DYNABYTE

5010

DISKETTE STORAGE UNIT REFERENCE MANUAL

DYNABYTE

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DISKETTE STORAGE UNIT

REFERENCE MANUAL
400382

DYNABYTE 115 INDEPENDENCE DRIVE, MENLO PARK, CALIFORNIA 94025
PHONE 415-329-8021/TWX 910-373-2019

PN 400284
SECTION I

REV. 11/80

NOTE: Throughout this documentation new model numbers are used. These refer to:

New Model Number	Previous Designation
5100	DB8/1
5200	DB8/2
5010	DB8/4
5012	DB8/6

REVISION RECORD

Revision Number	Pages Affected

DYNABYTE 5010 DISKETTE STORAGE UNIT
REFERENCE MANUAL

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5010 DISKETTE STORAGE UNIT
REFERENCE MANUAL

1.0 INTRODUCTION

The 5010 is a floppy disk storage system for use with a S100 microcomputer. It contains two floppy disk drives and all the electronics necessary for interfacing to a S100 bus computer. The system may be expanded to include additional disk drives. It is connected to the S100 computer by means of the disk controller electronics. The disk controller is divided between two cards. One of these cards referred to as the AUX DISK CONTROLLER CARD is mounted inside of the 5010 unit. The other card is referred to as the MAIN DISK CONTROLLER CARD and it is mounted in the S100 bus computer. These cards are connected by a 50 conductor cable. Each AUX DISK CONTROLLER CARD can support up to 8 disk drives. Each MAIN DISK CONTROLLER CARD can support up to two AUX DISK CONTROLLER CARDS. This means that each main card can support up to 16 drives.

The 5010 has the ability to record data in either single or double density. In the single density mode the unit utilizes IBM compatible 3740 soft sectored format. This provides 77 tracks of storage. Each track contains 26 sectors of 128 bytes. This gives a total formatted storage of 256,256 bytes per drive. Thus in single density the 5010 provides a total storage capacity of 512,512 bytes. In the double density mode the format is not IBM compatible. The number of tracks remains the same (77) but the number of sectors on all but the outer two tracks is increased to 54. The sector length remains the same as single density (128 bytes). This gives a format storage capacity per drive of 525,056 bytes. The resulting system capacity is 1,050,112. In both single and double density format the CP/M operating system occupies the outer two tracks and thus uses 6,656 bytes of storage. A small amount of the remaining storage is used to hold the disk directory and the rest is available for data and program storage.

1.1 ASSUMPTION OF EXPERTISE

The documentation supplied with the 5010 assumes a certain level of expertise on the part of the user. Specifically, it is assumed that the user is:

1. Familiar with the concept of floppy disks as mass storage media.
2. Familiar with terminology commonly used in the data processing industry.

If the user does not possess this level of familiarity, it is highly recommended that he or she seek support from the agent through whom the 5010 was acquired.

2.0 LICENSE REQUIREMENTS

The operating software utilized by the 5010 is supplied under license from Digital Research. This operating system is a version of CP/M called Dynabyte DOS Level 2.0.

IMPORTANT: All Digital Research programs are sold only on the condition that the purchaser agrees to the following license. READ THIS LICENSE CAREFULLY. If you do not agree to the terms contained in this license, return the packaged diskette UNOPENED to your distributor and your purchase price will be refunded. If you agree to the terms contained in this license, fill out the REGISTRATION card which is in the pocket of this manual cover and RETURN to Dynabyte by mail.

DIGITAL RESEARCH agrees to grant and the customer agrees to accept on the following terms and conditions nontransferable and nonexclusive licenses to use the software program(s) (licensed programs) herein delivered with this agreement.

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material to form an updated work, provided that, upon discontinuance of the license for such licensed program, the licensed program supplied by Digital Research will be completely removed from the updated work. Any portion of the licensed program included in an updated work shall be used only if on the designed system and shall remain subject to all other terms of the agreement.

You must return the postcard or form enclosed in this manual (which is reproduced below) to Dynabyte.

Please read the software license agreement before opening the diskette package. If you do not agree to the licensing contract, you may return the system to your distributor for refund as long as the diskette package remains unopened. Upon receipt of this registration card by Dynabyte, you will become a registered CP/M owner and receive the following:

CP/M User's Newsletter
Notices of updates and enhancements to Digital Research Software
Digital Research Software bug reports and patches
Discounts on updated versions of Digital Research Software

I have read the Digital Research Software Licensing Agreement and agree to abide by the terms contained in it:

DATE _____ CP/M Version _____ Serial #_____

NAME _____ SIGNATURE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

NOTE: Send this registration form or the registration form enclosed in the cover of this manual or a facsimile thereof to: DYNABYTE INC.
115 INDEPENDENCE DR.
MENLO PARK, CA. 94025

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3.0 INSTALLATION

The 5010 is connected to the host computer by means of the "disk controller card" (Dynabyte part # 800471) and a 50 conductor flat ribbon cable. The "disk controller card" must be installed in the host . If the 5010 is shipped separately then the "disk controller card" is shipped with the 5010 and must be installed by the user in a suitable S-100 bus computer. The unit is supplied with a length of ribbon cable that is complete with the necessary connectors attached to each end of the cable. The cable is symmetrical, it does not matter which end of the cable is connected to the 5010 One end of the cable attaches to the 50 pin connector on the back of the 5010. This connector is labeled "FLOPPY DISK I/O". The other end of the cable goes to the "disk controller card." If the disk controller card is mounted in a computer other than a DYNABYTE 5100 then the cable goes directly onto the connector on top of the "disk controller card." If the "disk controller card" is mounted in a 5100 then the cable connects to a 50 pin connector on the back of the 5100. This connector is labeled "FLOPPY DISK I/O." It is necessary to orient the cable properly. Pin 1 on the connector must correspond with pin 1 on the mating connectors at both ends. If the "disk controller card" is used in a 5100 then the ribbon cable from the back pannel of the computer must be connected to the top of the card. The correct orientation is shown by aligning the dots on the cable and connector.

3.1 INITIAL BOOT UP AND TEST

1. After connecting the system as described above the following steps should be followed carefully. This will test that the system is operating properly and at the same time produce a copy of the master diskette on a working diskette.

> NOTE: Through this discussion the messages typed into the system on the terminal or sent to the terminal by the software will be enclosed in quotation marks. This is simply a means of highlighting the message itself and the quotation marks should NOT be typed and will NOT be displayed on the terminal.

The programs must be copied onto write enabled diskettes before they can be used. All master diskettes should be kept in a safe place in case the working diskettes are accidentally erased or damaged.

2. Turn on the power to the computer and press and release the reset button. The red light on drive A should turn off when the reset button is pressed and begin to flash when the reset button is released.

3. Insert the master diskette in drive A with the label facing up and the elongated opening in the envelope pointing toward the cabinet. Insert the diskette gently into the horizontal slot in the drive. After seating the diskette close the drive door by pushing down on the bar located above the slot. After inserting the diskette and closing the door the system should boot up and display a sign on message followed by the prompt "A>". If this does not happen press and release the reset button and the system will boot up.

4. Type "DIR" followed by a carriage return and the system will list the directory of the master diskette.

5. Next type "FORMAT" and a carriage return. This causes the system to load and run the FORMAT program. This program formats blank diskettes and prepares them for use on the system. Before a new diskette can be used in the system it must first be formatted. Formatting marks out and labels the areas on the diskette so that it can be used by the system for data storage. The format program will type the request "WHAT DRIVE DO YOU WANT TO USE (A,B,C, or D)?" on the screen. Type in the letter of the appropriate drive (which in this case is B) followed by a carriage return. The program will respond by typing "DRIVE B IS A SINGLE SIDED 8 INCH DRIVE" or a similar message that informs you of the size of the drive and whether it is single or double sided. The system will proceed by asking "DO YOU WANT TO FORMAT, CHECK OR QUIT (F,C, or Q)?" on the following line of the screen. Respond by typing an "F" and a carriage return. The program will type "DO YOU WANT SINGLE OR DOUBLE DENSITY (1 or 2)?". Type a 1 or a 2 and a carriage return. The program will respond with the message "INSERT DISK AND HIT RETURN TO START". When the message is seen remove the master diskette from drive A. To remove this diskette press in on the door latch. The door latch is the bar with the red LED in the center. This will cause the door to pop open and eject the diskette. Now insert the blank diskette in drive B. Hit the return key and the system will type the message "FORMATING IS NOW BEING DONE PLEASE WAIT". This operation takes about 60 seconds and on completion the system will signal "FORMAT COMPLETED O.K." and request "REPEAT SAME OPERATION ON A NEW DISK Y or N ".

Now type "N" and carriage return. The program will repeat the question "DO YOU WANT TO FORMAT, CHECK OR QUITE (F,C, or Q)?". Respond with the appropriate letter. A "C" will check to be sure the diskette was formatted correctly. A "Q" and a carriage return will give you the response "TO REBOOT PUT SYSTEM DISK IN DRIVE A AND THEN HIT RETURN". Insert the system disk in drive A according to the above instructions and press the return key. The system will type "A ".

6. The blank formatted diskette should be left in the B drive.

7. The blank diskette in drive B has no data stored on it. The following steps will transfer data from the master in drive A to the blank in drive B.

8. First we will copy the operating system from the master on drive A ans store it on the diskette on drive B. The operating system is stored on the outer two tracks of the diskette and is copied by a special program called DYNAGEN. The operation of the DYNAGEN program is described in the CP/M manual "AN INTRODUCTION TO CP/M FEATURES AND FACILITIES" (in that manual the program is referred to under the name SYSGEN. SYSGEN and DYNAGEN operate identically from the users point of view. They differ only in some internal details that relate to DYNABYTE's unique dual density operating system) which is included in this binder. This manual need not be referred to at this time as the following instructions should be adequate to complete the diskette copy.

9. Load and run the DYNAGEN program by typing DYNAGEN followed by a carriage return. The system will respond with the request:

"SOURCE DRIVE NAME (OR RETURN TO SKIP)"

Since the diskette on drive A contains the system that you want to copy to drive B the source is on drive A and your response should be to type "A" followed by a carriage return. The system will then issue the request:

"SOURCE ON A THEN TYPE RETURN"

Since the source (the master diskette) is already on drive A you should hit the return key to reply to this request. The system will then move the operating system from the two outer tracks of the diskette on drive A to the computer memory. When this operation is complete the system will respond with the following message and request:

"FUNCTION COMPLETE"

"DESTINATION DRIVE NAME (OR RETURN TO REBOOT)"

Since the destination is on drive B you should reply by typing "B" followed by a carriage return. The system will then issue the command:

"DESTINATION ON DRIVE B, THEN TYPE RETURN"

Since the destination is already on drive B you should hit the return key. The system will then move the system from the computer memory and write it onto the two outer tracks of the diskette in drive B. After completing this operation the system will respond with:

"FUNCTION COMPLETE"

"DESTINATION DRIVE NAME (OR RETURN TO REBOOT)"

Now press the return key and the system will reboot and display the prompt "A>".

10. Now we will use the PIP program to transfer all the program and data files from the master diskette on drive A to the diskette on drive B. The PIP program is described in detail in the CP/M manual AN INTRODUCTION TO CP/M FEATURES AND FACILITIES". You need not refer to this manual at this time as all needed information will be presented below. Run the PIP program by typing:

"PIP B:=*.*"

This will cause the PIP program to be loaded and run by the operating system. The program will then copy all the data and program files from drive A to drive B. As each program or data file is copied its name will be listed on the console screen. When all the programs have been copied the system will reboot and display the prompt "A>". The diskette on drive B now is an exact copy of the diskette on drive A. The master diskette on drive A should now be removed and kept in a safe place. The diskette on drive B should be removed from drive B and placed in drive A.

11. To test that the system has been copied onto the diskette press and release the reset button. The system should boot up and display the prompt "A>". This diskette should be labeled and can now be used as a working diskette.

12. If all the above operations are completed without problems then the system has been checked out and is operating properly.

3.2 DISK CONTROLLER

The DYNABYTE floppy disk controller consists of two circuit cards. One of the cards (the MAIN CARD) plugs into the S-100 bus while the other card (AUX CARD) is mounted in the 5010. The MAIN CARD contains a six position DIP switch. The top switch can be used to enable or disable the boot strap ROM that is mounted on the main card. The other five switches set the upper bits of the I/O ports utilized by the board. The board is shipped with all switches except number four closed. DYNABYTE software will only work if the switches are in this positon. Under this condition the main board uses I/O ports 20H to 25H. The first four ports are used by the LSI controller chip while the last two ports are used for special control functions on the main card.

3.3 5010 DISK FORMAT COMPATIBILITY

The 5010 system, when operated in the single density mode, is fully compatible with IBM 3740 soft sectored format. This format consists of 77 tracks (numbered 0 to 76) with the lowest numbered track closest to the outside of the diskette. Each track is formatted into 26 sectors (numbered 1 to 26) of 128 bytes. The track format, starting from the index pulse is as follows:

	NUMBER OF BYTES	HEX VALUE OF BYTE WRITTEN
	40	FF
BRACKETED SET REPEATED ONCE FOR EACH SECTOR	6	00
	1	ID ADDRESS MARK
	1	TRACK NUMBER
	1	00
	1	SECTOR NUMBER
	1	00
	2	CRC
	11	FF
	6	00
	1	DATA ADDRESS MARK
	128	E5
	2	CRC
	2	FF
	APPROXIMATELY 247	FF

Some disk controllers currently being sold by other manufacturers do not properly format blank disks. They use inter-sector gaps of all zeros rather than the proper gap of a string of OFFH followed by six bytes of 00. This format is not IBM 3740 compatible and cannot be read by the DYNABYTE disk controller. This incompat-

ibility will prevent the 5010 from reading disks formatted on some other machines. There is, however, a simple solution to this problem. All systems that claim IBM compatibility will read and write on true IBM 3740 formatted diskettes. Thus if programs or data files intended for use on the 5010 are copied onto properly formatted disks on the source machine they may then be used on the 5010 If an improperly formatted diskette is used on the 5010 it will cause the error message:

"BDOS ERROR ON A: BAD SECTOR"

and the system will be unable to read any data stored on the diskette.

If an improperly formatted diskette is encountered then the following steps will provide a means to get around this problem.

1. Format a blank diskette in the 5010 using the FORMAT program.
2. Now copy the diskette that is improperly formatted onto the Diskette that was formatted above. Use the machine that generated the improper diskette to do the copy operation.
3. The copy will now work in the 5010

DYANBYTE double density format is not IBM compatible. It is not intended for exchange with machines other than another 5010

3.4 COMPUTER HARDWARE CONFIGURATION REQUIRED

The 5010 requires the following hardware configurations:

A. An S100 bus computer system including full functionality of these S100 bus signals:

1. A0 through A15
2. D10 through D17
3. D00 through D07
4. /PRESET
5. /POC
6. /PWR
7. /SOUT
8. PDBIN
9. SINP
10. SMEMR
11. /PHANTOM (this is an output from the MAIN CARD)
12. PSYNC
13. PHASE 2
14. PRDY
15. XRDY (optional replacement for PRDY with jumper change)

B. Z-80 CPU. The software that controls the floppy disks is written in Z-80 code.

C. 4 MHZ clock rate for the CPU. For double density operation the Z-80 must operate at a 4 MHZ rate. However, the 5010 may be operated at a 2 MHZ clock rate if only single density operation is required.

D. A minimum of 32K of RAM. The smallest RAM for which an operating system is supplied is 32K. This RAM must operate without any wait states.

E. /PHANTOM must be enabled for the RAM that occupies the memory address space from 0 to 256.

F. 2 I/O ports for the console status and data.

G. 2 I/O ports for the printer and its associated status (if one is used).

If the 5010 is used with the DYNABYTE 5100 computer then all these requirements are satisfied.

3.5 5010 CONVERSION FROM 115VAC TO 230VAC.

NOTE:

DYNABYTE RECOMMENDS THE FOLLOWING CHANGES BE MADE ONLY BY QUALIFIED EXPERIENCED PERSONNEL.

REF. PRINT NO. 6800022-1 "B" REVISION

1(a) On power supply terminal board as viewed from inside, towards rear panel, add and remove jumpers on term. board TB-2.

JUMPERS ADD	JUMPERS REMOVE
TB2-5 TO TB2-6	TB2-7 TO TB2-8
	TB2-12 TO TB2-13

1(b) For the first power up after wiring changes, the AC and DC connections to disk drives should be disconnected.

1(c) Check both AC and DC voltages at connector contacts:

Transformer leads T1-1 and T1-2 (115VAC)
T1-3 and T1-4 (115VAC)
T1-1 and T1-4 (230VAC)
Disk Drives Connectors P1, P2-1 (+24VDC ± 1.2V.)
P1, P2-2 (+24VDC)
P1, P2-3 (COMM)
P1, P2-4 (-5VDC)
P1, P2-5 (+5VDC ± 0.25V.)
P1, P2-6 (+5VDC RET.

2. If conversion is required for 50Hertz operation, REF. PRINT NO. 7800039-4 (SHUGART DRIVES)

   (a) Remove cable connectors from PCB and remove PCB Assembly.

   (b) Remove belt from drive pulley.

   (c) Loosen set screen and remove pulley.

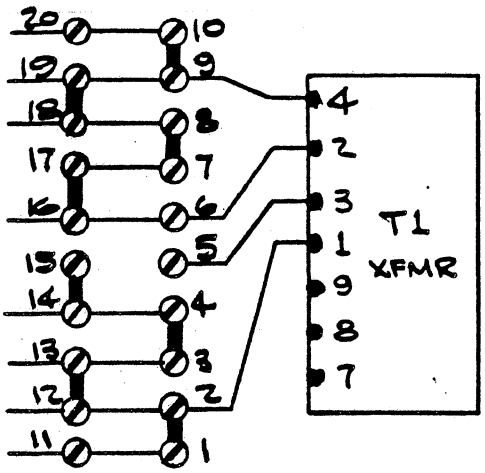
   (d) Reverse procedure for installation.

TO TEST AT 50 HERTZ, LINE FREQUENCY MUST BE 50 HERTZ OR USE A 50 HERTZ GENERATOR

CONT.

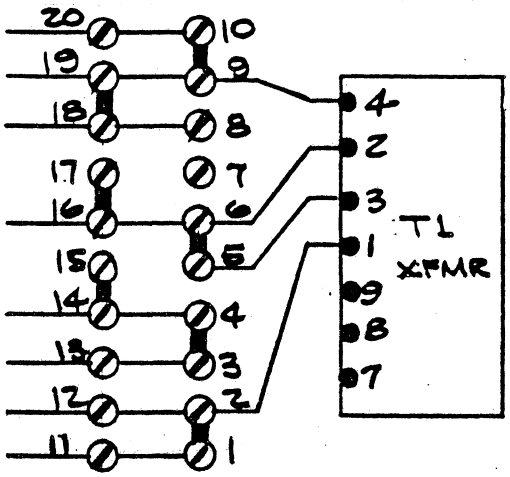
5010 CONVERSION FROM 115VAC TO 230VAC.

TB-2



WIRING CONFIGURATION
115 VAC 50-60HZ

TB-2



WIRING CONFIGURATION
230 VAC 50-60 HZ

POWER SUPPLY

4.0 ZASM

Z80 assembler - Zilog style

Table of Contents

4.1 INTRODUCTION

The Dynabyte Inc. Z-80 Zilog assembler, ZASM.COM, reads Zilog assembly language source files previously created with the systems text editor and produces Z-80 machine object code. The object output of the assembler is in INTEL standard hex format. The hex output can be converted to absolute machine code with the utility LOAD.COM.

4.2 Assembler Execution

The Assembler is called from disk simply by typing "ZASM" followed by the file name of the source code to be assembled. This source file MUST have the extension '.Z80' to be found by the Assembler, regardless of whether or not it consists entirely of Z80 code.

When calling ZASM, the user may specify an optional 3-letter drive-request for the file name that has NO relation to the 3-letter extension of the file name on disk. Note that if this 3-letter drive-instruction is omitted, ZASM will default to the CURRENT drive for all operations.

This drive-request instruction is of the form SXP, where:

S indicates where the SOURCE file is;
X indicates where the HEX object file is to be placed;
P indicates where the PRINT file is to be placed.

The letters (@, A through D) indicate the disk drive to place or find the file, where @ - current and otherwise a specific drive. For the two output files (print, and object), X, Y, or Z is allowed, which means:

X - Console
Y - Printer
Z - Dummy (no output)

The object file will be created on the disk with the extension, .HEX, and the print-listing will be created with the .PRN extension.

For example:

Suppose the file to be assembled resides on disk drive A under the file name SAMPLE.Z80. If it is desired not to have the .HEX and .PRN files sent to drive A (for lack of room on disk A, for example), the Assembler might be called by the command line:

ZASM SAMPLE.ABY (return)

This will assemble the source file on drive A, create an object file on drive B, and send the print-listing to the printer.

One option may be specified at assembly time if desired. It instructs the assembler to construct a cross-reference listing as part of the print (.PRN) file. This option is specified simply by typing it as part of the command line when calling ZASM. The option is designated by a single letter as follows:

X - generate a cross reference

It should be noted that the 'X' option requires additional memory space and on very lengthy programs an overflow error message may be given. Consider the following example:

ZASM SAMPLE X (return)

This will generate a X-reference as part of the file for this assembly. Notice that the options must be separated from the file name by at least one space.

4.3 SOURCE FORMAT

The Assembler recognizes four fields or different types of expressions. These are:

labels,
opcode mnemonics,
operands,
remarks.

The conventions which apply in the use of these four fields are given below.

Any two of the four fields must be separated from each other by at least one delimiter; these are: a tab, a space, a colon (after labels only) a semi-colon (before remarks only), or a CR-LF (to terminate lines). Multiple delimiters may be used to improve readability.

LABELS

May be as long as desired (if all on one line); however, only up to the first 6 characters are used by the assembler. Thus, the first six characters of a label may not be duplicated in another label.

The first character of a label must be an alphabetic character, the remaining characters may be any alphanumeric (A-Z, 0-9). The delimiter for a label is generally a colon space, colon-tab.

The label must be followed by a colon. The colon may be followed immediately by the operation or one or more blanks. Labels need not start in column one. A label can not be a register name.

Correct Labels:

T12345

A1

T123456 (last character is ignored)

Incorrect Labels:

A E SP HL

B F AF IX

C H BC IY

D L DE R

I

4A5B (Starts with a numeric character.)

OPCODES

May be preceded by a label. A space is not required between the label and the op-code. The op-code must be followed by at least one space.

The operands must be separated by commas. The length is governed by the type of reference. A reference to a register pair is typically two characters. A label as an operand is up to six alphanumeric characters, and a numeric literal may not exceed OFFFF hexadecimal. The op-code of an unlabeled code line may start in column 1.

The ZASM Assembler recognizes all standard Z-80 mnenomics. For those who do not have familiarity with these, they are well-documented in the Z-80 CPU Technical Manual published by both Zilog and Mostek. The following mnemonics are recognized by ASMZ in place of those published by ZILOG:

```
ADC s;          ADD n;          ADD r;
ADD (HL):       ADD (1x+d);     ADD (1Y+d);
SBC s;          IN A,n;         OUT n,A.
```

which were published by Zilog as:

```
ADC A,s;        ADD A,n;        ADD A,r;
ADD A,(HL);     ADD A,(1x+d);   ADD A,(1Y+d);
SBC A,s;        IN A,(n);       OUT (n),A.
```

PSEUDO-OPCODES

Pseudo-Opcodes are a special form recognized only by the Assembler and for which no object code is generated. The conventions of ZASM for pseudo-ops are described in another section. These are ORG, EQU, DEFB, DEFW, DEFS, and END.

OPERANDS

May consist of register names, constants, label names, or expressions. Register names include all standard Z-80 registers. These are documented in the Z-80 CPU Technical Manual published by Zilog and Mostek for the reader who is not familiar with their names or purposes. Constants consist of one of the types outlined below.

Constants - allowed; hexadecimal, decimal, and ASCII constants according to the following conventions:

Hex - Numbers formed from hexadecimal digits (0-9 and A-f) and terminated by the character 'H'. A hex number beginning with a letter MUST be preceded by a '0' to distinguish it from a label or register name.
Range: -0FFFFH .... 0FFFFH.

Example: LD DC,2B7AH

Decimal - Numbers formed from decimal digits (0-9) and left unterminated.
Range: -65535 65535

Example: LD BC,11130

ASCII - Numbers represented by the ASCII character(s) itself (themselves) enclosed in single quotes.
Range: ' ' through '^' which amounts to the values 20H through 7EH, including all alphanumerics and punctuation.

Example: LD BC,'+Z'

The "$" character may be used in the operand of any opcode allowing expressions as operands. The "$" is used to represent the current location counter of the Assembler. Note that "$" points to the BEGINNING of the instruction which contains it and not to the end.

Expressions - are allowed as operands. Computations are performed on both numbers and labels. The operations of addition, subtraction, multipication, and division are allowed. The expression is evaluated from left to right. The expression 2+6 * 2 will evaluate to 16.

```
Example:  LD B,2+6*2                    load with 16
```

COMMENTS

The comment field is free-format includ ing any printable ASCII characters as long as the comment is preceded by a ';'. The remark may follow an opcode, operand, or label or may exist on a line by itself. The ';' may be in column one if it is desired to have the remark on a line by itself. Multiple blanks or tabs may be used before or within the remark to improve readability. A CR-LF terminates the remark. Remarks may appear on any line.

PSEUDO-OPS

DEFB or DB (Defined BYTE)

The DB pseudo-op is used to tell the Assembler to reserve a byte or string of bytes as data in the object code. The bytes may be specified using any of the forms of constants described above; or as a series of labels which have been previously defined or equated to a value. Note that if the value or the label or constant exceeds the range 0 to 255 (or its equivalent representation in hexidecimal, octal, or binary), the DB will generate an expression error. Also note that either of the terms DB or DEFB may be used.

DEFW or DW (Defined Word)

The DW pseudo-op is used to tell the Assembler to reserve a word or string of words in the object code. A word is defined to be 2 bytes. Thus, the DW pseudo-op might be used to specify a look-up table or absolute addressess. The words may be specified

using any of the forms of constants described in the Constants section above, or a label which has been previously defined or equated to a word. Note that either of the terms DW or DEFW is recognized by ZASM. Also note that the Assembler places the low byte FIRST, treating every word of two bytes as though it were an address.

ORG (Program Origin)

The ORG pseudo-op sets the Assembler location counter and is used when it is desired to start assembly of a block of code at a particular address. This location may be set by the user to be absolute, or it may be left up to the Assembler to determine the value of the ORG. The location counter may be set to a value as often as desired in a source program; that is, multiple ORG statements may be used.

EQU (Equate)

The EQU pseudo-op is used to inform the Assembler that two named quantities are equivalent. It is also used to equate a label to a particular value. Once this label is defined, it is defined for the entire source program.

END (End Assembly Pass)

The END command is a signal to the Assembler that a logical body of code is complete. Therefore, only one END statement should appear in a module. Should the END appear in the middle of a block of code, everything following the statement will be ignored by ZASM. If an expression occurs, it will be used to indicate the execution address.

4.4 Error Messages

The following error conditons will be flagged by the Assembler and will be placed in the print listing ahead of the line number. A maximum of two errors per line will be given.

A	Argument error
D	Double definition
L	Label error
M	Missing Label
O	Op-code error
P	Phase error
R	Range error
S	Syntax error
U	Undefined
V	Value error

4.5 LOADING THE OBJECT

Once a file has been assembled, an Intel Standard HEX file is generated as described in Section VI. This file contains specific address information as to where the object code is to reside in memory. This file may be converted to a binary image by using LOAD or DDT and the SAVE command.

4.6 Object File Format

Record Mark Field: Frame 0

The ASCII code for a colon (:) is used to signal the start of a record.

Record Length Field: Frames 1 and 2

The number of data bytes in the record is represented by two ASCII hexadecimal digits in this field. The high-order digit is in frame 1. The maximum number of data bytes in a record is 255 (FF in hexadecimal). An end-of-file record contains two ASCII zeros in this field.

Load Address Field: Frames 3 to 6

The four ASCII hexadecimal digits in frames 3-6 give the address at which the data is loaded. The high-order digit is in frame 3, the low-order digit in frame 6. The first data byte is stored in the location indicated by the load address; successive bytes are stored in successive memory locations. This field in an end-of-file record contains zeros or the starting address of the program.

Record Type Field: Frames 7 and 8

The two ASCII hexadecimal digits in this field specify the record type. The high-order digit is in frame 7. All data records are type 0; end-of-file records are type 1. Other possible values for this field are reserved for future expansion.

Data Field: Frames 9 to +2* (record length) -1

A data byte is represented by two frames containing the ASCII characters 0-9 or A-F, which represent a hexadecimal value between 0 and FF (0 and 255 decimal). The high-order digit is in the first frame of each pair. If the data is 4-bit, when either the high or low-order digit represents the data and the other digit of the pair may be any ASCII hexadecimal digit. There are no data bytes in an end-of-file record.

Checksum Field: Frames 9+2* (record length) to 9+2* (record length) +1

The checksum field contains the ASCII hexadecimal representation of the twos complement of the 8-bit sum of the 8-bit bytes that result from converting each pair of ASCII hexadecimal digits to one byte of binary, from the record length field to and including the last byte of the data field. Therefore the sum of all the binary equivalent data, including the checksum is zero (0).

':' <len.2> <load address.4> <type.2> <data.n> <check.2>

5.0 DOS REV 2.1

5.10 INTRODUCTION

This version of Dynabyte DOS, which includes new support programs and a completely new set of CBIOS drivers, is intended to replace previous versions released by Dynabyte. It replaces versions 1.40-C and 1.40-F. Earlier versions that used the SBC processor card are not replaced by REV 2.1.

1. Eight and five inch drives may be used in the same system. This is done by connecting together a 5010 and a 5200. The connection is made with a 50 conductor cable between the connectors on the back of the units.
2. The 5010 can now be operated with a single density disk in one drive and a double density disk in the other drive. The PIP program can be used to transfer files between double and single density disks. The operating system automatically recognizes the density of the disk. The user does not have to keep track of the density.
3. The IOBYTE is partially supported. Output to the LST: (list) device can be directed to the console device, to a serial or a parallel output port.
4. The console and list device baud rates can be changed by a utility program called BAUD. This program also allows the list device to be switched between the Serial Port 1 and the Parallel Port.
5. The system is fully compatible with previous releases. Disks formated using DFORMAT, SFORMAT, or FORMAT can be used under the new REV 2.1 system. It is necessary to use the UPDATE program and the DYNAGEN program before running old disks on REV 2.1. See the following description of UPDATE and DYNAGEN for details

6. The number of entries in the disk directory can be selected when a disk is formated. Disks with different size directories can be used in different drives at the same time.

7. The FORMAT program has been expanded. A single program is used to do both single and double density formating. Formating may be done on any drive. The FORMAT program can be used to check a disk for hard errors.

8. The sector skew on double density eight inch disks has been changed. The change results in a faster boot and will speed the operation of some programs.

9. Double sided drives are supported by the system. It will warn the user of an attempt to read or write on a double sided disk in a single sided drive.

5.11 HOW TO USE REV 2.1

5.12 FORMAT AND UPDATE

REV 2.1 automatically recognizes the format of a disk. This is done by reading the density off the first sector of track zero. If the density code cannot be found the system assumes that the disk is a single sided single density eight inch disk. The FORMAT program REV 3.10 included with REV 2.1 writes the format code in the first sector of track zero during formatting. Five inch diskettes and double density diskettes formatted with releases of the FORMAT program prior to REV 3.0 do not have this code in sector one of track zero. In order to use these disks with REV 2.1 it is necessary to add this code. This done by using the UPDATE program. This procedure will not alter any files on the disk. The operation of the UPDATE program is self explanatory. Just run the program and follow the instructions.

CAUTION

USE UPDATE ONLY ON 5¼" DISKS

and DOUBLE DENSITY 8" DISKS

No updating is required for single density eight inch disks.

5.13 DYNAGEN

In REV 2.1 the functions previously performed by SYSGEN are performed by a new program called DYNAGEN. This program is similar to SYSGEN and the description in the manual INTRODUCTION TO CP/M also describes DYNAGEN.

Unlike previous releases that had different operating systems for double and single density REV 2.1 uses the same system for both. This system is also used for double sided operation. DYNAGEN differs from Sysgen in how it treats the first sector of track zero. This sector contains the format code written by FORMAT. It also contains the disk-boot program. Before writing the disk-boot to sector one of track zero DYNAGEN reads the format code off the disk and inserts it into the boot code. This prevents the format code from being obliterated during writing onto the disk.

CAUTION

DO NOT USE SYSGEN WITH REV 2.1. IT WILL DESTROY THE DISK FORMAT CODE AND THE SYSTEM WILL NOT WORK

5.14 MOVCPM

Operating systems for different memory sizes are generated by this program. Its operation is described in the manual INTRODUCTION TO CP/M. THERE ARE TWO EXCEPTIONS TO THIS DESCRIPTION. DYNAGEN must be used instead of SYSGEN and automatic system relocation will not work. Neither MOVCPM cr nor MOVCPM n cr will work. The same functions can be achieved by using MOVCPM * * cr or MOVCPM n * cr combined with DYNAGEN.

5.15 BAUD

The BAUD program is used to change the baud rate of the console and list device. It can also be used to switch the list device between the Serial 1 output port and the Parallel output ports. The program also displays the currently set baud rates and whether the

list device is connected to the Serial 1 port or the Parallel port. The operation of the BAUD program is self explanatory. Just run the program and answer the questions. Baud operates by altering the system on the disk in drive A. The change becomes permanent until BAUD is run again and further changes are made.

5.16 FORMAT

This program prepares blank disks for use in the system. All blank 5 1/4 inch disks must be formatted before use. Also double density eight inch disks must be formatted before use. Single density preformated disks may be used without reformating. The FORMAT program puts the format code onto sector 1 of track zero as described above in the section on UPDATE and DYNAGEN.

FORMAT may be modified to change the number of directory entries. This can be done by using DDT. The standard formats are described in TABLE 2! and the patches are given in TABLE 3.

5.2 CHANGING THE CBIOS I/O DRIVERS

The I/O drivers provided with REV 2.1 support the CP/M logical devices CON:, LST:, RDR: and PUN:. The PUN:, RDR: and LST: device are normally supported through Serial port 1. The BAUD program can switch LST: and PUN: to the parallel port. In certain applications it may be necessary to modify the I/O drivers. This can be done in several ways. The method used depends on the length of the driver.

In order to patch a new driver into the CBIOS or modify an existing driver it is necessary to understand the CBIOS memory map shown in TABLE 4. Care must be taken not to patch code into an area that CBIOS uses for buffer storage. In a 32K size system, the CBIOS can fill the area between 7A00H and 7EFFH. In REV 2.1 the area between 7A00H and 7E64H contains CBIOS code. The area between 7F00H and 7FFFH is used to store tables and as a buffer used by the CBIOS. Only the area between 7A00H and 7E7FH will be loaded during system boot.

The CBIOS code can be altered by using DDT. It can be extended to 7E7FH by this method. It can not be extended past 7E7FH since code in the area 7E80H to 7FFFH is not saved by DYANGEN. The data storage area on the system tracks contains only enough space to save a CBIOS which extends from 7A00H to 7E7FH. If it is necessary to extend the CBIOS beyond 7E7FH then because of a lack of space, this extra code can not be stored on the system track. This extra code can be stored in a special file that is moved into place during system boot.

This is accomplished using the CCP Auto-Load Feature. The Auto-Load Feature allows CP/M to be patched so that a selected program will be loaded and run every time the system boots up. (See the following note on Auto-Load) on page 53. This is accomplished by patching the command line into CCP starting at CCP+7 (for a 32K system this is 6508H). The length of the command line goes into

location CCP+7 (for a 32K system this is 6507H). If, for example, the user wants to add a large driver for the list devices and if the driver is too large to fit on the system track, then the following approach might be taken. Assume that the system has a 32K RAM space. In order to generate space for the extended drive, generate a 31K system using MOVCPM 31 *. Use the SAVE command to save this system. The driver will operate in the 1K space beyond the end of the 31K system. That space extends from 7C00H to 7FFFH. Modify the LIST jump vector at the head of the CBIOS to point to 7C00. Use the Auto-Load feature to load the drive code. For example, if the driver code is put in a file called LIST.COM then the Auto-Load Feature will load and run LIST. The program LIST.COM should be constructed as shown in the attached listing of LIST.PRN. The operation of LIST is described by the comments in the listing. The step-by-step patch sequence is shown in the following listing entitled "Setting Up Auto Load of a Large Driver" on page 56.

5.21 IOBYTE

The IOBYTE provides a means of assigning different physical I/O devices to the CP/M logical devices. It's function is described in the manual CP/M SYSTEM ALTERATION GUIDE on pages 15 and 16. The use of STAT to change device assignments is described in the manual AN INTRODUCTION TO CP/M FEATURES AND FACILITIES on pages 14,15, and 16. REV 2.1 initializes the IOBYTE to the value 95H. Logical devices to physical device assignment is supported only for the LST: device. The LST: device can be assigned to the CRT:, LPT: or ULI:. The CRT: is the same as the console. The LPT: is the Serial #1 output and ULI: is the Parallel output port. The BAUD program switches the LST: from Serial 1 to the Parallel Port by changing the initial value of the IOBYTE to D5H which connects LST: to ULI:. In order to extend the use of the IOBYTE, modify the CBIOS by following the steps outlined above.

5.22 ERROR MESSAGES

The REV 2.1 CBIOS will generate some new error messages in addition to those generated by CP/M. These messages are listed along with an explanation in TABLE 5. A CP/M operating system idiosyncrasy causes the WRITE PROTECTED error message to appear during an attempt to PIP a file larger than 16K from a write protected disk. To avoid this probelm, remove the write protect from the disk.

5.3 OPERATION OF AN INTERCONNECTED 5200 AND 5010

In order to connect a .5200. and a 5010 . together the following steps are required.

1. Change the system selection jumper on the main board as shown in Figure 1.

2. If necessary replace the boot strap PROM at location K4 on the main board with the proper PROM. The proper PROM is determined by the hardware configuration of the 5010. If the main card shipped with the .5010. is used then there will be no need to change the PROM. If the main card shipped with the 5200 . is used then it may be necessary to change the PROM. See Table 6 for the correspondence between PROM type and drive type.

3. Jumper the AUX card in the 5200 for BOARD 0 as shown in Figure 2.

4. Remove resistor pack from location A3 on the AUX card in the 8/2 system.

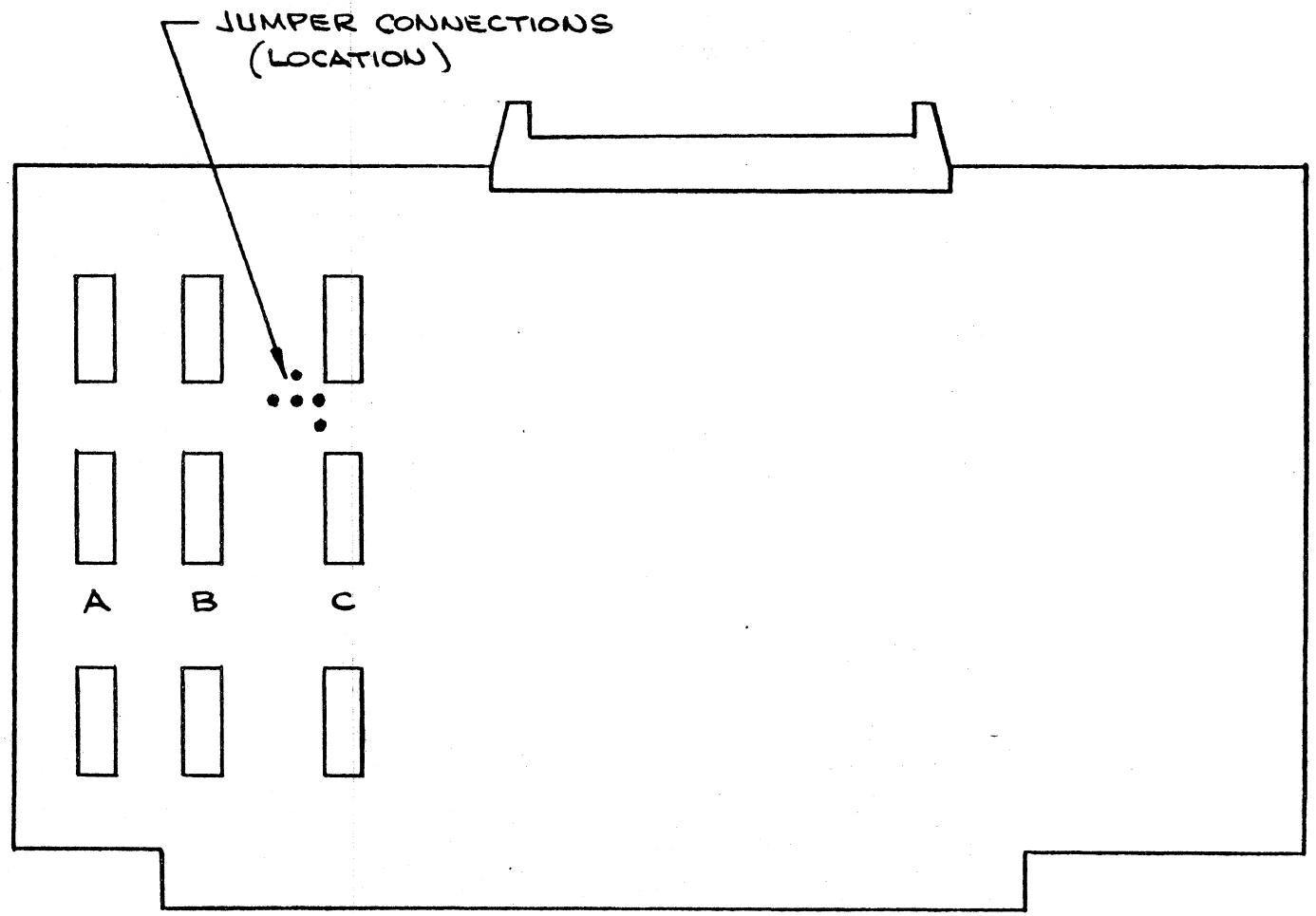
5. On the AUX card in the 8/2 system, connect together pin s 7 and 8 of L3.

6. Connect together the 50 pin connectors on the back of the 5200 and the 5010 systems. Make certain that the connecting cable is not reversed at the ends.

When the system is turned on, it will alternately attempt to boot on the A drive of the .5200 and the .5010 . Insert a system disk into the drive that you want to become the A drive boot. If, for example, you insert a disk into the A drive of the .5010. then when the system boots this drive will be the A drive. The drive labeled B on the 5010 will become the B drive. The drive labeled A on the 5200 will become the C drive and the drive labeled B on the 5200 will become the D drive. If the system boots on the A drive of the 5200 the situation is reversed.

CAUTION

IN ORDER TO USE THE COMBINED 5200 AND 5010 SYSTEM POWER MUST BE TURNED ON FOR BOTH SYSTEMS. THIS IS TRUE EVEN IF ONLY THE DRIVES ON THE 5200 ARE USED.

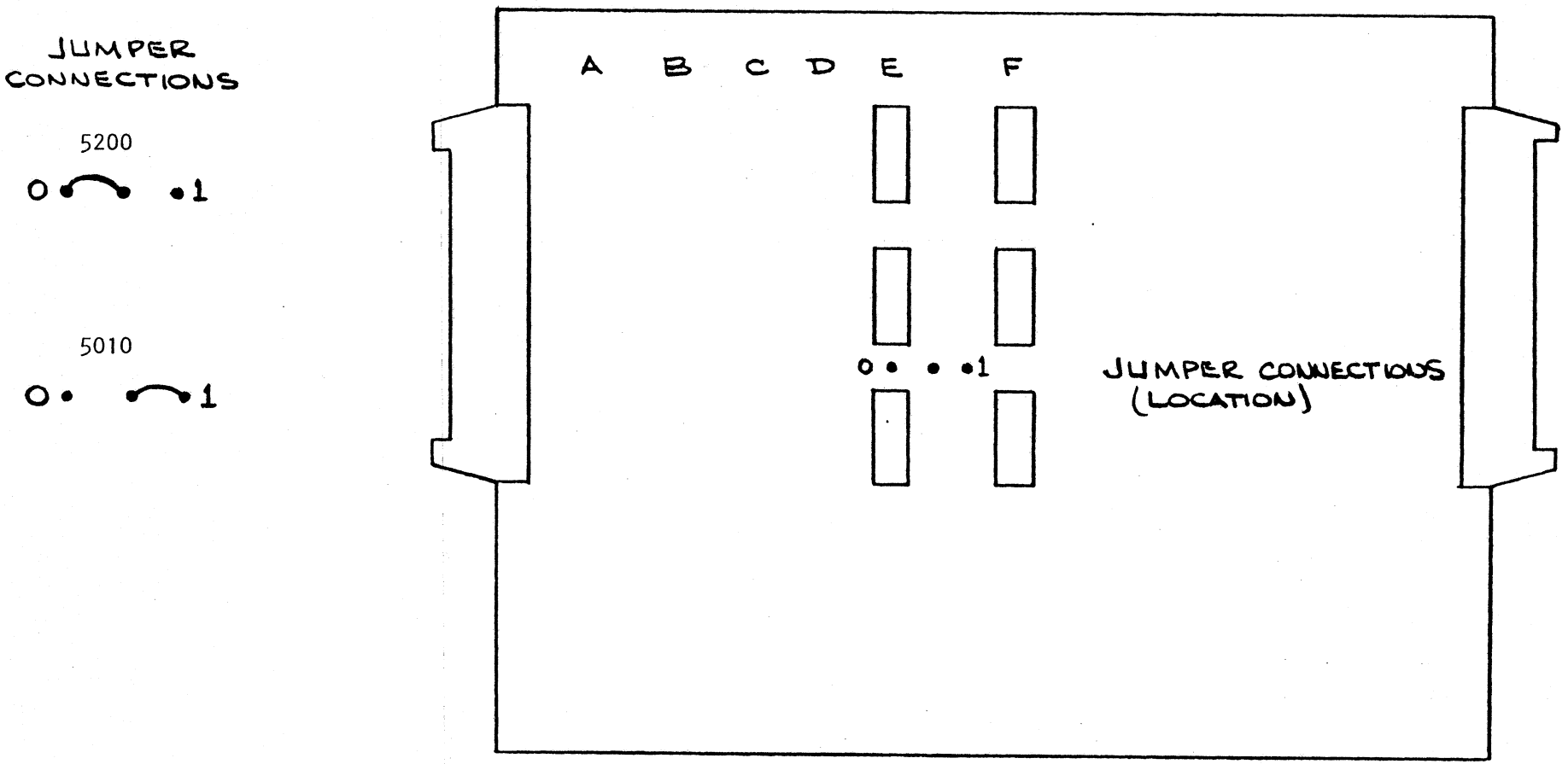


JUMPER CONNECTIONS

5200 and 5010

MAIN CONTROLLER CARD JUMPERS (STANDARD CONFIGURATION)

FIGURE 1



AUX. CONTROLLER CARD JUMPERS (STANDARD CONFIGURATION)

FIGURE 2

TABLE 1

LIST OF SOFTWARE INCLUDED WITH CP/M 2.1

NAME	REV	DESCRIPTION
BAUD.COM	1.0	Sets console, lists BAUD rate and selects serial or parallel list driver
CBIOS.Z80	2.1	Source for BIOS for CP/M
DBCOPY.COM	2.3	Type DBCOPY.TEX for explanation
DYNAGEN.COM	2.1	Performs the function of SYSGEN
FORMAT.COM	3.10	Formats and checks disks
UPDATE.COM	1.0	Update the format of old disks
STAT.COM	-	New version of STAT
MOVCPM.COM	2.1	Generates versions of operating system for different memory sizes
ZASM.COM	1.0	Assembler for ZILOG Z-80 MNEMONIC

TABLE 2

DISK FORMATS

DRIVE SIZE (inches)	SIDES	DENSITY	NUMBER OF TRACKS	SINGLE DENSITY TRACKS	SECTORS PER SINGLE DENSITY TRACK*	DOUBLE DENSITY TRACKS	SECTORS PER DOUBLE DENSITY TRACK*	SKEW TABLE FOR TRACKS 0-1	SKEW TABLE FOR TRACKS 2-76
5¼	1	2	77	NONE	---	0-76	32	1	2
8	1	1	77	0-76	26	---	---	3	3
8	1	2	77	0-1	26	2-76	54	3	4
8	2	1	154	0-153	26	---	---	3	3
8	2	2	154	0-1	26	2-153	54	3	4

*all sectors are 128 bytes long

SKEW TABLES

TABLE 2A

TABLE 1

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,
20,21,22,23,24,25,26,27,28,29,30,31,32

TABLE 2

1,9,17,25,2,10,18,26,3,11,19,27,4,12,20,28,5,13,
21,29,6,14,22,30,7,15,23,31,8,16,24,32

TABLE 3

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,
20,21,22,23,24,25,26

TABLE 4

1,32,9,40,17,48,25,2,33,10,41,18,49,26,3,34,11,
42,19,50,27,4,35,12,43,20,51,28,5,36,13,44,21,
52,29,6,37,14,45,22,53,30,7,38,15,46,23,54,31,
8,39,16,47,24

5.4 DISK STORAGE OF DYNABYTE SYSTEMS

This document describes the amount of storage one can expect to have available on Dynabyte systems. Evaluating the amount of storage in a system is somewhat akin to trying to make sense out of stereo system specs. The data, even if accurate, is hard to evaluate since there are many ways to define the measurements, some more realistic than others.

The values expressed here for the storage capacity of the Dynabyte systems reflect two ways of describing the capacity of the systems. UNFORMATTED CAPACITY is a calculated value based upon the number of tracks, sectors, and bytes per sector on a diskette. FORMATTED CAPACITY refers to the amount of space available after the diskette has been formatted by the DYNABYTE FORMAT program. It is found by executing the CP/M STAT program. This is perhaps the most realistic figure to quote when describing disk capacity since it refers to the actual storage available to the user.

Note that the capacities listed reflect the storage capacities of common Dynabyte systems; i.e., two floppy drives per system. To figure the storage on a single diskette, divide the figures by two.

Note also the column marked MEGABYTES. This is a rough translation of the storage capacity into units that are familiar to many people. It is just a 'rounded off' way of expressing the same information.

SYSTEM TYPE	DRIVE TYPE	UNFORMATTED CAPACITY	FORMATTED CAPACITY	MEGA-BYTES	NOTES
5200	5 1/4"	631 K	596 K	2/3	QUAD density
5010	8"	513 K	482 K	1/2	SINGLE density
5010	8"	1064 K	1008 K	1	DOUBLE density
5010-2	8"	1024 K	978 K	1	SINGLE density
5010-2	8"	2128 K	2030 K	2	DOUBLE density
5012	CMD	32579 K	25760 K	32 (26)	TWO DISKS
5012	CMD	65157 K	51520 K	64 (52)	THREE DISKS
5012	CMD	97754 K	77280 K	96 (77)	FOUR DISKS

TABLE 3

PATCHES TO FORMAT 3.10 TO CHANGE THE DIRECTORY SIZE

FORMAT	64 DIRECTORY ENTRIES ADDRESS/VALUE	128 DIRECTORY ENTRIES ADDRESS/VALUE	256 Directory ENTRIES ADDRESS/VALUE
8" single sided, single density	C6AH/3FH C6EH/C0H	C6AH/7FH C6EH/F0H	C6AH/FFH C6EH/FFH
8" single sided, double density	C75H/3FH C79H/80H	C75H/7FH C79H/C0H	C75H/FFH C79H/F0H
8" double sided, single density	C80H/3FH C84H/80H	C80H/7FH C84H/C0H	C80H/FFH C84H/F0H
8" double sided, double density	C8BH/3FH C8FH/80H	C8BH/7FH C8FH/80H	C8BH/FEH C8FH/C0H
5" single sided, double density	C96H/3FH C9AH/80H	C96H/7FH C9AH/C0H	C96H/FFH C9AH/F0H

TABLE 4

MEMORY MAP FOR 32K MEMORY SIZE

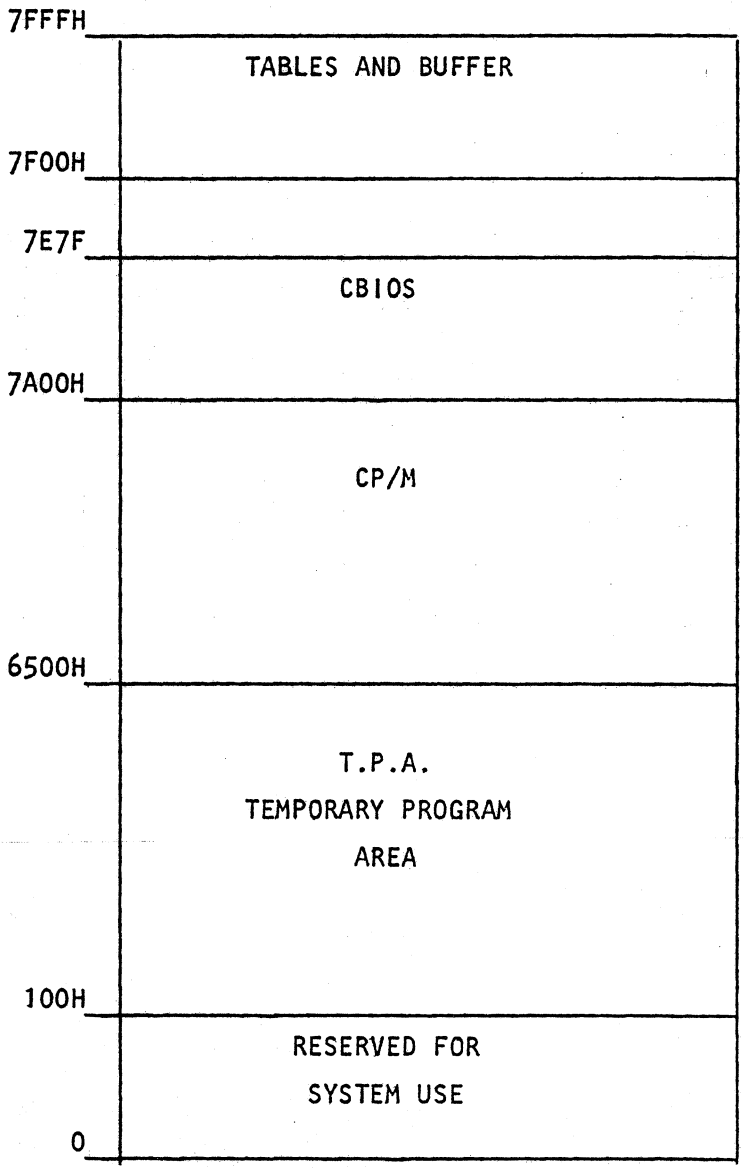


TABLE 5

CBIOS REV 2.1 ERROR MESSAGES

Message	Explanation
2 SIDED	Attempt to read or write on a two sided format on a one sided drive.
WRITE PROTECTED	Attempt to write on a disk which has been write protected with a write protect tab. (Eight inch disks are protected by removal of the tab and five inch disks are protected by putting the tab on the disk.) This message will also occur during an attempt to PIP a file larger than 16K from a write protected disk.

TABLE 6

PROM usage in 5010 systems and combined 5010 and 5200 systems.

5010 DRIVE TYPE	PROM
Single Sided Shugart	RBOOTIA
Single Sided Remex	RBOOT2
Double Sided Remex or Shugart	RBOOT3

5.5 THE CCP AUTO-LOAD FEATURE

This note describes the procedure for patching CP/M so that, on BOOT-UP, the system will enter directly into a particular program. This change eliminates the need for a system user to understand the operating system. It will keep the user in the applications program environment. This patch causes the system to return to the specified program on both a cold or warm boot. The patch is made to the CP/M operating system stored on the outer two tracks of the diskette. To make the patch proceed as follows:

1. First generate a shifted memory image of the CP/M system. This is done by starting with a diskette that contains the proper memory size CP/M system on its system tracks.

2. Use DYNAGEN to move the system into the computer memory. Type "DYNAGEN" followed by a carriage return. Respond to the request "SOURCE DRIVE NAME" with "A" or "B" depending on which drive the diskette is mounted. Respond to the request "SOURCE ON A, THEN HIT RETURN" with a carriage return when the source is mounted on the selected drive. Respond to the request "DESTINATION DRIVE NAME OR RETURN TO REBOOT" with a carriage return.

3. The system is now in RAM and should be saved by typing "SAVE 36 CPMXX,COM", where XX is the memory size in Kilobytes.

4. Now use the "DDT" program to patch this memory image of CP/M.

5. Type "DDT CPMXX.XOM" and then hit return. This causes the system to load DDT and the image of CP/M into memory.

6. Now patch in the command line which you want to execute on boot up. The length (in bytes) of the command line goes into memory location 987H and the command line itself (coded in ASC11) goes into memory starting at 988H. For example: if you want the system to directly boot into BASIC and you want BASIC to load and run a program called MENU.BAS, then the command line would be "BASIC MENU". This has 11 letters and since 11 decimal is equal to "B" in hexidecimal then "B" should be stored at location 987H. The letters of the command string must be converted to ASC11 (for example the letter B is equal to 42H, etc.) The "S" (set) command of DDT is used to set the values in memory.

7. After DDT displays the prompt "-", type "S987" followed by a carriage return. The system will respond with "987 00" and the cursor will remain positioned after the "00". Type the length of the command line (in the exampel "B") and hit return. DDT will then enter this value in memory and display the next memory location. Enter the desired value (in this case 42) and hit return. Proceed in this manner to the end of the command. Be sure to type a return after the last latter so that it is entered into memory. Then type a period (".") to exit the set command.

8. Exit DDT by typing a control C.

9. Before doing any other operation place the system, that is in memory, onto the diskette by using the command "DYNAGEN". Reply to the request "SOURCE NAME OR RETURN TO SKIP" with a return. Reply to the request for "DESTINATION DRIVE" with the name (A,B,C or D) of the drive that contains the diskette that you want to have the modified system.

10. When the system reboots, the command will be executed. If the command is repeated on the screen followed by a question mark, then it was not successfully executed. This can result if one of the required files was not found on the disk. If, for example, BASIC.COM is not present on the disk, then the above example will fail and the system will revert to normal CP/M operation and display the prompt " A> ".

5.6 SETTING UP AUTO LOAD OF A LARGE DRIVER

```
A>DDT LIST.HEX
DDT VERS 1.4
NEXT  PC
010C 0000
-ICODE.HEX
-R850C
NEXT  PC
011C 0000
-GO

A>SAVE 1 LIST.COM
A>MOVCPM 31 *

CONSTRUCTING 31K CP/M VERS 1.4
READY FOR "SYSGEN" OR
"SAVE 36 CPM31.COM"
A>SAVE 36 CPM31.COM
A>
A>DDT CPM31.COM
DDT VERS 1.4
NEXT  PC
2500 0100
-S987
0987 00 4
0988 20 4C
0989 20 49
098A 20 53
098B 20 54
098C 20 .
-D987,98C
0987 04 4C 49 53 54 20 .LIST
-
-A1E8F
1E8F  JMP 7C00
1E92  .
-GO

A>SAVE 36 CPM31.COM
A>DYNAGEN CPM31.COM
DYNAGEN VERS 2.0
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)A
DESTINATION ON A, THEN TYPE RETURN
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)
```

PATCH LIST TOGETHER WITH THE DRIVER CODE

CODE.HEX CONTAINS DRIVER CODE AT ORG 7C00H

SAVE THE PATCHED VERSION OF LIST

CONSTRUCT AND SAVE A 31K SYSTEM

SET UP AUTO-LOAD TO RUN LIST.COM

LENGTH OF COMMAND LINE

COMMAND LINE IN ASCI

CHECK PATCH

PATCH JMP VECTOR TO POINT TO NEW DRIVER AT 7C00H

SAVE PATCHED SYSTEM

PUT PATCHED SYSTEM ON DISK.

```
0000                    0001 ;*****************************************************
0000                    0002 ;***                    LIST                       ***
0000                    0003 ;*****************************************************
0000                    0004 ;
0000                    0005 ;
0000                    0006 ;
0000                    0007         ORG 100H
0100                    0008 ;
0100                    0009 ;
0100                    00 0 ;
0100                    00 1                          ;THIS MOVES THE LIST DRIVER
0100                    0012                          ;INTO THE AREA STARTING AT 7C00H
0100                    0013                          ;
0100  11007C            0014 MOVE:   LD DE,7C00H      ;START OF CODE IN CBIOS
0103  210C01            0015         LD HL,CODE       ;STARTING LOCATION OF CODE
0106  010004            0016         LD BC,400H       ;MAX LENGTH OF CODE
0109  EDB0              0017         LDIR             ;MOVE CODE
010B  C9                0018         RET              ;GO START CP/M
010C                    0019 ;
010C                    0020 ;
0 C                     0021 ;
0 C                     0022 ;
010C                    0023 CODE:                    ;STARTING LOCATION OF CODE
```

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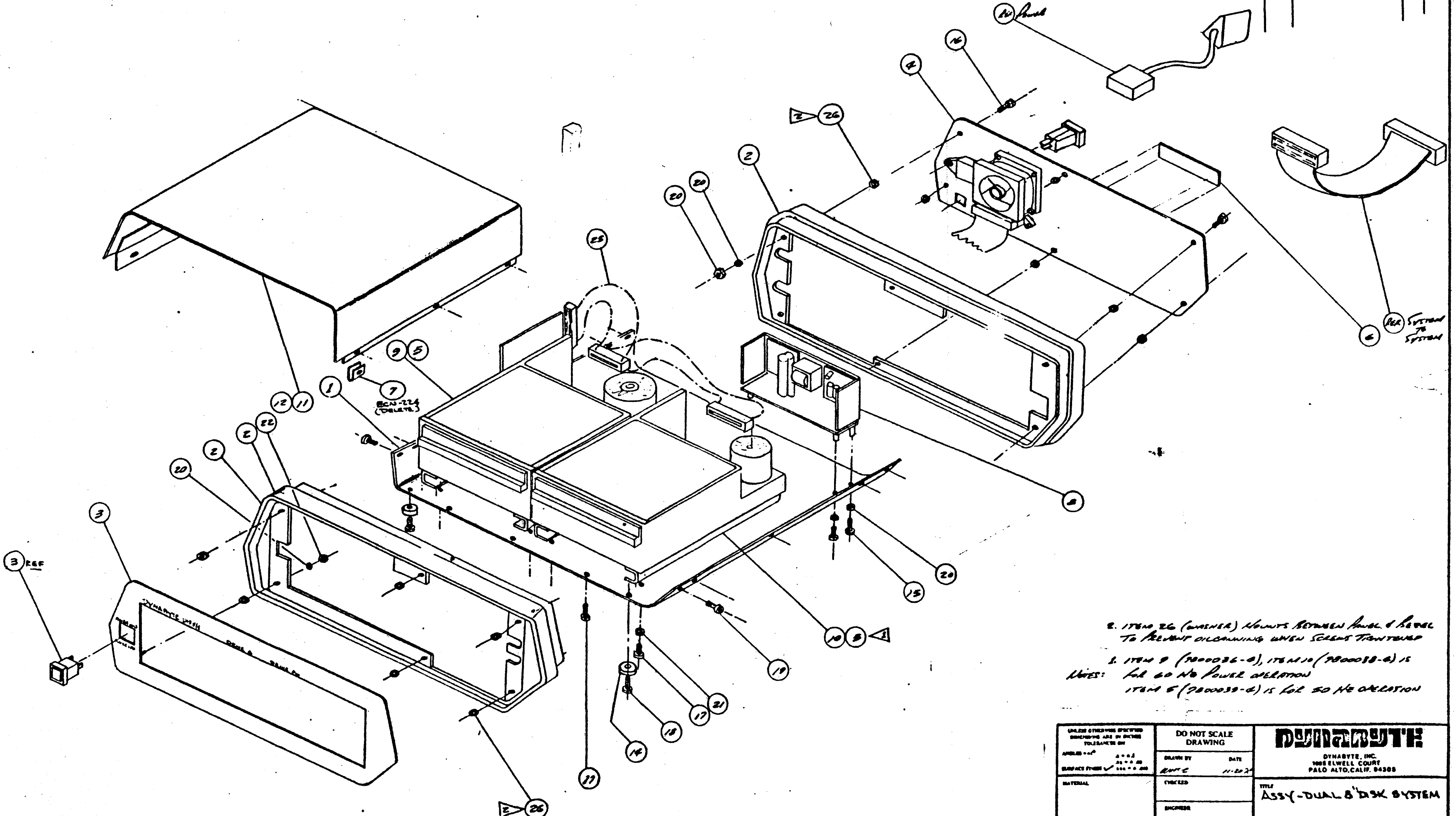
REV	DESCRIPTION	APP	DATE
A	REL.		8-79
B	ECN 181		5/79



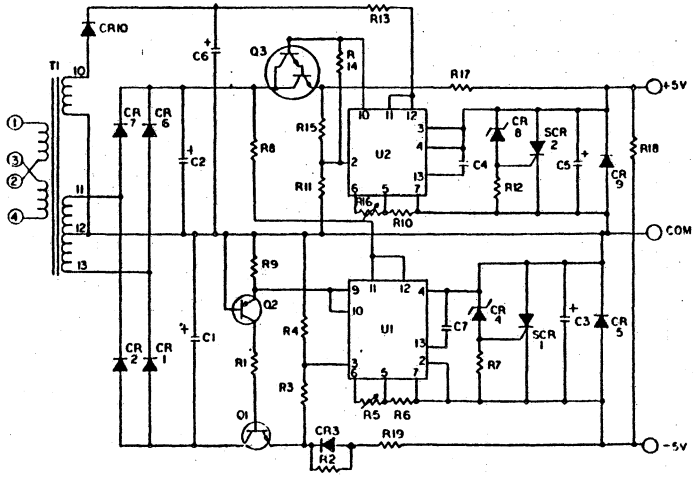
2. ITEM 26 (WASHER) MOUNTS BETWEEN PANEL & BEZEL TO PREVENT OILCANNING WHEN SCREWS TIGHTENED

NOTES: 1. ITEM 9 (7800036-0), ITEM 10 (7800038-0) IS FOR 60 HZ POWER OPERATION
ITEM 5 (7800039-0) IS FOR 50 HZ OPERATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON	DO NOT SCALE DRAWING	DYNABYTE
ANGLES ±	DRAWN BY: KURT C — DATE: 11-20-78	DYNABYTE, INC. 1005 ELWELL COURT PALO ALTO, CALIF. 94303
MATERIAL	CHECKED	TITLE: ASSY-DUAL 8" DISK SYSTEM 5010 G01
	ENGINEER	
FINISH	PROJECT ENGINEER	SIZE: D — DRAWING NO: 200144 — REV: B
	MFG ENGINEER	SCALE — SHEET 1 OF 1

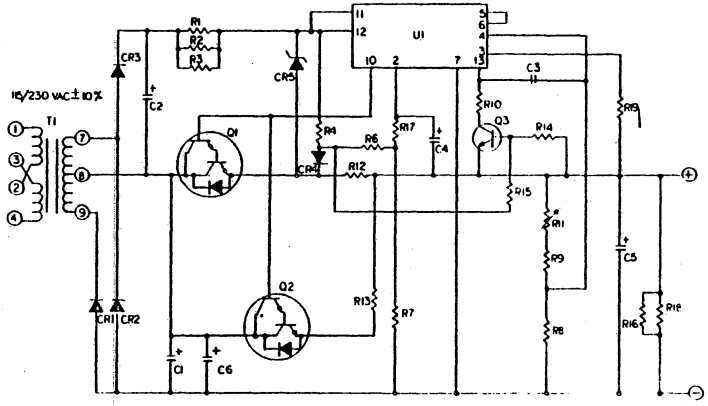
6.02 Dynabyte 5010 Power Supply

REF DES	CP206 ±5V	POWER-ONE PART NUMBER	DESCRIPTION
C1, 2	9000/15	102-10097	CAPACITOR ALUM. ELECT.
C6	100/35	101-10110	
C3,5	220/16	101-10107	ALUM. ELECT.
C4	.01/100	104-10095	MYLAR
C7	.1/100	104-10094	CAPACITOR MYLAR
CR1,2,3,6,7	AE3B	111-10252	DIODE 3A 100V
CR5,9,10	AE1C	111-10251	1A 200V
CR4,8	IN752A	112-10006	DIODE ZENER
SCR1,2	S0803LS3	160-10258	SCR 3A
Q3	2N6055	171-10263	TRANSISTOR
Q2	2N2907A	172-10248	TRANSISTOR
Q1	2N6569-3	171-10261	TRANSISTOR
R 9	4.7K	151-10381	RESISTOR ½W ± 5% CF
R3,8,13,14,16,17	270Ω	10351	
R11	1.2K	10367	
R4,6,10	2.2K	10373	
R15	240Ω	10350	
R7,12	47Ω	151-10333	½W ± 5% CF
R17	.12Ω	158-10077	2W WW, BWH
R19	.56Ω	158-10088	2W WW, BWH
R2	2.7Ω	151-10305	RESISTOR ½W ± 5%CF
R5,16	1.5K	155-10085	POTENTIOMETER
U1, U2	µa723	130-10287	I.C. VOLTAGE REGULATOR
T1	13699	082-13699	TRANSFORMER
PCB	12089	505-12089	PRINTED CIRCUIT BOARD
CHASSIS	11131	412-11131	CHASSIS ALUM



REF DES	CP 203	STD P/N	CP 206	STD P/N	CP 210	STD P/N	DESCRIPTION
C1, 6 ●	3700/60	102-10102	3700/60	102-10102	3700/60	102-10102	CAPACITOR ELECT
C2	47/50	101-10112	47/50	101-10112	47/50	101-10112	
C4	220/16	101-10107	220/16	101-10107	220/16	101-10107	
C5	330/35	101-10103	330/35	101-10103	330/35	101-10103	ELECT
C3	.01/100	104-10095	.01/100	104-10095	.01/100	104-10095	CAPACITOR MYLAR
CR1,2	AE3B	111-10252	AE3B	111-10252	AE3B	111-10252	DIODE 3A 100V
CR3,4	AE1C	111-10251	AE1C	111-10251	AE1C	111-10251	DIODE 1A 200V
CR5	IN752A	112-10006	IN752A	112-10006	IN752A	112-10006	DIODE ZENER
Q1,2	2N6055	171-10263	2N6055	171-10263	2N6055	171-10263	XSTR DARLINGTON
Q3	2N2219A	172-10247	2N2219A	172-10247	2N2219A	172-10247	XSTR SIG. NPN
R1,2,3	10K	151-10389	10K	151-10389	20K	151-10396	RESISTOR ½W ± 5% CF
R4	2.7K	151-10375	2.7K	151-10375	4.7K	151-10381	
R17	1 K	151-10365	1 K	151-10365	1 K	151-10365	
R7	47 K	151-10405	47 K	151-10405	47 K	151-10405	
R10, 16, 18	2.2K	151-10373	2.2K	151-10373	2.2K	151-10373	
R15	20 K	151-10386	10 K	151-10389	10 K	151-10389	
R19	6.8 Ω	151-10313	6.8 Ω	151-10313	6.8 Ω	151-10313	½W ± 5% CF
R8	1.6K	152-10510	1.6 K	152-10510	1.6 K	152-10510	½W 2% MF
R9	2.7K	152-10515	2.7 K	152-10515	2.7 K	152-10515	½W 2% MF
R12, 13	39 Ω	158-10081	39 Ω	158-10081	39 Ω	158-10081	RESISTOR 5W ± 5% CF
R11	1.5K	155-10085	1.5 K	155-10085	1.5 K	155-10085	POTENTIOMETER
R14	10 K	151-10389	7.5K	151-10386	7.5K	151-10386	RESISTOR ½W ± 5% CF
R6	1K	151-10361	1.2K	151-10367	1.2K	151-10367	RESISTOR ½W ± 5% CF
U1	µa 723	130-10287	µa 723	130-10287	µa 723	130-10287	IC V. REGULATOR
CHASSIS	11031	412-11031	11131	412-11131	13767 ##	412-13767	CHASSIS
T1	13625	082-13625	13699	082-13699	13625	082-13625	TRANSFORMER
P.C.B.	12913	505-12913	12913	505-12913	12913	505-12913	P.C. BOARD

PRODUCTION NOTES.
● C6 MOUNTED ON C1 WITH 13570 CLAMP.
■ ② SUBSTITUTE PART 5000/5C CAN BE USED.



6.03 Dynabyte 5010 Power Supply

APPLICATION DATA

1. Schematic
2. Parts List
3. Specification
4. Outline & Mounting Drawing
5. General User Information

MODEL

CP 206
Triple Output

SPECIFICATIONS:
AC Input: 115/230VAC, ±10% 47-440 Hz (Derate unit 10% at 50 Hz operation)
DC Output:

OUTPUT POWER			
VOLTAGE	+24V	+5V	-5V
CURRENT	3A average 3.4A peak	2.5A	.5A
OVP	NA	6.2±.4V	6.2±.4V

Line Regulation: ±.05% for a 10% input change
Load Regulation: ±.05% for a 50% load change
Output Ripple: 5.0mV, PK-PK, 0.5 mV RMS
Transient Response: 500 seconds for 50% load change
Overload & Short Circuit Protection: Automatic current limit/foldback. +24V will deliver up to 4A without foldback into any load for approximately .5 seconds
Reverse Voltage Protection: Reverse protection diodes across ±5V output terminals.
Stability: ±0.3% for 24 hours after warm-up.
Input Fusing: Recommended, fuse at 2A
Temperature Coefficient ±.03%/°C maximum
Cooling: Units are full rated to 50°C in free air, must be derated or fan cooled when mounted in confined area.
Temperature Rating:
0 - 50°C - 100%
60°C - 70%
71°C - 40%
Efficiency: Combined efficiency approx. 55% @ 115 VAC, full load on all outputs
Note: In systems where the AC voltage is controlled, operate at 108-110 VAC for greatest efficiency.
Construction: All alumium chassis
Weight: 8 lbs.
Vibration: Per MIL-STD-810 B, Method 514, procedure 1, curve AB, (to 50 Hz)
Shock: Per MIL-STD-810 B, Method 516 Procedure V.

TROUBLESHOOTING GUIDE

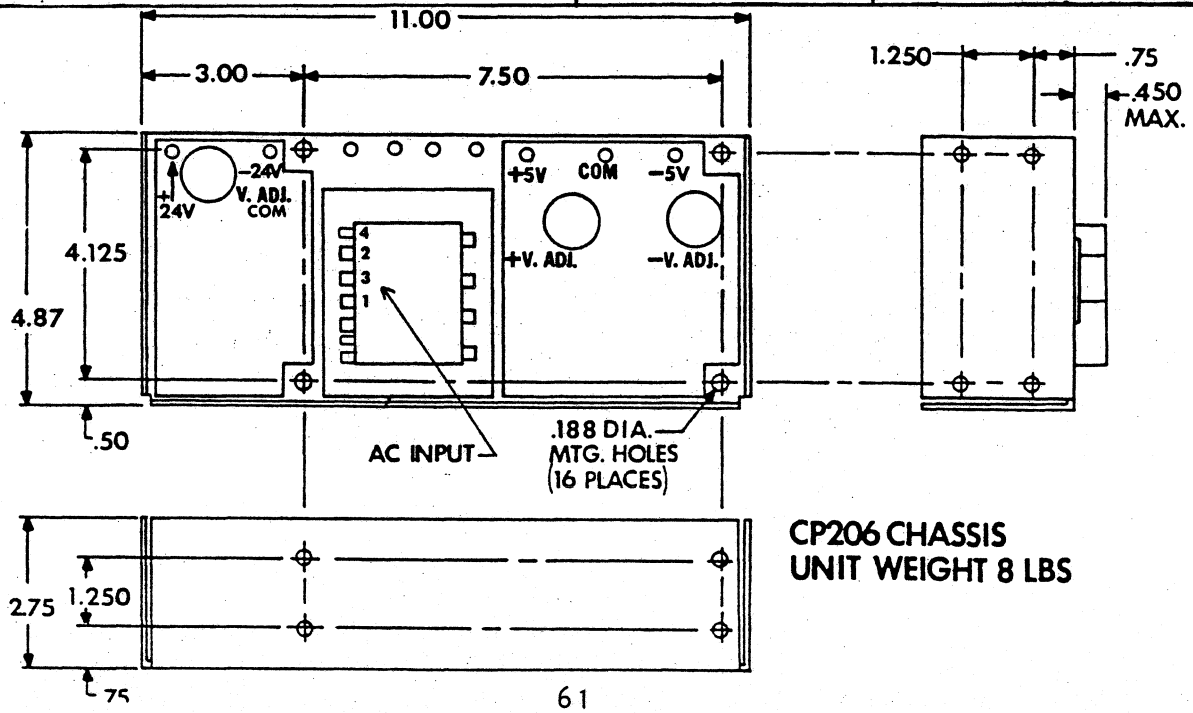
Refer to voltage test points shown on schematic for ease of failure determination.

24V Output

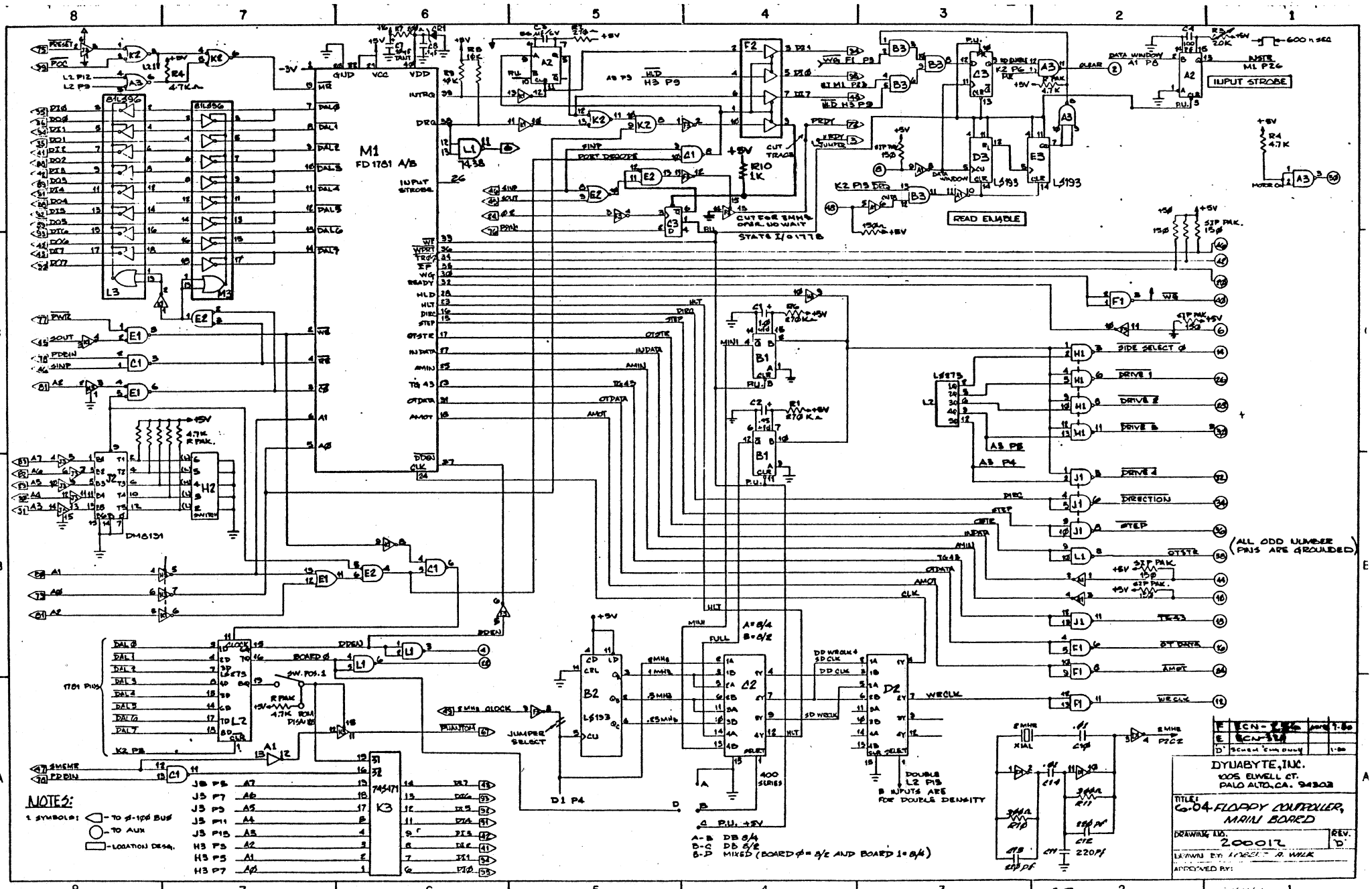
SYMPTOM	POSSIBLE PROBLEM
Unit Overheating	1. Output Overload 2. Inadequate Ventilation 3. Improper Transformer Primary Connection 4. High Input AC Voltage
Low Output Voltage With High Ripple	1. Output Overload 2. U1 Faulty 3. CR 1-2 or 3 4. C1, 2, or 6 5. Q 1 or 2 Open 6. R 8 Open
High Output Voltage and Ripple, Poor Regulation	1. Q 1 or 2 Shorted 2. U1 Faulty 3. R9 Open
High Input Current Blows Fuses	1. Improper Input Voltage or Frequency 2. C 1, 2 or 6 Shorted 3. CR 1, 2 or 3 Shorted

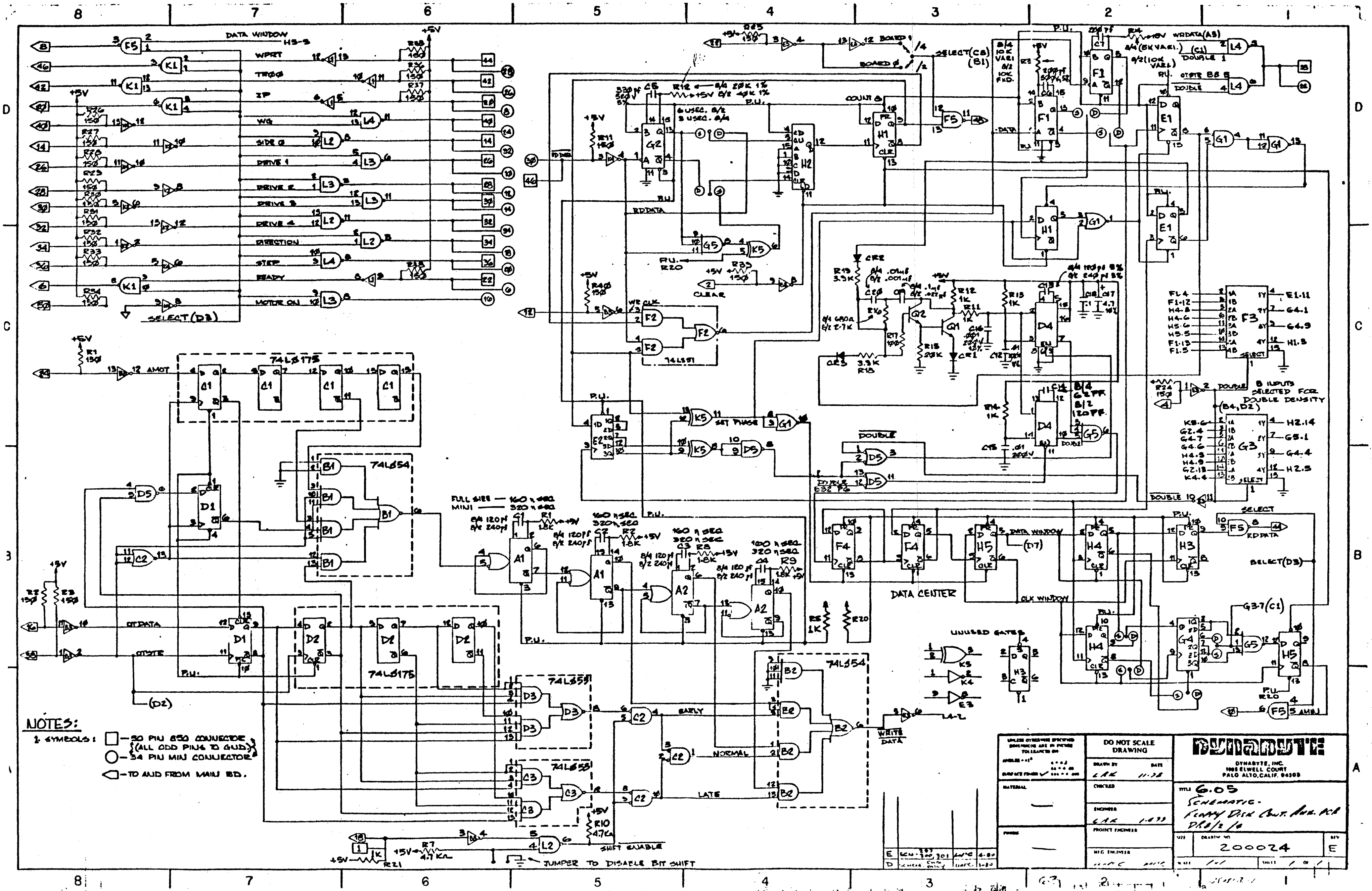
±5V OUTPUT

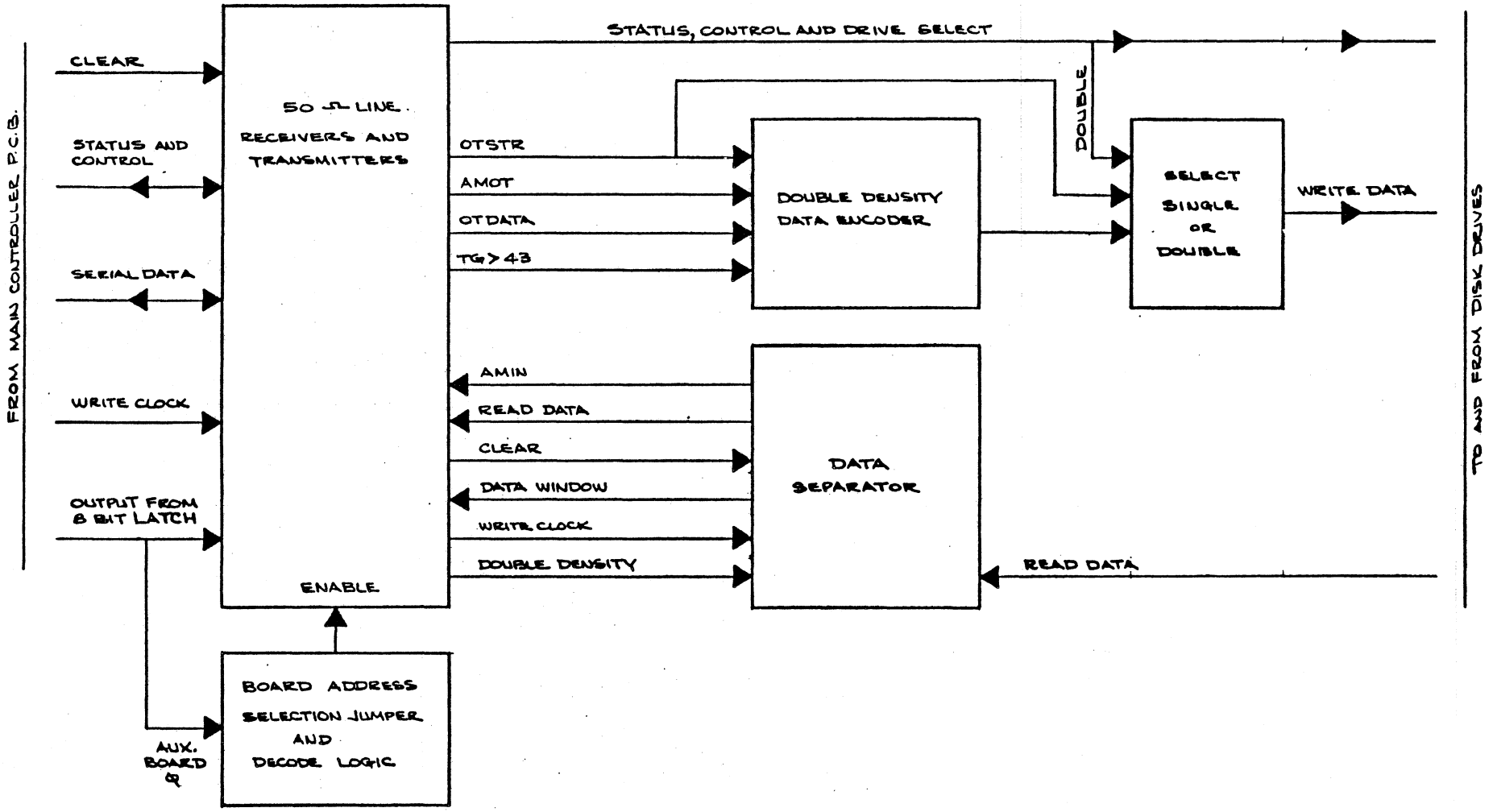
SYMPTOM	POSSIBLE PROBLEM
Unit Overheating	1. Output Overloaded 2. Inadequate Ventilation 3. Improper Transformer Primary Connection 4. High Input AC Voltage
Low Output Voltage With High Ripple	1. Output Overloaded 2. U1 or U2 Faulty 3. CR 1, 2, 6, 7, 10 Open 4. C 1, 2, 6 Leaky 5. Q1 or Q3 Open
High Output Voltage and Ripple, Poor Regulation	1. Q1 or Q3 Shorted 2. U1 or U2 Faulty
High Input Current Blows Fuses	1. Improper Input Voltage or Frequency 2. C 1, 2 or 6 Shorted 3. CR 1, 2, 7, 6, 10 Shorted
Unit Will Not Come On-Either or Both Outputs	1. Constant Current Load (too high for foldback circuit) 2. Excess Common Mode Current



CP206 CHASSIS
UNIT WEIGHT 8 LBS


M1
FD 1781 A/B
INPUT STROBE
READ ENABLE
DRIVE 0
DRIVE 1
DRIVE 2
DRIVE 3
SIDE SELECT 0
DIRECTION
STEP
WE
WE CLK
TK43
DT DATA
AMDT
(ALL ODD NUMBER PINS ARE GROUNDED)
DYUABYTE, INC.
1005 ELWELL CT.
PALO ALTO, CA. 94303
TITLE: 6-04 FLOPPY CONTROLLER, MAIN BOARD
DRAWING NO. 200017
REV. D
NOTES:
1 SYMBOL: TO 8-100 BUS
TO AUX
LOCATION DESG.
A-B DB 8/4
B-C DB 8/2
B-D MIXED (BOARD 0 = 8/2 AND BOARD 1 = 8/4)
DOUBLE L2 PIN B INPUTS ARE FOR DOUBLE DENSITY


NOTES:
1. SYMBOLS: □ —50 PIN 850 CONNECTOR (ALL ODD PINS TO GND)
○—34 PIN MINI CONNECTOR
◁—TO AND FROM MAIN BD.
JUMPER TO DISABLE BIT SHIFT
SHIFT ENABLE
DATA CENTER
UNUSED GATES
FULL SIZE — 160 n SEC
MINI — 320 n SEC
DO NOT SCALE DRAWING
DYNABYTE, INC.
1005 ELWELL COURT
PALO ALTO, CALIF. 94303
6.05
200024
E



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: ANGLES ±1° .X ± 0.1 .XX ± 0.02 SURFACE FINISH √ .XXX ± 0.005	DO NOT SCALE DRAWING	DYNABYTE, INC.
MATERIAL:	DRAWN BY WMC DATE 4-26-79	TITLE Block Diagram Aux. Controller P.C.B.
FINISH	CHECKED	
	ENGINEER	
	PROJECT ENGINEER C.B.K 9/4/79	SIZE C DRAWING NO. 480B102-5 REV N/C
	MFG ENGINEER	SCALE — SHEET 1 OF 1

7.0 USER COMMENTS

TECHNICAL PUBLICATIONS FILE REFERENCE

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NOTE:

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Contact:

Dynabyte Documentation Dept.,
415-329-8021/TWX 910-373-2019

115 Independence Drive
Menlo Park, CA 94025

Equipment_____ Serial Number_____ Purchased from_____

Document: (Title/Number/Revision)_____

COMMENTS:

5010 Summary Specification

The DYNABYTE 5010 consists of a unit containing two eight inch floppy disk drives and an interface card for the S-100 bus. Both single and double sided drives are available. It is constructed in a modular manner to allow easy service. The modules are:

1. Power Supply
2. Floppy Disk Drives
3. Disk Controller

1. Power Supply

1.01 Input voltage 115V or 230 V ± 10%
1.02 Input frequency 50/60 HZ
1.03 Output voltage +24V, +5V, -5V

2. Floppy Disk Drives

Description - Three different models are available:

1. Shugart singled sided model 800
2. Remex single sided model RFD2000
3. Remex double sided model RFD4000

Specification

2.01 Heads per drive

2.01.1 Model 800	1
2.01.2 RFD 2000	1
2.01.3 RFD 4000	2

2.02 Tracks per surface 77

2.03 Media

800 and RFD2000	Dysan P/N 800528
RFD4000	Dysan P/N 800802

2.04 Capacity unformatted per track

2.041 5212 bytes single density
2.042 10425 bytes double density

2.05 Capacity unformatted per surface

2.051	Single density	401 K bytes
2.052	Double density	803 K bytes

2.06 Capacity formatted per surface

Sector Size (Bytes)	Number of Sectors per track	Capacity per surface (Bytes)
128	54	518K
256	32	614K
512	17	653K
1024	9	691K

2.07 Transfer rate

2.071	Single density	250 K bits/sec
2.072	Double density	500 K bits/sec

2.08 Average latency 83 msec

2.09 Head load

2.091	Model 800	35 msec
2.092	RFD 2000	35 msec
2.093	RFD 4000	35 msec

2.10 Access time

2.101 Track to track

2.1011	Model 800	8 msec
2.1012	RFD2000	3 msec
2.1013	RFD4000	3 msec

2.102 Settling Time

2.1021	Model 800	8 msec
2.1022	RFD 2000	15 msec
2.1023	RFD 4000	15 msec

3. Disk Controller

Description:

The Dynabyte floppy disk controller is contained on two P.C. cards. It can operate in both single and double density modes and is software switchable between these modes. One card, called the Main Card, is plugged into the S-100 bus. The other card, called the Aux Card, is mounted on the side of the disk drive unit. The Main Card provides the interface between the controller and the computer bus. It also contains the Western Digital 1781 controller chip. The Aux Card provides the interface to the disk drives. It contains the data encoder and decoder logic. A single Main Card can support two Aux Cards. The Aux Cards are jumped as card 0 and card 1. Only one card is selected at a time. Daisy chaining of the Aux Cards allows different types of disk drives to be connected to the same Main Card. A 5010 with two double sided 8 inch drives and its own Aux Card can be daisy chained off the connector on the back of the 5200 or another 5010. This gives a system with 4 drives (two 5¼ inch drives and two 8 inch drives, or four 8 inch drives).

The disk controller contains a boot strap PROM. This PROM is located at location 0 in memory. When the power is turned on or the reset button pressed, the PROM is enabled and the processor reads code from the PROM. Logic on the Main Card activates the phantom line during memory reads from the PROM. This prevents conflict with the bottom of RAM. Phantom is not activated during memory writes and thus all memory writes will go into normal RAM. After boot-up the PROM is disabled under software control and the entire memory space becomes available. The PROM can be completely disabled by a DIP switch on the Main Card.

Specification:

3.01	Computer Interface	The controller can be operated as an interrupt device or a polled device.
3.02	Data Transfer Method	Programmed data transfer sychronized by use of the wait line.
3.03	Sector Format	Soft sectored format
3.04	IBM Compatibility	IBM-3740 compatible in single density mode.
3.05	Density Modes and Encoding	
3.051	Single density encoded FM	
3.052	Double density encoded MFM with write precompensation for tracks greater than 43.	
3.06	Sector formats available (Single or Double Density)	
3.061	IBM 3740 sector lengths 128, 256, 512, 1024 bytes	
3.062	Non IBM sector lengths 16 to 4096 bytes in increments of 16 bytes.	
3.07	Commands	
3.071	Restore	Move head to track 0
3.072	Seek	Move head to specified track
3.073	Read	Read single or multiple records
3.074	Write	Write single or multiple records
3.075	Step in	Move head one track toward center
3.076	Step out	Move head one track toward outside of disk
3.077	Write track	Write new format on track
3.078	Force Interrupt	Terminate active command
3.08	Drive Selection	Each main card can support two Aux cards and each Aux card can support up to four drives.

SECTION II

The following chart will assist you to determine the specific manufacturer's diskette drive model installed in the 5010 models.

	Up to 11/79	11/79 - 2/81	After 2/81
5010-01	Shugart SA800	Remex RFD 2000	Shugart SA800
5010-02	Remex RFD 4000	Remex RFD 4000	Remex RFD 4000