EQUIPMENT SWITCH S01

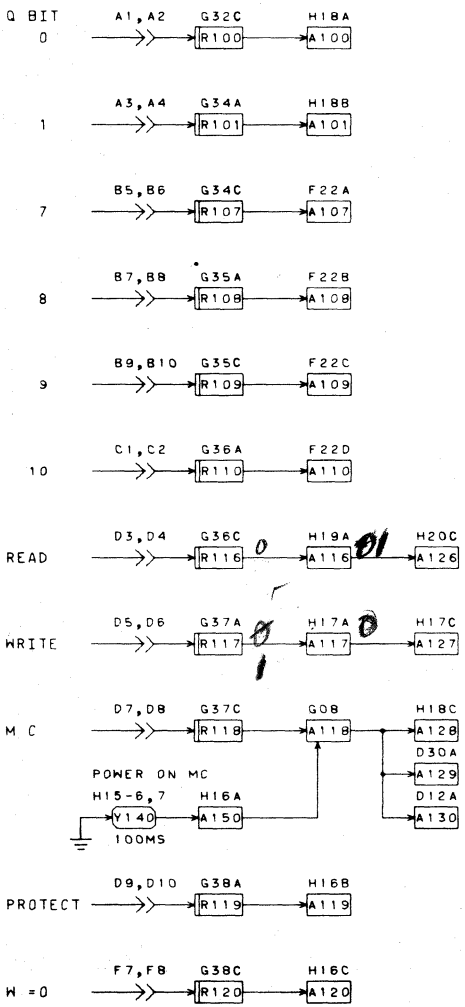
The position of this switch specifies the controller address. If bits 7 through 10 of the address cable match the setting of this switch and the W = 0 line = "1", the controller is selected by the computer.

TAPE UNIT SELECT

The Unit Select FF corresponding to the unit select code from the translation inverters will be set by inverter I115 if all of the following conditions are met:

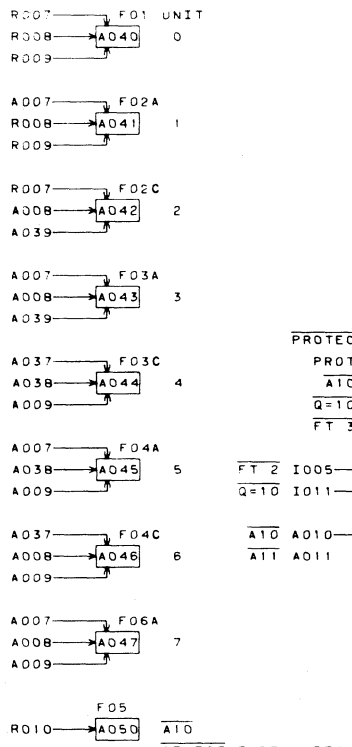
1. The unit is protected and the Protect bit is present; or the unit is not protected.
2. Bit 0 of Q = "0" and bit 1 of Q = "1".
3. A10 = "1".
4. Function time 3 is present.

ADDRESS CABLE
1G1-1G2

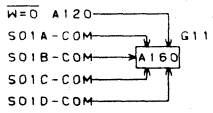


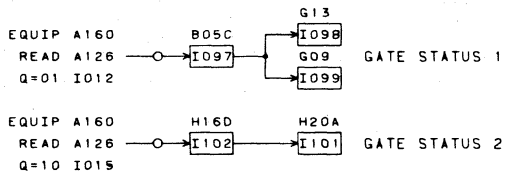
STATUS GATES

DATA BITS A7-A10
TRANSLATIONS

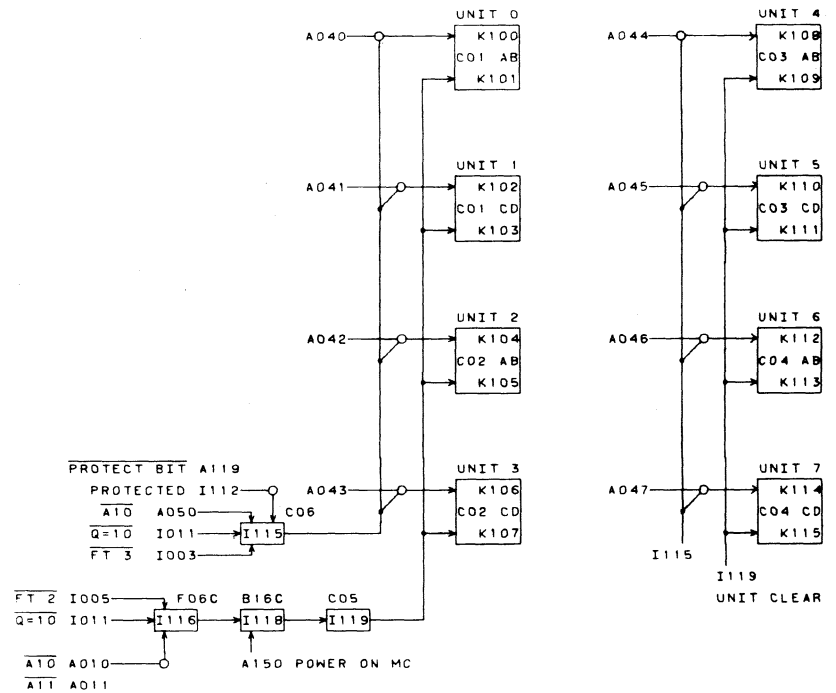


EQUIPMENT TRANSLATION

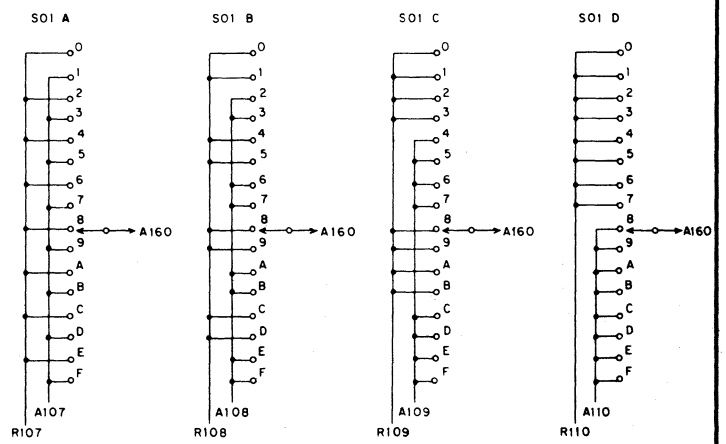




TAPE UNIT SELECT



EQUIPMENT SWITCH S01



CONTROL DATA DEVELOPMENT DIVISION	TITLE I/O CHANNEL INTERFACE ADDRESS CABLE UNIT SELECT	PRODUCT 1732-A/B	
		SIZE C	DRAWING NO. 60208200
		REV. 2	
		SHEET 3	PAGE 1-5

TERM	LOCATION	PAGE
A030	H11B	1-3
A032	H10D	1-3
A040	F01	1-5
A041	F02A	1-5
A042	F02C	1-5
A043	F03A	1-5
A044	F03C	1-5
A045	F04A	1-5
A046	F04C	1-5
A047	F06A	1-5
A050	F05	1-5
A060	F09	1-3
A100	H18A	1-5
A102	H18B	1-5
A116	H19A	1-5
A117	H17A	1-5
A118	G08	1-5
A129	D30A	1-5
A160	G11	1-5
E017	E33D	1-11
E016	F34A	1-11
E020	E09C	1-11
E026	A19C	1-11
E092	F34B	1-13
E104	G14A	1-21
E106	D36A	1-21
E115	D33A	1-21
E119	E40C	1-21
E124	D33C	1-21
E127	D34A	1-21
I118	B16C	1-5
K030	D09A	1-9
K040	D10A	1-9
K102	C01B	1-5
K103	C01D	1-5
K105	C02B	1-5
K107	C02D	1-5
K109	C03B	1-5
K111	C03D	1-5
K113	C04B	1-5
K115	C04D	1-5
M114	B39B	1-21
R002	G22C	1-3
R004	G24A	1-3
R005	G24C	1-3
R004	G26A	1-3
R006	G28A	1-3
R208	G32C	1-5
R201	G34A	1-5
R117	G37A	1-5
R119	G38A	1-5
Y101	B13B	1-21
Y102	B15B	1-21
Z034	H07A	1-11
Z063	E31C	1-13
Z064	E32A	1-13
Z100	B14A	1-21
Z102	B12A	1-21
Z110	C39A	1-21
Z124	C11A	1-19
Z125	C11C	1-19

READ/WRITE REQUEST AND INTERRUPT REQUEST

Each bit of the control function code instructs the controller to perform one specific operation. Some of these operations need continuous control until they are completed. Others require only a one-time initiation. The continuous control functions (Write File Mark, Write, Read Backspace, Search Forward, Search Backward, and the interrupts) set the Request FF's, while the one-time control functions (Rewind, Rewind Unload, Clear Controller, and Clear Interrupt) do not. The Request FF's remain set until their respective operations are completed. The Write File Mark, Write Request, Read Request, or Backspace Request FF's initiate tape motion, and thereby drive controller active inverter I083 to a "1". This Controller Active condition causes a Reject signal to be returned to the computer if a new select function code is initiated.

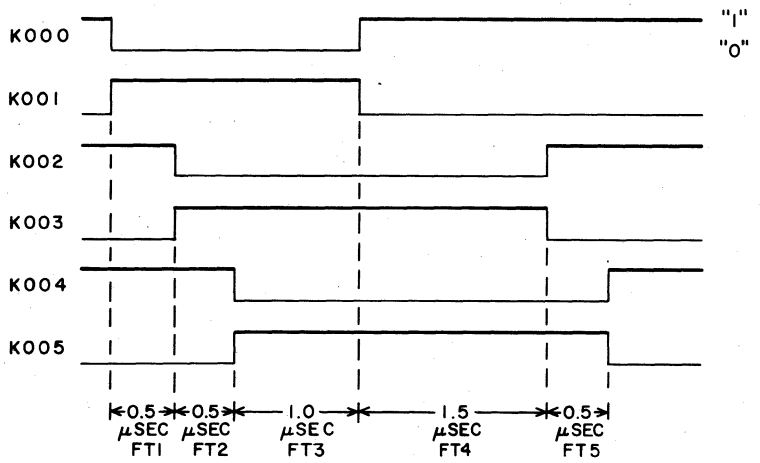
The Search File Mark/Tape Mark Forward FF (Z094/95) and Search File Mark/Tape Mark Backward FF (Z096/97) are set at FT3 by function bits (A10-7 = 0110/or 0111) from the 1700. When either FF is set, the search operation is initiated, being enabled by a "1" from I048.

The Search Request FF's are cleared by a 5-μsec pulse from I042 when both inputs to it are zeroes. This clearing pulse occurs when a File Mark or Tape Mark has been detected, i.e. FF Z124/25 (diagram 1-19) sets. If a File Mark or Tape Mark is not detected during a Search Backward operation, the request FF clears when load point is sensed.

FUNCTION TIMING

The function timing chain cycles once whenever a Write signal is present on the address cable and the unit select or control function code is present on the data cable.

The following timing chart indicates that in operations requiring continuous control, time FT 1 enables the input to the Reject FF on diagram 1-9 if conditions will not permit performance of a requested function.



Time FT 2 permits clearing of the Read/Write Request FF's (through the Clear Controller circuit) and the Unit Select FF's preparatory to receiving a new function. Time FT 3 permits setting of the proper Read/Write Request and Unit Select FF's. Time FT 5 enables the input to the Reply FF on diagram 1-9 if conditions permit performance of the requested function.

The 1.5 microseconds of FT 4 allows time for the tape transport to respond.

PROTECT

The Protect switches (S02 through S09) are mounted on the controller and provide the protect feature for the tape transports. With the switches in the open position, the tape transports are protected and the PROTECT indicator on the controller lights if the protected unit is selected.

When a tape transport is protected, all instructions except status requests must have a "1" on the protect line of the address cable. If an unprotected program attempts any unprotected function with a protected tape transport, inverter I107 a causes a Reject signal to be sent to the computer. Inverter I112 provides a "1" output to the Unit Select circuit if the tape transport selected is protected.

BCD/BINARY

This FF determines whether even (BCD) or odd (binary) parity will be generated and checked. The FF is set by bit A1 (BCD) of the unit select code which lights the BCD indicator on the controller. The FF is cleared by bit A2 (binary) of the unit select code. Setting and clearing of the FF can occur only at FT2 and FT3 of the function timing chain. A unit select function containing neither bit A1 nor A2 clears the FF, putting the controller in the binary mode.

A/D MODE

FF K022/23 sets when the Assembly/Disassembly mode of operation has been selected via a unit select. The FF is cleared by a function clear or a Master Clear.

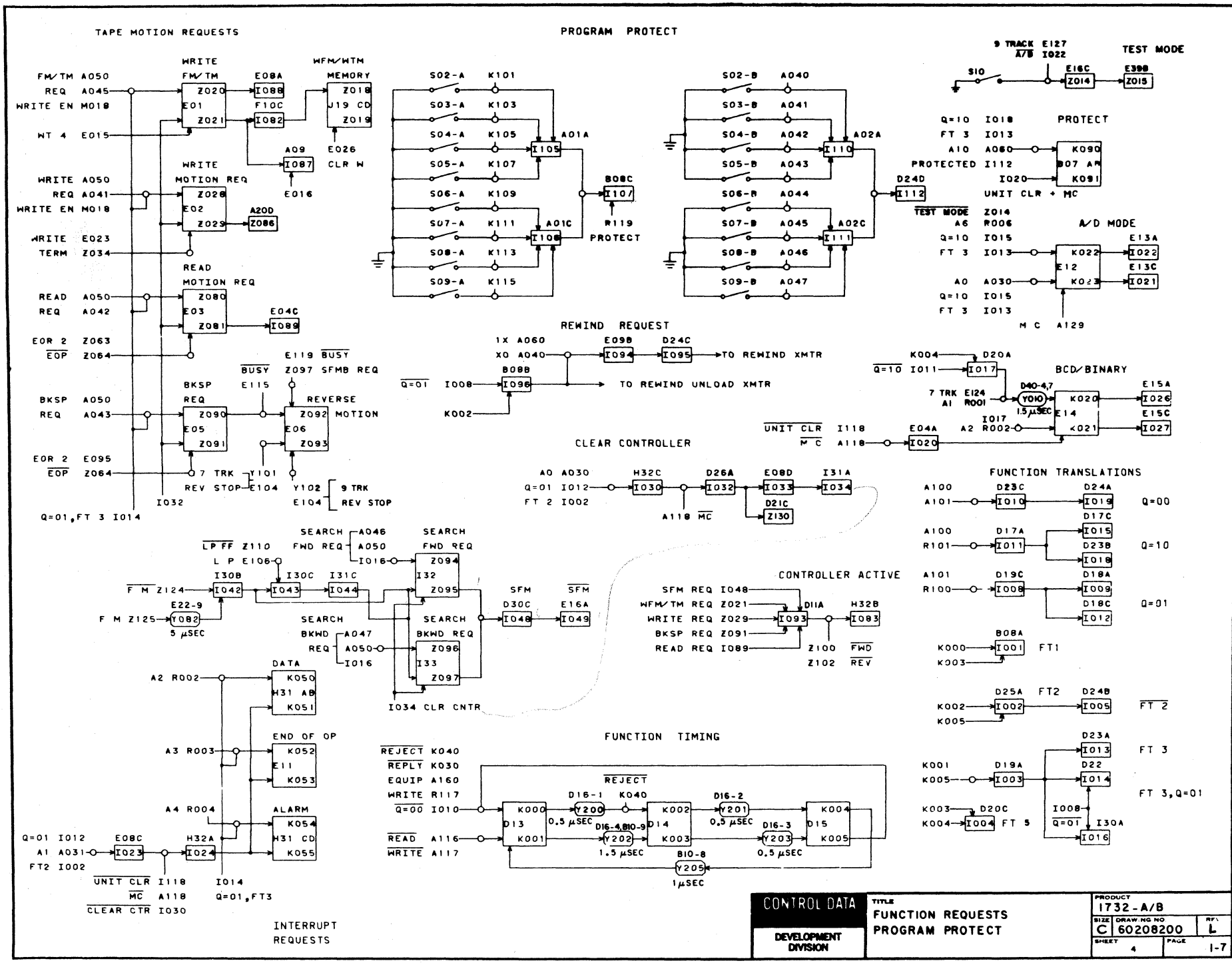
FUNCTION TRANSLATIONS

These inverters translate the outputs from the function timing chain and the contents of bits 0 and 1 of the Q register. The function time translations enable control circuitry during function requests. Bits 0 and 1 determine whether the controller treats the contents of the data cable as data or status when the Read signal is present, or as data or a function request when the Write signal is present.

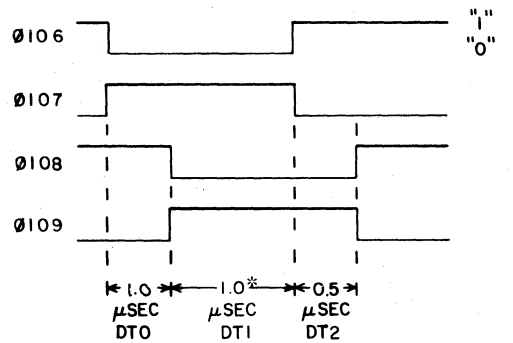
TEST MODE

The controller TEST MODE switch, located on the back of the chassis, activates and deactivates the Test mode. The Test mode provides a means for checking the accuracy of the hardware which generates the Cyclic Redundancy Character.

When the switch at S10 is open (in the UP position) and when a nine-track tape and Character mode are selected, a "1" from Z015 enables Test mode.


TAPE MOTION REQUESTS
PROGRAM PROTECT
TEST MODE
9 TRACK E127
A/B I022
S10
E16C
Z014
E39B
Z015
WRITE
FM/TM
WFM/WTM
MEMORY
FM/TM A050
REQ A045
WRITE EN M018
WT 4 E015
Z020
E01
Z021
E08A
I088
F10C
I082
Z018
J19 CD
Z019
E026
CLR W
A09
I087
E016
WRITE
MOTION REQ
WRITE A050
REQ A041
WRITE EN M018
Z028
E02
Z029
A20D
Z086
WRITE E023
TERM Z034
READ
MOTION REQ
READ A050
REQ A042
Z080
E03
Z081
E04C
I089
EOR 2 Z063
EOP Z064
E119 BUSY
BUSY E115
Z097 SFMB REQ
BKSP
REQ
REVERSE
MOTION
BKSP A050
REQ A043
Z090
E05
Z091
E06
Z092
Z093
EOR 2 E095
EOP Z064
7 TRK Y101
REV STOP E104
Y102 E104
9 TRK
REV STOP
I032
Q=01, FT 3 I014
S02-A K101
S03-A K103
S04-A K105
S05-A K107
S06-A K109
S07-A K111
S08-A K113
S09-A K115
A01A
I105
A01C
I106
B08C
I107
R119
PROTECT
S02-B A040
S03-B A041
S04-B A042
S05-B A043
S06-B A044
S07-B A045
S08-B A046
S09-B A047
A02A
I110
A02C
I111
D24D
I112
Q=10 I018
FT 3 I013
A10 A060
PROTECTED I112
I020
K090
B07 A
K091
UNIT CLR + MC
TEST MODE Z014
A6 R006
A/D MODE
Q=10 I015
FT 3 I013
A0 A030
Q=10 I015
FT 3 I013
E12
K022
K023
E13A
I022
E13C
I021
M C A129
REWIND REQUEST
1X A060
XO A040
E09B
I094
D24C
I095
TO REWIND XMTR
TO REWIND UNLOAD XMTR
Q=01 I008
B08B
I096
K002
K004
Q=10 I011
D20A
I017
BCD/BINARY
7 TRK E124
A1 R001
Y010
1.5 μSEC
D40-4,7
K020
E14
K021
E15A
I026
E15C
I027
I017
A2 R002
UNIT CLR I118
M C A118
E04A
I020
CLEAR CONTROLLER
A0 A030
Q=01 I012
FT 2 I002
H32C
I030
D26A
I032
E08D
I033
I31A
I034
D21C
Z130
A118 MC
FUNCTION TRANSLATIONS
A100
A101
D23C
I010
D24A
I019
Q=00
D17C
I015
A100
R101
D17A
I011
D23B
I018
Q=10
A101
R100
D19C
I008
D18A
I009
D18C
I012
Q=01
B08A
K000
K003
I001
FT1
D25A
FT2
D24B
K002
K005
I002
I005
FT 2
D23A
I013
FT 3
K001
K005
D19A
I003
D22
I014
FT 3, Q=01
K003
K004
D20C
I004
FT 5
I008
Q=01
I30A
I016
LP FF Z110
L P E106
SEARCH
FWD REQ
A046
A050
I016
Z094
I32
Z095
I30B
I042
I30C
I043
I31C
I044
F M Z124
F M Z125
E22-9
Y082
5 μSEC
SFM
D30C
I048
SFM
E16A
I049
SEARCH
BKWD
REQ
A047
A050
I016
SEARCH
BKWD REQ
Z096
I33
Z097
I034 CLR CNTR
CONTROLLER ACTIVE
SFM REQ I048
WFM/TM REQ Z021
WRITE REQ Z029
BKSP REQ Z091
READ REQ I089
D11A
I093
H32B
I083
Z100
Z102
FWD
REV
DATA
A2 R002
K050
H31 AB
K051
END OF OP
A3 R003
K052
E11
K053
A4 R004
ALARM
K054
H31 CD
K055
Q=01 I012
A1 A031
FT2 I002
E08C
I023
H32A
I024
UNIT CLR I118
MC A118
CLEAR CTR I030
I014
Q=01, FT3
INTERRUPT
REQUESTS
FUNCTION TIMING
REJECT K040
REPLY K030
EQUIP A160
WRITE R117
Q=00 I010
READ A116
WRITE A117
K000
D13
K001
0.5 μSEC
D16-1
Y200
REJECT
K040
K002
D14
K003
D16-4,B10-9
Y202
1.5 μSEC
D16-2
Y201
0.5 μSEC
D16-3
Y203
0.5 μSEC
K004
D15
K005
B10-8
Y205
1 μSEC
CONTROL DATA
DEVELOPMENT DIVISION
TITLE
FUNCTION REQUESTS
PROGRAM PROTECT
PRODUCT
1732-A/B
SIZE C
DRAWING NO 60208200
REV L
SHEET 4
PAGE 1-7

TERM	LOCATION	PAGE			
A00N	H11A	1-5	1026	E15A	1-7
A001	H11C	1-5	1027	E15C	1-7
A010	F39C	1-5	1033	E08D	1-7
A032	F10A	1-5	1034	I51A	1-7
A033	E08D	1-5	1093	M32B	1-7
A034	B04C	1-5	1089	E04C	1-7
A035	H12C	1-5	1097	B05C	1-5
A040	F01	1-5	1102	M16D	1-5
A050	F05	1-5	1107	B08C	1-7
A060	F09	1-5	1118	B16C	1-5
A110	H19A	1-5	K003	D14C	1-7
A117	H17A	1-5	K050	M31A	1-7
A120	H20C	1-5	K052	E11A	1-7
A127	H17C	1-5	K053	E11C	1-7
A130	D12A	1-5	K054	M31C	1-7
A160	G11	1-5	M014	B41B	1-21
E002	E21A	1-11	R020	G22A	1-19
E007	E19B	1-11	R000	G22A	1-3
E014	E19D	1-11	R001	G22C	1-3
E015	E37D	1-11	R003	G24C	1-3
E031	I36	1-11	R005	G26C	1-3
E050	E41	1-13	R006	G28A	1-3
E054	E42	1-13	R010	G32A	1-3
E055	E39A	1-13	R011	G19A	1-3
E062	E19C	1-13	R116	G36C	1-5
E063	E38	1-13	R117	G37A	1-5
E067	E21C	1-13	Z020	E01A	1-7
E084	E34C	1-13	Z028	E02A	1-7
E091	E34	1-13	Z029	E02C	1-7
E092	E35A	1-13	Z030	M34A	1-11
E093	I28A	1-13	Z033	M35C	1-11
E094	D36B	1-13	Z043	E17C	1-11
E096	E35C	1-13	Z050	F28A	1-13
E100	D36A	1-21	Z058	F29A	1-13
E108	D28B	1-21	Z060	F29A	1-13
E112	D37C	1-21	Z063	F31C	1-13
E116	D32C	1-21	Z064	F32A	1-13
E114	D38A	1-21	Z065	F32C	1-13
E120	D32A	1-21	Z074	F26A	1-13
E121	E40A	1-21	Z081	E03C	1-7
E123	D30B	1-21	Z083	F37C	1-13
I001	B08A	1-7	Z096	A20D	1-7
I004	D20C	1-7	Z094	I52A	1-7
I009	D18A	1-7	Z096	I33A	1-7
I018	D23B	1-7	Z124	C11A	1-19
I019	D24A	1-7			
I020	E04A	1-7			
I021	E13C	1-7			
I022	E13A	1-7			
I023	E09C	1-7			



REJECT

The conditions which set the Reject FF and cause a Reject signal to be sent to the computer are as follows:

1. At FT 1 of the function timing chain (see diagram 1-7) if any of the following conditions exist:
   a. An unprotected program selects a protected tape transport.
   b. The Ready signal from the tape transport is not present when a tape motion control function code is received from the computer.
   c. The tape transport is issuing a Busy signal when a Rewind or a Rewind Unload Control Function code is received from the computer.
   d. The End of Operation condition (see diagram 1-13) is not present when a control function code is received from the computer.
   e. A select function is sent to the controller when the controller is Active (I083 = "1").
2. At FT 4 if the conditions necessary for the performance of a Control Function or a Unit Select instruction are not present.
3. If the data transfer counter indicates that, during a data transfer, the previous frame has not had sufficient time to be transferred.

REPLY

The four conditions which set the Reply FF and cause a Reply signal to be sent to the computer are as follows:

1. The Director Function or Unit Select instruction from the computer is accepted by the controller and can be performed at time FT 4 of the function timing chain (see diagram 1-7).
2. During a Write operation, the word to be written has been accepted by the controller at time DT 2 of the data transfer counter.
3. During a Read operation, 0.5 microsecond after the transfer of the data to the data cable.
4. During a director status request, 0.5 microsecond after transfer of the status information to the data cable.

INTERRUPT CONDITIONS

DATA INTERRUPT

The inverter I056 will be a "1" when a data transfer can be successfully accomplished. If the Data Interrupt Request FF (diagram 1-7) has been set by the data interrupt request bit of the control function code, inverter I056 will initiate the Interrupt signal to the computer (diagram 1-3).

END OF OPERATION (EOP) INTERRUPT

The EOP Interrupt FF will be set at completion of a tape motion operation. If the EOP Interrupt Request FF (diagram 1-7) has been set by the EOP interrupt request bit of the control function code, K057 will initiate the Interrupt signal to the computer via the interrupt cable (diagram 1-3).

ALARM INTERRUPT

If the Alarm Interrupt Request FF (diagram 1-7) has been set by the alarm interrupt request bit of the control function code, inverter I059 will initiate the Interrupt signal to the computer (diagram 1-3) if any of the following conditions occur:

1. A Lost Data condition occurs.
2. A parity error is detected.
3. The tape transport senses the end of the tape.
4. A File Mark/Tape Mark is detected.
5. When the condition of the tape transport changes from Ready to Not Ready, setting the Ready Monitor FF.

DATA TRANSFER COUNTER

The data transfer counter provides the timing for data transfer between the computer and the controller 0 register.

TIMING DURING A READ OPERATION

The Read signal and Q = 00 from the computer starts the data transfer counter by setting the O106/107 FF at time DT 0 (see timing chart below). The following occur:

1. If the O Full FF is clear at time DT0, indicating that the O register on diagram 1-15 contains no data, the Reject FF is set by the outputs of inverters I066 and I074. The Reject signal to the computer causes the Read signal to drop, which clears the O106/107 and Reject FF's.
2. If the O Full FF is set at time DT0, indicating that the 0 register contains data, the Reject FF remains cleared and the O108/109 FF sets at time DT 1. The data from the O register is enabled to the data cable (diagram 1-3) by the "1" outputs of inverters I075 and I076. The output of O108 also initiates the 0.5-microsecond delay path to set the Reply FF at time DT 1. The Reply signal to the computer indicates that data is available; the Read signal drops, clearing the O106/107 and Reply FF's when the data channel accepts the word. FF O108/O109 is cleared 0.5 µsec later. DT 2 clears the O Full FF.

* WRITE - DT 1 always equals 1.0 µsec.
READ - DT 1 equals the time from the sending of the Read Reply until the computer accepts data.

TIMING DURING A WRITE OPERATION

The Write signal from the computer starts the data transfer counter by setting the O106/107 FF (DT 0, see timing chart). The O register is cleared at time DT 0 by the output of inverters I071 and I072. At time DT1, the O108/109 FF sets and the data on the data cable (diagram 1-3) is enabled to the O register by inverters I058 and I069. At time DT 2, the Reply FF is set by the Write signal and inverter I065. The Reply signal to the computer causes the Write signal to drop, which clears the Data transfer counter and Reply FF. DT 2 sets the O Full FF, rejecting further transfers until the word has been written on tape.

TRANSFER LOCKOUT AND LOST DATA

DURING A READ OPERATION

If the computer does not issue a Read signal and a record has not been completely read by the controller, the Transfer Lockout condition blocks any further data transfer until the end of the record is reached.

If the O Full FF is set when time RT 0 occurs (diagram 1-13), the Transfer Lockout FF is set. The Transfer Lockout FF disables any further setting of the O Full FF, thereby causing the Reject FF to be set for all further read transfer attempts. The Lost Data FF sets if the computer attempts to read another word after the Transfer Lockout FF has set. An Alarm signal will be sent to the computer when the Lost Data FF sets, if the interrupt has been selected. The new function clear inverter E093 (diagram 1-13) clears the Transfer Lockout FF.

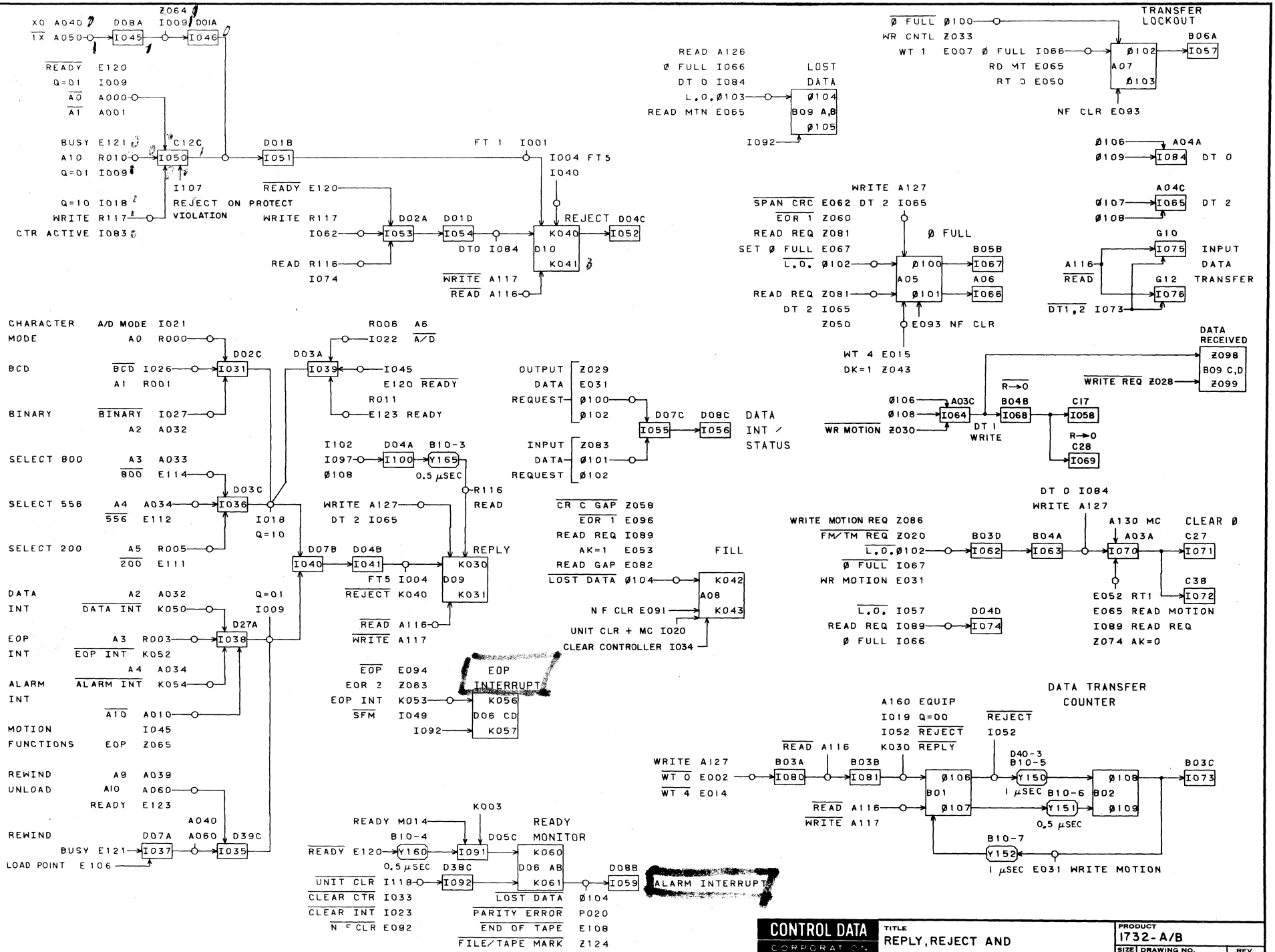
DURING A WRITE OPERATION

If the computer does not output a word at the time necessary for continuous recording, the controller will initiate an End of Record sequence. The Transfer Lockout condition blocks any further write attempts by the computer.

If the O Full FF is clear when WT 1 occurs, the Transfer Lockout FF is set. The Transfer Lockout FF starts the End of Record sequence described in the preceding paragraph.

FILL

The Fill FF indicates that input data was transferred in the Assembly mode, and the number of bytes in the tape record was odd. Thus, the lower 8 bits of the last data transfer contain all zeroes.



CONTROL DATA CORPORATION
DEVELOPMENT DIVISION

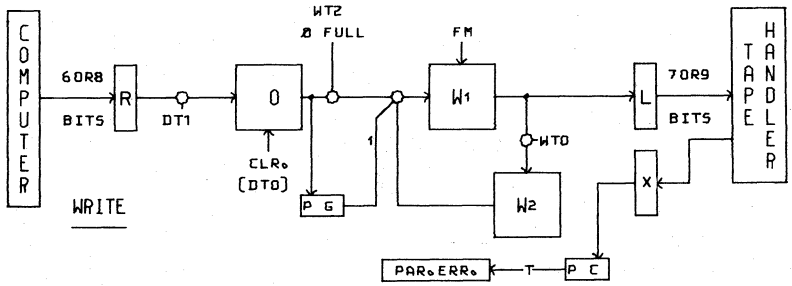
TITLE
REPLY, REJECT AND DATA TRANSFER

PRODUCT 1732-A/B
SIZE C | DRAWING NO. 60208200 | REV. J
SHEET 5 | PAGE 1-9

TERM	LOCATION	PAGE
A110	G08	1-5
A120	H18C	1-5
E091	E34	1-13
E092	E35A	1-13
E105	D37C	1-21
E112	D32C	1-21
E114	D38A	1-21
E115	D33A	1-21
E124	D33C	1-21
E125	D35A	1-21
E126	D28A	1-21
I057	D06A	1-9
I064	A03C	1-9
I066	A06	1-9
I082	F10C	1-7
I088	E08A	1-7
K022	E12A	1-7
K023	E12C	1-7
M012	B40C	1-21
0103	A07C	1-9
Z018	J19C	1-7
Z021	E01C	1-7
Z028	E02A	1-7
Z029	E02C	1-7
Z099	B09D	1-9
Z111	C39C	1-21

WRITE CONTROL

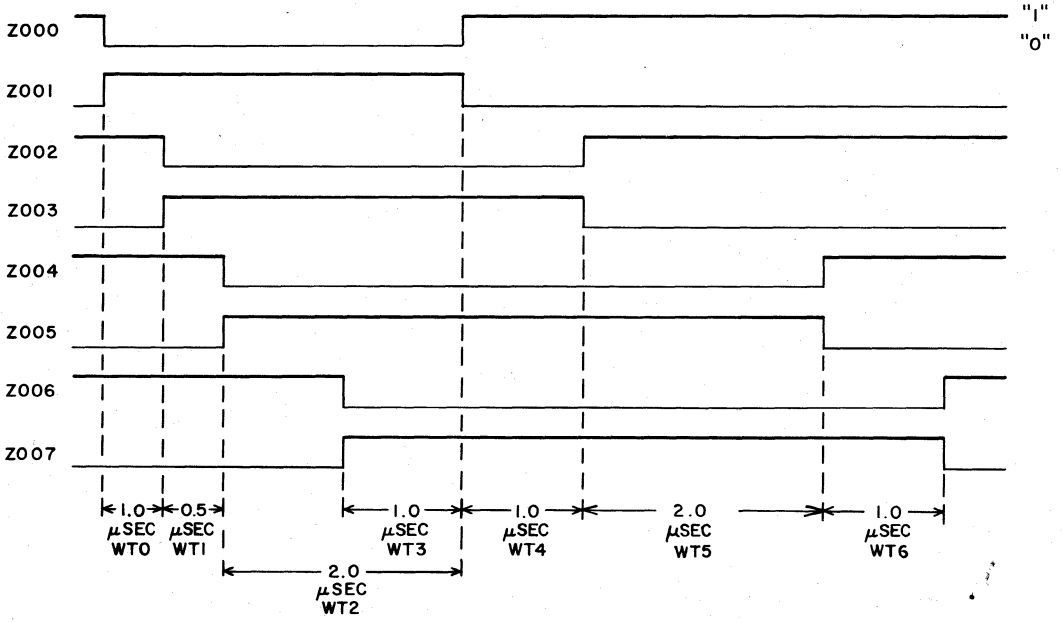
Because of the interdependence of the write control logic and the logic on other pages, no attempt will be made to define the Write control logic independently. A general explanation of a Write operation is provided instead. Refer to the following block diagram for data transfer information during a Write operation.



Refer to the timing chart at the bottom of the page for the WT 0 through WT 5 times referred to in this description.

WRITE SEQUENCE

1. The Write Request FF (diagram 1-7) is set by a Director Function code with Write bit 07 = "1". When the Write Request FF sets, the W_1 register is cleared. If the tape transport is Not Busy, the Write Motion FF and the Forward FF (diagram 1-21) are set. The Forward signal is sent to the tape transport, starting tape motion.



2. After a 7-millisecond delay to allow for tape acceleration (160 milliseconds if the tape is initially at load point to allow for a gap in the tape after the load point), the Write Control FF sets. The free-running oscillator (V000 or V002) develops the write timing. Inverter E024 allows the write timing chain to be enabled four times slower for a 200 bpi selection than for a 800 bpi selection after the first enable.
3. The Write signal from the computer starts the data transfer counter (diagram 1-9). At DT 0, the O register is cleared in preparation for the receipt of the output data.
4. At DT2, the O Full FF is set, indicating that the O register contains data. The Reply FF is set and the Reply signal to the computer drops the write signal. (If WT 1 occurs before DT 2, the O Full FF is not set, the Transfer Lockout condition exists, and the Reject FF will be set. This stops the Write sequence.)
5. At WT 0, the contents of rank W_1 are transferred to rank W_2 of the Write register (diagram 1-15).
6. If the controller is operating in Assembly/Disassembly mode, the contents of the O_2 register (bits 8-13 or 8-15) transfer to the B rank of the inverters when WT 2 occurs and the disassembly counter equals zero. At WT 2, when the disassembly counter equals 1, the contents of the O_1 register (bits 0-5 or 0-7) are transferred to the B rank of inverters. The latter transfer conditions are true in either Assembly/Disassembly mode or Character mode.
7. WT 3 enables this character to pass to the tape transport via rank 1 (W1) of the Write register. WT 3 also enables setting of the Write Sprocket FF which sends the Sprocket signal to the tape transport with each character.
8. At WT 4, and DK = 1, the 0 Full FF is cleared by the output of inverter E015.
9. At WT 6, the Write Sprocket FF is cleared.

WRITE TERMINATION

7-Track Termination

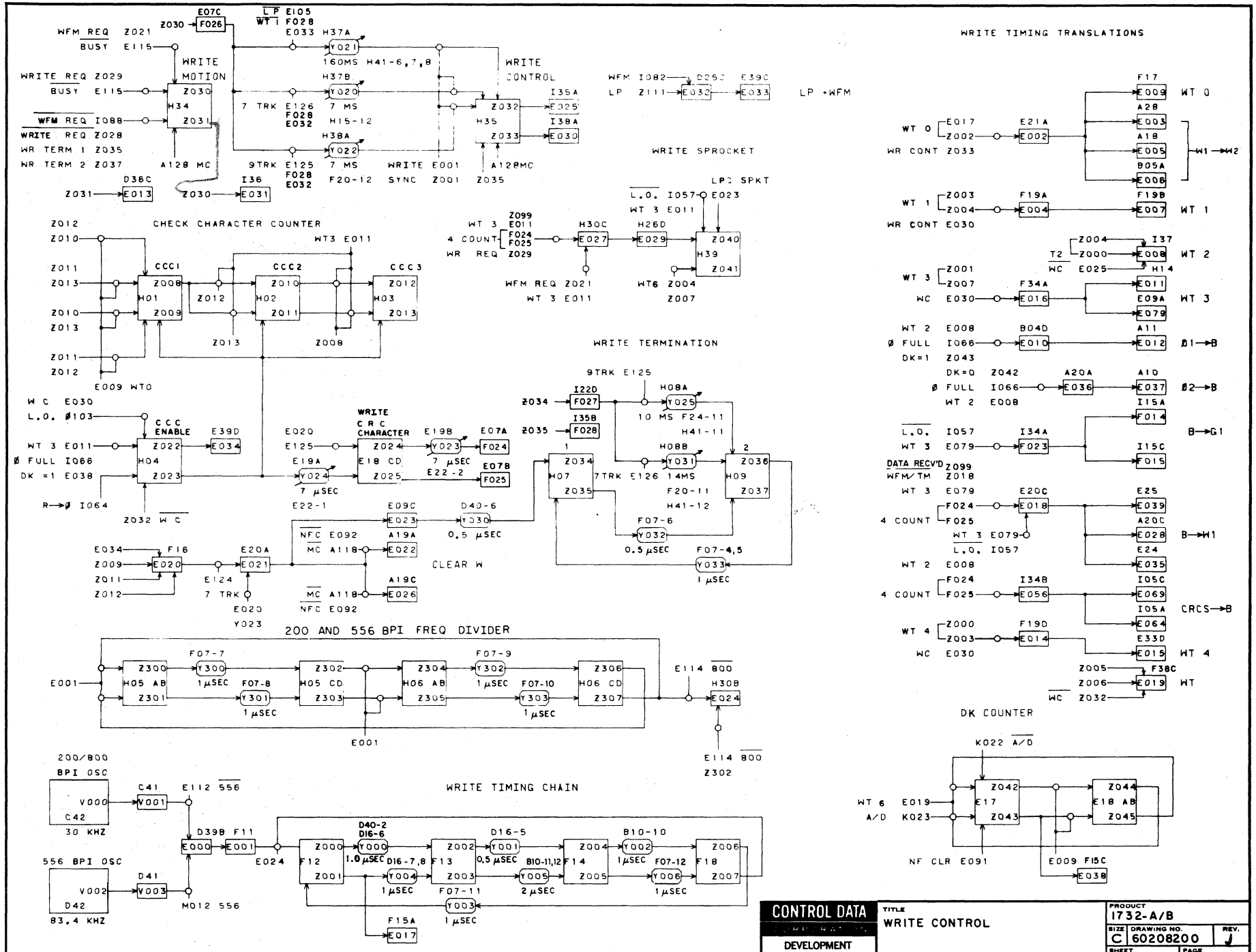
Inverter I064 normally prevents continuous toggling of the check character counter. However, when Write signals are no longer received from the computer, the counter counts the cycles of the write timing chain. On the fourth cycle counted, inverters E022 and E026 clear rank W_1 of the Write register which generates the check character. Inverter E023 sets the Write Sprocket FF, which initiates the Sprocket signal to the tape transport, causing it to write the check character. The Write Terminate I FF is set 0.5 microsecond later, clears the Write Control FF, and initiates a 14-millisecond delay path to set the Write Terminate II FF.

9-Track Termination

During termination of a Write operation on a 9-track tape transport, a cyclic code word is written on tape on the fourth cycle of the write timing chain after the last word received from the computer. On the eighth cycle of the timing chain after the last word, inverters E022 and E026 clear rank W_1 of the Write register generating the check character. The remainder of the sequence is identical to 7-track termination.

When the Write Terminate II FF sets, the Write Motion FF and the Forward FF (diagram 1-21) are cleared, the Forward signal to the tape transport drops, and tape motion stops.

If the Write Request FF (diagram 1-7) is re-set within the 10- or 14-millisecond delay before the Write Terminate II FF sets, the Write sequence is restarted from Step 1 of the Write sequence. The Write Motion FF and the Forward FF are not cleared and a Nonstop Write results.

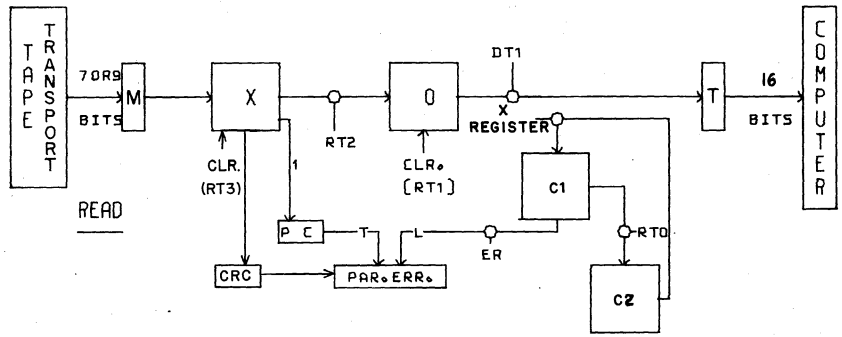


CONTROL DATA DEVELOPMENT DIVISION	TITLE: WRITE CONTROL	PRODUCT: 1732-A/B	
		SIZE: C	DRAWING NO.: 60208200
		REV.: J	
		SHEET: 6	PAGE: 1-11

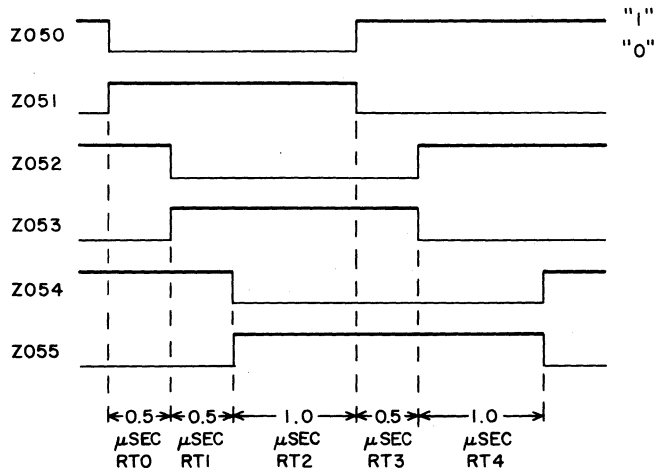
TERM	LOCATION	PAGE
A060	F09	1-3
A130	D12A	1-5
E009	F17	1-11
E013	D36C	1-11
E016	D36C	1-11
E031	I36	1-11
E107	I31B	1-21
E110	D26A	1-21
E110	D26A	1-21
E113	D31A	1-21
E115	D33A	1-21
E116	D31C	1-21
E117	I23B	1-21
E118	I23C	1-21
E122	F21D	1-21
E125	D35A	1-21
E126	D28A	1-21
E127	D34A	1-21
G000	J21A	1-17
G001	J21C	1-17
I003	D19A	1-7
I004	D20C	1-7
I015	D17C	1-7
I022	E13A	1-7
I048	D30C	1-7
I049	E16A	1-7
I057	D06A	1-9
I083	H32B	1-7
I094	E09B	1-7
I095	D24C	1-7
K000	D13A	1-7
K022	E12A	1-7
K023	E12C	1-7
M009	B39C	1-21
X001	B26C	1-17
X003	B27C	1-17
X005	B28C	1-17
X007	B29C	1-17
X009	B30C	1-17
X011	B31C	1-17
X013	B32C	1-17
X014	B33A	1-17
X017	B34C	1-17
Y100	B13A	1-21
Z014	E16C	1-7
Z020	E01A	1-7
Z026	E02A	1-7
Z080	E03A	1-7
Z081	E03C	1-7
Z090	E05A	1-7
Z092	E06A	1-7
Z093	E06C	1-7
Z095	I32C	1-7
Z096	I33A	1-7
Z100	B14A	1-21
Z102	B12A	1-21
Z110	C39A	1-21
Z130	D21C	1-7

READ CONTROL

Because of the interdependence of the read control logic and the logic on other pages, no attempt will be made to define the Read control logic independently. A general explanation of a Read operation is provided instead. Refer to the following block diagram for data transfer information during a Read operation.



Refer to the following timing chart for the RT 0 through RT 4 times referred to in this description.



READ SEQUENCE

1. The Read Request FF (diagram 1-7) is set by a Director Function code with Read bit 08 = "1". If the tape transport is Not Busy, the Read Motion FF and the Forward FF (diagram 1-21) are set. The Forward FF issues the Forward signal to the tape transport and tape motion begins.
2. After a 4-millisecond delay to allow for tape acceleration (44 milliseconds if the tape is at loadpoint, to allow for a gap in the tape after load point), the output of inverter E086 becomes "0". This removes the clear-side input to the Z048/49 Read Sprocket FF which allows the read timing chain to start.
3. After the tape has moved to the first character recorded on the tape, inverter E071 senses a sprocket (any bits on the tape) and its output becomes "1".
4. After a delay (64, 24, or 14 microseconds, depending on the recording density selected), FF Z048/49 sets, starting the read timing chain. RT 0 enables the transfer of the contents of rank C_1 to rank C_2 of the longitudinal parity check register (diagram 1-17). RT 0 also enables the shift of the contents of rank G1 of the Cyclic Redundancy Check register to rank G2.
5. At RT 1 the O register is cleared to enable it to accept new data and the vertical parity check of the character (diagram 1-17) now in the X register (diagram 1-17) is enabled.
6. At RT 2, if the controller is operating in Assembly mode, a word goes to the 0_2 rank of the transfer register when the assembly counter equals 0; when the assembly counter equals 1, a word goes to the 0_1 rank. In character mode RT 2 enables transfer of the tape word to the 0_1 rank.

   RT 2 also enables transfer of the character and parity bit from the X register to the G1 register for CRC check.
7. At RT 3 the Begin Record I FF (used in the Read Termination sequence) sets. Also at RT 3 the X register is cleared for the next character. The O Full FF sets and the Data Interrupt signal is sent to the computer.
8. RT 4 (and Assembly mode) enable the setting of the Assembly counter.
9. The computer issues the Read signal which starts the data transfer counter (diagram 1-9). At DT 1, the transfer of data from the O register to the data cable is enabled. At DT 1, the Reply signal to the computer is initiated. The computer drops the Read signal when it receives the Reply signal. When the Read signal drops, the data transfer counter and the O Full FF's clear. The next character causes the sequence to repeat from step 3. (During a Write operation, the read timing chain is enabled. RT 0, RT1, and RT 2 permit the read-after-write capability of the tape transport to perform a longitudinal and vertical parity check of the character shortly after it has been written on the tape.)

READ TERMINATION

When time RT 2 sets the Begin Record I FF in step 6 of the Read sequence, each absence of a Sprocket pulse causes the output of inverter E080 to become a "1", enabling the delay path.

When no more sprockets are sensed (end of record), the delay path (80, 120, or 330 μsec, depending on the density selected), sets the SPAN CRC FF (Z058/59) if the Begin Record II FF is set and the Backspace motion FF is not set. Following the setting of the SPAN CRC FF, there is a 120- or 470-μsec delay (if 9 track has been selected) before the EOR 1 FF is set.

The EOR II FF is set 500 μsec after the EOR I FF. The EOR II FF enables the longitudinal and CRC parity check (diagram 1-19) for 1.0 μsec after the EOR II FF sets and before the End of Operation FF sets. The pulse from E044 drops when the 1.0 μsec delay expires, setting the EOP FF.

If a new Read operation is not selected within the next 4 ms, the Read Motion FF is cleared which, after a 0.5-μsec delay, clears the Forward FF and drops the Forward signal to the tape transport (diagram 1-21).

If a new Read operation is initiated within the 4-ms delay of step 2 of the Read sequence, the Read Request FF (diagram 1-7) will be re-set and a new Read sequence will start from step 2. This action results in a mode of operation termed Nonstop Read.

Search Request

The Search request initiates tape motion without data transfer. Each End of Record starts the End of Operation sequence and when End of Record 2 FF sets, FF Z068/69 sets if no File Mark/Tape Mark has been sensed. Setting Z068/69 clears the EOR 1 and EOR 2 FF's, preventing the EOP FF from setting. When the File Mark/Tape Mark is detected, Z068/69 does not set, allowing the End of Operation sequence to conclude. FF Z066/67 prevents the End of Operation sequence from completing, while reading the LRC and CRC during a backspace or Search Backward (9 track only).

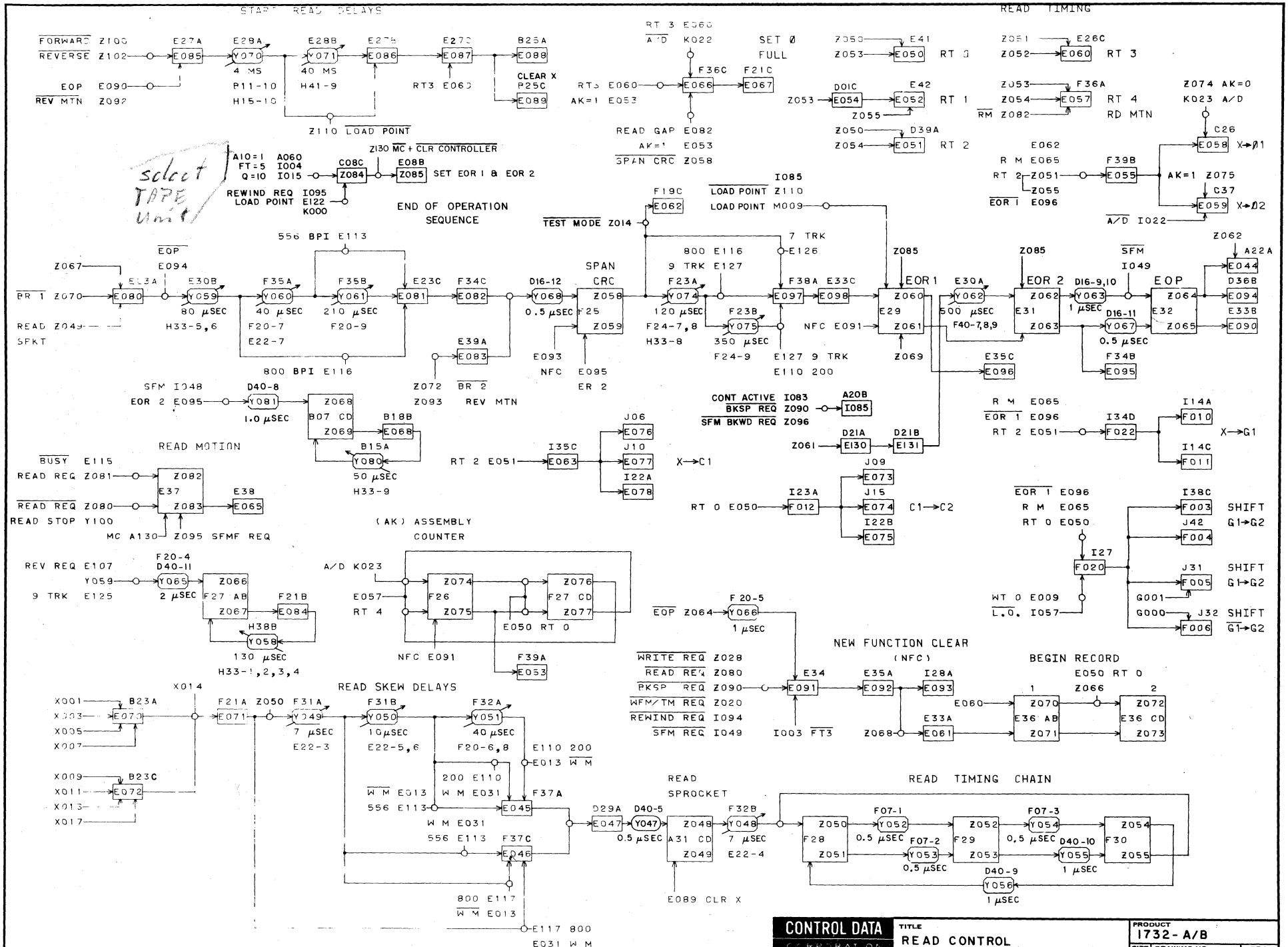
Read Skew Delays

This circuit detects each character as it is received by the X register and delays setting of the Read Sprocket FF and starting of the read timing chain. This delay allows all data bits in each tape word to reach the X register before the data transfer takes place. This is necessary to correct tape skew errors.

ASSEMBLY COUNTER (AK)

The assembly counter synchronizes the transfer of data from the Read register to the O (Assembly) register. It is set by the A/D mode of operation and a "1" from E057, which indicates Read Motion and Read Time 4. In Character mode, when AK = 0 (Z074/75 is clear), the contents of the X register is transferred to the O_1 rank of the O (Assembly) register at Read Time 2. When AK = 0 and read time = 0, the O register is cleared to receive another character.

When AK = 0 (Z074/75 is set) and the controller is operating in A/D mode, the contents of the X register is transferred to the O_2 rank of the O register at RT 2. When AK = 1, the contents of the X register are transferred to the O_1 rank of the O register at RT 2.



CONTROL DATA CORPORATION
DEVELOPMENT DIVISION

TITLE: READ CONTROL

PRODUCT: 1732-A/B
SIZE: C | DRAWING NO.: 60208200 | REV.: K
SHEET: 7 | PAGE: 1-13

TERM	LOCATION	PAGE
A126	H18B	1-5
B036	B17C	1-19
E003	A2B	1-11
E005	A1B	1-11
E006	B05A	1-11
E008	I37	1-11
E012	A11	1-11
E022	A19A	1-11
E026	A19C	1-11
E028	A20C	1-11
E035	E24	1-11
E037	A10	1-11
E039	E25	1-11
E052	E42	1-13
E058	C26	1-13
E059	C37	1-13
E064	I05A	1-11
E065	E38	1-13
E069	I05C	1-11
E095	I28A	1-13
E096	E35C	1-13
E125	D35A	1-21
E126	D28A	1-21
E127	D34A	1-21
G002	J33A	1-17
G012	J34A	1-17
G022	J35A	1-17
G035	J36C	1-17
G042	J37A	1-17
G053	J38C	1-17
G062	J39A	1-17
G072	J40A	1-17
I057	D06A	1-9
I058	C17	1-9
I069	C2B	1-9
I071	C27	1-9
I072	C28	1-9
I087	A09	1-7
R000	G22A	1-3
R001	G22C	1-3
R002	G24A	1-3
R003	G24C	1-3
R004	G26A	1-3
R005	G26C	1-3
R006	G28A	1-3
R007	G28C	1-3
R008	G30A	1-3
R009	G30C	1-3
R010	G32A	1-3
R011	G19A	1-3
R012	G19C	1-3
R013	G17A	1-3
R014	G17C	1-3
R015	G15A	1-3
X001	B26C	1-17
X003	B27C	1-17
X005	B28C	1-17
X007	B29C	1-17
X009	B30C	1-17
X011	B31C	1-17
X013	B32C	1-17
X015	B33C	1-17
X037	I21C	1-17
Z006	F18A	1-11
Z015	E39B	1-7

WRITE REGISTER

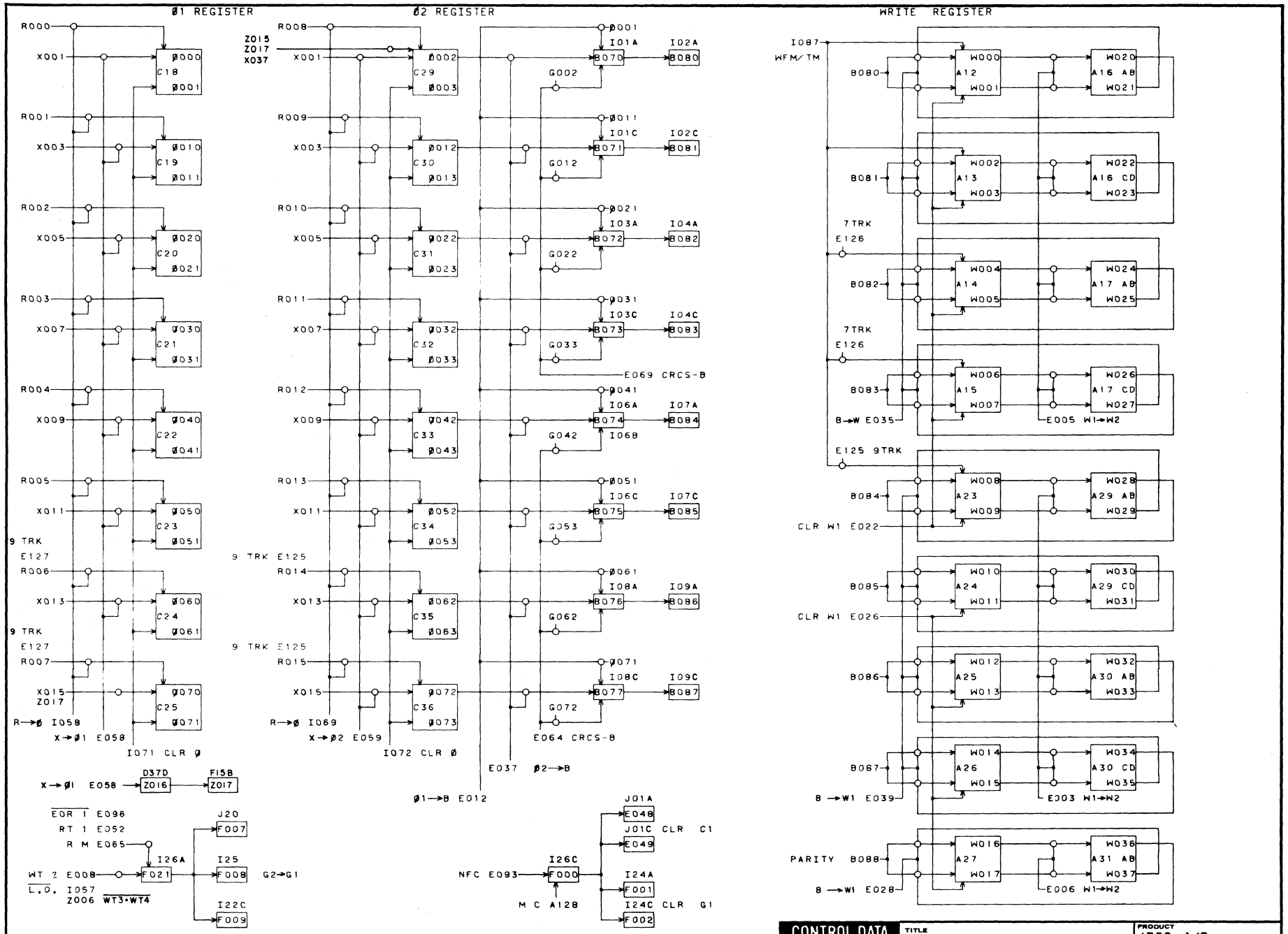
The Write register performs the change-on-ones function. The Write register (ranks W_1 and W_2) toggles to determine the actual representation recorded on the tape. At each WT 3 (diagram 1-11), a determination is made by the W_1 rank of FF's. If the input to a Rank W_1 FF is a "1", and if the previous output (state of the corresponding W_2 FF) was a "1", the new output will be a "0" (a change). If the input is a "1", and if the previous output (state of the corresponding Rank W_2 FF) was a "0", the new output will be a "1" (a change). If the input is a "0", the new output is the same as the previous output (no change). At each WT 0 time, the output of rank W_1 is transferred to rank W_2 in preparation for the next determination.

Each rank W_1 FF is in a Set condition after an odd number of bits has been written by it. A check character bit is written automatically at the end of the record when rank W_1 is cleared and a Sprocket pulse is generated. The check character bit provides an even parity bit for the track on the tape represented by the set FF.

O Register

The O register consists of two 8 FF ranks which store data as it waits to be synchronized for transfer through the controller. The O register serves as the Assembly/Disassembly register when the controller is operating in Assembly/Disassembly mode. During either a Read or a Write operation, rank 1 receives bits 0-5 or 0-7 (depending on whether 7- or 9-track mode is selected) and rank 2 receives bits 8-13 or 8-15.

During a Write operation the contents of the O_2 rank transfer to the Write register first, via the rank of "B" inverters; then the contents of O_1 transfer to the Write register via the rank of "B" inverters; then the contents of O transfer to the Write register via the "B" inverters. During a Read operation, the O_2 rank receives the first character from the Read register and the O_1 rank receives the next character. O_1 sends its contents to bit positions 0 through 5 or 0 through 7 of the controller transmitter cards (diagram 1-3) which sends the data to the computer. O_2 sends its contents to bit positions 8 through 13 or 8 through 15 of the controller transmitter cards. Rank O_2 is not used when the controller is operating in Character mode.



CONTROL DATA
DEVELOPMENT DIVISION

TITLE
DATA REGISTERS

PRODUCT 1732-A/B
SIZE C | DRAWING NO. 60208200 | REV. J
SHEET 8 | PAGE 1-15

TERM	LOCATION	PAGE
B080	I02A	1-15
B081	I02C	1-15
B082	I04A	1-15
B083	I04C	1-15
B084	I07A	1-15
B085	I07C	1-15
B086	I09A	1-15
B087	I09C	1-15
B088	B17C	1-19
E048	J01A	1-15
E049	J01C	1-15
E073	J09	1-13
E074	J15	1-13
E075	I22B	1-13
E076	J06	1-13
E077	J10	1-13
E078	I22A	1-13
E088	B25A	1-13
E089	B25C	1-13
F001	I24A	1-15
F002	I24C	1-15
F003	I38C	1-13
F004	J38	1-13
F005	J31	1-13
F006	J32	1-13
F007	J20	1-15
F008	I25	1-15
F009	I22C	1-15
F010	I41A	1-13
F011	I41C	1-13
F014	I15A	1-11
F015	I15C	1-11
M000	B36A	1-21
M001	B36B	1-21
M002	B36C	1-21
M003	B37A	1-21
M004	B37B	1-21
M005	B37C	1-21
M006	B38A	1-21
M007	B38B	1-21
M008	B38C	1-21

READ REGISTER

The Read (X) register performs a data stabilization function during a Write and Read operation. Outputs from this register are gated to the Parity and File Mark Detection circuits (diagram 1-17) during both a Read operation and the read-after-write transfer, and to the O register during a Read operation.

CRC REGISTER

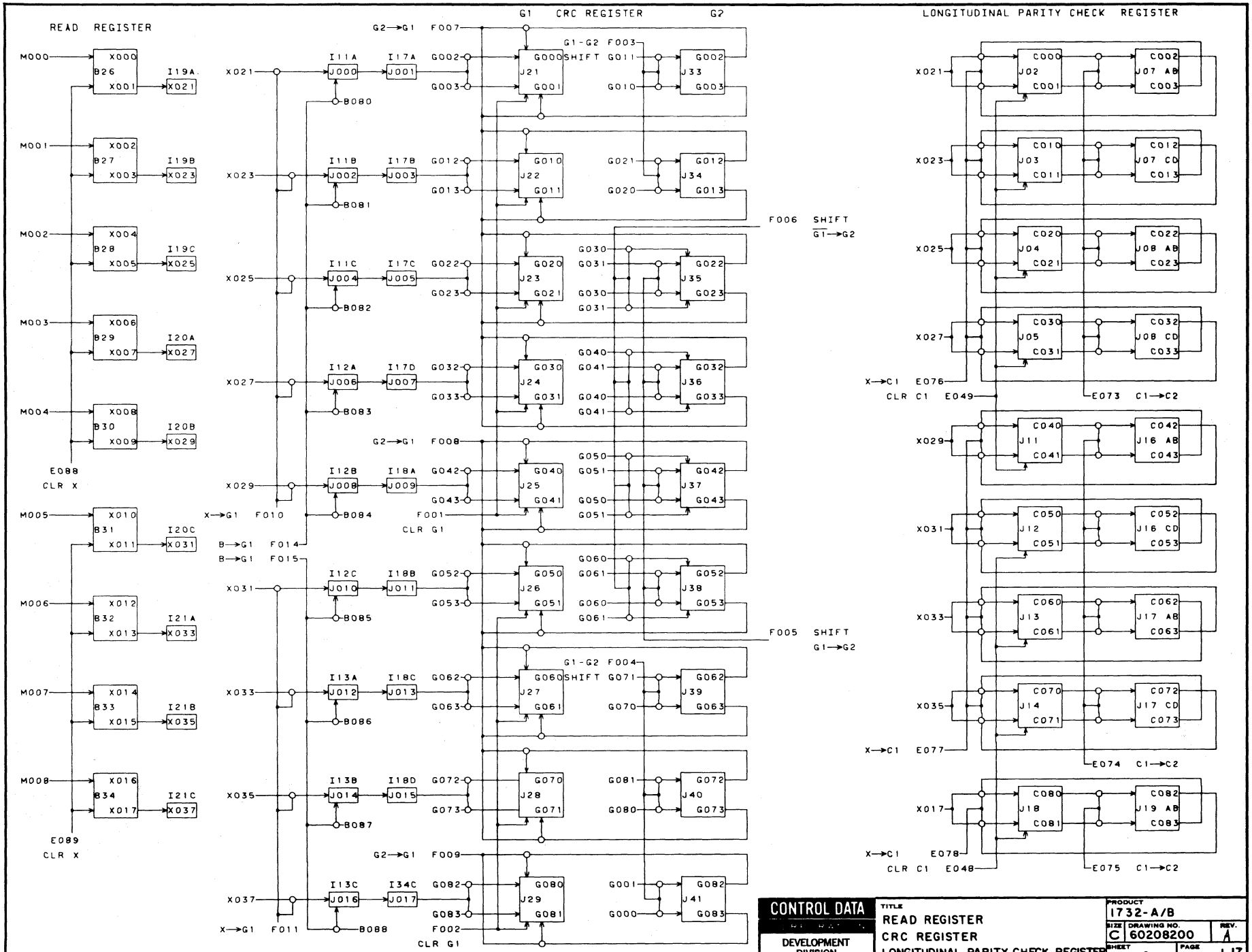
The Cyclic Redundancy Check register receives data words during Read and Write operations and generates a cyclic code word which (along with the longitudinal and transverse parity) checks the accuracy of data written on tape. It is used only during a 9-track operation (i.e. with a 609).

During a Write operation the CRC register receives each 9-bit data character from the "B" rank of inverters (diagram 1-15). Each character is fed into the G_1 rank of the CRC register. Following the receipt of the initial character, Rank G_1 FF's are set or cleared by one's in the data character depending on the state of the G_2 rank. The contents of the G_1 register then shift positions; bit zero of G_1 register goes to bit position 9 in G_2, bit one goes to bit zero of G_2, bit 2 of G_1 goes to bit 1 of G_2, and so forth in an end-around shift. The enables for the shift of bits 3, 4, 5 and 6 of G_1, 2, 3, 4 and 5 of G_2, are F006 and F005. If F006 enables the shift, it indicates that bit 0 of G_1 = "1", and therefore, bits 3, 4, 5 and 6 of G_1 are inverted (complemented) when the shift to G_2 takes place. If F005 enables the shift, then bit 0 of G_1 = "0", and the bits are not complemented. At WT 2 the contents of G_2 are transferred to G_1. At WT 3 another character is transferred to G_1 and at WT 0 the contents of G_1 are shifted to G_2 again. The cycle continues toggling the CRC register until the last character has been transferred to G_1. This last character is shifted to G_2, and at this point the contents of G_2 determine the cyclic character. The complemented value of bits 0, 1, 2, 4, 6, 7, and 8, and the true value of bits 3 and 5 are sent to the rank of "B" inverters which sends the cyclic code word to the Write register which sends it to the tape unit.

During a Read operation the CRC register receives each data word and the cyclic word from the X register. The same shifting, adding and complementing cycle occurs. At the end of the data transfer the contents of G_1 are sent to inverters P016 and P017 (diagram 1-19). If the data which has been transferred is correct, the contents of G_1 will send a "1" from the set side outputs to P016, except for bit 3 and 5, which will send zeroes to P017. Any other arrangement will set the CRC Error FF (diagram 1-19) if there is Read Motion, the End of Record 1 FF is set and the End of Record 2 FF is not set.

LONGITUDINAL PARITY CHECK REGISTER

The Longitudinal Parity Check register receives each data word from the X register. The C_1 rank toggles according to the state of the C_2 rank and the state of the bit received, in the same manner as the Write register. When the C_1 rank receives the Longitudinal parity word, all FF's in the C_1 rank should be clear. If they are not clear, the Parity Error FF (diagram 1-19) sets.



CONTROL DATA
DEVELOPMENT DIVISION

TITLE
READ REGISTER
CRC REGISTER
LONGITUDINAL PARITY CHECK REGISTER

PRODUCT 1732-A/B
SIZE C | DRAWING NO. 60208200 | REV. A
SHEET 9 | PAGE 1-17

TERM	LOCATION	PAGE
B070	I01A	1-15
B071	I01C	1-15
B072	I03A	1-15
B073	I03C	1-15
B074	I06A	1-15
B075	I06C	1-15
B076	I08A	1-15
B077	I08C	1-15
B080	I02A	1-15
B081	I02C	1-15
B082	I04A	1-15
B083	I04C	1-15
B084	I07A	1-15
B085	I07C	1-15
B086	I09A	1-15
B087	I09C	1-15
C001	J02C	1-17
C011	J03C	1-17
C021	J04C	1-17
C031	J05C	1-17
C041	J11C	1-17
C051	J12C	1-17
C061	J13C	1-17
C071	J14C	1-17
C080	J18A	1-17
E044	A22A	1-13
E052	E42	1-13
E062	E38	1-13
E069	I05C	1-11
E072	B23C	1-13
E090	E33B	1-13
E091	E34	1-13
E095	I28A	1-13
E094	D36B	1-13
E09B	E33C	1-13
E124	D33C	1-21
E125	D35A	1-21
E127	D34A	1-21
G001	J21C	1-17
G011	J22C	1-17
G021	J23C	1-17
G031	J24C	1-17
G041	J25C	1-17
G051	J26C	1-17
G061	J27C	1-17
G071	J28C	1-17
G081	J29C	1-17
G082	J41A	1-17
I020	F04A	1-7
I027	F15C	1-7
I032	D26	1-7
I049	E16A	1-9
I057	D06A	1-9
I082	F10C	1-7
I116	F06C	1-5
K020	E14A	1-7
K021	E14C	1-7
K091	B07B	1-7
K100	C01A	1-5
K102	C01C	1-5
K104	C02A	1-5
K106	C02C	1-5
K108	C03A	1-5
K110	C03C	1-5
K112	C04A	1-5
K114	C04C	1-5
X000	B26A	1-17
X001	B26C	1-17
X002	B27A	1-17
X003	B27C	1-17
X004	B28A	1-17
X005	B28C	1-17
X006	B29A	1-17
X007	B29C	1-17
X008	B30A	1-17
X009	B30C	1-17
X010	B31A	1-17
X011	B31C	1-17
X012	B32A	1-17
X013	B32C	1-17
X014	B33A	1-17
X015	B33C	1-17
X016	B34A	1-17
X017	B34C	1-17
7058	F25A	1-13
7060	E29A	1-13
7062	E31A	1-13
7063	E31C	1-13
7101	B14C	1-21

TAPE PARITY GENERATION AND CHECKING

The Tape Parity Check circuits provide vertical parity checking for each line of tape data, and longitudinal parity checking and cyclic redundancy checking for each record of data. The controller checks CRC during Read operations only, but checks longitudinal and vertical parity during both Read and Write operations. Any tape parity error sets the Parity Error FF, lights the PARITY ERROR indicator, and is available for a status check. The Parity Error FF clears whenever a new tape motion operation is initiated, or the controller accepts another unit select.

The Vertical Parity Check circuit examines the bits present in each line of data as it is sent to the X register (diagram 1-17) during both a Read and a Read-after Write. If an even number of bits are present in a line and odd parity is selected, the Parity Error FF sets; if an odd number of pits are present in a line and even parity is selected, the Parity Error FF sets. A file mark always generates a parity error when the controller is operating in Binary mode (odd parity).

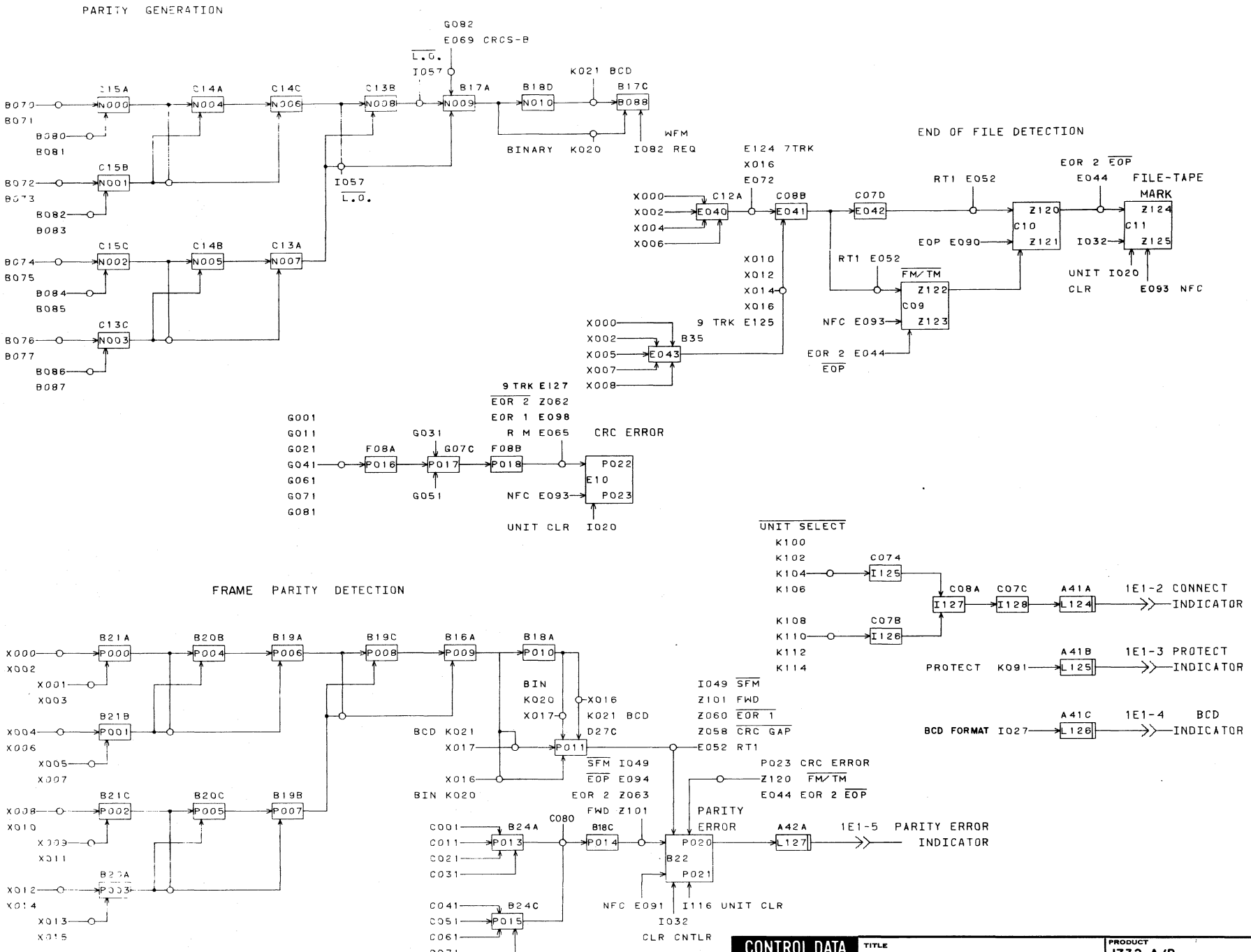
Longitudinal parity is checked whenever an end of record occurs. The check is made by examining the final state of the Longitudinal Check register (diagram 1-15).

FILE MARK DETECTION

The File Mark/Tape Mark FF is set at the end of an operation if a file mark (7 track, 17_8 in BCD) or tape mark (9 track, 23_8) is detected in the X register. The File Mark/Tape Mark FF provides an indication of file mark/tape mark detection to the computer as Director Status 1 information.

CYCLIC REDUNDANCY CHARACTER ERROR FF

This FF (P022/23) sets when the cyclic character does not leave the CRC register in a 727_8 condition at the end of each record during a read. When this FF sets, the EOP pulse enables setting of the Parity Error FF.



CONTROL DATA
DEVELOPMENT DIVISION

TITLE
PARITY CHECK AND GENERATION
END OF FILE DETECTION

PRODUCT 1732-A/B
SIZE C | DRAWING NO. 60208200 | REV. J
SHEET 10 | PAGE 1-19

TERM	LOCATION	PAGE
A003	F10B	1-3
A004	H10B	1-3
A005	H10C	1-3
A044	F03C	1-5
A060	F09	1-3
A130	D12A	1-5
E051	I3A	1-11
E091	E34	1-13
I017	D20A	1-7
I089	E04C	1-7
I095	D24C	1-7
I096	B08B	1-7
K101	C01B	1-5
K103	C01D	1-5
K105	C02B	1-5
K107	C02D	1-5
K109	C03B	1-5
K111	C03D	1-5
K113	C04B	1-5
K115	C04D	1-5
W001	A12C	1-15
W003	A13C	1-15
W005	A14C	1-15
W007	A15C	1-15
W009	A23C	1-15
W011	A24C	1-15
W013	A25C	1-15
W015	A26C	1-15
W017	A27C	1-15
Z030	H34A	1-11
Z031	H34C	1-11
Z037	H07C	1-11
Z041	H39C	1-11
Z081	E03C	1-7
Z085	F37C	1-13
Z091	E05C	1-7
Z093	E06C	1-7
Z095	I32C	1-7
Z097	I33C	1-7

DATA LINES

Cables 1A1-1A2 carry the output character and parity bit to the tape transport. Cable 1B1-1B2 carry the input character from the tape transport. The other signals carried by the cables are defined as follows:

TAPE TRANSPORT RESPONSE SIGNALS

End of Tape

This signal indicates that the tape transport has sensed an end-of-tape reflective marker. The EOT signal remains on the line until the tape unit senses Reverse motion or load point.

Write Enable

This signal indicates that a file protection ring is on the tape reel of the selected tape transport. If this signal is not present, information can be read from the tape but a Write operation cannot be performed.

Load Point

This signal indicates that the photocells of the tape transport are sensing a load point reflective marker. The 5-microsecond delay and the LP (load point) FF assure that the tape transport is on the load point and allows the tape to move off load point before data transfer can be accomplished.

Busy

This signal indicates that the tape is in motion.

Density 556

This signal indicates that the tape transport has been selected for 556 bpi density operation. If the Density 556 signal and the Density 800 signal are both absent, a density of 200 bpi is selected.

Density 800

This signal indicates that the tape transport has been selected for 800 bpi density operation. If the Density 800 and Density 556 signal are both absent, a density of 200 bpi is selected.

Ready

This signal indicates that a tape transport is selected and is in a Ready condition.

9 Track

This signal indicates that the controller has selected a 609 tape transport.

TAPE TRANSPORT INSTRUCTION SIGNALS

Write Select

This signal activates the tape transport Write and Read after Write circuits and turns on the erase-head current.

Forward

This signal starts forward tape motion at a rate of 37-1/2 inches per second. When the signal drops, tape motion stops.

Reverse

This signal starts reverse tape motion at a rate of 37-1/2 inches per second. When the signal drops, tape motion stops.

Rewind

This signal starts reverse tape motion at high speed. Tape motion stops when the photocells in the tape transport sense a load point reflective marker. When the load point is sensed, the tape reloads itself and the tape transport becomes a Not Busy.

Rewind Unload

This signal activates the tape transport in the same manner as the Rewind signal except that it becomes Not Ready immediately, and will become Ready by manual intervention only.

Density Select

These signals set delays in the tape transport to cause data transfer at rates of 200, 556, or 800 bpi.

Master Clear (MC)

This signal establishes initial operating conditions in the tape handler by clearing all previous operating conditions. Tape motion stops immediately if this signal is issued.

Select Lines

These lines carry the unit select translation to the tape transports. The tape transport with a Unit Select switch position matching the Unit Select code will be selected and will send a Ready signal to the controller.

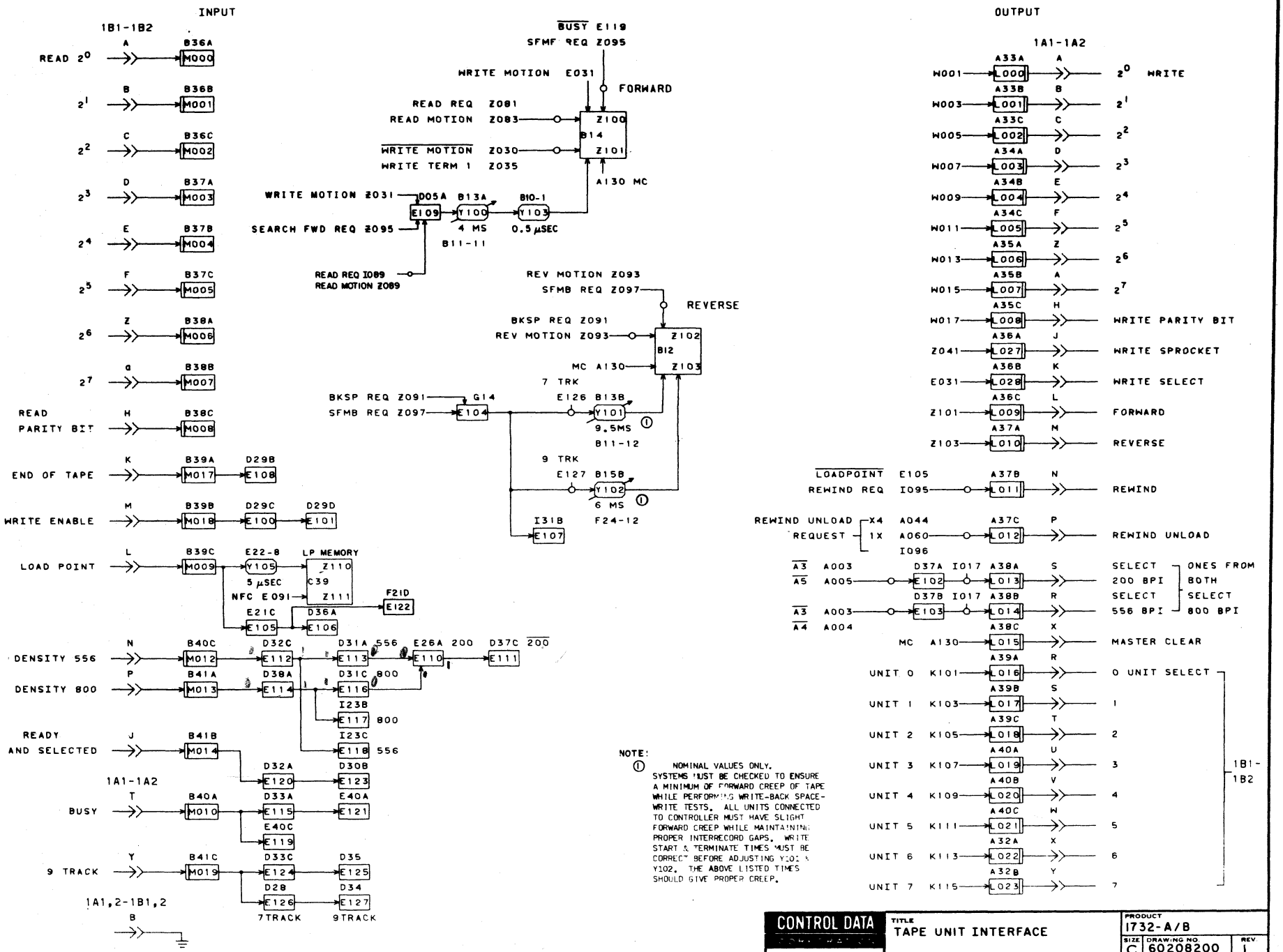
Write Sprocket

This signal is sent to the tape transport with each character to enable synchronization of the data transfer.

Forward and Reverse FF's

When set, these FF's initiate tape motion signals to the selected tape transport. The Forward FF is set by the Write motion FF, Search File Mark/Tape Mark Forward request FF, or the Read request and Read Motion FF's. The absence of all of these conditions clears the Forward FF 4 ms after the setting condition drops. This 4-ms delay allows for proper positioning of the tape following the operation.

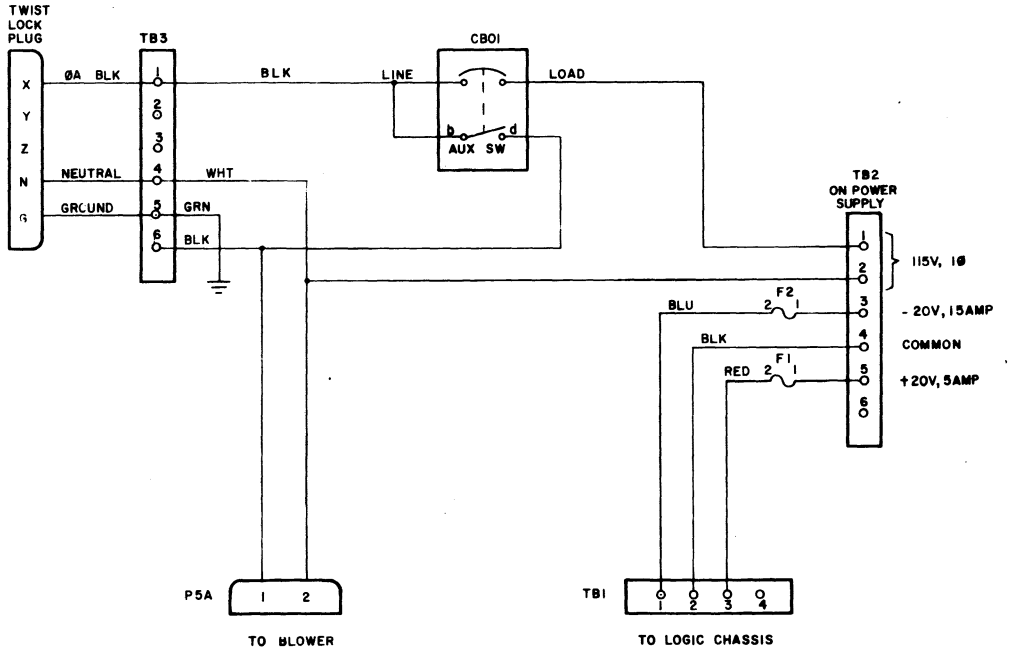
The Reverse FF is set by the Reverse Motion FF and either the Search File Mark/Tape Mark Backward FF or the Backspace request FF. The Reverse FF clears 9.5 ms (7-track) or 6 ms (9-track) after the Backspace request FF or Search File Mark/Tape Mark Backward FF clears. Clearing the Forward or Reverse FF stops tape motion in the tape transport.



CONTROL DATA
DEVELOPMENT DIVISION

TITLE: TAPE UNIT INTERFACE

PRODUCT: 1732-A/B
SIZE: C | DRAWING NO: 60208200 | REV: L
SHEET: 11 | PAGE: 1-21



CONTROL DATA	TITLE	PRODUCT	
DEVELOPMENT DIVISION	POWER DISTRIBUTION	1732	
		SIZE C / DRAWING NO. 60208200	REV. H
		SHEET	PAGE 1-23

PART 2

MAINTENANCE

PART 2

MAINTENANCE

INTRODUCTION

The controller is constructed of standard Control Data components with properties identical to those of 3000 Series computers. It requires a dust-free, air-conditioned environment. Blowers cool the controller by drawing air through reusable filters in the base of the controller cabinet. The filters should be cleaned after every 40 hours of operation.

For troubleshooting and adjustment procedures of the power supply, refer to the Control Data Power Supplies Manual.

TABLE 2-1. CONTROLLER SPECIFICATIONS

chassis height	41 in.
chassis depth	6 in.
chassis width	20 in.
chassis weight	200 lb.
total weight of cabinet	550 lb.
heat dissipation	2000 BTU/hr
type cooling	blower
power consumption	(50/60 Hz, 115v, single phase) 0.550 KW
line current	(50/60 Hz, 208v, 3-phase) 4.85 amps
breaker size	8 amps
terminator power (provided by main system)	+20 vdc and -20 vdc

TEST MODE

The controller TEST MODE switch, located on the back of the chassis, activates and deactivates the Test mode. The Test mode provides a means for checking the accuracy of the hardware which generates the cyclic redundancy character.

The CRC hardware is checked by activating the Test mode (Up position), selecting character mode and a 9-track tape transport, generating a cyclic character by writing a short record, reading the record, including the cyclic code word which was generated, and then comparing the generated cyclic character with one generated in the computer program for that record.

This feature is intended for checkout and diagnostic purposes only, and care should be taken to deactivate the Test mode before attempting normal operation.

CAPACITIVE DELAYS

Capacitive delays in the 1732 controller require periodic maintenance. The frequency of delay checking must be determined by the 1732 operational reliability, rather than by hourly standards.

When checking a delay, the location symbol of which contains a test point (active delay), the scope may be connected directly to the indicated test point (see Figure 2-1).

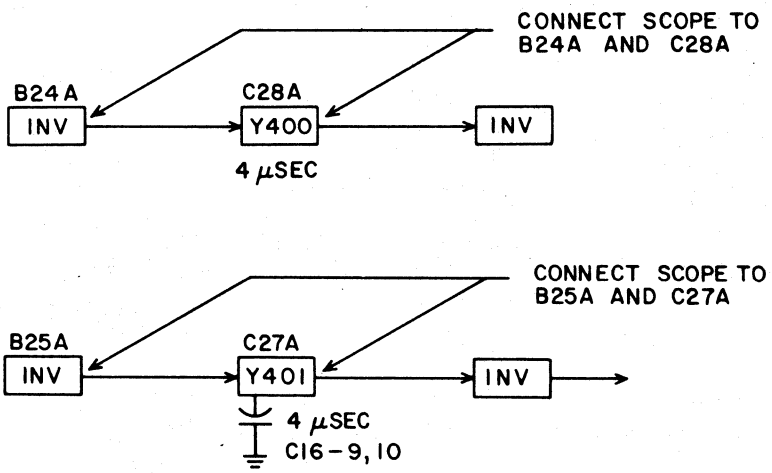


Figure 2-1. Active Delays

When checking a delay, the location symbol of which does not contain a test point (passive delay), the scope must be connected to the switching logic elements, rather than to the delay itself (see Figure 2-2).

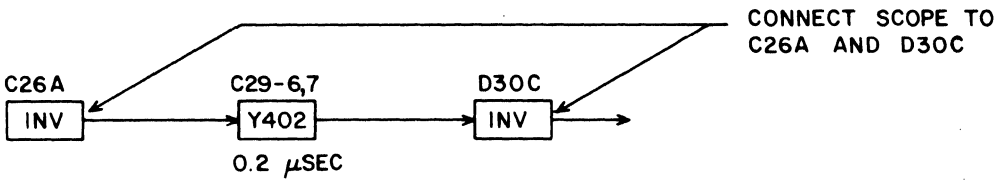


Figure 2-2. Passive Delays

Capacitive delays may be adjustable or non-adjustable. Adjustable delays are shown with an arrow through the delay symbol. The size of the capacitor and the voltage level it must attain to switch a circuit element determine the time consumed by each capacitive delay.

Non-Adjustable Delays

Most of the delays in the 1732 are non-adjustable. When they are determined to be slow or fast (not within 20 percent of the designated value), they must be replaced by changing cards.

Adjustable Delays

Adjustable delays may be varied by increasing or decreasing the switching voltage across the capacitor with an adjustable potentiometer on the circuit card. Table 2-2 lists the adjustable delays in the 1732.

TABLE 2-2. ADJUSTABLE DELAYS

TERM	SHEET	DELAY TIME	LOCATION
Y020	1-11	7 ms	H37B
Y021	1-11	160 ms	H37A
Y022	1-11	7 ms	H38A
Y023	1-11	7 μsec	E19B
Y024	1-11	7 μsec	E19A
Y025	1-11	10 ms	H08A
Y031	1-11	14 ms	H08B
Y048	1-13	7 μsec	F32B
Y049	1-13	7 μsec	F31A
Y050	1-13	10 μsec	F31B
Y051	1-13	40 μsec	F32A
Y058	1-13	130 μsec	H38B
Y059	1-13	80 μsec	E30B
Y060	1-13	40 μsec	F35A
Y061	1-13	210 μsec	F35B
Y062	1-13	500 μsec	E30A
Y070	1-13	4 ms	E28A
Y071	1-13	40 ms	E28B
Y074	1-13	120 μsec	F23A
Y075	1-13	350 μsec	F23B
Y080	1-13	50 μsec	B15A
Y100	1-21	4 ms	B13A
Y101	1-21	9.5 ms	B13B
Y102	1-21	6 ms	B15B

TIMING CHARTS

Figure 2-3, 2-4, 2-5, and 2-6 illustrate the relationship between pertinent controller circuits which are active during Read, Write, Write File Mark/Tape Mark and Backspace operations.

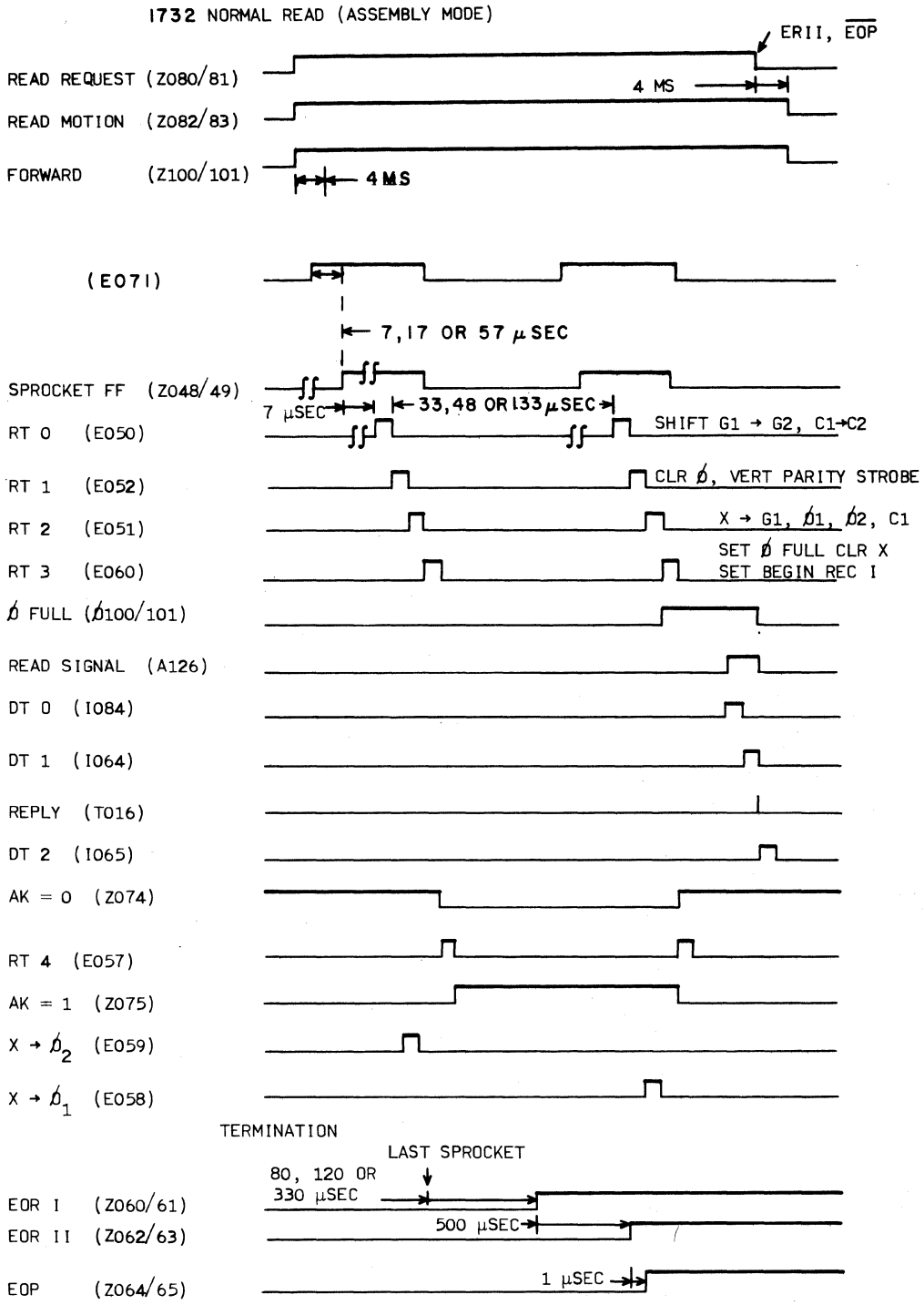


Figure 2-3. Read Data Sequence

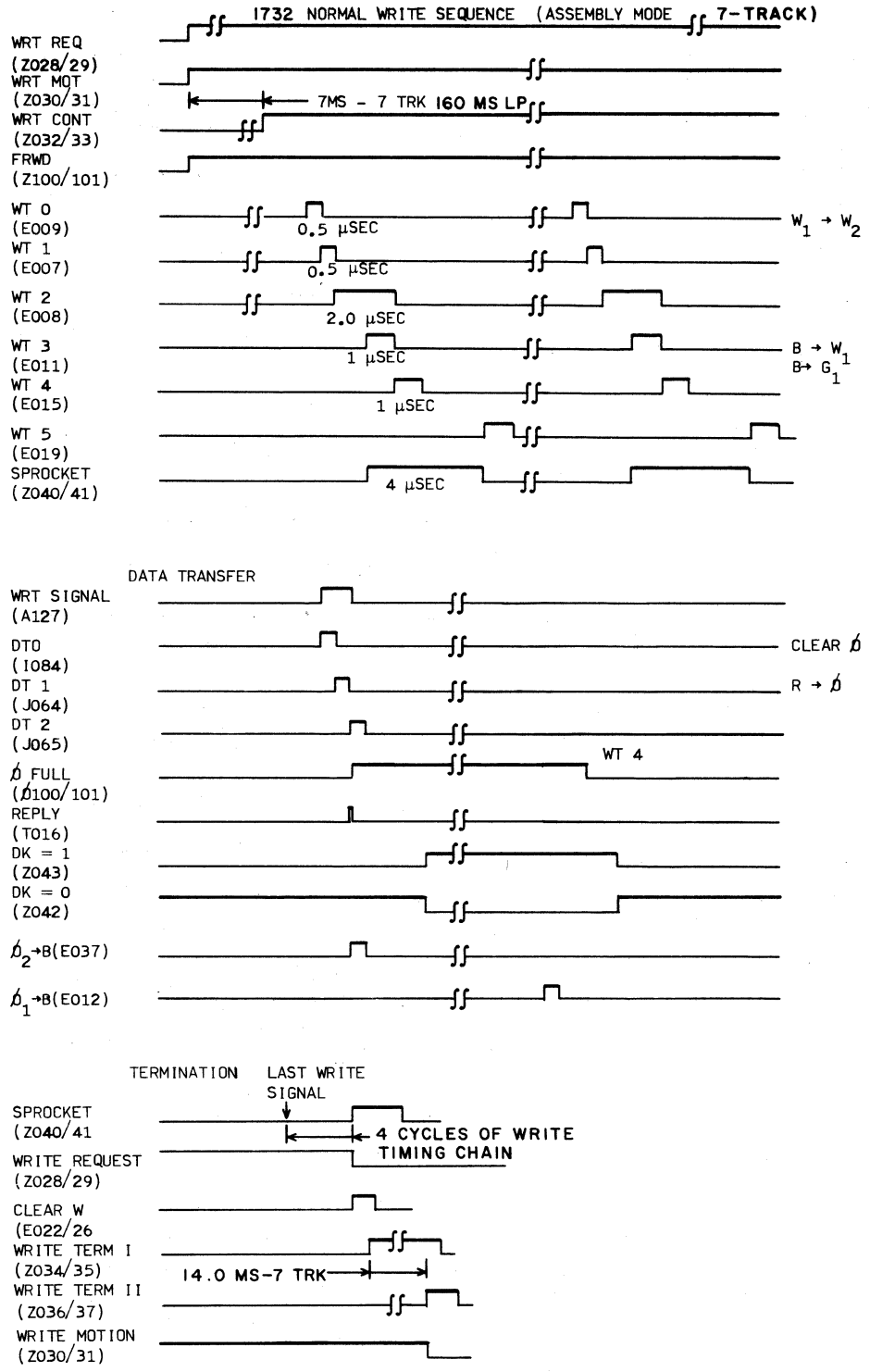


Figure 2-4. Write Data Sequence

FILE MARK / TAPE MARK

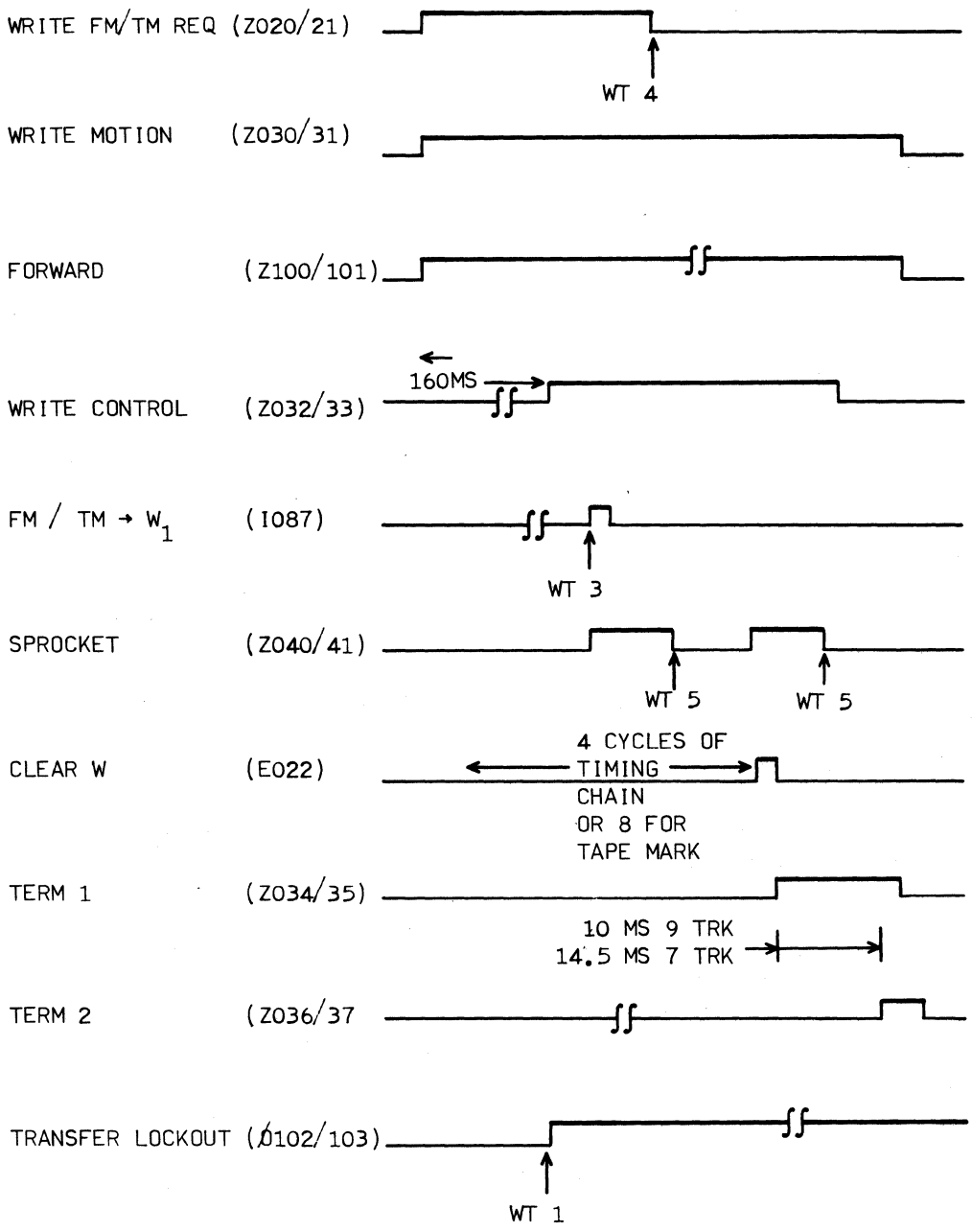


Figure 2-5. Write File Mark/Tape Mark

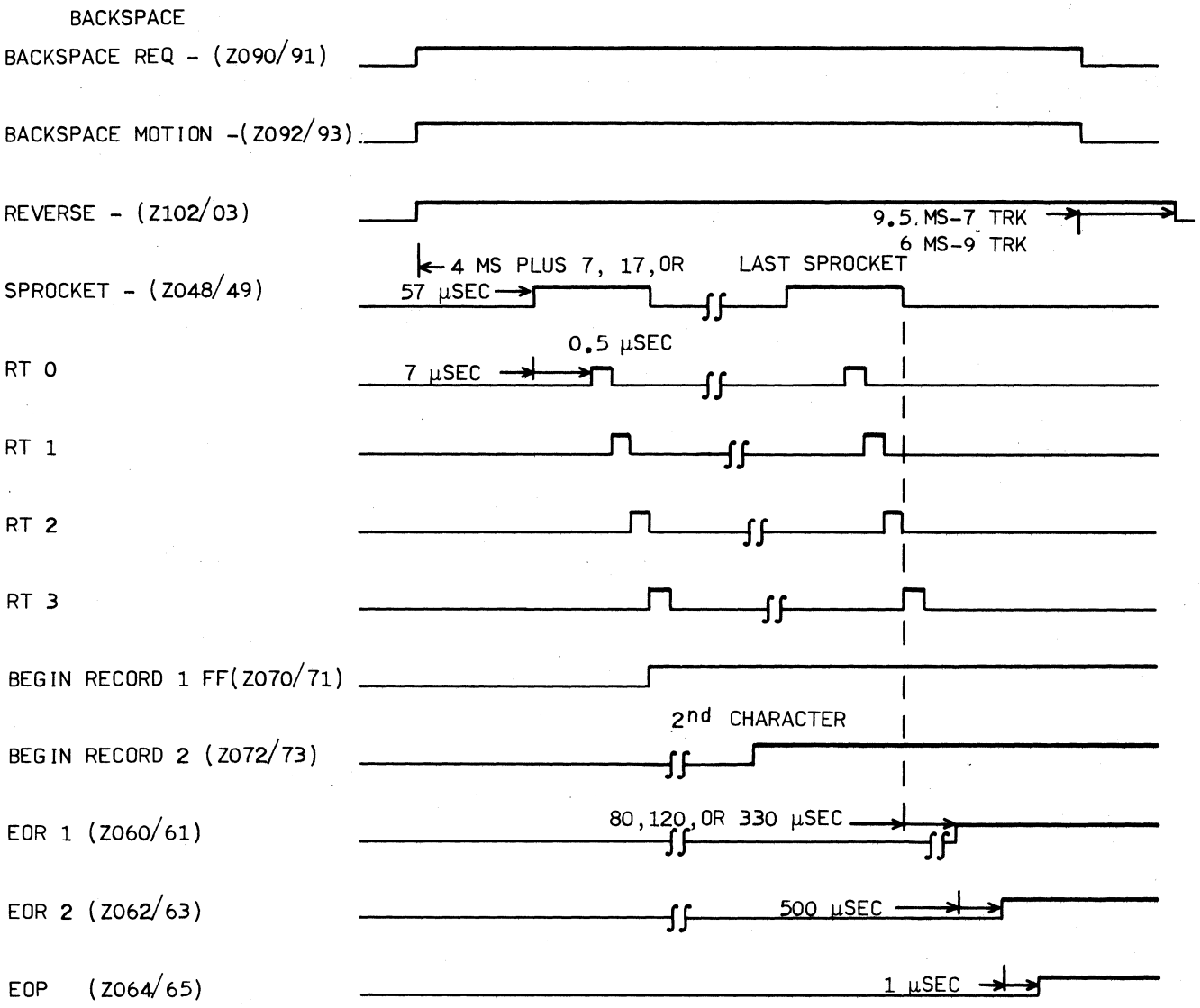


Figure 2-6. Backspace

CABLING INFORMATION

The controller communicates with the data channel via one data cable and one address cable that fastens to the controller at 1F1 and 1G1 respectively. (See Figure 2-7.) Pin and signal assignments for these cables are shown in Table 2-3. The data channel may be extended to another peripheral controller by placing a data cable in 1F2 and an address cable in 1G2. If not extended, place 61-pin terminators on all unused connectors.

The controller communicates with a tape unit via one output cable and one input cable that fastens to the controller at 1A1 and 1B1 respectively. Pin and signal assignments for these cables are shown in Tables 2-4 and 2-5. The controller may be extended to another tape unit by placing an output cable in 1A2 and an input cable in 1B2 of the connected tape unit. If not extended, place 24-pin terminators on all unused connectors.

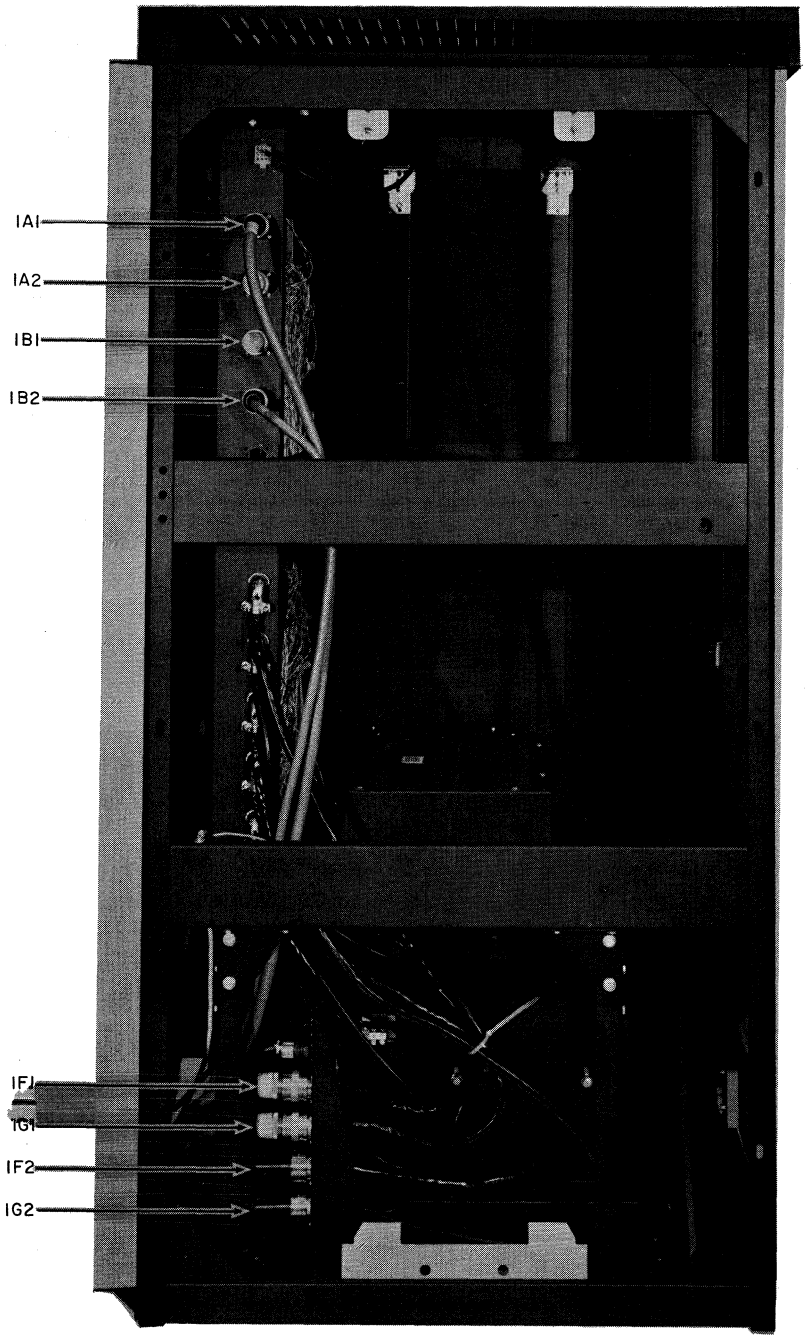


Figure 2-7. Controller and Connector Location

TABLE 2-3. 1700 I/O CHANNEL CABLES, SIGNAL AND PIN ASSIGNMENTS

DATA CABLE SIGNAL	PIN	ADDRESS CABLE SIGNAL
Data Bit 00	A1-2	Address Bit 00
01	A3-4	01
02	A5-6	02
03	A7-8	03
04	A9-10	04
05	B1-2	05
06	B3-4	06
07	B5-6	07
08 } To/From	B7-8	08 } From
09 } A Reg.	B9-10	09 } Q Reg.
10	C1-2	10
11	C3-4	11
12	C5-6	12
13	C7-8	13 } W
14	C9-10	14
15	D1-2	15
Reply	D3-4	Read
Reject	D5-6	Write
Character Input	D7-8	Master Clear
Priority**	D9-10	Program Protect
Unused	E1-2	Buffer Active**
	E3-4	Timing Pulse**
	E5-6	Unused
	E7-8	
	E9-10	
	F1-2	
	F3-4	
	F5-6	Unused
Unused	F7-8	W=0
Termination power	F9-10	Termination power

* The 29-pair cables (Two) terminate in 61-pin connectors. Pins F9-10 of each connector are used to provide power to the terminator assembly and do not connect to lines in the I/O cable.

** These signals exist in the cables from a BAQ only, and are used by devices which use the BAQ channel only.

TABLE 2-4. SIGNAL AND PIN ASSIGNMENTS: OUTPUT CABLE FROM 1732 TO TAPE UNIT

CONNECTOR 1A1, 1A2 PIN	SIGNAL
*A	2^0 Write
*B	2^1 Write
*C	2^2 Write
*D	2^3 Write
*E	2^4 Write
*F	2^5 Write
*H	(Parity)
*J	Write Sprocket
*K	Write Select
*L	Forward
*M	Reverse
*N	Rewind
*P	Rewind Unload
*R	Density Select (200 bpi)
*S	Density Select (556 bpi)
	R and S both "1" (800 bpi)
**T	Busy
U	Spare
V	Spare
W	Spare
*X	Master Clear
**Y	9 Track
*Z	2^6 Write
*a	2^7 Write
b	Gnd

* From controller to tape units

** From tape unit to controller

TABLE 2-5. SIGNAL AND PIN ASSIGNMENTS: INPUT CABLE TO CONTROLLER FROM TAPE UNIT

CONNECTOR 1B1, 1B2 PIN	SIGNAL
**A	2^0 Read
**B	2^1 Read
**C	2^2 Read
**D	2^3 Read
**E	2^4 Read
**F	2^5 Read
**H	(Parity)
**J	Ready and Selected
**K	End of Tape
**L	Load Point
**M	Write Enable
**N	Density Reply (1 = 556 bpi)
**P	Density Reply (1 = 800 bpi)
*R	Address 0
*S	Address 1
*T	Address 2
*U	Address 3
*V	Address 4
*W	Address 5
*X	Address 6
*Y	Address 7
**Z	2^6 Read
**a	2^7 Read
b	Gnd

* From controller to tape unit

** From tape unit to controller

PART 3

PARTS LIST

PART 3
PARTS LIST

The parts list provides the identification and ordering data necessary for the replacement of electrical and hardware parts for this equipment. The equipment designation, final assembly number, and equipment name appear at the top of each page. The list is arranged in disassembly order, using levels of assembly to indicate the relationship of parts.

A typical parts list is shown below:

MAG14-C 18588000 D MAG14C CENTRAL STORAGE MOD

LEVEL*	PART NO	REV	DESCRIPTION	EFFECTIVITY**
1	18515400	B	SYSTEM SUB-ASSY	
2	18074900	J	STOR MODULE ASSY WIRED	IN 7/31/67
3	18074700	G	PL TOP STORAGE MODULE	
3	18074800	H	STACK AND DR DK ASSY WIRED	
4	18075000	G	STACK ASSY WIRED STOR MODULE	
5	63130100	F	PLANE ASSY INNER STOR MODULE	IN 12/ 1/67
6	63702100	J	BOARD BLANK MEMORY PLANE IN	

Refer to the Literature Distribution Center Catalog for related manuals on printed circuit card assemblies, peripheral cabinets, power supplies, and vendor parts lists necessary to complete a total parts breakdown of the equipment.

*The level of assembly in relation to the final cabinet assembly (2 is the subassembly of level 1, 3 is the subassembly of level 2, etc).

**The date or serial effectivity on which the part is either added (IN) or deleted (OUT) in the equipment.

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
1	18452000	A	DISTRIBUTION BOX ASSY	
2	11816500	E	PROC SPEC PWR SUP +20V (SA)	
2	24547501	B	PLATE WARNING	
2	18450600	A	BOX DISTRIBUTION POWER	
2	00838200	H	NUT U TYPE NO. 6-32NC	
2	10127111		SCR MACH PAN PHL 6-32	
2	10127113		SCR MACH PAN PHL 6-32	
2	09018412	C	SCR MACH PAN HD PHL NO.6	
2	10127121		SCR MACH PAN PHL 8-32	
2	10127124		SCR MACH PAN PHL 8-32	
2	10125106		HEXAGON MACHINE SCREW NUTS	
2	10126103		INTERNAL TOOTH LOCK WASHERS	
2	10126104		INTERNAL TOOTH LOCK WASHERS	
2	10125606		PLAIN WASHERS	
2	24550608	D	CKT BRK SP 115V 60CPS	
2	24501204		STRIP TERMINAL	
2	24501605	G	BLOCK, TERMINAL	
2	24502204	B	STRIP MARKER 1 THRU 4	
2	24533300	A	FUSEHOLDER - 1/4 x 1 1/4 FUSE	
2	24518101	D	CONN FLEX. CND AND CABLE	
2	24518102	D	CONN FLEX. CND AND CABLE	
2	18494400	B	WIRE LIST DISTRIBUTION BOX	
3	18401004	B	CABLE ASSY POWER 60 CYCLE	
4	24515100	C	CONNECTOR PLUG ELEC MALE	
4	24500535	D	CABLE PWR ELECT 12 GA 5 COND	
4	94327900	A	COVER CONNECTOR	IN 1/26/67
3	93508000	B	WIRE ELECTRICAL 14 AWG -0	
3	93508222	B	WIRE ELECTRICAL 14 AWG -2	
3	93464999	C	WIRE ELECTRICAL 16 AWG -9	
3	93508555	B	WIRE ELECTRICAL 14 AWG -5	
3	93508666	B	WIRE ELECTRICAL 14 AWG -6	
3	93508999	B	WIRE ELECTRICAL 14 AWG -9	
3	93464000	C	WIRE ELECTRICAL 16 AWG -0	
3	24524804	J	TERMINAL, LUG CRIMP-INSULATED	
3	24536112	F	TERMINAL, SOLDERLESS RING	
3	24552309	C	INS SLV, 5/8 LG 14 AWG BLK	
3	93943001		CONTACT, SOCKET, SERIES .090	
3	24528616	E	INS SLEEVING, ELEC-BULK	
3	93947006	B	CONNECTOR SOCKET HOUSING	
2	32586400		COVER DISTRIBUTION BOX	
1	18071700	B	PANEL CONNECTOR	
1	32584800	A	PIN PIVOT	
1	18494800	D	CHASSIS ASSEMBLY 1732	
2	17901553	E	5-40 SCR THD ROLL PHL H PAN	IN 8/25/67
2	17901555	E	5-40 SCR THD ROLL PHL H PAN	IN 8/25/67
2	32585400	A	CARD SPACER ASSY	IN 3/21/67
2	09040201		WASHER LOCK-DISH TYPE	IN 0/ 0/00
2	32584200	A	ANGLE MOUNTING MOUNTING BAR	
2	25152900	B	MTG., BAR, CONNECTOR (01-42)	IN 3/21/67
2	32585000		BRACKET MTG CONNECTOR	
2	18071800	E	FRAME CHASSIS	
2	11412600	B	STRIP, MARKER (01-21)	IN 3/21/67

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
2	11412700	B	STRIP, MARKER (22-42)	IN 3/21/67
2	25153100		STRIP MARKER NARROW (01-21)	
3	10057600	A	EXTRUSION NARROW MARKER STRIP	IN 0/ 0/00
2	25153200		STRIP MARKER NARROW (22-42)	
3	10057600	A	EXTRUSION NARROW MARKER STRIP	IN 0/ 0/00
2	10001800	S	CONN RECEP 30 SOCKET CONTACT	IN 3/21/67
2	30094402		CONN RECEPT 10 CONTACT (RED)	
2	30094410		CONN RECEPT 10 CONTACT (BLACK	
2	30094406		CONN RECEPT 10 CONTACT (BLUE)	
2	32586300		SHEET FILLER CHASSIS	IN 3/21/67
2	30013802	B	SPACER	IN 3/21/67
2	30002201	F	CAP FXD ELECTROLYTIC	IN 3/21/67
2	25151200		RIM LATCH-POWER SUPPLY	
2	18894400	A	PANEL SWITCH	IN 12/19/67
2	24550900	A	SW TGL DPST 2POS 15A-120VAC	IN 12/19/67
2	18090100	A	CONNECTOR ASSEMBLY 1E1	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	93943001		CONTACT, SOCKET, SERIES .090	
3	93947001		CONNECTOR (SOCKET HOUSING)	
2	18494900	A	CARD PLACEMENT MODEL 1732 A	
3	10242401	D	CARD ASSEMBLY TYPE 03A	
3	10242701	D	CARD ASSEMBLY TYPE 04	
3	10243001	A	CARD ASSEMBLY TYPE 05A	
3	10201801	B	CARD ASSEMBLY TYPE 11A	
3	10201901	B	CARD ASSEMBLY TYPE 12A	IN 1/ 4/68
3	10202001	C	CARD ASSEMBLY TYPE 13A	IN 1/ 4/68
3	10202501	B	CARD ASSEMBLY TYPE 14A	
3	10202601	B	CARD ASSEMBLY TYPE 15A	
3	10232201	D	CARD ASSEMBLY TYPE 20A	IN 1/ 4/68
3	10202801	B	CARD ASSEMBLY TYPE 21A	
3	10203401	B	CARD ASSEMBLY TYPE 22A	
3	10203501	C	CARD ASSEMBLY TYPE 23A	
3	10203601	B	CARD ASSEMBLY TYPE 24A	
3	10232501	A	CARD ASSEMBLY TYPE 28A	
3	10232801	B	CARD ASSEMBLY TYPE 29B	IN 1/ 4/68
3	10334401	B	CARD ASSEMBLY TYPE 30A	
3	10203701	B	CARD ASSEMBLY TYPE 31A	
3	10203801	B	CARD ASSEMBLY TYPE 32A	
3	10203901	B	CARD ASSEMBLY TYPE 33A	IN 1/ 4/68
3	10005901	A	CARD ASSEMBLY TYPE 62	
3	10335201		CARD ASSEMBLY TYPE 73A	
3	10213501		CARD ASSEMBLY TYPE 77	
3	24406901	H	CARD ASSEMBLY TYPE 97B	
3	24414101	C	CARD ASSEMBLY TYPE 244141	

1732-A 18455100 C MODEL 1732A MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	93279079	B	CARD ASSEMBLY TYPE CC82-1	
3	93279080	B	CARD ASSEMBLY TYPE CC82-2	
3	17678800	A	CARD ASSEMBLY TYPE E11	
3	50020602	OO	CARD ASSEMBLY TYPE 1SC	
3	50025700	A	CARD ASSEMBLY TYPE 0SA	
3	17683900	E	CARD ASSEMBLY TYPE P14	
3	17684200	A	CARD ASSEMBLY TYPE P15	
3	17684500	A	CARD ASSEMBLY TYPE P16A	
2	18089900	A	CABLE ASSY.24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
2	18487800	A	CABLE ASSY 1A1 24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	IN 0/ 0/00
2	18526400	A	CABLE ASSY 1A2 24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18090900	A	CABLE ASSY, 24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP, 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18089800	B	CABLE ASSY 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	IN 7/26/68
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18531200	A	CABLE ASSY 1F1 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	30000902	K	FEMALE CONTACT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18091100	A	CABLE ASSEMBLY 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	

1732-A 18455100 C MODEL 1732A MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18531300	A	CABLE ASSY 1F2 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	00865004	H	GROM STR REL 0.468 ID	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18494700	A	LOGIC WIRE TAB	
3	24511402	F	LEAD,ELECTRICAL, 2 INCH.	IN 12/27/67
3	24511403	F	LEAD,ELECTRICAL, 3 INCH.	IN 12/27/67
3	24511404	F	LEAD,ELECTRICAL, 4 INCH.	IN 12/27/67
3	24511405	F	LEAD,ELECTRICAL, 5 INCH.	IN 12/27/67
3	24511406	F	LEAD,ELECTRICAL, 6 INCH.	
3	24511407	F	LEAD,ELECTRICAL, 7 INCH.	IN 12/27/67
3	24511408	F	LEAD,ELECTRICAL, 8 INCH.	IN 12/27/67
3	24511409	F	LEAD,ELECTRICAL, 9 INCH.	IN 12/27/67
3	24511410	F	LEAD,ELECTRICAL,10 INCH.	IN 12/27/67
3	24511411	F	LEAD,ELECTRICAL,11 INCH.	
3	24511412	F	LEAD,ELECTRICAL,12 INCH.	IN 12/27/67
3	24511413	F	LEAD,ELECTRICAL,13 INCH.	IN 12/27/67
3	24511414	F	LEAD,ELECTRICAL,14 INCH.	IN 12/27/67
3	24511415	F	LEAD,ELECTRICAL,15 INCH.	IN 12/27/67
3	24511416	F	LEAD,ELECTRICAL,16 INCH.	IN 12/27/67
3	24511417	F	LEAD,ELECTRICAL,17 INCH.	IN 12/27/67
3	24511418	F	LEAD,ELECTRICAL,18 INCH.	IN 12/27/67
3	24511419	F	LEAD,ELECTRICAL,19 INCH.	IN 12/27/67
3	24511420	F	LEAD,ELECTRICAL,20 INCH.	IN 12/27/67
3	24511421	F	LEAD,ELECTRICAL,21 INCH.	
3	24511422	F	LEAD,ELECTRICAL,22 INCH.	IN 12/27/67
3	24511423	F	LEAD,ELECTRICAL,23 INCH.	
3	24511424	F	LEAD,ELECTRICAL,24 INCH.	
3	24511425	F	LEAD,ELECTRICAL,25 INCH.	
3	24511426	F	LEAD,ELECTRICAL,26 INCH.	
3	24511427	F	LEAD,ELECTRICAL,27 INCH.	IN 12/27/67
3	24511428	F	LEAD,ELECTRICAL,28 INCH.	
3	24511429	F	LEAD,ELECTRICAL,29 INCH.	
2	18894300	A	CONTROL PANEL, WIRE TABS	IN 12/19/67
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	93462000	C	WIRE ELECTRICAL 20 AWG -0	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	

1732-A 18455100 C MODEL 1732A MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24500804	F	INSULATION SLEEVING ELECT	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
2	18090400	A	CABLE ASSEMBLY , 1 H1-3 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	31000001	B	WIRE, 24GA TWIST, PR, BR-W/RD	
3	24528612	E	INS, SLV, ELEC-BULK	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500808	F	INSULATION SLEEVING ELECT	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
2	18090500	A	CABLE ASSY 3 PIN	
3	31000002	B	WIRE, 24GA TWIST, PR, BR-W/YE	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24528612	E	INS, SLV, ELEC-BULK	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18090600	A	CABLE ASSY, 3 PIN	
3	31000003	B	WIRE, 24GA TWIST, PR, BR-W/BL	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24528635	E	INS SLEEVING, ELEC-BULK	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
2	18092201	B	SWITCH ROT 2-17 POS 1 POL/SEC	
1	00853907		WASHER THRUST	
1	00855129	A	BRG SLV FLG .250	
1	00856810		BRG SLV-FLG NYLON .376	
1	25160900	B	STRIKE LATCH - PWR SUP	
1	32584900	A	SPACER STRIKER	
1	30121811	D	STRAP GROUND	
2	24536117	F	TERMINAL, SOLDERLESS RING	IN 1/16/67
2	24534806	A	SHIELD, ELECT, BRAIDED-BULK	IN 4/ 8/66
1	24501601	G	BLOCK, TERMINAL	
1	24501656	G	BLOCK TERMINAL	
1	24515636	U	LENS INDICATOR LIGHT DIVIDED	
1	17981102	H	LENS INDICATOR COPORATE SW	
1	24511742	L	LENS, IND. LIGHT	
1	45948504	A	I/O TERMINATION ASSY	
1	24515806	A	LAMP, INCANDESCENT	
1	18494300	C	CONN ASSEMBLY 1E1	
2	24548307	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67

1732-A	18455100	C	MODEL 1732A MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
2	24548311	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548312	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548313	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548314	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24528617	E	INS SLEEVING, ELEC-BULK	IN 5/ 3/67
2	93948001		CONNECTOR (PIN HOUSING)	
2	93942001		CONTACT PIN SERIES .090	
2	24552314	C	INS SLV, 5/8 LG 10 AWG BLK	
2	24511601	D	LAMPHOLDER	
1	18455700	C	WIRE LIST- FINAL ASSEMBLY	IN 2/ 2/67
2	93464666	C	WIRE ELECTRICAL 16 AWG -6	IN 2/ 2/67
2	93464000	C	WIRE ELECTRICAL 16 AWG -0	IN 2/ 2/67
2	93464222	C	WIRE ELECTRICAL 16 AWG -2	IN 2/ 2/67
2	24500702	G	PIN TAPER	IN 2/ 2/67
2	24528639	E	INS SLEEVING, ELEC-BULK	IN 2/ 2/67
2	18132601	B	LEAD ELECT 24 GA 3 IN BLACK	
2	18132602	B	LEAD ELECT 24 GA 3 IN RED	
2	18132603	B	LEAD ELECT 24 GA 3 IN BLUE	
2	24548301	J	WIRE ELECT 24 AWG - 0	
2	24548303	J	WIRE ELEC STRD INS. UL APPD	
2	24548307	J	WIRE ELEC STRD INS. UL APPD	
2	24500707	G	PIN TAPER	
2	24500810	F	INSULATION SLEEVING ELECT	IN 2/ 2/67
2	17743003	G	LEAD ELECT 18 GA 5 IN BLUE	
2	17743002	G	LEAD ELECT 18 GA 5 IN RED	
2	24528613	E	INS SLEEVING, ELEC-BULK	IN 2/ 2/67
1	45738000	00	00000000000000000000000000000000	IN 2/ 2/67
1	25161711	K	PLATE IDENTIFICATION	IN 9/15/67

1732-B 18455200 C MODEL 1732B MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
1	18452001	A	DISTRIBUTION BOX ASSY	
2	24547501	B	PLATE WARNING	
2	18450600	A	BOX DISTRIBUTION POWER	
2	00838200	H	NUT U TYPE NO. 6-32NC	
2	10127111		SCR MACH PAN PHL 6-32	
2	10127113		SCR MACH PAN PHL 6-32	
2	09018412	C	SCR MACH PAN HD PHL NO.6	
2	10127121		SCR MACH PAN PHL 8-32	
2	10127124		SCR MACH PAN PHL 8-32	
2	10125106		HEXAGON MACHINE SCREW NUTS	
2	10126103		INTERNAL TOOTH LOCK WASHERS	
2	10126104		INTERNAL TOOTH LOCK WASHERS	
2	10125606		PLAIN WASHERS	
2	24550608	D	CKT BRK SP 115V 60CPS	
2	24501204		STRIP TERMINAL	
2	24501605	G	BLOCK, TERMINAL	
2	24502204	B	STRIP MARKER 1 THRU 4	
2	24533300	A	FUSEHOLDER - 1/4 X 1 1/4 FUSE	
2	24518101	D	CONN FLEX. CND AND CABLE	
2	24518102	D	CONN FLEX. CND AND CABLE	
2	32586400		COVER DISTRIBUTION BOX	
2	11816501	E	PROC SPEC PWR SUP +20V (SA)	
2	32586500	A	BRACKET MOUNTING POWER SUPPLY	
2	18494401	B	WIRE LIST DISTRIBUTION BOX	
1	18071700	B	PANEL CONNECTOR	
1	32584800	A	PIN PIVOT	
1	18494800	D	CHASSIS ASSEMBLY 1732	
2	17901553	E	5-40 SCR THD ROLL PHL H PAN	IN 8/25/67
2	17901555	E	5-40 SCR THD ROLL PHL H PAN	IN 8/25/67
2	32585400	A	CARD SPACER ASSY	IN 3/21/67
2	09040201		WASHER LOCK-DISH TYPE	IN 0/ 0/00
2	32584200	A	ANGLE MOUNTING MOUNTING BAR	
2	25152900	B	MTG. BAR, CONNECTOR (01-42)	IN 3/21/67
2	32585000		BRACKET MTG CONNECTOR	
2	18071800	E	FRAME CHASSIS	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
2	11412600	B	STRIP, MARKER (01-21)	IN 3/21/67
2	11412700	B	STRIP, MARKER (22-42)	IN 3/21/67
2	25153100		STRIP MARKER NARROW (01-21)	
3	10057600	A	EXTRUSION NARROW MARKER STRIP	IN 0/ 0/00
2	25153200		STRIP MARKER NARROW (22-42)	
3	10057600	A	EXTRUSION NARROW MARKER STRIP	IN 0/ 0/00
2	10001800	S	CONN RECEP 30 SOCKET CONTACT	IN 3/21/67
2	30094402		CONN RECEPT 10 CONTACT (RED)	
2	30094410		CONN RECEPT 10 CONTACT (BLACK	
2	30094406		CONN RECEPT 10 CONTACT (BLUE)	
2	32586300		SHEET FILLER CHASSIS	IN 3/21/67
2	30013802	B	SPACER	IN 3/21/67
2	30002201	F	CAP FXD ELECTROLYTIC	IN 3/21/67
2	25151200		RIM LATCH-POWER SUPPLY	
2	18894400	A	PANEL SWITCH	IN 12/19/67
2	24550900	A	SW TGL DPST 2POS 15A-120VAC	IN 12/19/67
2	18090100	A	CONNECTOR ASSEMBLY 1E1	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	93943001		CONTACT, SOCKET, SERIES .090	
3	93947001		CONNECTOR (SOCKET HOUSING)	
2	18494900	A	CARD PLACEMENT MODEL 1732 A	
3	10242401	D	CARD ASSEMBLY TYPE 03A	
3	10242701	D	CARD ASSEMBLY TYPE 04	
3	10243001	A	CARD ASSEMBLY TYPE 05A	
3	10201801	B	CARD ASSEMBLY TYPE 11A	
3	10201901	B	CARD ASSEMBLY TYPE 12A	IN 1/ 4/68
3	10202001	C	CARD ASSEMBLY TYPE 13A	IN 1/ 4/68
3	10202501	B	CARD ASSEMBLY TYPE 14A	
3	10202601	B	CARD ASSEMBLY TYPE 15A	
3	10232201	D	CARD ASSEMBLY TYPE 20A	IN 1/ 4/68
3	10202801	B	CARD ASSEMBLY TYPE 21A	
3	10203401	B	CARD ASSEMBLY TYPE 22A	
3	10203501	C	CARD ASSEMBLY TYPE 23A	
3	10203601	B	CARD ASSEMBLY TYPE 24A	
3	10232501	A	CARD ASSEMBLY TYPE 28A	
3	10232801	B	CARD ASSEMBLY TYPE 29B	IN 1/ 4/68
3	10334401	B	CARD ASSEMBLY TYPE 30A	
3	10203701	B	CARD ASSEMBLY TYPE 31A	
3	10203801	B	CARD ASSEMBLY TYPE 32A	
3	10203901	B	CARD ASSEMBLY TYPE 33A	IN 1/ 4/68
3	10005901	A	CARD ASSEMBLY TYPE 62	
3	10335201		CARD ASSEMBLY TYPE 73A	
3	10213501		CARD ASSEMBLY TYPE 77	
3	24406901	H	CARD ASSEMBLY TYPE 97B	
3	24414101	C	CARD ASSEMBLY TYPE 244141	

1732-B 18455200 C MODEL 1732B MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	93279079	B	CARD ASSEMBLY TYPE CC82-1	
3	93279080	B	CARD ASSEMBLY TYPE CC82-2	
3	17678800	A	CARD ASSEMBLY TYPE E11	
3	50020602	OO	CARD ASSEMBLY TYPE 1SC	
3	50025700	A	CARD ASSEMBLY TYPE 0SA	
3	17683900	E	CARD ASSEMBLY TYPE P14	
3	17684200	A	CARD ASSEMBLY TYPE P15	
3	17684500	A	CARD ASSEMBLY TYPE P16A	
2	18089900	A	CABLE ASSY,24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
2	18487800	A	CABLE ASSY 1A1 24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	

1732-B 18455200 C MODEL 1732B MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	IN 0/ 0/00
2	18526400	A	CABLE ASSY 1A2 24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP. 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18090900	A	CABLE ASSY,24 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548319	J	WIRE ELEC STRD INS. UL APPD	
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
3	24548300	J	WIRE, ELECT, 24 AWG INSUL, U/L	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24512001	C	CONN RECEP, 4 HOLE PNL MTG 24	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18089800	B	CABLE ASSY 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	IN 7/26/68
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18531200	A	CABLE ASSY 1F1 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	30000902	K	FEMALE CONTACT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18091100	A	CABLE ASSEMBLY 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	
3	00865004	H	GROM STR REL 0.468 ID	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18531300	A	CABLE ASSY 1F2 61 PIN	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000004	B	WIRE, 24GA TWIST, PR. BR-W/GY	
3	31000005	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	31000006	B	WIRE, 24GA TWIST, PR. RD-W/RD	
3	31000007	B	WIRE, 24GA TWIST, PR. RD-W/YE	
3	31000008	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000009	B	WIRE, 24GA TWIST, PR. RD-W/GY	
3	31000010	B	WIRE, 24GA TWIST, PR. RD-W/BL	
3	31000011	B	WIRE, 24GA TWIST, PR. OR-W/RD	
3	31000012	B	WIRE, 24GA TWIST, PR. OR-W/YE	
3	31000013	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000014	B	WIRE, 24GA TWIST, PR. OR-W/GY	
3	31000015	B	WIRE, 24GA TWIST, PR. OR-W/BL	
3	31000016	B	WIRE, 24GA TWIST, PR. YE-W/R	
3	31000017	B	WIRE, 24GA TWIST, PR. YE-W/YE	
3	31000018	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000019	B	WIRE, 24GA TWIST, PR. YE-W/GY	
3	31000020	B	WIRE, 24GA TWIST, PR. YE-W/BL	
3	31000021	B	WIRE, 24GA TWIST, PR. GR-W/RD	
3	31000022	B	WIRE, 24GA TWIST, PR. GR-W/YE	
3	31000023	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000024	B	WIRE, 24GA TWIST, PR. GR-W/GY	
3	31000025	B	WIRE, 24GA TWIST, PR. GR-W/BL	
3	31000026	B	WIRE, 24GA TWIST, PR. BLU-W/R	
3	31000027	B	WIRE, 24GA TWIST, PR. BLU-W/Y	
3	31000028	B	WIRE, 24GA TWIST, PR. BLU-W/B	
3	31000029	B	WIRE, 24GA TWIST, PR. BLU-W/B	

1732-B 18455200 C MODEL 1732B MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	30000902	K	FEMALE CONTACT	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	00865004	H	GROM STR REL 0.468 ID	
3	30000901	K	CONN. RECP ELEC 61 PIN CONT	
3	24528639	E	INS SLEEVING, ELEC-BULK	
2	18494700	A	LOGIC WIRE TAB	
3	24511402	F	LEAD,ELECTRICAL, 2 INCH.	IN 12/27/67
3	24511403	F	LEAD,ELECTRICAL, 3 INCH.	IN 12/27/67
3	24511404	F	LEAD,ELECTRICAL, 4 INCH.	IN 12/27/67
3	24511405	F	LEAD,ELECTRICAL, 5 INCH.	IN 12/27/67
3	24511406	F	LEAD,ELECTRICAL, 6 INCH.	
3	24511407	F	LEAD,ELECTRICAL, 7 INCH.	IN 12/27/67
3	24511408	F	LEAD,ELECTRICAL, 8 INCH.	IN 12/27/67
3	24511409	F	LEAD,ELECTRICAL, 9 INCH.	IN 12/27/67
3	24511410	F	LEAD,ELECTRICAL,10 INCH.	IN 12/27/67
3	24511411	F	LEAD,ELECTRICAL,11 INCH.	
3	24511412	F	LEAD,ELECTRICAL,12 INCH.	IN 12/27/67
3	24511413	F	LEAD,ELECTRICAL,13 INCH.	IN 12/27/67
3	24511414	F	LEAD,ELECTRICAL,14 INCH.	IN 12/27/67
3	24511415	F	LEAD,ELECTRICAL,15 INCH.	IN 12/27/67
3	24511416	F	LEAD,ELECTRICAL,16 INCH.	IN 12/27/67
3	24511417	F	LEAD,ELECTRICAL,17 INCH.	IN 12/27/67
3	24511418	F	LEAD,ELECTRICAL,18 INCH.	IN 12/27/67
3	24511419	F	LEAD,ELECTRICAL,19 INCH.	IN 12/27/67
3	24511420	F	LEAD,ELECTRICAL,20 INCH.	IN 12/27/67
3	24511421	F	LEAD,ELECTRICAL,21 INCH.	
3	24511422	F	LEAD,ELECTRICAL,22 INCH.	IN 12/27/67
3	24511423	F	LEAD,ELECTRICAL,23 INCH.	
3	24511424	F	LEAD,ELECTRICAL,24 INCH.	
3	24511425	F	LEAD,ELECTRICAL,25 INCH.	
3	24511426	F	LEAD,ELECTRICAL,26 INCH.	
3	24511427	F	LEAD,ELECTRICAL,27 INCH.	IN 12/27/67
3	24511428	F	LEAD,ELECTRICAL,28 INCH.	
3	24511429	F	LEAD,ELECTRICAL,29 INCH.	
2	18894300	A	CONTROL PANEL, WIRE TABS	IN 12/19/67
3	24548311	J	WIRE ELEC STRD INS. UL APPD	
3	24548312	J	WIRE ELEC STRD INS. UL APPD	
3	24548313	J	WIRE ELEC STRD INS. UL APPD	
3	24548314	J	WIRE ELEC STRD INS. UL APPD	
3	24548315	J	WIRE ELEC STRD INS. UL APPD	
3	24548316	J	WIRE ELEC STRD INS. UL APPD	
3	24548317	J	WIRE ELEC STRD INS. UL APPD	
3	24548318	J	WIRE ELEC STRD INS. UL APPD	
3	24548303	J	WIRE ELEC STRD INS. UL APPD	
3	24548305	J	WIRE ELEC STRD INS. UL APPD	
3	24548306	J	WIRE ELEC STRD INS. UL APPD	
3	24548307	J	WIRE ELEC STRD INS. UL APPD	
3	93462000	C	WIRE ELECTRICAL 20 AWG -0	

1732-B	18455200	C	MODEL 1732B MAG TAPE CONT	
LEVEL	PARTNO	REV		EFFECTIVITY
3	24548320	J	WIRE ELEC STRD INS. UL APPD	
3	24548321	J	WIRE ELEC STRD INS. UL APPD	
3	24548323	J	WIRE ELEC STRD INS. UL APPD	
3	24548324	J	WIRE ELEC STRD INS. UL APPD	
3	24548325	J	WIRE ELEC STRD INS. UL APPD	
3	24548326	J	WIRE ELEC STRD INS. UL APPD	
3	24548327	J	WIRE ELEC STRD INS. UL APPD	
3	24500804	F	INSULATION SLEEVING ELECT	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500707	G	PIN TAPER	
3	24548322	J	WIRE ELEC STRD INS. UL APPD	
3	24548328	J	WIRE ELEC STRD INS. UL APPD	
2	18090400	A	CABLE ASSEMBLY , 1 H1-3 PIN	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	31000001	B	WIRE, 24GA TWIST, PR. BR-W/RD	
3	24528612	E	INS, SLV, ELEC-BULK	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24500808	F	INSULATION SLEEVING ELECT	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
2	18090500	A	CABLE ASSY 3 PIN	
3	31000002	B	WIRE, 24GA TWIST, PR. BR-W/YE	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24528612	E	INS, SLV, ELEC-BULK	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
3	24500808	F	INSULATION SLEEVING ELECT	
2	18090600	A	CABLE ASSY, 3 PIN	
3	31000003	B	WIRE, 24GA TWIST, PR. BR-W/BL	
3	24548301	J	WIRE ELECT 24 AWG - 0	
3	24500707	G	PIN TAPER	
3	24500810	F	INSULATION SLEEVING ELECT	
3	24528635	E	INS SLEEVING, ELEC-BULK	
3	17896900	B	CONNECTOR RECEP 3 CONTACTS	
2	18092201	B	SWITCH ROT 2-17 POS 1 POL/SEC	
1	00853907		WASHER THRUST	
1	00855129	A	BRG SLV FLG .250	
1	00856810		BRG SLV-FLG NYLON .376	
1	25160900	B	STRIKE LATCH - PWR SUP	
1	32584900	A	SPACER STRIKER	
1	30121811	D	STRAP GROUND	
2	24536117	F	TERMINAL, SOLDERLESS RING	IN 1/16/67
2	24534806	A	SHIELD, ELECT, BRAIDED-BULK	IN 4/ 8/66
1	24501601	G	BLOCK, TERMINAL	
1	24501656	G	BLOCK TERMINAL	
1	24515636	U	LENS INDICATOR LIGHT DIVIDED	
1	17981102	H	LENS INDICATOR COPORATE SW	
1	24511742	L	LENS, IND. LIGHT	
1	45948504	A	I/O TERMINATION ASSY	
1	24515806	A	LAMP, INCANDESCENT	
1	18494300	C	CONN ASSEMBLY 1E1	

1732-B 18455200 C MODEL 1732B MAG TAPE CONT

LEVEL	PARTNO	REV		EFFECTIVITY
2	24548307	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548311	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548312	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548313	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24548314	J	WIRE ELEC STRD INS. UL APPD	IN 5/ 3/67
2	24528617	E	INS SLEEVING, ELEC-BULK	IN 5/ 3/67
2	93948001		CONNECTOR (PIN HOUSING)	
2	93942001		CONTACT PIN SERIES .090	
2	24552314	C	INS SLV, 5/8 LG 10 AWG BLK	
2	24511601	D	LAMPHOLDER	
1	18455700	C	WIRE LIST- FINAL ASSEMBLY	IN 2/ 2/67
2	93464666	C	WIRE ELECTRICAL 16 AWG -6	IN 2/ 2/67
2	93464000	C	WIRE ELECTRICAL 16 AWG -0	IN 2/ 2/67
2	93464222	C	WIRE ELECTRICAL 16 AWG -2	IN 2/ 2/67
2	24500702	G	PIN TAPER	IN 2/ 2/67
2	24524804	J	TERMINAL, LUG CRIMP-INSULATED	IN 2/ 2/67
2	24528639	E	INS SLEEVING, ELEC-BULK	IN 2/ 2/67
2	18132601	B	LEAD ELECT 24 GA 3 IN BLACK	
2	18132602	B	LEAD ELECT 24 GA 3 IN RED	
2	18132603	B	LEAD ELECT 24 GA 3 IN BLUE	
2	24548301	J	WIRE ELECT 24 AWG - 0	
2	24548303	J	WIRE ELEC STRD INS. UL APPD	
2	24548307	J	WIRE ELEC STRD INS. UL APPD	
2	24500707	G	PIN TAPER	
2	24500810	F	INSULATION SLEEVING ELECT	IN 2/ 2/67
2	17743003	G	LEAD ELECT 18 GA 5 IN BLUE	
2	17743002	G	LEAD ELECT 18 GA 5 IN RED	
2	24528613	E	INS SLEEVING, ELEC-BULK	IN 2/ 2/67
1	45738000	00	00000000000000000000000000000000	IN 2/ 2/67
1	25161711	K	PLATE IDENTIFICATION	IN 9/15/67

PART 4

CARD PLACEMENT

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 2 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
A01	24A	I105		I106		13	A19	21A	E022		E026		10
A02	24A	I110		I111		13	A20	20A	E036	I085	E028	Z086	9
A03	23A	I070		I064		12	A21						
A04	22A	I084		I065		11	A22	22A	E044				11
A05	33A	O100		O101		19	A23	32A	W008		W009		18
A06	11A	I066				4	A24	32A	W010		W011		18
A07	32A	O102		O103		18	A25	32A	W012		W013		18
A08	33A	K042		K043		19	A26	32A	W014		W015		18
A09	12A	I087				5	A27	32A	W016		W017		18
A10	11A	E037				4	A28	11A	E003				4
A11	11A	E012				4	A29	30A	W028	W029	W030	W031	16
A12	32A	W000		W001		18	A30	30A	W032	W033	W034	W035	16
A13	32A	W002		W003		18	A31	30A	W036	W037	Z048	Z049	16
A14	32A	W004		W005		18	A32	ISC	L022		L023		31
A15	32A	W006		W007		18	A33	ISC	L000	L001	L002		31
A16	30A	W020	W021	W022	W023	16	A34	ISC	L003	L004	L005		31
A17	30A	W024	W025	W026	W027	16	A35	ISC	L006	L007	L008		31
A18	11A	E005				4	A36	ISC	L027	L028	L009		31

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 3 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
A37	ISC	L010	L011	L012		31							
A38	ISC	L013	L014	L015		31							
A39	ISC	L016	L017	L018		31							
A40	ISC	L019	L020	L021		31							
A41	62	L124	L125	L126		27							
A42	62	L127				27							

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 4 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
B01	32A	O106		O107		18	B19	28A	P006	P007	P008		14
B02	31A	O108		O109		17	B20	28A	P003	P004	P005		14
B03	20A	I080	I081	I073	I062	9	B21	28A	P000	P001	P002		14
B04	20A	I063	I068	A034	E010	9	B22	33A	P020		P021		19
B05	29A	E006	I067	I097		15	B23	24A	E070		E072		13
B06	11A	I057				4	B24	24A	P013		P015		13
B07	30A	K090	K091	Z068	Z069	16	B25	21A	E088		E089		10
B08	28A	I001	I096	I107		14	B26	31A	X000		X001		17
B09	30A	O104	O105	Z098	Z099	16	B27	31A	X002		X003		17
B10	E11		Delay			24	B28	31A	X004		X005		17
B11	77		Delay			22	B29	31A	X006		X007		17
B12	33A	Z102		Z103		19	B30	31A	X008		X009		17
B13	97B	Y100	Y101			20	B31	31A	X010		X011		17
B14	33A	Z100		Z101		19	B32	31A	X012		X013		17
B15	97B	Y080	Y102			20	B33	31A	X014		X015		17
B16	22A	P009		I118		11	B34	31A	X016		X017		17
B17	23A	N009		B088		12	B35	15A	E043				8
B18	20A	P010	E068	P014	N010	9	B36	OSA	M000	M001	M002		30

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 5 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
B37	OSA	M003	M004	M005		30							
B38	OSA	M006	M007	M008		30							
B39	OSA	M017	M018	M009		30							
B40	OSA	M010		M012		30							
B41	OSA	M013	M014	M019		30							
B42													

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 6 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
C01	30A	K100	K101	K102	K103	16	C19	32A	O010		O011		18
C02	30A	K104	K105	K106	K107	16	C20	32A	O020		O021		18
C03	30A	K108	K109	K110	K111	16	C21	32A	O030		O031		18
C04	30A	K112	K113	K114	K115	16	C22	32A	O040		O041		18
C05	11A	I119				4	C23	32A	O050		O051		18
C06	14A	I115				7	C24	32A	O060		O061		18
C07	20A	I125	I126	I128	E042	9	C25	32A	O070		O071		18
C08	28A	I127	E041	Z084		14	C26	12A	E058				5
C09	32A	Z122		Z123		18	C27	11A	I071				4
C10	32A	Z120		Z121		18	C28	11A	I069				4
C11	33A	Z124		Z125		19	C29	33A	O002		O003		19
C12	24A	E040		I050		13	C30	32A	O012		O013		18
C13	28A	N007	N008	N003		14	C31	32A	O022		O023		18
C14	28A	N004	N005	N006		14	C32	32A	O032		O033		18
C15	28A	N000	N001	N002		14	C33	32A	O042		O043		18
C16							C34	32A	O052		O053		18
C17	11A	I058				4	C35	32A	O062		O063		18
C18	32A	O000		O001		18	C36	32A	O072		O073		18

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 7 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
C37	13A	E059				6							
C38	11A	I072				4							
C39	31A	Z110		Z111		17							
C40													
C41	04	V001				2							
C42	03A	V000				1							

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 8 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
D01	20A	I046	I051	E054	I054	9	D19	21A	I003		I008		10
D02	23A	I053		I031		12	D20	22A	I017		I004		11
D03	23A	I039		I036		12	D21	20A	E130	E131	Z130		9
D04	20A	I100	I041	I052	I074	9	D22	12A	I014				5
D05	23A	E109		I091		12	D23	29B	I013	I018	I010		15
D06	30A	K060	K061	K056	K057	16	D24	20A	I019	I005	I095	I112	9
D07	28A	I037	I040	I055		14	D25	22A	I002		E032		11
D08	29B	I045	I059	I056		15	D26	11A	I032				4
D09	33A	K030		K031		19	D27	24A	I038		P011		13
D10	33A	K040		K041		19	D28	11A	E126				4
D11	15A	I093				8	D29	20A	E047	E108	E100	E101	9
D12	21A	A130		A009		10	D30	29B	A129	E123	I048		15
D13	32A	K000		K001		18	D31	21A	E113		E116		10
D14	31A	K002		K003		17	D32	21A	E120		E112		10
D15	31A	K004		K005		17	D33	21A	E115		E124		10
D16	141		Delay			23	D34	11A	E127				4
D17	21A	I011		I015		10	D35	11A	E125				4
D18	21A	I009		I012		10	D36	29B	E106	E094	E013		15

FORM 982A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
D37	20A	E102	E013	E111	Z016	9							
D38	21A	E114		I092		10							
D39	28A	E051	E000	I035		14							
D40	E11		Delay			24							
D41	04	V003				2							
D42	05A	V002				3							

FORM 502A

Rev D

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 10 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
E01	32A	Z020		Z021		18	E19	97B	Y024	Y023			20
E02	32A	Z028		Z029		18	E20	22A	E021		E018		11
E03	32A	Z080		Z081		18	E21	21A	E002		E105		10
E04	21A	I020		I089		10	E22	CC82-1		Delay			25
E05	32A	Z090		Z091		18	E23	23A	E080		E081		12
E06	32A	Z092		Z093		18	E24	11A	E035				4
E07	29B	F024	F025	F026		15	E25	11A	E039				4
E08	20A	I088	Z085	I023	I033	9	E26	22A	E110		E060		11
E09	29B	E079	I094	E023		15	E27	28A	E085	E086	E087		14
E10	32A	P022		P023		18	E28	97B	Y070	Y071			20
E11	31A	K052		K053		17	E29	33A	Z060		Z061		19
E12	32A	K022		K023		18	E30	97B	Y062	Y059			20
E13	21A	I022		I021		10	E31	32A	Z062		Z063		18
E14	32A	K020		K021		18	E32	31A	Z064		Z065		17
E15	21A	I026		I027		10	E33	20A	E061	E090	E098	E015	9
E16	21A	I049		Z014		10	E34	13A	E091				6
E17	32A	Z042		Z043		18	E35	21A	E092		E096		10
E18	30A	Z044	Z045	Z024	Z025	16	E36	30A	Z070	Z071	Z072	Z073	16

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 11 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
E37	33A	Z082		Z083		19							
E38	11A	E065				4							
E39	20A	E083	Z015	E033	E034	9							
E40	21A	E121		E119		10							
E41	12A	E080				5							
E42	12A	E082				5							

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 12 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
F01	13A	A040				6	F19	20A	E004	E007	E062	E014	9
F02	23A	A041		A042		12	F20	73A		Delay			21
F03	23A	A043		A044		12	F21	20A	E071	E084	E067	E122	9
F04	23A	A045		A046		12	F22	20A	A107	A108	A109	A110	9
F05	11A	A050				4	F23	97B	Y074	Y075			20
F06	23A	A047		I116		12	F24	73A		Delay			21
F07	E11		Delay			24	F25	32A	Z058		Z059		18
F08	20A	P016	P018	A011	A033	9	F26	32A	Z074		Z075		18
F09	11A	A060				4	F27	30A	Z066		Z076	Z077	16
F10	29B	A032	A003	I082		15	F28	31A	Z050		Z051		17
F11	11A	E001				4	F29	31A	Z052		Z053		17
F12	31A	Z000		Z001		17	F30	31A	Z054		Z055		17
F13	31A	Z002		Z003		17	F31	97B	Y049	Y050			20
F14	31A	Z004		Z005		17	F32	97B	Y051	Y048			20
F15	29B	E017	Z017	E038		15	F33						
F16	14A	E020				7	F34	29B	E016	E095	E082		15
F17	11A	E009				4	F35	97B	Y060	Y061			20
F18	31A	Z006		Z007		17	F36	23A	E057		E066		12

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 13 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
F37	23A	E045		E046		12							
F38	23A	E097		E019		12							
F39	29B	E053	E055	A010		15							
F40	73A		Delay			21							
F41		Not available for Card Placement. Used for terminating unused connector wires.											
F42													

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 14 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
G01		Not available for Card					G19	P16A	R011		R012		29
G02		Placement. Used for					G20	P14C	T011		T012		28
G03		terminating unused connector wires.					G21	P14C	T000		T001		28
G04							G22	P16A	R000		R001		29
G05	P15	Interrupt Line terminator				32	G23	P14C	T002		T003		28
G06		Not available for Card Placement.					G24	P16A	R002		R003		29
G07	23A	B041		P017		12	G25	P14C	T004		T005		28
G08	12A	A118				5	G26	P16A	R004		R005		29
G09	11A	I099				4	G27	P14C	T006		T007		28
G10	12A	I075				5	G28	P16A	R006		R007		29
G11	15A	A160				8	G29	P14C	T008		T009		28
G12	12A	I076				5	G30	P16A	R008		R009		29
G13	11A	I098				4	G31	P14C	T010		T018		28
G14	12A	E104				5	G32	P16A	R010		R100		29
G15	P16A	R015				29	G33						
G16	P14C	T015				28	G34	P16A	R101		R107		29
G17	P16A	R013		R014		29	G35	P16A	R108		R109		29
G18	P14C	T013		T014		28	G36	P16A	R110		R116		29

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 15 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
G37	P16A	R117		R118		29							
G38	P16A	R119		R120		29							
G39	P14C	T016		T017		28							
G40**	P14C		T032			28							
G41*	P14C		T033			28							
G42**	P14C	T030		T031		28							
*Note:	Add P14 card to G41 for single Cable Interrupt												
	System (1K1). Remove P14 cards from												
	G40 and G42.												
**Note:	For three Interrupt Cable System 1H1 (EOP);												
	1J1 (Alarm); 1K1 (Data Int.) Reverse the												
	above procedure: Remove P14 from G41;												
	Add P14's to G40 and G42.												

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 16 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
H01	33A	Z008		Z009		19	H19	11A	A116				4
H02	32A	Z010		Z011		18	H20	21A	I101		A126		10
H03	32A	Z012		Z013		18	H21	23A	B033		B034		12
H04	32A	Z022		Z023		18	H22	23A	B030		B031		12
H05	30A	Z300	Z301	Z302	Z303	16	H23	20A	B000	B001	B002	B003	9
H06	30A	Z304	Z305	Z306	Z307	16	H24	20A	B004	B005	B006	B007	9
H07	31A	Z034		Z035		17	H25	20A	B008	B009	B010	B011	9
H08	97B	Y025	Y031			20	H26	20A	B012	B013	B040	E029	9
H09	32A	Z036		Z037		18	H27	28A	B032	B035	B036		14
H10	20A	A002	A004	A005	A031	9	H28	28A	B037	B038	B039		14
H11	29B	A000	A030	A001		15	H29	28A	B060	B061	B062		14
H12	29B	A037	A038	A039		15	H30	28A	B063	E024	E027		14
H13	21A	A007		A008		10	H31	30A	K050	K051	K054	K055	16
H14	11A	E011				4	H32	29B	I024	I083	I030		15
H15	77		Delay			22	H33	CC82-2		Delay			26
H16	20A	A150	A119	A120	I102	9	H34	32A	Z030		Z031		18
H17	21A	A117		A127		10	H35	33A	Z032		Z033		19
H18	29B	A100	A101	A128		15	H36						

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 17 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
H37	97B	Y021	Y020			20							
H38	97B	Y022	Y058			20							
H39	33A	Z040		Z041		19							
H40													
H41	77		Delay			22							
H42													

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

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SHEET 18 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
I01	23A	B070		B071		12	I19	29B	X021	X023	X025		15
I02	21A	B080		B081		10	I20	29B	X027	X029	X031		15
I03	23A	B072		B073		12	I21	29B	X033	X035	X037		15
I04	21A	B082		B083		10	I22	20A	E078	E075	F009	F027	9
I05	21A	E064		E069		10	I23	29B	F012	E117	E118		15
I06	23A	B074		B075		12	I24	21A	F001		F002		10
I07	21A	B084		B085		10	I25	11A	F008				4
I08	23A	B076		B077		12	I26	22A	F021		F000		11
I09	21A	B086		B087		10	I27	12A	F020				5
I10							I28	11A	E093				4
I11	28A	J000	J002	J004		14	I29						
I12	28A	J006	J008	J010		14	I30	28A	I016	I042	I043		14
I13	28A	J012	J014	J016		14	I31	29B	I034	E107	I044		15
I14	21A	F010		F011		10	I32	32A	Z094		Z095		18
I15	21A	F014		F015		10	I33	32A	Z096		Z097		18
I16							I34	20A	F023	E056	J017	F022	9
I17	20A	J001	J003	J005	J007	9	I35	29B	E025	F028	E063		15
I18	20A	J009	J011	J013	J015	9	I36	11A	E031				4

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 19 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
I37	13A	E008				6							
I38	21A	E030		F003		10							
I39													
I40													
I41													
I42													

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 20 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
J01	21A	E048		E049		10	J19	30A	C082	C083	Z018	Z019	16
J02	32A	C000		C001		18	J20	11A	F007				4
J03	32A	C010		C011		18	J21	33A	G000		G001		19
J04	32A	C020		C021		18	J22	33A	G010		G011		19
J05	32A	C030		C031		18	J23	33A	G020		G021		19
J06	11A	E076				4	J24	33A	G030		G031		19
J07	30A	C002	C003	C012	C013	16	J25	33A	G040		G041		19
J08	30A	C022	C023	C032	C033	16	J26	33A	G050		G051		19
J09	11A	E073				4	J27	33A	G060		G061		19
J10	11A	E077				4	J28	33A	G070		G071		19
J11	32A	C040		C041		18	J29	33A	G080		G081		19
J12	32A	C050		C051		18	J30						
J13	32A	C060		C061		18	J31	12A	F005				5
J14	32A	C070		C071		18	J32	12A	F006				5
J15	11A	E074				4	J33	31A	G002		G003		17
J16	30A	C042	C043	C052	C053	16	J34	31A	G012		G013		17
J17	30A	C062	C063	C072	C073	16	J35	32A	G022		G023		18
J18	32A	C080		C081		18	J36	32A	G032		G033		18

FORM 582A

CONTROL DATA CORPORATION
COMPUTER DIVISION

CARD PLACEMENT

CHASSIS: 1732 MAG. TAPE CONTROLLER

CP | DOCUMENT NO. 18494900 | REV. C

SHEET 21 OF 21

LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
J37	32A	G042		G043		18							
J38	32A	G052		G053		18							
J39	31A	G062		G063		17							
J40	31A	G072		G073		17							
J41	31A	G082		G083		17							
J42	11A	F004				4							

FORM 582A

Rev D

PART 5

EQUATION SUMMARY

```
A000 = R000
  1H011A / 29      * A030 * I050

A001 = R001
  1H011C / 29      * A031 * I050

A002 = R002
  1H010A / 20      * A032

A003 = R003
  1F010B / 29      * A033 * E102 * E103

A004 = R004
  1H010B / 20      * A034 * E103

A005 = R005
  1H010C / 20      * E102

A007 = R007
  1H013A / 21      * A037 * A041 * A043 * A045 * A047

A008 = R008
  1H013C / 21      * A038 * A042 * A043 * A046 * A047

A009 = R009
  1D012C / 21      * A039 * A044 * A045 * A046 * A047

A010 = R010
  1F039C / 29      * A060 * I038 * I116

A011 = R011
  1F008C / 20      * I116

A030 = A000
  1H011B / 29      * I030 * K023

A031 = A001
  1H010D / 20      * I023

A032 = A002
  1F010A / 29      * I031 * I038

A033 = A003
  1F008D / 20      * I036

A034 = A004
  1B004C / 20      * I036 * I038

A037 = A007
  1H012A / 29      * A044 * A046
```

```
A038 = A008
  1H012B / 29       * A044 * A045

A039 = A009
  1H012C / 29       * A042 * A043 * I035

A040 = R007 + R008 + R009
  1F001A / 13       * I035 * I045 * I094 * I110 * K100

A041 = A007 + R008 + R009
  1F002A / 23       * I110 * K102 * Z028

A042 = R007 + A008 + A039
  1F002C / 23       * I110 * K104 * Z080

A043 = A007 + A008 + A039
  1F003A / 23       * I110 * K106 * Z090

A044 = A037 + A038 + A009
  1F003C / 23       * I111 * K108 * L012

A045 = A007 + A038 + A009
  1F004A / 23       * I111 * K110 * Z020

A046 = A037 + A008 + A009
  1F004C / 23       * I111 * K112 * Z094

A047 = A007 + A008 + A009
  1F006A / 23       * I111 * K114 * Z096

A050 = R010
  1F005A / 11       * I045 * I115 * Z020 * Z028 * Z080 * Z090 * Z094
                    * Z096

A060 = A010
  1F009A / 11       * I035 * I035 * I094 * K090 * L012 * Z084

A100 = R100
  1H018A / 29       * I010 * I011

A101 = R101
  1H018B / 29       * I008 * I010

A107 = R107
  1F022A / 20

A108 = R108
  1F022B / 20

A109 = R109
  1F022C / 20

A110 = R110
  1F022D / 20
```

```
A116 = R116
  1H019A / 11       * A126 * I075 * I076 * I081 * K001 * K031 * K041
                    * 0107

A117 = R117
  1H017A / 21       * A127 * K001 * K031 * K041 * 0107

A118 = R118 + A150
  1G008A / 12       * A128 * A129 * A130 * E022 * E026 * I020 * I024
                    * I032

A119 = R119
  1H016B / 20       * I115

A120 = R120
  1H016C / 20       * A160

A126 = A116
  1H020C / 21       * I097 * I102 * 0104 * T018

A127 = A117
  1H017C / 21       * I070 * I080 * K030 * 0100

A128 = A118
  1H018C / 29       * F000 * Z031 * Z033

A129 = A118
  1D030A / 29       * K023

A130 = A118
  1D012A / 21       * I070 * L015 * Z083 * Z101 * Z103

A150 = Y140
  1H016A / 20       * A118 * I118

A160 = A120 + OPEN + OPEN + OPEN + OPEN
  1G011A / 15       * I097 * I102 * K000 * 0106

B000 = B030
  1H023A / 20       * T000

B001 = B031
  1H023B / 20       * T001

B002 = B032
  1H023C / 20       * T002

B003 = B033
  1H023D / 20       * T003

B004 = B034
  1H024A / 20       * T004
```

```
B005 = B035
  1H024B / 20        * T005

B006 = B036
  1H024C / 20        * T006

B007 = B037
  1H024D / 20        * T007

B008 = B038
  1H025A / 20        * T008

B009 = B039
  1H025B / 20        * T009

B010 = B060
  1H025C / 20        * T010

B011 = B061
  1H025D / 20        * T011

B012 = B062
  1H026A / 20        * T012

B013 = B063
  1H026B / 20        * T013

B030 = I075 0001 + I098 F123 + I101 E113
  1H022A / 23        * B000

B031 = I075 0011 + I098 F121 + I101 E116
  1H022C / 23        * B001

B032 = I075 0021 + I098 B040
  1H027A / 28        * B002

B033 = I075 0031 + I098 I056 + I101 E124
  1H021A / 23        * B003

B034 = I075 0041 + I098 Z065 + I101 E101
  1H021C / 23        * B004

B035 = I075 0051 + I099 I059
  1H027B / 28        * B005

B036 = I075 0061 + I099 0105
  1H027C / 28        * B006

B037 = I075 0071 + I099 K091
  1H028A / 28        * B007

B038 = I076 0003 + I099 P021
  1H028B / 28        * B008
```

```
B039 = I076 0013 + I099 M017
  1H028C / 28       * B009

B040 = B041
  1H026C / 20       * B032 * T033

B041 = K053 K057 + I059 K055 + I056 K051
  1G007A / 23       * B040

B060 = I076 0023 + I098 E106
  1H029A / 28       * B010

B061 = I076 0033 + I098 Z125
  1H029B / 28       * B011

B062 = I076 0043 + I098 I083
  1H029C / 28       * B012

B063 = I076 0053 + I099 K043
  1H030A / 28       * B013

B070 = 0001 E012 + 0003 F037 + G002 E069
  1I001A / 23       * B080 * N000

B071 = 0011 E012 + 0013 F037 + G012 E069
  1I001C / 23       * B081 * N000

B072 = 0021 E012 + 0023 F037 + G022 E069
  1I003A / 23       * B082 * N001

B073 = 0031 E012 + 0033 F037 + G033 E069
  1I003C / 23       * B083 * N001

B074 = 0041 E012 + 0043 F037 + G042 E064
  1I006A / 23       * B084 * N002

B075 = 0051 E012 + 0053 F037 + G053 E064
  1I006C / 23       * B085 * N002

B076 = 0061 E012 + 0063 F037 + G062 E064
  1I008A / 23       * B086 * N003

B077 = 0071 E012 + 0073 F037 + G072 E064
  1I008C / 23       * B087 * N003

B080 = B070
  1I002A / 21       * J000 * N000 * W000 * W001

B081 = B071
  1I002C / 21       * J002 * N000 * W002 * W003

B082 = B072
  1I004A / 21       * J004 * N001 * W004 * W005
```

```
B083 = B073
  1I004C / 21       * J006 * N001 * W006 * W007

B084 = B074
  1I007A / 21       * J008 * N002 * W008 * W009

B085 = B075
  1I007C / 21       * J010 * N002 * W010 * W011

B086 = B076
  1I009A / 21       * J012 * N003 * W012 * W013

B087 = B077
  1I009C / 21       * J014 * N003 * W014 * W015

B088 = N010 K021 + N009 K020 + I082
  1B017C / 23       * J016 * W016 * W017

C000 = C001 + X021 E076 C002 + GND
  1J002A / 32       * C001 * C003

C001 = C000 + X021 E076 C003 + E049
  1J002C / 32       * C000 * C002 * P013

C002 = C003 + C001 E073
  1J007A / 30       * C000 * C003

C003 = C002 + C000 E073
  1J007B / 30       * C001 * C002

C010 = C011 + X023 E076 C012 + GND
  1J003A / 32       * C011 * C013

C011 = C010 + X023 E076 C013 + E049
  1J003C / 32       * C010 * C012 * P013

C012 = C013 + C011 E073
  1J007C / 30       * C010 * C013

C013 = C012 + C010 E073
  1J007D / 30       * C011 * C012

C020 = C021 + X025 E076 C022 + GND
  1J004A / 32       * C021 * C023

C021 = C020 + X025 E076 C023 + E049
  1J004C / 32       * C020 * C022 * P013

C022 = C023 + C021 E073
  1J008A / 30       * C020 * C023

C023 = C022 + C020 E073
  1J008B / 30       * C021 * C022
```

```
C030 = C031 + X027 E076 C032 + GND
  1J005A / 32       * C031 * C033

C031 = C030 + X027 E076 C033 + E049
  1J005C / 32       * C030 * C032 * P013

C032 = C033 + C031 E073
  1J008C / 30       * C030 * C033

C033 = C032 + C030 E073
  1J008D / 30       * C031 * C032

C040 = C041 + X029 E077 C042 + GND
  1J011A / 32       * C041 * C043

C041 = C040 + X029 E077 C043 + E049
  1J011C / 32       * C040 * C042 * P015

C042 = C043 + C041 E074
  1J016A / 30       * C040 * C043

C043 = C042 + C040 E074
  1J016B / 30       * C041 * C042

C050 = C051 + X031 E077 C052 + GND
  1J012A / 32       * C051 * C053

C051 = C050 + X031 E077 C053 + E048
  1J012C / 32       * C050 * C052 * P015

C052 = C053 + C051 E074
  1J016C / 30       * C050 * C053

C053 = C052 + C050 E074
  1J016D / 30       * C051 * C052

C060 = C061 + X033 E077 C062 + GND
  1J013A / 32       * C061 * C063

C061 = C060 + X033 E077 C063 + E048
  1J013C / 32       * C060 * C062 * P015

C062 = C063 + C061 E074
  1J017A / 30       * C060 * C063

C063 = C062 + C060 E074
  1J017B / 30       * C061 * C062

C070 = C071 + X035 E077 C072 + GND
  1J014A / 32       * C071 * C073

C071 = C070 + X035 E077 C073 + E048
  1J014C / 32       * C070 * C072 * P015
```

```
C072 = C073 + C071 E074
  1J017C / 30        * C070 * C073

C073 = C072 + C070 E074
  1J017D / 30        * C071 * C072

C080 = C081 + X017 E078 C082 + GND
  1J018A / 32        * C081 * C083 * P014

C081 = C080 + X017 E078 C083 + E048
  1J018C / 32        * C080 * C082

C082 = C083 + C081 E075
  1J019A / 30        * C080 * C083

C083 = C082 + C080 E075
  1J019B / 30        * C081 * C082

E000 = V001 E112 + V003 M012
  1D039B / 28        * E001

E001 = E000
  1F011A / 11        * Z000 * Z032 * Z032 * Z032 * Z300 * Z301 * Z304
                     * Z305

E002 = E017 Z002 Z033
  1E021A / 21        * E003 * E005 * E006 * E009 * I080

E003 = E002
  1A028A / 11        * W028 * W029 * W030 * W031 * W032 * W033 * W034
                     * W035

E004 = Z003 Z004 E030
  1F019A / 20        * E007

E005 = E002
  1A018A / 11        * W020 * W021 * W022 * W023 * W024 * W025 * W026
                     * W027

E006 = E002
  1B005A / 29        * W036 * W037

E007 = E004
  1F019B / 20        * O102

E008 = Z000 + Z004 + E025
  1I037A / 13        * E010 * E036 * E056 * F021

E009 = E002
  1F017A / 11        * F020 * Z008 * Z008 * Z009 * Z009 * Z044 * Z045

E010 = Z043 I066 E008
  1B004D / 20        * E012
```

```
E011 = E016
  1H014A / 11       * F027 * B027 * Z010 * 7011 * Z012 * 7013 * 7022
                    * Z040

E012 = E010
  1A011A / 11       * B070 * B071 * B072 * B073 * B074 * B075 * B076
                    * B077

E013 = Z031
  1D036C / 29       * E045 * E045 * E046

E014 = Z000 7003 E030
  1F019D / 20       * E015 * I080

E015 = E014
  1E033D / 20       * 0101 * 7021

E016 = Z001 Z007 E030
  1F034A / 29       * E011 * E079 * I087

E017 = Z000
  1F015A / 29       * E002

E018 = F024 F025 E079 Z018 Z099 * E079 I057
  1E020C / 22       * E028 * E035 * E039

E019 = Z005 + Z006 + Z032
  1F038C / 23       * Z042 * Z043

E020 = E034 + 7009 + Z011 + 7012
  1F016A / 14       * E021 * E021 * Z024

E021 = E020 E124 + E020 Y023
  1E020A / 22       * E022 * E023 * E026

E022 = E021 E092 A118
  1A019A / 21       * W001 * W003 * W005 * W007 * W009

E023 = E021
  1E009C / 29       * Z029 * Z034 * Z040

E024 = Z306 E114 + E114 7302
  1H030B / 28       * Z000

E025 = Z033
  1I035A / 29       * E008

E026 = E021 F092 A118
  1A019C / 21       * W011 * W013 * W015 * W017 * Z019

E027 = Z029 E011 F024 F025 Z099 * Z021 E011
  1H030C / 28       * E029

E028 = E018
  1A020C / 20       * W016 * W017
```

```
E029 = E027
  1H026D / 20       * Z040

E030 = Z032
  1I038A / 21       * E004 * E014 * E016 * Z022

E031 = Z030
  1I036A / 11       * E045 * E046 * E046 * I055 * I062 * L028 * O107
                    * Z100

E032 = I082 + Z111
  1D025C / 22       * E033 * Y020 * Y022

E033 = E032
  1E039C / 20       * Y021

E034 = Z023
  1E039D / 20       * E020

E035 = E018
  1E024A / 11       * W000 * W001 * W002 * W003 * W004 * W005 * W006
                    * W007

E036 = Z042 I066 E008
  1A020A / 20       * E037

E037 = E036
  1A010A / 11       * B070 * B071 * B072 * B073 * B074 * B075 * B076
                    * B077

E038 = Z042
  1F015C / 29       * Z022

E039 = E018
  1E025A / 11       * W008 * W009 * W010 * W011 * W012 * W013 * W014
                    * W015

E040 = X000 + X002 + X004 + X006
  1C012A / 24       * E041

E041 = E040 E124 X016 E072 + X010 X012 X014 X016 E125 E043
  1C008B / 28       * E042 * Z122

E042 = E041
  1C007D / 20       * Z120

E043 = X000 + X002 + X005 + X007 + X008
  1B035A / 15       * E041

E044 = Z065 + Z062
  1A022A / 22       * P020 * Z123 * Z124
```

```
E045 = E110 E013 Y051 + E110 E031 Y050 + E118 E013 Y050
  1F037A / 23       * E047

E046 = E118 E031 Y049 + E117 E013 Y049 + E117 E031 E071
  1F037C / 23       * E047

E047 = E045 E046
  1D029A / 20       * Z048

E048 = F000
  1J001A / 21       * C051 * C061 * C071 * C081

E049 = F000
  1J001C / 21       * C001 * C011 * C021 * C031 * C041

E050 = Z050 + Z053
  1E041A / 12       * F012 * F020 * 0102 * Z072 * Z076 * Z077


E051 = Z050 + Z054
  1D039A / 28       * E063 * F022

E052 = E054 + Z055
  1E042A / 12       * F021 * I070 * P020 * Z120 * Z122

E053 = Z074
  1F039A / 29       * E066 * E066 * K042
E054 = Z053
  1D001C / 20       +E052
E055 = Z051 Z055 E065 E062 E096
  1F039B / 29       * E058 * E059

E056 = E008 F024 F025
  1I034B / 20       * E064 * E069

E057 = Z082 + Z053 + Z054
  1F036A / 23       * Z074 * Z075

E058 = E055 + Z074 K023
  1C026A / 12       * 0000 * 0010 * 0020 * 0030 * 0040 * 0050 * 0060
                    * Z016

E059 = E055 + Z075 + I022
  1C037A / 13       * 0002 * 0012 * 0022 * 0032 * 0042 * 0052 * 0062
                    * 0072

E060 = Z051 + Z052
  1E026C / 22       * E066 * E066 * E087 * Z070

E061 = E092 Z068
  1E033A / 20       * Z071

E062 = Z059 Z014
  1F019C / 20       * E055 * 0100

E063 = E051
  1I035C / 29       * E076 * E077 * E078
```

```
E064 = E056
  1I005A / 21       * B074 * B075 * B076 * B077

E065 = Z082
  1E038A / 11       * E055 * F020 * F021 * F022 * I070 * 0102 * 0104
                    * F022

E066 = E060 K022 + E060 F053 + Z058 E082 E053
  1F036C / 23       * E067

E067 = E066
  1F021C / 20       * 0100

E068 = Z068
  1B018B / 20       * Y080

E069 = E056
  1I005C / 21       * B070 * B071 * B072 * B073 * N009

E070 = X001 + X003 + X005 + X007
  1B023A / 24       * E071

E071 = E070 E072 X014
  1F021A / 20       * E046 * Y049

E072 = X009 + X011 + X013 + X017
  1B023C / 24       * E041 * F071

E073 = F012
  1J009A / 11       * C002 * C003 * C012 * C013 * C022 * C023 * C032
                    * C033

E074 = F012
  1J015A / 11       * C042 * C043 * C052 * C053 * C062 * C063 * C072
                    * C073

E075 = F012
  1I022B / 20       * C082 * C083

E076 = E063
  1J006A / 11       * C000 * C001 * C010 * C011 * C020 * C021 * C030
                    * C031

E077 = E063
  1J010A / 11       * C040 * C041 * C050 * C051 * C060 * C061 * C070
                    * C071

E078 = E063
  1I022A / 20       * C080 * C081

E079 = E016
  1F009A / 29       * E018 * E018 * F023
```

```
E080 = Z067 + Z070 + Z040
  1E023A / 23       * Y059

E081 = Y060 E113 + Y061 + Y059 E116
  1E023C / 23       * E082

E082 = E081
  1F034C / 29       * E066 * K042 * Z058

E083 = Z072 Z093
  1E039A / 20       * Z058

E084 = Z066
  1F021B / 20       * Y058

E085 = Z100 Z102 + E090 7092
  1E027A / 28       * Y070

E086 = Y071 + Y070 Z110
  1E027B / 28       * E087

E087 = E086 + E060
  1E027C / 28       * E088 * E089

E088 = E087
  18025A / 21       * X001 * Y003 * X005 * X007 * X009

E089 = E087
  18025C / 21       * X011 * X013 * X015 * X017 * Z049

E090 = Z064
  1E033B / 20       * E085 * 7121

E091 = Z064 Y066 + I003 + Z028 Z080 Z090 Z020 I094 I049
  1E034A / 13       * E092 * K043 * P021 * 7043 * Z061 * 7075 * Z111

E092 = E091
  1E035A / 21       * E022 * E026 * E061 * E093 * I092

E093 = E092
  11028A / 11       * E000 * 0101 * 0103 * P023 * Z059 * 7123 * Z125

E094 = Z065
  1D036B / 29       * K056 * P020 * Y059

E095 = Z062
  1F034B / 29       * Z059 * Z068 * Z091

E096 = Z061
  1E035C / 21       * E055 * F020 * F021 * F022 * K042

E097 = Z059 E126 + Y074 E116 E127 + Y075 E110 E127
  1F038A / 23       * E098
```

```
E098 = E097
  1E033C / 20       * P022 * 7060

E100 = M018
  1D029C / 20       * E101

E101 = E100
  1D029D / 20       * B034

E102 = A003 A005
  1D037A / 20       * L013

E103 = A003 A004
  1D037B / 20       * L014

E104 = Z091 + 7097
  1G014A / 12       * E107 * Y101 * Y102 * 7093 * Z093

E105 = M009
  1E021C / 21       * E106 * E122 * L011 * Y021

E106 = E105
  1D036A / 29       * B060 * I037 * I043

E107 = E104
  11031B / 29       * Z066

E108 = M017
  1D029B / 20       * I050

E109 = Z031 + I089 + Z083 + Z095
  1D005A / 23       * Y100

E110 = E113 + E116
  1E026A / 22       * E045 * E045 * E097 * E111

E111 = E110
  1D037C / 20       * I036

E112 = M012
  1D032C / 21       * E000 * E113 * E118 * I036

E113 = E112
  1D031A / 21       * B030 * E081 * E110

E114 = M013
  1D038A / 21       * E024 * E024 * E116 * E117 * I036

E115 = M010
  1D033A / 21       * E121 * Z030 * Z030 * 7082 * Z092

E116 = E114
  1D031C / 21       * B031 * E081 * E097 * E110
```

```
E117 = E114
  1I023B / 29       * E046 * E046

E118 = E112
  1I023C / 29       * E045 * E046

E119 = M010
  1E040C / 21       * Z092 * Z100

E120 = M014
  1D032A / 21       * E123 * I039 * I050 * I053 * I091

E121 = E115
  1E040A / 21       * B031 * I037 * I050

E122 = E105
  1F021D / 20       * Z084

E123 = E120
  1D030B / 29       * B030 * I035 * I039

E124 = M019
  1D033C / 21       * B033 * F021 * E041 * F125 * K020

E125 = E124
  1D035A / 11       * E041 * 0062 * 0072 * W008 * Y022 * Y025 * Z024
                    * Z066

E126 = M019
  1D028A / 11       * E097 * E127 * W004 * W006 * Y020 * Y031 * Y101

E127 = E126
  1D034A / 11       * E097 * E097 * 0060 * 0070 * P022 * Y102 * Z014

E130 = Z061
  1D021A / 20       * E131

E131 = E130
  1D021B / 20       * Y062

F000 = E093 + A128
  1I026C / 22       * E048 * E049 * F001 * F002

F001 = F000
  1I024A / 21       * G001 * G011 * G021 * G031 * G041

F002 = F000
  1I024C / 21       * G051 * G061 * G071 * G081

F003 = F020
  1I038C / 21       * G002 * G003 * G012 * G013

F004 = F020
  1J042A / 11       * G062 * G063 * G072 * G073 * G082 * G083
```

```
F005 = F020 + G001
  1J031A / 12       * G022 * G023 * G032 * G033 * G042 * G043 * G052
                    * G053

F006 = F020 + G000
  1J032A / 12       * G022 * G023 * G032 * G033 * G042 * G043 * G052
                    * G053

F007 = F021
  1J020A / 11       * G000 * G001 * G010 * G011 * G020 * G021 * G030
                    * G031

F008 = F021
  1I025A / 11       * G040 * G041 * G050 * G051 * G060 * G061 * G070
                    * G071

F009 = F021
  1I022C / 20       * G080 * G081

F010 = F022
  1I014A / 21       * J000 * J002 * J004 * J006 * J008

F011 = F022
  1I014C / 21       * J010 * J012 * J014 * J016

F012 = E050
  1I023A / 29       * E073 * E074 * E075

F014 = F023
  1I015A / 21       * J000 * J002 * J004 * J006 * J008

F015 = F023
  1I015C / 21       * J010 * J012 * J014 * J016

F020 = E009 I057 + E050 E065 E096
  1I027A / 12       * F003 * F004 * F005 * F006

F021 = E008 I057 Z006 + E096 E052 E065
  1I026A / 22       * F007 * F008 * F009

F022 = E065 E096 E051
  1I034D / 20       * F010 * F011

F023 = I057 E079
  1I034A / 20       * F014 * F015

F024 = Y023
  1E007A / 29       * E018 * E027 * E056

F025 = Z024
  1E007B / 29       * E018 * E027 * E056
```

```
F026 = Z030
  1E007C / 29       * Y020 * Y021 * Y022

F027 = Z034
  1I022D / 20       * Y025 * Y031

F028 = Z035
  1I035B / 29       * Y020 * Y021 * Y022

0   GND  =
          NO JACK     * C000 * C010 * C020 * C030 * C040 * C050 * C060
                      * C070 * C080 * G000 * G010 * G020 * G030 * G040
                      * G050 * G060 * G070 * G080 * K000 * K020 * K022
                      * K031 * K031 * K041 * K041 * K042 * K042 * 0001
                      * 0003 * 0003 * 0011 * 0013 * 0021 * 0023 * 0031
                      * 0033 * 0041 * 0043 * 0051 * 0053 * 0061 * 0063
                      * 0071 * 0073 * 0100 * 0103 * 0106 * P022 * W010
                      * W012 * W014 * W016 * Z008 * Z010 * Z012 * Z020
                      * Z028 * Z033 * Z037 * Z041 * Z041 * Z058 * Z061
                      * Z063 * Z074 * Z080 * Z082 * Z082 * Z090 * Z094
                      * Z096 * Z102 * Z120 * Z122 * Z124 * Z124

G000 = G001 + G003 F007 + G002 J001 + GND
  1J021A / 33       * F006 * G001 * G083

G001 = G000 + G002 F007 + G003 J001 + F001
  1J021C / 33       * F005 * G000 * G082 * P016

G002 = G003 + G011 F003
  1J033A / 31       * B070 * G000 * G001 * G003

G003 = G002 + G010 F003
  1J033C / 31       * G000 * G001 * G002

G010 = G011 + G013 F007 + G012 J003 + GND
  1J022A / 33       * G003 * G011

G011 = G010 + G012 F007 + G013 J003 + F001
  1J022C / 33       * G002 * G010 * P016

G012 = G013 + G021 F003
  1J034A / 31       * B071 * G010 * G011 * G013

G013 = G012 + G020 F003
  1J034C / 31       * G010 * G011 * G012

G020 = G021 + G023 F007 + G022 J005 + GND
  1J023A / 33       * G013 * G021

G021 = G020 + G022 F007 + G023 J005 + F001
  1J023C / 33       * G012 * G020 * P016

G022 = G023 + G030 F006 + G031 F005
  1J035A / 32       * B072 * G020 * G021 * G023
```

```
G023 = G022 + G031 F006 + G030 F005
  1J035C / 32       * G020 * G021 * G022

G030 = G031 + G033 F007 + G032 J007 + GND
  1J024A / 33       * G022 * G023 * G031

G031 = G030 + G032 F007 + G033 J007 + F001
  1J024C / 33       * G022 * G023 * G030 * P017

G032 = G033 + G040 F006 + G041 F005
  1J036A / 32       * G030 * G031 * G033

G033 = G032 + G041 F006 + G040 F005
  1J036C / 32       * B073 * G030 * G031 * G032

G040 = G041 + G043 F008 + G042 J009 + GND
  1J025A / 33       * G032 * G033 * G041

G041 = G040 + G042 F008 + G043 J009 + F001
  1J025C / 33       * G032 * G033 * G040 * P016

G042 = G043 + G050 F006 + G051 F005
  1J037A / 32       * B074 * G040 * G041 * G043

G043 = G042 + G051 F006 + G050 F005
  1J037C / 32       * G040 * G041 * G042

G050 = G051 + G053 F008 + G052 J011 + GND
  1J026A / 33       * G042 * G043 * G051

G051 = G050 + G052 F008 + G053 J011 + F002
  1J026C / 33       * G042 * G043 * G050 * P017

G052 = G053 + G060 F006 + G061 F005
  1J038A / 32       * G050 * G051 * G053

G053 = G052 + G061 F006 + G060 F005
  1J038C / 32       * B075 * G050 * G051 * G052

G060 = G061 + G063 F008 + G062 J013 + GND
  1J027A / 33       * G052 * G053 * G061

G061 = G060 + G062 F008 + G063 J013 + F002
  1J027C / 33       * G052 * G053 * G060 * P016

G062 = G063 + G071 F004
  1J039A / 31       * B076 * G060 * G061 * G063

G063 = G062 + G070 F004
  1J039C / 31       * G060 * G061 * G062

G070 = G071 + G073 F008 + G072 J015 + GND
  1J028A / 33       * G063 * G071
```

```
G071 = G070 + G072 F008 + G073 J015 + F002
  1J028C / 33       * G062 * G070 * P016

G072 = G073 + G081 F004
  1J040A / 31       * G077 * G070 * G071 * G073

G073 = G072 + G080 F004
  1J040C / 31       * G070 * G071 * G072

G080 = G081 + G083 F009 + G002 J017 + GND
  1J029A / 33       * G073 * G081

G081 = G080 + G082 F009 + G083 J017 + F002
  1J029C / 33       * G072 * G080 * P016

G082 = G083 + G001 F004
  1J041A / 31       * G080 * G081 * G083 * M009

G083 = G082 + G000 F004
  1J041C / 31       * G080 * G081 * G082

I001 = K000 + K003
  1B008A / 28       * K040

I002 = K002 + K005
  1D025A / 22       * I005 * I023 * I030

I003 = K001 K005
  1D019A / 21       * E091 * I013 * I014 * I016 * I115

I004 = K003 + K004
  1D020C / 22       * K030 * K040 * Z084

I005 = I002
  1D024B / 20       * I116

I008 = A101 B100
  1D019C / 21       * I009 * I012 * I014 * I016 * I096

I009 = I008
  1D018A / 21       * I010 * I046 * I050 * I050

I010 = A100 A101
  1D023C / 29       * I019 * K000

I011 = A100 B101
  1D017A / 21       * I015 * I017 * I018 * I115 * I116

I012 = I008
  1D018C / 21       * I023 * I030 * I097

I013 = I003
  1D023A / 29       * K022 * K023 * K090
```

```
I014 = I003 + I008
  1D022A / 12       * K050 * K052 * K054 * Z020 * Z028 * Z080 * Z090

I015 = I011
  1D017C / 21       * I102 * K022 * K023 * Z084

I016 = I003 + I008
  1I030A / 28       * Z094 * Z096

I017 = K004 + I011
  1D020A / 22       * K020 * K021 * L013 * L014

I018 = I011
  1D023B / 29       * I040 * I050 * K090

I019 = I010
  1D024A / 20       * O106

I020 = A118 I118
  1E004A / 21       * K021 * K043 * K091 * P023 * Z125

I021 = K022
  1E013C / 21       * I031

I022 = K023
  1E013A / 21       * E039 * I039 * Z014

I023 = I012 A031 I002
  1E008C / 20       * I024 * I092

I024 = I023 I118 A118 I030
  1H032A / 29       * K051 * K053 * K055

I026 = K021
  1E015A / 21       * I031

I027 = K020
  1E015C / 21       * I031 * L126

I030 = A030 I012 I002
  1H032C / 29       * I024 * I032

I031 = I021 R000 + I026 R001 + I027 A032
  1D002C / 23       * I040

I032 = I030 A118
  1D026A / 11       * I033 * P021 * Z021 * Z029 * Z081 * Z091 * Z125
                    * Z130

I033 = I032
  1E008D / 20       * I034 * I092

I034 = I033
  1I031A / 29       * K043 * Z095 * Z097
```

```
I035 = A039 A060 E123 + A040 A060 I037
  1D039C / 28       * I040

I036 = A033 E114 + A034 E112 + R005 E111
  1D003C / 23       * I040

I037 = E121 + E106
  1D007A / 28       * I035

I038 = A032 K050 + R003 K052 + A034 K054 + A010 I045 Z065
  1D027A / 24       * I040

I039 = R006 I022 + I045 E120 + R011 E123
  1D003A / 23       * I040

I040 = I018 I031 I036 I039 + I009 I035 I038
  1D007B / 28       * I041 * K040

I041 = I040
  1D004B / 20       * K030

I042 = Z125 Y082 + Z124
  11030B / 28       * I043+Z095

I043 = I042 + E106 Z110
  11030C / 28       * I044

I044 = I043
  11031C / 29       * Z097

I045 = A040 A050
  1D008A / 29       * I038 * I039 * I046

I046 = I045 Z064 I009
  1D001A / 20       * I051

I048 = Z094 Z096
  1D030C / 29       * I049 * I093 * Z068

I049 = I048
  1E016A / 21       * E091 * K056 * P020 * P020 * Z064

I050 = I107 + I018 R117 I083 + E121 R010 I009 + E120 I009 A000
  A001
  1C012C / 24       * I051

I051 = I046 I050
  1D001B / 20       * K040

I052 = K041
  1D004C / 20       * O106 * O108

I053 = E120 + R117 I062 + R116 I074
  1D002A / 23       * I054
```

```
I054 = I053
  1D001D / 20       * K040

I055 = Z029 F031 0100 0102 + Z083 0101 0102
  1D007C / 28       * I056

I056 = I055
  1D008C / 29       * B033 * B041 * T032

I057 = 0103
  18006A / 11       * E018 * F020 * F021 * F023 * I074 * N009 * N009
                    * Z040

I058 = I068
  1C017A / 11       * 0000 * 0010 * 0020 * 0030 * 0040 * 0050 * 0060
                    * 0070

I059 = 0104 P020 E108 Z124 K060
  1D008B / 29       * B035 * B041 * T031

I062 = Z020 0102 I067 E031 Z086
  18003D / 20       * I053 * I063

I063 = I062
  18004A / 20       * I070

I064 = 0106 + 0108 + Z030
  1A003C / 23       * I068 * Z023 * Z098

I065 = 0107 + 0108
  1A004C / 22       * K030 * 0100 * 0101

I066 = 0100
  1A006A / 11       * E010 * E036 * I074 * 0102 * 0104 * Z022

I067 = 0101
  18005B / 29       * I062

I068 = I064
  18004B / 20       * I058 * I069

I069 = I068
  1C028A / 11       * 0002 * 0012 * 0022 * 0032 * 0042 * 0052 * 0062
                    * 0072

I070 = A130 + I063 I084 A127 + E052 E065 I089 Z074
  1A003A / 23       * I071 * I072

I071 = I070
  1C027A / 11       * 0001 * 0011 * 0021 * 0031 * 0041 * 0051 * 0061
                    * 0071
```

```
I072 = I070
  1C038A / 11       * 0003 * 0013 * 0023 * 0033 * 0043 * 0053 * 0063
                    * 0073

I073 = 0109
  1B003C / 20       * I075 * I076

I074 = I057 I089 I066
  1D004D / 20       * I053

I075 = I073 + A116
  1G010A / 12       * B030 * B031 * B032 * B033 * B034 * B035 * B036
                    * B037

I076 = I073 + A116
  1G012A / 12       * B038 * B039 * B060 * B061 * B062 * B063 * T014
                    * T015

I080 = A127 E002 E014
  1B003A / 20       * I081

I081 = I080 A116
  1B003B / 20       * 0106

I082 = Z020
  1F010C / 29       * B088 * F032 * Z018

I083 = I093 Z100 Z102
  1H032B / 29       * B062 * I050 * I085

I084 = 0106 + 0109
  1A004A / 22       * I070 * K040 * 0104

I085 = I083 Z090 Z096
  1A020B / 20       * Z060

I087 = Z020 + F016
  1A009A / 12       * W000 * W002 * W004 * W006 * W008

I088 = Z021
  1E008A / 20       * Z031

I089 = Z080
  1E004C / 21       * E100 * I070 * I074 * I093 * K042

I091 = K003 + M014 + E120 Y160
  1D005C / 23       * K060

I092 = I118 I033 I023 E092
  1D038C / 21       * K057 * K061 * 0105

I093 = Z021 + Z029 + Z091 + I089 + I048
  1D011A / 15       * I033
```

```
I094 = I096 A040 A060
  1E009B / 29       * E091 * I095

I095 = I094
  1D024C / 20       * L011 * Z084

I096 = I008 + K002
  1B008B / 28       * I094 * L012

I097 = A160 A126 I012
  1B005C / 29       * I098 * I099 * I100

I098 = I097
  1G013A / 11       * B030 * B031 * B032 * B033 * B034 * B060 * B061
                    * B062

I099 = I097
  1G009A / 11       * B035 * B036 * B037 * B038 * B039 * B063

I100 = I102 I097 O108
  1D004A / 20       * K030

I101 = I102
  1H020A / 21       * B030 * B031 * B033 * B034

I102 = A160 A126 I015
  1H016D / 20       * I100 * I101

I105 = K101 + K103 + K105 + K107
  1A001A / 24       * I107

I106 = K109 + K111 + K113 + K115
  1A001C / 24       * I107

I107 = I105 I106 + R119
  1B008C / 28       * I050

I110 = A040 + A041 + A042 + A043
  1A002A / 24       * I112

I111 = A044 + A045 + A046 + A047
  1A002C / 24       * I112

I112 = I110 I111
  1D024D / 20       * I115 * K090

I115 = I003 + I011 + A050 + A119 I112
  1C006A / 14       * K100 * K102 * K104 * K106 * K108 * K110 * K112
                    * K114

I116 = I003 + I011 + A050 A011
  1E006C / 23       * I118 * R021

I118 = I116 + A150
```

```
  1B016C / 22       * I020 * I024 * I092 * I119

I119 = I118
  1C005A / 11       * K101 * K103 * K105 * K107 * K109 * K111 * K113
                    * K115

I125 = K100 K102 K104 K106
  1C007A / 20       * I127

I126 = K108 K110 K112 K114
  1C007B / 20       * I127

I127 = I125 + I126
  1C008A / 28       * I128

I128 = I127
  1C007C / 20       * L124

J000 = X021 F010 + B080 F014
  11011A / 28       * J001

J001 = J000
  11017A / 20       * G000 * G001

J002 = X023 F010 + B081 F014
  11011B / 28       * J003

J003 = J002
  11017B / 20       * G010 * G011

J004 = X025 F010 + B082 F014
  11011C / 28       * J005

J005 = J004
  11017C / 20       * G020 * G021

J006 = X027 F010 + B083 F014
  11012A / 28       * J007

J007 = J006
  11017D / 20       * G030 * G031

J008 = X029 F010 + B084 F014
  11012B / 28       * J009

J009 = J008
  11018A / 20       * G040 * G041

J010 = X031 F011 + B085 F015
  11012C / 28       * J011

J011 = J010
  11018B / 20       * G050 * G051
```

```
J012 = X033 F011 + B086 F015
  1I013A / 28       * J013

J013 = J012
  1I018C / 20       * G060 * G061

J014 = X035 F011 + B087 F015
  1I013B / 28       * J015

J015 = J014
  1I018D / 20       * G070 * G071

J016 = X037 F011 + B088 F015
  1I013C / 28       * J017

J017 = J016
  1I034C / 20       * G080 * G081

K000 = K001 + K004 K040 K030 A160 R117 I010 + GND
  1D013A / 32       * I001 * K001 * K003 * Z084

K001 = K000 + K005 Y205 + A116 A117
  1D013C / 32       * I003 * K000 * K002

K002 = K003 + K001 K040 Y200
  1D014A / 31       * I002 * I096 * K003 * K005

K003 = K002 + K000 Y202
  1D014C / 31       * I001 * I004 * I091 * K002 * K004

K004 = K005 + K003 Y201
  1D015A / 31       * I004 * I017 * K000 * K005

K005 = K004 + K002 Y203
  1D015C / 31       * I002 * I003 * K001 * K004

K020 = K021 + I017 E124 P001 Y010 + GND
  1E014A / 32       * B088 * I027 * K021 * P011 * P011

K021 = K020 + I017 R002 + I020
  1E014C / 32       * B088 * I026 * K020 * P011 * P011

K022 = K023 + R006 I015 I013 Z014 + GND
  1E012A / 32       * E066 * I021 * K023 * T018 * Z042

K023 = K022 + I013 A030 I015 + A129
  1E012C / 32       * E058 * I022 * K022 * Z043 * Z074

K030 = K031 + I100 R116 Y165 + A127 I065 + I041 I004 K040
  1D009A / 33       * K000 * K031 * Q106

K031 = K030 + A116 A117 + GND  + GND
  1D009C / 33       * K030 * T016
```

```
K040 = K041 + I040 I004 + I051 I001 + I054 I084
  1D010A / 33       * K000 * K002 * K030 * K041

K041 = K040 + A116 A117 + GND  + GND
  1D010C / 33       * I052 * K040 * T017

K042 = K043 + F096 I089 F053 E082 0104 Z058 + GND  + GND
  1A008A / 33       * K043

K043 = K042 + F091 + I020 + I034
  1A008C / 33       * B033 * K042

K050 = K051 + I014 R002
  1H031A / 30       * I038 * K051

K051 = K050 + I024
  1H031B / 30       * B041 * K050 * T032

K052 = K053 + I014 R003
  1E011A / 31       * I038 * K053

K053 = K052 + I024
  1E011C / 31       * B041 * K052 * K056 * T030

K054 = K055 + I014 R004
  1H031C / 30       * I038 * K055

K055 = K054 + I024
  1H031D / 30       * B041 * K054 * T031

K056 = K057 + F094 Z063 K053 I049
  1D006C / 30       * K057

K057 = K056 + I092
  1D006D / 30       * B041 * K056 * T030

K060 = K061 + I091
  1D006A / 30       * I050 * K061

K061 = K060 + I092
  1D006B / 30       * K060

K090 = K091 + I018 I013 A060 I112
  1B007A / 30       * K091

K091 = K090 + I020
  1B007B / 30       * B037 * K090 * L125

K100 = K101 + I115 A040
  1C001A / 30       * I125 * K101

K101 = K100 + I119
  1C001B / 30       * I105 * K100 * L016
```

```
K102 = K103 + I115 A041
  1C001C / 30       * I125 * K103

K103 = K102 + I119
  1C001D / 30       * I105 * K102 * L017

K104 = K105 + I115 A042
  1C002A / 30       * I125 * K105

K105 = K104 + I119
  1C002B / 30       * I105 * K104 * L018

K106 = K107 + I115 A043
  1C002C / 30       * I125 * K107

K107 = K106 + I119
  1C002D / 30       * I105 * K106 * L019

K108 = K109 + I115 A044
  1C003A / 30       * I126 * K109

K109 = K108 + I119
  1C003B / 30       * I106 * K108 * L020

K110 = K111 + I115 A045
  1C003C / 30       * I126 * K111

K111 = K110 + I119
  1C003D / 30       * I106 * K110 * L021

K112 = K113 + I115 A046
  1C004A / 30       * I126 * K113

K113 = K112 + I119
  1C004B / 30       * I106 * K112 * L022

K114 = K115 + I115 A047
  1C004C / 30       * I126 * K115

K115 = K114 + I119
  1C004D / 30       * I106 * K114 * L023

L000 = W001
  1A033A / ISC

L001 = W003
  1A033B / ISC

L002 = W005
  1A033C / ISC

L003 = W007
  1A034A / ISC
```

```
L004 = W009
  1A034B / ISC

L005 = W011
  1A034C / ISC

L006 = W013
  1A035A / ISC

L007 = W015
  1A035B / ISC

L008 = W017
  1A035C / ISC

L009 = Z101
  1A036C / ISC

L010 = Z103
  1A037A / ISC

L011 = E105 I095
  1A037B / ISC

L012 = A044 A060 I096
  1A037C / ISC

L013 = E102 I017
  1A038A / ISC

L014 = E103 I017
  1A038B / ISC

L015 = A130
  1A038C / ISC

L016 = K101
  1A039A / ISC

L017 = K103
  1A039B / ISC

L018 = K105
  1A039C / ISC

L019 = K107
  1A040A / ISC

L020 = K109
  1A040B / ISC

L021 = K111
  1A040C / ISC
```

```
L022 = K113
  1A032A / ISC

L023 = K115
  1A032B / ISC

L027 = Z041
  1A036A / ISC

L028 = E031
  1A036B / ISC

L124 = I128
  1A041A / 62

L125 = K091
  1A041B / 62

L126 = I027
  1A041C / 62

L127 = P021
  1A042A / 62

M000 = OPEN
  1B036A / OSA      * X000

M001 = OPEN
  1B036B / OSA      * X002

M002 = OPEN
  1B036C / OSA      * X004

M003 = OPEN
  1B037A / OSA      * X006

M004 = OPEN
  1B037B / OSA      * X008

M005 = OPEN
  1B037C / OSA      * X010

M006 = OPEN
  1B038A / OSA      * X012

M007 = OPEN
  1B038B / OSA      * X014

M008 = OPEN
  1B038C / OSA      * X016

M009 = OPEN
  1B039C / OSA      * E105 * Z060 * Z110
```

```
M010 = OPEN
  1B040A / OSA      * E115 * E119

M012 = OPEN
  1B040C / OSA      * E000 * E112

M013 = OPEN
  1B041A / OSA      * E114

M014 = OPEN
  1B041B / OSA      * E120 * I091

M017 = OPEN
  1B039A / OSA      * B039 * E108

M018 = OPEN
  1B039B / OSA      * E100 * Z020 * Z028

M019 = OPEN
  1B041C / OSA      * E124 * E126

N000 = B070 B071 + B080 B081
  1C015A / 28       * N004 * N006

N001 = B072 B073 + B082 B083
  1C015B / 28       * N004 * N006

N002 = B074 B075 + B084 B085
  1C015C / 28       * N005 * N007

N003 = B076 B077 + B086 B087
  1C013C / 28       * N005 * N007

N004 = N000 + N001
  1C014A / 28       * N006

N005 = N002 + N003
  1C014B / 28       * N007

N006 = N004 + N000 N001
  1C014C / 28       * N008 * N009

N007 = N005 + N002 N003
  1C013A / 28       * N008 * N009

N008 = N006 + N007
  1C013B / 28       * N009

N009 = N008 I057 + N006 N007 I057 + G082 E069
  1B017A / 23       * B088 * N010

N010 = N009
  1B018D / 20       * B088
```

```
0       OPEN =
              NO JACK     * A160 * A160 * A160 * A160 * M000 * M001 * M002
                          * M003 * M004 * M005 * M006 * M007 * M008 * M009
                          * M010 * M012 * M013 * M014 * M017 * M018 * M019
                          * R000 * R000 * R001 * R001 * R002 * R002 * R003
                          * R003 * R004 * R004 * R005 * R005 * R006 * R006
                          * R007 * R007 * R008 * R008 * R009 * R009 * R010
                          * R010 * R011 * R011 * R012 * R012 * R013 * R013
                          * R014 * R014 * R015 * R015 * R100 * R100 * R101
                          * R101 * R107 * R107 * R108 * R108 * R109 * R109
                          * R110 * R110 * R116 * R116 * R117 * R117 * R118
                          * R118 * R119 * R119 * R120 * R120 * Y020 * Y020
                          * Y021 * Y021 * Y022 * Y022 * Y023 * Y023 * Y024
                          * Y024 * Y025 * Y025 * Y031 * Y031 * Y048 * Y048
                          * Y049 * Y049 * Y050 * Y050 * Y051 * Y051 * Y058
                          * Y058 * Y059 * Y059 * Y060 * Y060 * Y061 * Y061
                          * Y062 * Y062 * Y070 * Y070 * Y071 * Y071 * Y074
                          * Y074 * Y075 * Y075 * Y080 * Y080 * Y100 * Y100
                          * Y101 * Y101 * Y102 * Y102

0000 = 0001 + R000 I058 + X001 E058
  1C018A / 32       * C001

0001 = 0000 + I071 + GND
  1C018C / 32       * B030 * R070 * 0000

0002 = 0003 + R008 I069 + X001 E059 + 7015 X037 4017
  1C029A / 33       * 0003

0003 = 0002 + I072 + GND  + GND
  1C029C / 33       * B038 * R070 * 0002

0010 = 0011 + R001 I058 + X003 E058
  1C019A / 32       * 0011

0011 = 0010 + I071 + GND
  1C019C / 32       * B031 * R071 * 0010

0012 = 0013 + R009 I069 + X003 E059
  1C030A / 32       * 0013

0013 = 0012 + I072 + GND
  1C030C / 32       * B039 * R071 * 0012

0020 = 0021 + R002 I058 + X005 E058
  1C020A / 32       * 0021

0021 = 0020 + I071 + GND
  1C020C / 32       * B032 * R072 * 0020

0022 = 0023 + R010 I0[illegible] + X005 E05[illegible]
  1C031A / 32       * 0027

0023 = 0022 + I072 + GND
  1C031C / 32       * B060 * R072 * 0022
```

```
0030 = 0031 + R003 I058 + X007 E058
  1C021A / 32       * 0031

0031 = 0030 + I071 + GND
  1C021C / 32       * E033 * R073 * 0030

0032 = 0033 + R011 I069 + X007 E059
  1C032A / 32       * 0033

0033 = 0032 + I072 + GND
  1C032C / 32       * E061 * R073 * 0032

0040 = 0041 + R004 I058 + X009 E058
  1C022A / 32       * 0041

0041 = 0040 + I071 + GND
  1C022C / 32       * E034 * R074 * 0040

0042 = 0043 + R012 I069 + X009 E059
  1C033A / 32       * 0043

0043 = 0042 + I072 + GND
  1C033C / 32       * E062 * R074 * 0042

0050 = 0051 + R005 I058 + X011 E058
  1C023A / 32       * 0051

0051 = 0050 + I071 + GND
  1C023C / 32       * E035 * R075 * 0050

0052 = 0053 + R013 I069 + X011 E059
  1C034A / 32       * 0053

0053 = 0052 + I072 + GND
  1C034C / 32       * E063 * R075 * 0052

0060 = 0061 + R006 E127 I058 + X013 E058
  1C024A / 32       * 0061

0061 = 0060 + I071 + GND
  1C024C / 32       * E036 * R076 * 0060

0062 = 0063 + R014 E125 I069 + X013 E059
  1C035A / 32       * 0063

0063 = 0062 + I072 + GND
  1C035C / 32       * R076 * 0062 * T014

0070 = 0071 + R007 E127 I058 + X015 Z017
  1C025A / 32       * 0071

0071 = 0070 + I071 + GND
  1C025C / 32       * E037 * R077 * 0070
```

```
0072 = 0073 + R015 E125 I069 + X015 E059
  1C036A / 32       * 0073

0073 = 0072 + I072 + GND
  1C036C / 32       * R077 * 0072 * T015

0100 = 0101 + A127 I065 + E062 Z060 Z081 E067 0102 + GND
  1A005A / 33       * I055 * I066 * 0101 * 0102

0101 = 0100 + R093 + E015 Z043 + Z081 I065 Z050
  1A005C / 33       * I055 * I067 * 0100

0102 = 0103 + 0100 Z033 R007 + I066 E065 E050
  1A007A / 32       * I055 * I055 * I062 * 0100 * 0103

0103 = 0102 + R093 + GND
  1A007C / 32       * I057 * 0102 * 0104 * Z022

0104 = 0105 + A126 I066 I084 0103 E065
  1B009A / 30       * I059 * K042 * 0105

0105 = 0104 + I092
  1B009B / 30       * R036 * 0104

0106 = 0107 + I081 A160 I019 I052 K030 + GND
  1B001A / 32       * I064 * I084 * 0107 * 0109

0107 = 0106 + A116 A117 + 0109 E031 Y152
  1B001C / 32       * I065 * 0106 * 0108

0108 = 0109 + 0107 I052 Y150
  1B002A / 31       * I064 * I065 * I100 * 0109

0109 = 0108 + 0106 Y151
  1B002C / 31       * I073 * I084 * 0107 * 0108 * T018

P000 = X000 X002 + X001 X003
  1B021A / 28       * P004 * P006

P001 = X004 X006 + X005 X007
  1B021B / 28       * P004 * P006

P002 = X008 X010 + X009 X011
  1B021C / 28       * P005 * P007

P003 = X012 X014 + X013 X015
  1B020A / 28       * P005 * P007

P004 = P000 + P001
  1B020B / 28       * P008

P005 = P002 + P003
  1B020C / 28       * P007
```

```
P006 = P004 + P000 P001
  1B019A / 28       * P008 * P009

P007 = P005 + P002 P003
  1B019B / 28       * P008 * P009

P008 = P006 + P007
  1B019C / 28       * P009

P009 = P008 + P006 P007
  1B016A / 22       * P010 * P011 * P011

P010 = P009
  1B018A / 20       * P011 * P011

P011 = P010 X017 K020 + P009 X017 K021 + P009 X016 K020 + P010
  X016 K021
  1D027C / 24       * P020

P013 = C001 + C011 + C021 + C031
  1B024A / 24       * P014

P014 = P013 P015 C080
  1B018C / 20       * P020

P015 = C041 + C051 + C061 + C071
  1B024C / 24       * P014

P016 = G001 G011 G021 G041 G061 G071 G081
  1F008A / 20       * P017

P017 = P016 + G031 + G051
  1G007C / 23       * P018

P018 = P017
  1F008B / 20       * P022

P020 = P021 + P011 Z058 Z060 E052 Z101 I049 + P014 E094 Z063 Z101
  I049 + P023 Z120 E044
  1B022A / 33       * I050 * P021

P021 = P020 + F091 + I032 + I116
  1B022C / 33       * B038 * L127 * P020

P022 = P023 + F127 Z062 E098 E065 P018 + GND
  1E010A / 32       * P023

P023 = P022 + F093 + I020
  1E010C / 32       * P020 * P022

R000 = OPEN + OPEN
  1G022A / P16      * A000 * I031 * 0000
```

```
R001 = OPEN + OPEN
  1G022C / P16      * A001 * I031 * K020 * 0010

R002 = OPEN + OPEN
  1G024A / P16      * A002 * K021 * K050 * 0020

R003 = OPEN + OPEN
  1G024C / P16      * A003 * I038 * K052 * 0030

R004 = OPEN + OPEN
  1G026A / P16      * A004 * K054 * 0040

R005 = OPEN + OPEN
  1G026C / P16      * A005 * I036 * 0050

R006 = OPEN + OPEN
  1G028A / P16      * I030 * K022 * 0060

R007 = OPEN + OPEN
  1G028C / P16      * A007 * A040 * A042 * 0070

R008 = OPEN + OPEN
  1G030A / P16      * A008 * A040 * A041 * 0002

R009 = OPEN + OPEN
  1G030C / P16      * A009 * A040 * A041 * 0012

R010 = OPEN + OPEN
  1G032A / P16      * A010 * A050 * I050 * 0022

R011 = OPEN + OPEN
  1G019A / P16      * A011 * I039 * 0032

R012 = OPEN + OPEN
  1G019C / P16      * 0042

R013 = OPEN + OPEN
  1G017A / P16      * 0052

R014 = OPEN + OPEN
  1G017C / P16      * 0062

R015 = OPEN + OPEN
  1G015A / P16      * 0072

R100 = OPEN + OPEN
  1G032C / P16      * A100 * I008

R101 = OPEN + OPEN
  1G034A / P16      * A101 * I011

R107 = OPEN + OPEN
  1G034C / P16      * A107
```

```
R108 = OPEN + OPEN
  1G035A / P16      * A108

R109 = OPEN + OPEN
  1G035C / P16      * A109

R110 = OPEN + OPEN
  1G036A / P16      * A110

R116 = OPEN + OPEN
  1G036C / P16      * A116 * I053 * K030

R117 = OPEN + OPEN
  1G037A / P16      * A117 * I050 * I053 * K000

R118 = OPEN + OPEN
  1G037C / P16      * A118

R119 = OPEN + OPEN
  1G038A / P16      * A119 * I107

R120 = OPEN + OPEN
  1G038C / P16      * A120

T000 = B000
  1G021A / P14

T001 = B001
  1G021C / P14

T002 = B002
  1G023A / P14

T003 = B003
  1G023C / P14

T004 = B004
  1G025A / P14

T005 = B005
  1G025C / P14

T006 = B006
  1G027A / P14

T007 = B007
  1G027C / P14

T008 = B008
  1G029A / P14

T009 = B009
  1G029C / P14
```

```
T010 = B010
  1G031A / P14

T011 = B011
  1G020A / P14

T012 = B012
  1G020C / P14

T013 = B013
  1G018A / P14

T014 = I076 0063
  1G018C / P14

T015 = I076 0073
  1G016A / P14

T016 = K031
  1G039A / P14

T017 = K041  Y011
  1G039C / P14

T018 = 0109 A126 K022 Z014
  1G031C / P14

T030 = K053 K057
  1G042A / P14

T031 = I059 K055
  1G042C / P14

T032 = I056 K051
  1G040C / P14

T033 = B040
  1G041C / P14

V000 =
        NO JACK     * V001

V001 = V000
  1C041A / 04       * E000

V002 =
        NO JACK     * V003

V003 = V002
  1D041A / 04       * E000

W000 = W001 * I087 * B080 W020 E035
  1A012A / 32       * W001 * W021
```

```
W001 = W000 + E022 + B080 W021 E035
  1A012C / 32       * L000 * W000 * W020

W002 = W003 + I087 + B081 W022 E035
  1A013A / 32       * W003 * W023

W003 = W002 + E022 + B081 W023 E035
  1A013C / 32       * L001 * W002 * W022

W004 = W005 + I087 E126 + B082 W024 E035
  1A014A / 32       * W005 * W025

W005 = W004 + E022 + B082 W025 E035
  1A014C / 32       * L002 * W004 * W024

W006 = W007 + I087 E126 + B083 W026 E035
  1A015A / 32       * W007 * W027

W007 = W006 + E022 + B083 W027 E035
  1A015C / 32       * L003 * W006 * W026

W008 = W009 + I087 E125 + B084 W028 E039
  1A023A / 32       * W009 * W029

W009 = W008 + E022 + B084 W029 E039
  1A023C / 32       * L004 * W008 * W028

W010 = W011 + B085 W030 E039 + GND
  1A024A / 32       * W011 * W031

W011 = W010 + E026 + B085 W031 E039
  1A024C / 32       * L005 * W010 * W030

W012 = W013 + B086 W032 E039 + GND
  1A025A / 32       * W013 * W033

W013 = W012 + E026 + B086 W033 E039
  1A025C / 32       * L006 * W012 * W032

W014 = W015 + B087 W034 E039 + GND
  1A026A / 32       * W015 * W035

W015 = W014 + E026 + B087 W035 E039
  1A026C / 32       * L007 * W014 * W034

W016 = W017 + B088 W036 E028 + GND
  1A027A / 32       * W017 * W037

W017 = W016 + E026 + B088 W037 E028
  1A027C / 32       * L008 * W016 * W036

W020 = W021 + W001 E005
  1A016A / 30       * W000 * W021
```

```
W021 = W020 + W000 E005
  1A016B / 30       * W001 * W020

W022 = W023 + W003 E005
  1A016C / 30       * W002 * W023

W023 = W022 + W002 E005
  1A016D / 30       * W003 * W022

W024 = W024 + W005 E005
  1A017A / 30       * W004 * W024

W025 = W025 + W004 E005
  1A017B / 30       * W005 * W025

W026 = W027 + W007 E005
  1A017C / 30       * W006 * W027

W027 = W026 + W006 E005
  1A017D / 30       * W007 * W026

W028 = W029 + W009 E003
  1A029A / 30       * W008 * W029

W029 = W028 + W008 E003
  1A029B / 30       * W009 * W028

W030 = W031 + W011 E003
  1A029C / 30       * W010 * W031

W031 = W030 + W010 E003
  1A029D / 30       * W011 * W030

W032 = W033 + W013 E003
  1A030A / 30       * W012 * W033

W033 = W032 + W012 E003
  1A030B / 30       * W013 * W032

W034 = W035 + W015 E003
  1A030C / 30       * W014 * W035

W035 = W034 + W014 E003
  1A030D / 30       * W015 * W034

W036 = W037 + W017 E006
  1A031A / 30       * W016 * W037

W037 = W036 + W016 E006
  1A031B / 30       * W017 * W036

X000 = X001 + M000
  1B026A / 31       * E040 * E043 * P000 * X001 * X021
```

```
X001 = X000 + E088
  1B026C / 31       * E070 * 0000 * 0002 * P000 * X000

X002 = X003 + M001
  1B027A / 31       * E040 * E043 * P000 * x003 * x023

X003 = X002 + E088
  1B027C / 31       * E070 * 0010 * 0012 * P000 * X002

X004 = X005 + M002
  1B028A / 31       * E040 * P001 * X005 * X025

X005 = X004 + E088
  1B028C / 31       * E043 * E070 * 0020 * 0022 * P001 * X004

X006 = X007 + M003
  1B029A / 31       * E040 * P001 * X007 * x027

X007 = X006 + E088
  1B029C / 31       * E043 * E070 * 0030 * 0032 * P001 * x006

X008 = X009 + M004
  1B030A / 31       * E043 * P002 * X009 * x029

X009 = X008 + E088
  1B030C / 31       * E072 * 0040 * 0042 * P002 * X008

X010 = X011 + M005
  1B031A / 31       * E041 * P002 * X011 * x031

X011 = X010 + E089
  1B031C / 31       * E072 * 0050 * 0052 * P002 * X010

X012 = X013 + M006
  1B032A / 31       * E041 * P003 * X013 * x033

X013 = X012 + E089
  1B032C / 31       * E072 * 0060 * 0062 * P003 * X012

X014 = X015 + M007
  1B033A / 31       * E041 * E071 * P003 * x015 * X035

X015 = X014 + E089
  1B033C / 31       * 0070 * 0072 * P003 * x014

X016 = X017 + M008
  1B034A / 31       * E041 * E041 * P011 * P011 * X017 * x037

X017 = X016 + E089
  1B034C / 31       * C080 * C081 * E072 * P011 * P011 * x016

X021 = X000
  11019A / 29       * C000 * C001 * J000
```

```
X023 = X002
  1J019B / 29       * C010 * C011 * J002

X025 = X004
  1J019C / 29       * C020 * C021 * J004

X027 = X006
  1J020A / 29       * C030 * C031 * J006

X029 = X008
  1J020B / 29       * C040 * C041 * J008

X031 = X010
  1J020C / 29       * C050 * C051 * J010

X033 = X012
  1J021A / 29       * C060 * C061 * J012

X035 = X014
  1J021B / 29       * C070 * C071 * J014

X037 = X016
  1J021C / 29       * J016 * 0002

0   Y000 =
          NO JACK     * Z002

0   Y001 =
          NO JACK     * Z004

0   Y002 =
          NO JACK     * Z006

0   Y003 =
          NO JACK     * Z001

0   Y004 =
          NO JACK     * Z003

0   Y005 =
          NO JACK     * Z005

0   Y006 =
          NO JACK     * Z007

0   Y010 =
          NO JACK     * K020

    Y011 =
          NO JACK    *T017

Y020 = F026 F028 E032 E126 * OPEN * OPEN
  1H037B / 97       * Z032

Y021 = F026 F028 E033 E105 * OPEN * OPEN
  1H037A / 97       * Z032

Y022 = F026 F028 E032 E125 * OPEN * OPEN
  1H038A / 97       * Z032
```

```
        Y023 = Z025 + OPEN + OPEN
          1E019B / 97       * E021 * F024

        Y024 = Z022 + OPEN + OPEN
          1E019A / 97       * Z025

        Y025 = F027 E125 + OPEN + OPEN
          1H008A / 97       * Z036

0       Y030 =
                  NO JACK     * Z034

        Y031 = F027 E126 + OPEN + OPEN
          1H008B / 97       * Z036

0       Y032 =
                  NO JACK     * Z037

0       Y033 =
                  NO JACK     * Z035

0       Y047 =
                  NO JACK     * Z048

        Y048 = Z049 + OPEN + OPEN
          1F032B / 97       * Z050

        Y049 = E071 Z050 + OPEN + OPEN
          1F031A / 97       * E046 * E046 * Y050

        Y050 = Y049 + OPEN + OPEN
          1F031B / 97       * E045 * E045 * Y051

        Y051 = Y050 + OPEN + OPEN
          1F032A / 97       * E045

0       Y052 =
                  NO JACK     * Z052

0       Y053 =
                  NO JACK     * Z053

0       Y054 =
                  NO JACK     * Z054

0       Y055 =
                  NO JACK     * Z055

0       Y056 =
                  NO JACK     * Z051

        Y058 = E084 + OPEN + OPEN
          1H038B / 97       * Z067
```

```
      Y059 = E080 E094 + OPEN + OPEN
        1E030B / 97       * E081 * Y060 * Z066

      Y060 = Y059 + OPEN + OPEN
        1F035A / 97       * E081 * Y061

      Y061 = Y060 + OPEN + OPEN
        1F035B / 97       * E081

      Y062 = E131 + OPEN + OPEN
        1E030A / 97       * Z062

0     Y063 =
              NO JACK     * Z064

0     Y065 =
              NO JACK     * Z066

0     Y066 =
              NO JACK     * E091

0     Y067 =
              NO JACK     * Z065

0     Y068 =
              NO JACK     * Z056

      Y070 = E085 + OPEN + OPEN
        1F028A / 97       * E086 * Y071

      Y071 = Y070 + OPEN + OPEN
        1E028B / 97       * E086

      Y074 = Z059 + OPEN + OPEN
        1F023A / 97       * E097 * Y075

      Y075 = Y074 + OPEN + OPEN
        1F023B / 97       * E097

      Y080 = E068 + OPEN + OPEN
        1B015A / 97       * Z069

0     Y081 =
              NO JACK     * Z068

0     Y082 =
              NO JACK     * I042

      Y100 = E109 + OPEN + OPEN
        1B013A / 97       * Z083 * Z101
```

```
      Y101 = E104 E126 + OPEN + OPEN
        1B013B / 97      * Z093 * Z103

      Y102 = E104 E127 + OPEN + OPEN
        1B015B / 97      * Z093 * Z103

0     Y103 =
              NO JACK    * Z101

0     Y105 =
              NO JACK    * Z110

0     Y140 =
              NO JACK    * A150

0     Y150 =
              NO JACK    * 0108

0     Y151 =
              NO JACK    * 0109

0     Y152 =
              NO JACK    * 0107

0     Y160 =
              NO JACK    * I091

0     Y165 =
              NO JACK    * K030

0     Y200 =
              NO JACK    * K002

0     Y201 =
              NO JACK    * K004

0     Y202 =
              NO JACK    * K003

0     Y203 =
              NO JACK    * K005

0     Y205 =
              NO JACK    * K001

0     Y300 =
              NO JACK    * Z302

0     Y301 =
              NO JACK    * Z303

0     Y302 =
              NO JACK    * Z306
```

```
Y303 =
        NO JACK     * Z307

Z000 = Z001 + Z006 E001 F024
  1F012A / 31       * E008 * F014 * E017 * Z001 * Z003

Z001 = Z000 + Z007 Y003
  1F012C / 31       * E016 * Z000 * Z002 * Z032 * Z032 * Z032

Z002 = Z003 + Z001 Y000
  1F013A / 31       * E002 * Z003 * Z005

Z003 = Z002 + Z000 Y004
  1F013C / 31       * E004 * E014 * Z002 * Z004

Z004 = Z005 + Z003 Y001
  1F014A / 31       * E004 * F008 * Z005 * Z007 * Z041

Z005 = Z004 + Z002 Y005
  1F014C / 31       * E019 * Z004 * Z006

Z006 = Z007 + Z005 Y002
  1F018A / 31       * E019 * F021 * Z000 * Z007

Z007 = Z006 + Z004 Y006
  1F018C / 31       * E016 * Z001 * Z006 * Z041

Z008 = Z009 + E009 Z010 Z012 + E009 Z011 Z013 + GND
  1H001A / 33       * Z009 * Z012 * Z013

Z009 = Z008 + E009 Z010 Z013 + E009 Z011 Z012 + Z022
  1H001C / 33       * E020 * Z008 * Z010 * Z011

Z010 = Z011 + E011 Z009 Z012 + GND
  1H002A / 32       * Z008 * Z009 * Z011 * Z013

Z011 = Z010 + E011 Z009 Z013 + Z022
  1H002C / 32       * E020 * Z008 * Z009 * Z010 * Z012

Z012 = Z013 + E011 Z011 Z008 + GND
  1H003A / 32       * E020 * Z008 * Z009 * Z010 * Z013

Z013 = Z012 + E011 Z010 Z008 + Z022
  1H003C / 32       * Z008 * Z009 * Z011 * Z012

Z014 = I022 E127
  1E016C / 21       * E062 * K022 * T018 * Z015

Z015 = Z014
  1E039B / 20       * 0002

Z016 = E058
  1D037D / 20       * Z017
```

```
Z017 = Z016
  1F015B / 29       * 0002 * 0070

Z018 = Z019 + I082
  1J019C / 30       * E018 * Z019

Z019 = Z018 + F026
  1J019D / 30       * Z018

Z020 = Z021 + I014 A050 A045 M018 + GND
  1E001A / 32       * E091 * I062 * I082 * I087 * Z021

Z021 = Z020 + I032 + E015
  1E001C / 32       * E027 * I088 * I093 * Z020 * Z030

Z022 = Z023 + F030 0103 + E011 I066 E038
  1H004A / 32       * Y024 * Z009 * Z011 * Z013 * Z023

Z023 = Z022 + Z032 + I064
  1H004C / 32       * E034 * Z022

Z024 = Z025 + E020 E125
  1E018C / 30       * F025 * Z025

Z025 = Z024 + Y024
  1E018D / 30       * Y023 * Z024

Z028 = Z029 + I014 A050 A041 M018 + GND
  1E002A / 32       * E091 * Z029 * Z031 * Z086 * Z099

Z029 = Z028 + I032 + E023 Z034
  1E002C / 32       * E027 * I055 * I093 * Z028 * Z030

Z030 = Z031 + Z021 E115 + Z029 E115
  1H034A / 32       * E031 * F026 * I064 * Z031 * Z101

Z031 = Z030 + A128 + I088 Z028 Z035 Z037
  1H034C / 32       * E013 * E109 * Z030

Z032 = Z033 + Y021 E001 Z001 + Y020 E001 Z001 + Y022 E001 Z001
  1H035A / 33       * E019 * E030 * Z023 * Z033

Z033 = Z032 + A128 + Z035 + GND
  1H035C / 33       * E002 * F025 * 0102 * Z032

Z034 = Z035 + F023 Y030
  1H007A / 31       * F027 * Z029 * Z035 * Z037

Z035 = Z034 + Z037 Y033
  1H007C / 31       * F028 * Z031 * Z033 * Z034 * Z101

Z036 = Z037 + Y025 + Y031
  1H009A / 32       * Z037
```

```
Z037 = Z036 + Z034 Y032 + GND
  1H009C / 32      * Z031 * Z035 * Z036

Z040 = Z041 + E023 + E029 + I057 E011
  1H039A / 33      * Z041

Z041 = Z040 + Z004 Z007 + GND  + GND
  1H039C / 33      * L027 * Z040

Z042 = Z043 + E019 Z044 + K022
  1E017A / 32      * E036 * E038 * Z043 * Z045

Z043 = Z042 + E019 K023 Z045 + E091
  1E017C / 32      * E010 * 0101 * Z042 * Z044

Z044 = Z045 + E009 Z043
  1E018A / 30      * Z042 * Z045

Z045 = Z044 + E009 Z042
  1E018B / 30      * Z043 * Z044

Z048 = Z049 + E047 Y047
  1A031C / 30      * Z049

Z049 = Z048 + E089
  1A031D / 30      * E080 * Y048 * Z048

Z050 = Z051 + Z054 Y048
  1F028A / 31      * E050 * E051 * 0101 * Y049 * Z051 * Z053

Z051 = Z050 + Z055 Y056
  1F028C / 31      * E055 * E060 * Z050 * Z052

Z052 = Z053 + Z051 Y052
  1F029A / 31      *      * E060 * Z053 * Z055

Z053 = Z052 + Z050 Y053
  1F029C / 31      * E050 * E057 * Z052 * Z054 * E054

Z054 = Z055 + Z053 Y054
  1F030A / 31      * E051 * E057 * Z050 * Z055

Z055 = Z054 + Z052 Y055
  1F030C / 31      * E052 * E055 * Z051 * Z054

Z058 = Z059 + E082 E083 Y068 + GND
  1F025A / 32      * E066 * K042 * P020 * Z059

Z059 = Z058 + E093 + E095
  1F025C / 32      * E062 * E097 * Y074 * Z058

Z060 = Z061 + E098 + Z110 M009 I085 + Z085
  1E029A / 33  48  * 0100 * P020 * Z061 * Z063
```

```
Z061 = Z060 + E091 + Z069 + GND
  1E029C / 33       * E096 * E130 * Z060

Z062 = Z063 + Y062 + Z085
  1E031A / 32       * E044 * E095 * P022 * Z063 * Z065

Z063 = Z062 + Z060 + GND
  1E031C / 32       * K056 * P020 * Z062 * Z064 * Z081

Z064 = Z065 + Z063 I049 Y063
  1E032A / 31       * E090 * E091 * I046 * Z065 * Z081 * Z091

Z065 = Z064 + Z062 Y067
  1E032C / 31       * B034 * E044 * E094 * I038 * Z064

Z066 = Z067 + E107 Y059 E125 Y065
  1F027A / 30       * E084 * Z067 * Z072

Z067 = Z066 + Y058
  1F027B / 30       * E080 * Z066

Z068 = Z069 + I048 E095 Y081
  18007C / 30       * E061 * E068 * Z069

Z069 = Z068 + Y080
  18007D / 30       * Z061 * Z068

Z070 = Z071 + E060
  1E036A / 30       * E080 * Z071 * Z073

Z071 = Z070 + E061
  1E036B / 30       * Z070 * Z072

Z072 = Z073 + Z071 E050 Z066
  1E036C / 30       * E083 * Z073

Z073 = Z072 + Z070
  1E036D / 30       * Z072

Z074 = Z075 + E057 K023 Z076 + GND
  1F026A / 32       * E053 * E058 * I070 * Z075 * Z077

Z075 = Z074 + E057 Z077 + E091
  1F026C / 32       * E050 * Z074 * Z076

Z076 = Z077 + E050 Z075
  1F027C / 30       * Z074 * Z077

Z077 = Z076 + E050 Z074
  1F027D / 30       * Z075 * Z076

Z080 = Z081 + I014 A050 A042 + GND
  1E003A / 32       * E091 * I089 * Z081 * Z083
```

```
Z081 = Z080 + I032 + Z063 Z064
  1E003C / 32       * 0100 * 0101 * Z080 * Z082 * Z100

Z082 = Z083 + E115 Z081 + GND  + GND
  1E037A / 33       * E057 * E065 * Z083

Z083 = Z082 + Z080 Y100 + A130 + Z095
  1E037C / 33       * I055 * Z082 * Z100

Z084 = A060 I004 I015 + I095 E122 K000
  1C008C / 28       * Z085

Z085 = Z084 Z130
  1E008B / 20       * Z060 * Z062

Z086 = Z028
  1A020D / 20       * I062


Z090 = Z091 + I014 A050 A043 + GND
  1E005A / 32       * E091 * I085 * Z091

Z091 = Z090 + I032 + E095 Z064
  1E005C / 32       * E104 * I093 * Z090 * Z092 * Z102

Z092 = Z093 + Z091 E115 + Z097 E119
  1E006A / 32       * E085 * Z093

Z093 = Z092 + E104 Y101 + E104 Y102
  1E006C / 32       * E083 * Z092 * Z102 * Z102

Z094 = Z095 + A046 A050 I016 + GND
  11032A / 32       * I04A * Z095

Z095 = Z094 + I034 + I042
  11032C / 32       * E10o * Z083 * Z094 * Z100

Z096 = Z097 + A047 A050 I016 + GND
  11033A / 32       * I04A * I085 * Z097

Z097 = Z096 + I034 + I044
  11033C / 32       * E104 * Z092 * Z096 * Z102

Z098 = Z099 + I064
  1B009C / 30       * Z099

Z099 = Z098 + Z028
  1B009D / 30       * E01A * E027 * Z098

Z100 = Z101 + E031 + Z081 Z083 + Z095 E119
  1B014A / 33       * E085 * I083 * Z101 *

Z101 = Z100 + A130 + Y100 Y103 + Z030 Z035
  1B014C / 33       * L009 * P020 * P020 * Z100

Z102 = Z103 + Z091 Z093 + Z093 Z097 + GND
  1B012A / 33       * E085 * I083 * Z103

Z103 = Z102 + A130 + Y101 + Y102
  1B012C / 33       * L010 * Z102
```

```
Z110 = Z111 + M009 Y105
  1C039A / 31       * E086 * I043 * Z060 * Z111

Z111 = Z110 +  E091
  1C039C / 31       * E032 * Z110

Z120 = Z121 + E042 E052 + GND
  1C010A / 32       * P020 * Z121

Z121 = Z120 + E090 + Z123
  1C010C / 32       * Z120 * Z124

Z122 = Z123 + E041 E052 + GND
  1C009A / 32       * Z123

Z123 = Z122 + E093 + E044
  1C009C / 32       * Z121 * Z122

Z124 = Z125 + Z121 E044 + GND  + GND
  1C011A / 33       * I042 * I059 * Z125

Z125 = Z124 + I032 + I020 + E093
  1C011C / 33       * B061 * I042 * Z124

Z130 = I032
  1D021C / 20       * Z085

Z300 = Z301 + Z306 E001
  1H005A / 30       * Z301 * Z303

Z301 = Z300 + Z307 E001
  1H005B / 30       * Z300 * Z302

Z302 = Z303 + Z301 Y300
  1H005C / 30       * E024 * Z303 * Z305

Z303 = Z302 + Z300 Y301
  1H005D / 30       * Z302 * Z304

Z304 = Z305 + E001 Z303
  1H006A / 30       * Z305 * Z307

Z305 = Z304 + E001 Z302
  1H006B / 30       * Z304 * Z306

Z306 = Z307 + Z305 Y302
  1H006C / 30       * E024 * Z300 * Z307

Z307 = Z306 + Z304 Y303
  1H006D / 30       * Z301 * Z306
```

PART 6

WIRE LISTS

GND	1J002 02
GND	1J003 02
GND	1J004 02
GND	1J005 02
GND	1J011 02
GND	1J012 02
GND	1J013 02
GND	1J014 02
GND	1J018 02
GND	1J021 03
GND	1J022 03
GND	1J023 03
GND	1J024 03
GND	1J025 03
GND	1J026 03
GND	1J027 03
GND	1J028 03
GND	1J029 03
GND	1D013 02
GND	1E014 02
GND	1E012 02
GND	1D009 08
GND	1D009 09
GND	1D010 08
GND	1D010 09
GND	1A008 02
GND	1A008 03
GND	1C018 08
GND	1C029 08
GND	1C029 09
GND	1C019 08
GND	1C030 08
GND	1C020 08
GND	1C031 08
GND	1C021 08
GND	1C032 08
GND	1C022 08
GND	1C033 08
GND	1C023 08
GND	1C034 08
GND	1C024 08
GND	1C035 08
GND	1C025 08
GND	1C036 08
GND	1A005 03
GND	1A007 08
GND	1B001 02
GND	1E010 02
GND	1A024 02
GND	1A025 02
GND	1A026 02

	GND		1A027 02
	GND		1H001 03
	GND		1H002 02
	GND		1H003 02
	GND		1E001 02
	GND		1E002 02
	GND		1H035 09
	GND		1H009 08
	GND		1H039 08
	GND		1H039 09
	GND		1F025 02
	GND		1E029 09
	GND		1E031 08
	GND		1F026 02
	GND		1E003 02
	GND		1E037 02
	GND		1E037 03
	GND		1E005 02
	GND		1I032 02
	GND		1I033 02
	GND		1B012 03
	GND		1C010 02
	GND		1C009 02
	GND		1C011 02
	GND		1C011 03
09	1A001	01	1C001 06
10	1A001	02	1C001 12
08	1A001	03	1C002 06
09	1A001	04	1C002 12
03	1A001	06	1A001 12
06	1A001	06	1B008 09
08	1A001	07	1C003 06
09	1A001	08	1C003 12
08	1A001	09	1C004 06
08	1A001	10	1C004 12
03	1A001	12	1A001 06
18	1A002	01	1F001 09
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18	1A002	03	1F002 12
17	1A002	04	1F003 06
03	1A002	06	1A002 12
18	1A002	07	1F003 12
17	1A002	08	1F004 06
18	1A002	09	1F004 12
16	1A002	10	1F006 06
03	1A002	12	1A002 06
14	1A002	12	1D024 10
12	1A003	01	1D012 06
05	1A003	02	1B004 03
03	1A003	02	1A004 06
15	1A003	03	1E004 11
17	1A003	05	1C038 01
13	1A003	06	1C027 01
05	1A003	07	1B001 06

05	1A003 08	1B002 06
26	1A003 09	1H034 04
05	1A003 10	1B009 07
23	1A003 11	1H004 08
04	1A003 12	1B004 04
06	1A004 01	1B001 05
07	1A004 02	1B002 11
04	1A004 04	1A007 11
03	1A004 04	1A006 08
11	1A004 05	1D010 03
03	1A004 06	1A003 02
06	1A004 07	1B001 12
05	1A004 08	1B002 05
02	1A004 10	1A005 09
04	1A004 11	1A005 01
23	1A004 11	1H017 09
10	1A004 12	1D009 02
04	1A005 01	1A004 11
03	1A005 02	1A007 03
16	1A005 02	1E003 12
	1A005 03	GND
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03	1A005 04	1A007 01
03	1A005 05	1A006 01
03	1A005 06	1A007 06
28	1A005 07	1I028 11
15	1A005 08	1E017 11
14	1A005 09	1E003 11
02	1A005 09	1A004 10
04	1A005 11	1B005 05
03	1A005 12	1A007 05
11	1A005 12	1D007 10
03	1A006 01	1A005 05
18	1A006 07	1F015 12
03	1A006 08	1A004 04
04	1A006 08	1B009 01
19	1A006 09	1E038 07
03	1A006 09	1A007 02
05	1A006 10	1B006 08
08	1A006 11	1A020 01
14	1A006 11	1E017 06
05	1A006 12	1B004 10
03	1A007 01	1A005 04
03	1A007 02	1A006 09
03	1A007 03	1A005 02
06	1A007 04	1B005 08
07	1A007 04	1A020 12
03	1A007 05	1A005 12
03	1A007 06	1A005 06
11	1A007 06	1D007 09
28	1A007 07	1I028 10
	1A007 08	GND
22	1A007 10	1H004 01
04	1A007 11	1A004 04
03	1A007 12	1B006 01

05	1A008 01	1B009 02
	1A008 02	GND
	1A008 03	GND
18	1A008 07	1E034 11
14	1A008 08	1E004 05
27	1A008 09	1I031 04
19	1A008 12	1G009 07
15	1A009 01	1E001 03
20	1A009 02	1F034 02
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04	1A009 10	1A014 01
04	1A009 11	1A013 01
04	1A009 12	1A012 01
06	1A010 01	1A020 03
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14	1A010 06	1C035 12
14	1A010 07	1C034 11
13	1A010 08	1C033 11
13	1A010 09	1C032 11
12	1A010 10	1C031 11
12	1A010 11	1C030 11
12	1A010 12	1C029 11
08	1A011 01	1B004 12
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11	1A011 06	1C024 11
10	1A011 07	1C023 11
10	1A011 08	1C022 11
09	1A011 09	1C021 11
09	1A011 10	1C020 11
09	1A011 11	1C019 11
08	1A011 12	1C018 11
04	1A012 01	1A009 12
16	1A012 02	1E024 12
04	1A012 02	1A016 03
04	1A012 06	1A016 04
05	1A012 07	1A019 06
15	1A012 08	1E024 11
04	1A012 08	1A016 06
04	1A012 11	1A016 01
11	1A012 12	1A033 01
04	1A013 01	1A009 11
04	1A013 02	1A016 09
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04	1A013 07	1A019 05
03	1A013 08	1A016 12
03	1A013 11	1A016 07
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03	1A014 06	1A017 04
04	1A014 07	1A019 04
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14	1A015 01	1D028 09
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03	1A015 02	1A017 09
03	1A015 06	1A017 10
04	1A015 07	1A019 03
03	1A015 08	1A017 12
03	1A015 11	1A017 07
10	1A015 12	1A034 01
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04	1A016 01	1A012 11
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04	1A016 04	1A012 06
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03	1A017 10	1A015 06
13	1A017 12	1E024 05
03	1A017 12	1A015 08
15	1A018 01	1E021 05
03	1A018 05	1A017 10
02	1A018 06	1A017 07
03	1A018 07	1A017 04
03	1A018 08	1A017 01
03	1A018 09	1A016 10
03	1A018 10	1A016 07
03	1A018 11	1A016 04
04	1A018 12	1A016 01
15	1A019 01	1E020 06
04	1A019 02	1A023 07
04	1A019 03	1A015 07
04	1A019 04	1A014 07
04	1A019 05	1A013 07

05	1A019 06	1A012 07
15	1A019 07	1E035 05
29	1A019 08	1J019 10
05	1A019 09	1A027 07
05	1A019 10	1A026 07
04	1A019 11	1A025 07
04	1A019 12	1A024 07
08	1A020 01	1A006 11
06	1A020 03	1A010 01
16	1A020 04	1E005 05
10	1A020 06	1B039 11
15	1A020 07	1E020 12
05	1A020 08	1A027 08
06	1A020 08	1B017 10
05	1A020 09	1A027 01
06	1A020 09	1B017 11
15	1A020 10	1E002 04
07	1A020 12	1A007 04
16	1A022 01	1E032 11
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09	1A022 04	1C011 01
10	1A022 05	1C009 08
05	1A022 06	1B022 03
13	1A023 01	1D035 09
08	1A023 01	1A009 08
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04	1A023 02	1A029 03
04	1A023 06	1A029 04
04	1A023 07	1A019 02
15	1A023 08	1E025 11
04	1A023 08	1A029 06
04	1A023 11	1A028 12
07	1A023 12	1A034 05
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	1A024 02	GND
04	1A024 06	1A029 10
04	1A024 07	1A019 12
14	1A024 08	1E025 09
04	1A024 08	1A029 12
04	1A024 11	1A029 07
06	1A024 12	1A034 09
15	1A025 01	1E025 08
04	1A025 01	1A030 03
	1A025 02	GND
03	1A025 06	1A028 07
04	1A025 07	1A019 11
14	1A025 08	1E025 07
04	1A025 08	1A030 06
03	1A025 11	1A028 08
06	1A025 12	1A035 01
04	1A026 01	1A030 09
	1A026 02	GND
03	1A026 06	1A028 05
05	1A026 07	1A019 10

04	1A026 08	1A030 12
03	1A026 11	1A028 06
06	1A026 12	1A035 05
05	1A027 01	1A020 09
04	1A027 01	1A031 03
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12	1C006 06	1F004 11
03	1C006 06	1C004 01
03	1C006 07	1C003 07
12	1C006 08	1F003 11
04	1C006 08	1C003 01
10	1C006 09	1F003 05
04	1C006 09	1C002 07
11	1C006 10	1F002 11
04	1C006 10	1C002 01
10	1C006 11	1F002 05
04	1C006 11	1C001 07
11	1C006 12	1F001 08
05	1C006 12	1C001 01
04	1C007 01	1C001 03
03	1C007 03	1C008 01
03	1C007 04	1C004 03
03	1C007 06	1C008 02
03	1C007 07	1C008 04
17	1C007 09	1A041 01
03	1C007 10	1C008 08
04	1C007 12	1C010 01
03	1C008 01	1C007 03
03	1C008 02	1C007 06

03	1C008 04	1C007 07
04	1C008 05	1C012 06
12	1C008 06	1B031 06
03	1C008 07	1C009 01
03	1C008 08	1C007 10
07	1C008 09	1D017 09
05	1C008 10	1D013 04
07	1C008 12	1E008 04
17	1C009 01	1E042 08
03	1C009 01	1C008 07
	1C009 02	GND
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03	1C009 12	1C010 08
17	1C010 01	1E042 09
04	1C010 01	1C007 12
	1C010 02	GND
08	1C010 06	1B022 03
09	1C010 06	1E010 12
13	1C010 07	1E033 05
03	1C010 08	1C009 12
04	1C010 12	1C011 01
09	1C011 01	1A022 04
04	1C011 01	1C010 12
	1C011 02	GND
	1C011 03	GND
05	1C011 05	1D008 05
05	1C011 05	1B009 03
22	1C011 06	1I030 06
09	1C011 07	1D026 06
08	1C011 08	1E004 02
21	1C011 09	1I028 06
09	1C011 11	1E022 09
13	1C011 12	1G013 06
08	1C012 01	1B026 06
08	1C012 02	1B027 06
09	1C012 03	1B028 06
09	1C012 04	1B029 06
07	1C012 06	1B023 12
04	1C012 06	1C008 05
05	1C012 07	1B008 12
07	1C012 08	1D023 07
05	1C012 09	1D018 04
05	1C012 10	1D018 03
10	1C012 10	1D032 04
07	1C012 12	1D001 04
03	1C013 01	1C014 08
03	1C013 02	1C013 11
06	1C013 03	1B017 02
03	1C013 03	1C014 11
02	1C013 04	1C013 06
03	1C013 05	1C014 12
02	1C013 06	1C013 04
06	1C013 08	1B006 07

06	1C013 08	1B017 01
19	1C013 09	1I008 05
19	1C013 10	1I009 05
03	1C013 11	1C013 02
03	1C013 11	1C015 11
03	1C013 12	1C014 06
03	1C014 01	1C015 04
03	1C014 02	1C015 08
03	1C014 04	1C014 09
03	1C014 05	1C015 12
03	1C014 06	1C013 12
03	1C014 08	1C013 01
03	1C014 09	1C014 04
03	1C014 10	1C015 07
03	1C014 10	1C015 03
03	1C014 11	1C013 03
03	1C014 12	1C013 05
21	1C015 01	1I001 05
21	1C015 02	1I002 05
03	1C015 03	1C014 10
03	1C015 04	1C014 01
21	1C015 05	1I003 05
20	1C015 06	1I004 05
03	1C015 07	1C014 10
03	1C015 08	1C014 02
20	1C015 09	1I006 05
19	1C015 10	1I007 05
03	1C015 11	1C013 11
03	1C015 12	1C014 05
08	1C017 01	1B004 06
05	1C017 05	1C025 01
05	1C017 06	1C024 01
05	1C017 07	1C023 01
04	1C017 08	1C022 01
14	1C017 08	1G026 04
04	1C017 09	1C021 01
14	1C017 09	1G024 09
04	1C017 10	1C020 01
13	1C017 10	1G024 03
04	1C017 11	1C019 01
14	1C017 11	1G022 09
04	1C017 12	1C018 01
13	1C017 12	1G022 04
04	1C018 01	1C017 12
06	1C018 02	1B026 11
06	1C018 07	1C027 12
	1C018 08	GND
08	1C018 11	1A011 12
20	1C018 11	1I001 01
14	1C018 12	1G010 12
04	1C019 01	1C017 11
05	1C019 02	1C026 11
05	1C019 07	1C027 11
	1C019 08	GND

09	1C019	11	1A011	11
21	1C019	11	1I001	07
14	1C019	12	1G010	11
04	1C020	01	1C017	10
05	1C020	02	1C026	10
05	1C020	07	1C027	10
	1C020	08	GND	
09	1C020	11	1A011	10
20	1C020	11	1I003	01
14	1C020	12	1G010	10
04	1C021	01	1C017	09
04	1C021	02	1C026	09
04	1C021	07	1C027	09
	1C021	08	GND	
09	1C021	11	1A011	09
21	1C021	11	1I003	07
14	1C021	12	1G010	09
04	1C022	01	1C017	08
04	1C022	02	1C026	08
04	1C022	07	1C027	08
	1C022	08	GND	
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20	1C022	11	1I006	01
14	1C022	12	1G010	08
15	1C023	01	1G026	10
05	1C023	01	1C017	07
03	1C023	02	1C026	07
04	1C023	07	1C027	07
	1C023	08	GND	
10	1C023	11	1A011	07
21	1C023	11	1I006	07
14	1C023	12	1G010	07
08	1C024	01	1D034	10
05	1C024	01	1C017	06
03	1C024	02	1C026	06
03	1C024	07	1C027	06
	1C024	08	GND	
11	1C024	11	1A011	06
20	1C024	11	1I008	01
14	1C024	12	1G010	06
08	1C025	01	1D034	09
05	1C025	01	1C017	05
13	1C025	02	1F015	07
05	1C025	02	1B033	12
03	1C025	07	1C027	05
	1C025	08	GND	
11	1C025	11	1A011	05
21	1C025	11	1I008	07
14	1C025	12	1G010	05
13	1C026	01	1F039	08
11	1C026	02	1F026	05
08	1C026	05	1D037	10
03	1C026	06	1C024	02
05	1C026	06	1B032	11

03	1C026 07	1C023 02
05	1C026 07	1B031 11
04	1C026 08	1C022 02
05	1C026 08	1B030 11
04	1C026 09	1C021 02
05	1C026 09	1B029 10
05	1C026 10	1C020 02
05	1C026 10	1B028 10
05	1C026 11	1C019 02
05	1C026 11	1B027 11
05	1C026 12	1B026 11
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03	1C027 05	1C025 07
03	1C027 06	1C024 07
04	1C027 07	1C023 07
04	1C027 08	1C022 07
04	1C027 09	1C021 07
05	1C027 10	1C020 07
05	1C027 11	1C019 07
06	1C027 12	1C018 07
12	1C028 01	1B004 05
05	1C028 05	1C036 01
05	1C028 06	1C035 01
05	1C028 07	1C034 01
15	1C028 07	1G017 06
04	1C028 08	1C033 01
15	1C028 08	1G019 12
04	1C028 09	1C032 01
14	1C028 09	1G019 04
04	1C028 10	1C031 01
13	1C028 10	1G032 03
04	1C028 11	1C030 01
14	1C028 11	1G030 09
04	1C028 12	1C029 01
13	1C028 12	1G030 03
04	1C029 01	1C028 12
06	1C029 02	1C037 12
04	1C029 02	1B026 10
10	1C029 03	1E039 06
06	1C029 07	1C038 12
	1C029 08	GND
	1C029 09	GND
12	1C029 11	1A010 12
22	1C029 11	1I001 02
16	1C029 12	1H028 05
04	1C030 01	1C028 11
05	1C030 02	1C037 11
04	1C030 02	1B027 10
05	1C030 07	1C038 11
	1C030 08	GND
12	1C030 11	1A010 11
23	1C030 11	1I001 08
16	1C030 12	1G012 11
04	1C031 01	1C028 10

05	1C031 02	1C037 10
04	1C031 02	1B028 09
05	1C031 07	1C038 10
	1C031 08	GND
12	1C031 11	1A010 10
22	1C031 11	1I003 02
15	1C031 12	1H029 01
04	1C032 01	1C028 09
04	1C032 02	1C037 09
04	1C032 02	1B029 09
04	1C032 07	1C038 09
	1C032 08	GND
13	1C032 11	1A010 09
23	1C032 11	1I003 08
16	1C032 12	1H029 05
04	1C033 01	1C028 08
04	1C033 02	1C037 08
04	1C033 02	1B030 10
04	1C033 07	1C038 08
	1C033 08	GND
13	1C033 11	1A010 08
22	1C033 11	1I006 02
16	1C033 12	1G012 08
05	1C034 01	1C028 07
04	1C034 02	1B031 10
03	1C034 02	1C037 07
04	1C034 07	1C038 07
	1C034 08	GND
14	1C034 11	1A010 07
23	1C034 11	1I006 08
15	1C034 12	1H030 01
07	1C035 01	1D035 11
05	1C035 01	1C028 06
04	1C035 02	1B032 10
03	1C035 02	1C037 06
03	1C035 07	1C038 06
	1C035 08	GND
15	1C035 11	1G018 07
14	1C035 12	1A010 06
22	1C035 12	1I008 02
06	1C036 01	1D035 10
05	1C036 01	1C028 05
04	1C036 02	1B033 11
03	1C036 02	1C037 05
03	1C036 07	1C038 05
	1C036 08	GND
15	1C036 11	1G016 01
15	1C036 12	1A010 05
23	1C036 12	1I008 08
12	1C037 01	1F039 07
13	1C037 02	1F026 12
14	1C037 03	1E013 06
03	1C037 05	1C036 02
03	1C037 06	1C035 02

03	1C037 07	1C034 02
04	1C037 08	1C033 02
04	1C037 09	1C032 02
05	1C037 10	1C031 02
05	1C037 11	1C030 02
06	1C037 12	1C029 02
17	1C038 01	1A003 05
03	1C038 05	1C036 07
03	1C038 06	1C035 07
04	1C038 07	1C034 07
04	1C038 08	1C033 07
04	1C038 09	1C032 07
05	1C038 10	1C031 07
05	1C038 11	1C030 07
06	1C038 12	1C029 07
12	1C039 01	1E022 08
04	1C039 01	1B039 10
04	1C039 04	1B039 11
09	1C039 04	1E029 02
05	1C039 05	1D036 02
09	1C039 06	1E028 06
08	1C039 07	1E034 06
08	1C039 12	1D025 08
02	1C041 01	1C042 02
04	1C041 12	1D039 05
02	1C042 02	1C041 01
05	1D001 01	1D006 02
02	1D001 03	1D001 04
07	1D001 04	1C012 12
02	1D001 04	1D001 03
06	1D001 06	1D010 02
15	1D001 07	1F029 11
18	1D001 09	1E042 01
03	1D001 10	1D002 06
06	1D001 12	1D010 03
14	1D002 01	1D032 03
19	1D002 02	1G037 04
06	1D002 02	1B003 12
04	1D002 03	1D004 12
03	1D002 06	1D001 10
08	1D002 07	1E013 12
08	1D002 08	1E015 06
08	1D002 09	1E015 12
02	1D002 12	1D003 12
04	1D002 12	1D007 05
07	1D003 01	1E013 05
04	1D003 02	1D008 03
13	1D003 03	1G019 05
03	1D003 06	1D003 12
16	1D003 07	1D036 02
09	1D003 07	1F008 12
14	1D003 08	1D032 09
08	1D003 08	1B004 09
15	1D003 09	1G026 11
03	1D003 12	1D003 06
02	1D003 12	1D002 12

17	1D004 01	1H016 12
07	1D004 01	1B005 10
08	1D004 03	1B010 03
04	1D004 03	1D009 01
03	1D004 04	1D007 08
04	1D004 06	1D009 03
05	1D004 07	1D010 12
08	1D004 08	1B001 11
04	1D004 09	1D009 05
11	1D004 09	1G011 09
08	1D004 10	1B006 08
05	1D004 10	1E004 10
04	1D004 12	1D002 03
18	1D004 12	1G036 11
20	1D005 01	1H034 11
07	1D005 02	1E004 12
22	1D005 03	1I032 12
10	1D005 06	1B013 01
06	1D005 07	1D014 10
18	1D005 08	1B041 07
09	1D005 09	1B010 04
04	1D005 12	1D006 01
04	1D006 01	1D005 12
03	1D006 03	1D008 05
15	1D006 04	1D038 11
06	1D006 07	1E011 11
15	1D006 10	1D038 12
05	1D006 11	1E011 10
06	1D006 12	1E011 12
16	1D007 01	1E040 05
14	1D007 02	1D036 03
10	1D007 04	1F001 12
08	1D007 05	1D023 08
04	1D007 05	1D002 12
06	1D007 06	1D018 06
04	1D007 07	1D010 01
03	1D007 08	1D004 04
06	1D007 09	1E002 11
11	1D007 09	1A007 06
14	1D007 10	1E037 11
11	1D007 10	1A005 12
03	1D007 12	1D008 09
10	1D008 01	1F001 11
06	1D008 02	1D018 05
05	1D008 02	1D001 01
12	1D008 03	1D032 05
04	1D008 03	1D003 02
10	1D008 04	1D027 04
05	1D008 05	1C011 05
03	1D008 05	1D006 03
18	1D008 06	1G042 07
10	1D008 07	1G007 02
12	1D008 08	1G009 12
03	1D008 09	1D007 12

16	1D008 10	1H031 05
10	1D008 11	1G007 03
11	1D008 12	1G013 09
17	1D009 01	1G036 10
04	1D009 01	1D004 03
16	1D009 02	1H017 10
10	1D009 02	1A004 12
02	1D009 03	1D010 04
04	1D009 03	1D004 06
08	1D009 05	1B003 06
04	1D009 05	1D004 09
08	1D009 06	1D023 11
02	1D009 06	1D010 06
14	1D009 07	1H017 04
	1D009 08	GND
	1D009 09	GND
16	1D009 12	1G039 01
06	1D010 01	1D020 11
04	1D010 01	1D007 07
08	1D010 02	1B008 04
06	1D010 02	1D001 06
11	1D010 03	1A004 05
06	1D010 03	1D001 12
02	1D010 04	1D009 03
06	1D010 04	1D020 12
04	1D010 05	1D013 11
02	1D010 06	1D009 06
04	1D010 06	1D015 04
14	1D010 07	1H019 06
	1D010 08	GND
	1D010 09	GND
14	1D010 11	1D040 01
05	1D010 12	1D004 07
08	1D011 01	1E001 10
08	1D011 02	1E002 10
07	1D011 03	1E005 11
07	1D011 04	1E004 09
10	1D011 05	1D030 11
09	1D011 12	1B014 05
16	1D011 12	1H032 05
13	1D012 01	1G008 10
07	1D012 02	1B012 07
07	1D012 03	1B014 07
13	1D012 04	1E037 08
15	1D012 05	1A038 09
12	1D012 06	1A003 01
14	1D012 07	1G030 12
08	1D012 08	1F006 03
09	1D012 09	1F004 09
08	1D012 10	1F004 03
09	1D012 11	1F003 09
14	1D012 12	1H012 09
12	1D013 01	1G011 10
03	1D013 01	1D015 04

	1D013	02	GND
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06	1D013	04	1D024 08
07	1D013	05	1B010 09
03	1D013	05	1D014 07
09	1D013	06	1B008 01
08	1D013	07	1B010 08
03	1D013	07	1D015 10
14	1D013	08	1H019 08
04	1D013	11	1D010 05
04	1D013	11	1D014 01
03	1D013	12	1D015 11
03	1D014	01	1D016 01
04	1D014	01	1D013 11
03	1D014	04	1D015 07
08	1D014	05	1B008 06
06	1D014	06	1D025 01
03	1D014	07	1D013 05
03	1D014	07	1D016 04
03	1D014	09	1D015 01
06	1D014	10	1D005 07
04	1D014	11	1D020 07
10	1D014	12	1B008 02
03	1D015	01	1D014 09
02	1D015	01	1D016 02
04	1D015	04	1D010 06
03	1D015	04	1D013 01
04	1D015	05	1D020 01
04	1D015	06	1D020 08
03	1D015	07	1D016 03
03	1D015	07	1D014 04
03	1D015	10	1D013 07
03	1D015	11	1D013 12
04	1D015	11	1D019 01
06	1D015	12	1D025 02
03	1D016	01	1D014 01
02	1D016	02	1D015 01
03	1D016	03	1D015 07
03	1D016	04	1D014 07
07	1D016	05	1F014 01
12	1D016	06	1D040 02
07	1D016	06	1F013 01
02	1D016	07	1D016 08
02	1D016	08	1D016 07
07	1D016	08	1F012 03
02	1D016	09	1D016 10
04	1D016	09	1E016 02
02	1D016	10	1D016 09
08	1D016	11	1E031 03
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07	1D017	03	1C006 02
04	1D017	04	1D023 05
03	1D017	05	1D020 02

02	1D017 06	1D017 07	
02	1D017 07	1D017 06	*
07	1D017 09	1C008 09	
03	1D017 09	1D020 10	*
05	1D017 10	1D023 03	
05	1D017 10	1E012 07	*
05	1D017 11	1D023 04	
04	1D017 11	1E012 01	*
11	1D017 12	1G011 11	
04	1D018 01	1D019 12	*
14	1D018 03	1H011 03	*
05	1D018 03	1C012 10	
11	1D018 04	1E040 04	
05	1D018 04	1C012 09	*
06	1D018 05	1D008 02	
08	1D018 05	1E032 04	*
06	1D018 06	1D027 06	*
06	1D018 06	1D007 06	
03	1D018 07	1D019 11	*
12	1D018 10	1G011 12	
10	1D018 10	1B005 09	*
05	1D018 11	1D025 04	*
14	1D018 11	1H011 08	
05	1D018 12	1D025 05	
07	1D018 12	1E008 07	*
04	1D019 01	1D015 11	
08	1D019 02	1C006 01	
17	1D019 03	1I030 01	
03	1D019 04	1D022 01	
04	1D019 05	1D023 01	
08	1D019 06	1E034 02	
13	1D019 07	1G032 11	
10	1D019 08	1B008 05	
17	1D019 09	1I030 02	
04	1D019 10	1D022 02	
03	1D019 11	1D018 07	
04	1D019 12	1D018 01	
04	1D020 01	1D015 05	*
03	1D020 02	1D017 05	*
09	1D020 03	1D037 06	*
09	1D020 04	1D037 03	*
06	1D020 05	1E014 07	*
07	1D020 06	1D033 08	
05	1D020 06	1E014 01	*
04	1D020 07	1D014 11	*
04	1D020 08	1D015 06	*
03	1D020 10	1D017 09	
09	1D020 10	1F009 07	*
06	1D020 11	1D010 01	
06	1D020 12	1D010 04	
08	1D021 01	1E029 11	*
02	1D021 03	1D021 04	
02	1D021 04	1D021 03	*
06	1D021 06	1E030 01	
04	1D021 07	1D026 05	*
08	1D021 09	1E008 04	

03	1D022 01	1D019 04	*
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09	1D022 06	1E005 01	
10	1D022 07	1E003 01	
11	1D022 08	1B039 06	*
10	1D022 08	1E002 01	
11	1D022 09	1B039 07	*
11	1D022 09	1E001 01	
10	1D022 10	1G026 05	
07	1D022 11	1E011 01	*
10	1D022 12	1G024 04	
04	1D023 01	1D019 05	*
03	1D023 02	1D024 11	
03	1D023 02	1D023 06	*
05	1D023 03	1D017 10	*
05	1D023 04	1D017 11	*
04	1D023 05	1D017 04	*
03	1D023 06	1D023 02	
11	1D023 06	1B007 01	*
12	1D023 07	1G037 05	
07	1D023 07	1C012 08	*
08	1D023 08	1D007 05	
13	1D023 09	1H018 04	
08	1D023 11	1D009 06	*
04	1D023 12	1D024 01	
04	1D024 01	1D023 12	*
13	1D024 03	1B001 01	*
03	1D024 04	1D025 06	*
11	1D024 06	1F006 07	
09	1D024 07	1E009 07	*
09	1D024 08	1F021 12	*
06	1D024 08	1D013 04	
05	1D024 09	1E021 10	
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14	1D024 10	1A002 12	
10	1D024 11	1F009 09	
03	1D024 11	1D023 02	*
10	1D024 12	1C006 04	
13	1D024 12	1H016 06	*
06	1D025 01	1D014 06	*
06	1D025 02	1D015 12	*
05	1D025 04	1D018 11	
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11	1D025 07	1F010 11	*
08	1D025 08	1C039 12	*
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09	1D026 11	1B022 08
10	1D026 12	1E008 10
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09	1D027 02	1E011 06
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10	1D027 04	1D008 04
06	1D027 04	1E032 09
06	1D027 06	1D018 06
07	1D027 06	1D039 12
08	1D027 07	1E014 04
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08	1D027 08	1E014 10
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08	1D027 09	1E014 03
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09	1D029 04	1B039 03
09	1D029 06	1B022 06
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13	1D030 08	1H022 02
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07	1D031	05		1E023	07
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05	1D031	09		1E026	02
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07	1D031	10		1F038	02
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08	1D032	01		1B041	08
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03	1D032	06		1D030	05
08	1D032	07		1B040	11
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08	1D033	01		1B040	04
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07	1D033	08		1D020	06
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07	1D033	11		1E020	01
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06	1D035	05		1E030	10
09	1D035	06		1E018	07
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07	1D035 11	1C035 01
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07	1D036 11	1F037 03
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04	1D039 05	1C041 12
07	1D039 06	1B040 12
03	1D039 06	1D041 12
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07	1D039 12	1D027 06

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09	1D040 09	1F028 07
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04	1E001 06	1E005 06
02	1E001 06	1E002 06
12	1E001 07	1D026 10
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15	1E001 09	1D033 05
08	1E001 10	1D011 01
05	1E001 11	1E008 01
12	1E001 12	1H014 11
10	1E002 01	1D022 08
05	1E002 01	1F002 04
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02	1E002 06	1E003 06
02	1E002 06	1E001 06
12	1E002 07	1D026 09
05	1E002 08	1E009 12
15	1E002 09	1D033 04
08	1E002 10	1D011 02
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06	1E002 11	1D007 09
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12	1E002 12	1H014 12
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	1E003 02	GND
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07	1E004 09	1D011 04	
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11	1E004 11	1F026 04	
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07	1E004 12	1E037 12	
09	1E005 01	1D022 06	*
06	1E005 01	1F005 07	
	1E005 02	GND	
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04	1E005 06	1E001 06	*
11	1E005 07	1D026 07	*
13	1E005 08	1E032 02	
03	1E005 09	1E006 11	
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03	1E005 10	1E006 01	*
07	1E005 11	1D011 03	
08	1E005 12	1G014 01	
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11	1E006 08	1B015 12	*
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06	1E007 05	1E018 09	*
03	1E007 06	1E007 02	*

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06	1E009	09	1E020	05
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11	1E017 07	1F038 11
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07	1E021	01		1F013	06
07	1E021	02		1F019	11
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05	1E021	11		1F021	10
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07	1E022	03		1F031	03
08	1E022	04		1F032	09
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07	1E023	02		1E036	03
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07	1E023	07		1D031	05
08	1E023	08		1F035	12
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14	1E024	06		1A017	09
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12	1E028	03		1B011	10
02	1E028	05		1E028	07
09	1E028	06		1C039	06
02	1E028	06		1E027	06
02	1E028	07		1E028	05
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03	1G026	02	1G025	06
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09	1G030	06	1H013	07
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08	1G032	12	1H018	01
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09	1G034	12	1F022	01
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06	1G037	05	1H032	07
12	1G037	05	1D023	07
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11	1G038	06	1H016	04
11	1G038	12	1H016	07
16	1G039	01	1D009	12
12	1G039	07	1D040	01
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17	1G042	11	1G005	03
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03	1H001	08	1H003	04
03	1H001	08	1H002	10
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03	1H001	10	1H002	07
04	1H001	11	1H003	03
12	1H001	12	1F016	02
07	1H002	01	1H014	10
03	1H002	01	1H003	03
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03	1H002	04	1H003	07
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10	1H002	05	1F017	09
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03	1H002	06	1H001	01
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02	1H002	11	1H003	12
03	1H002	11	1H001	02
11	1H002	12	1F016	03
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03	1H003	01	1H002	09
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10	1H003	04	1F017	08
02	1H003	05	1H002	06
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06	1H003	07	1H014	07
03	1H003	07	1H002	04
03	1H003	08	1H004	03
03	1H003	10	1H002	07
06	1H003	10	1H014	09
03	1H003	11	1H001	07
02	1H003	12	1H002	11
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03	1H004	03	1H003	08
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07	1H005 01	1F011 08
03	1H005 01	1H006 08
07	1H005 03	1F007 08
03	1H005 03	1H005 10
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02	1H005 06	1H005 07
08	1H005 07	1F007 07
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03	1H005 08	1H006 04
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08	1H009 07	1F007 06
03	1H009 07	1H007 04

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08	1H014 12	1H030 09
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07	1H016 09	1G011 01
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06	1H022 08	1G013 11
14	1H022 09	1D031 12
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