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S-100-4
COMPUTER ASSEMBLY
AND
OPERATING INSTRUCTIONS

DATA SCIENCE, INC.

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TABLE OF CONTENTS

CHAPTER ONE 1

INTRODUCTION 1

WHAT'S IN THIS BOX? 1
   FUNCTIONAL DEFINITION 1
MISUSES OF A COMPUTER 2
PHYSICAL DEFINITION 3
   THE HARDWARE (Illustrated on page 4) 3
   THE SOFTWARE 6
SYSTEM STRUCTURE 7
USING YOUR COMPUTER 8
USAGE CONSIDERATIONS 9
GLOSSARY 11
   GLOSSARY (con't) 12

CHAPTER TWO 13

INSPECTION 13

UNPACKING 13
INSPECTION 13
DISKETTES 13
SOFT SECTORED IDENTIFICATION 13
   SINGLE SIDED 13
   DOUBLE SIDED 13
DISK DRIVE 14
DRIVE NOTES (DISK CAPACITY FORMATTING WITH "DFOCO") 14
   STANDARD DRIVES (8") 14
   MINI DRIVES (5 1/4") 14
TERMINAL 15
INITIAL POWER ON 15
MONITOR COMMANDS 15
   D (DUMP) 15
   L (LOAD) 16
   F (FILL) 16
   M (MOVE) 16
   V (VIEW) 16
   G (GO) 16
   H (HEX) 16
   X (EXAMINE) 16
DISK DRIVE BOOT UP 16
   FLOPPY SYSTEMS 16
   HARD DISK SYSTEMS 17
DISK UTILITIES 17
   DFOCO.COM 18
      FORMATTING WITH DFOCO 18
      COPYING WITH DFOCO 18
      VALIDATING WITH DFOCO 18

TABLE OF CONTENTS (Con't)

CHAPTER THREE 19

GENERAL OPERATING PROCEDURES 19

S100 POWER SUPPLY 19
BUS POWER SUPPLY SCHEMATIC 20
S-1004 BUS POWER SUPPLY (PICTURE) 21
DRIVE POWER SUPPLY 22
DRIVE POWER SCHEMATIC 23
DRIVE POWER SUPPLY PARTS LAYOUT 24
DRIVE POWER SUPPLY PARTS LIST 24-B
TANDON JUMPER LOCATIONS SIDE VIEW CIRCUIT BOARD (PICTURE) . 25
TANDON SIDE VIEW MOTOR PULLY AND BELT (PICTURE) 26
MITSUBISHI JUMPERS 27
INTERNAL VIEW (PICTURE) 28
SUB-ASSEMBLY (PICTURE) 29
BOARD REMOVAL 30
INTERNAL CABLES 30
DRIVE JUMPERS 30
   TANDON (8" THIN LINE) 30
   MITSUBISHI JUMPERING (8" THIN LINE) 30
BAUD RATE SELECT 30
   SERIAL I/O BAUD RATE SELECT 30
   BAUD RATE SWITCH SETTINGS CPU BOARD 31
XOR DISK UTILITIES "A" 32
XOR DISK UTILITIES "B" 32
FILE EXTENTIONS 32
EXPLANATION OF DISK FILES 33
   BACKUP:COM * 33
   DIAGNOSE.COM 33
   HELP.COM 33
   SURVEY. 33
   DFOCO:COM * 33
   M, M2 33
   WORM, WORM 48 34
   DDUMP: 34
      OPERATION 34
      FILL 34
      EDIT 35
   DSYSGEN: * 35
   D: 36
   DSKTYP: * 36
   DDT: 36
   ED: 36
   ASM: 36
   LOAD: 36
   STAT: 37
   PIP: * 37
   SUBMIT: 37
   XSUB: 37
   MACRO.LIB & Z80.LIB 37
   BLKSYS61.SUB: 38

TABLE OF CONTENTS (Con't)

BLKEQU61.ASM: 38
IO.ASM: 39
FLOP.ASM: 39
BLK.ASM: 39
DATA.ASM: 39
CBOOT.ASM: 39
MDISK 39
DSYSGEN 40
MODIFYING AND GENERATING CP/M SYSTEMS 41
STEP BY STEP 42
A - MODIFICATION *** 42
B - EXAMINATION *** 42
C - CONCATENATION AND ASSEMBLY *** 42
D - GENERATING CP/M *** 42
E - PUTTING SYSTEM ON SYSTEM TRACKS *** 42
F - SYSTEM TRACKS AVAILABLE ON VARIOUS MEDIA *** . . 43
G - DESTINATION DISK PARAMETERS *** 44
DETAILED DSYSGEN OPERATING INSTRUCTIONS 44
PRINTER PORTS (PARALLEL AND SERIAL) 47
CXLST.ASM 47
USING DDUMP TO CHANGE BYTE OF SYSTEM DISK 47
USING MACRO ASSEMBLER TO CHANGE BIOS JUMP TABLE 47
PRINTER.COM 48
PRINTER T (TEST MODE) 48
CUSTOM PRINTER.COM PROGRAMS 50
PRINTER NOTES 51
SOME TIPS ON HOOKING UP PRINTERS 51
PARALLEL CABLE WIRING 52

CHAPTER FOUR 53

TROUBLE SHOOTING AND SERVICE POLICY 53

MONITOR AND SIGN ON 53
MEMORY CHECKS 53
MEMORY TESTS 53
M AND M2 53
WORM AND WORM48 54
CPU CHECKS 55
DISK CONTROLLER CHECKS AND ERROR MESSAGES 55
POWER SUPPLY CHECKS 56
SERVICE POLICY 57

FORWARD

This manual is divided into four chapters and a section called MICRO NOTES for your convenience.

Chaper One, INTRODUCTION, is a overview of computers, their basic operation and what you can expect it to do for you and what you can expect it not to do for you.

Chaper Two, INSPECTION, contains the initial unpacking, inspection and testing instructions. The contents of this chapter is intended to help get you up and running.

Chapter Three, GENERAL OPERATION PROCEDURES, consists of technical information on systems hardware and software.

Chapter Four, contains TROUBLE SHOOTING AND RETURN MATERIAL AUTHORIZTION (RMA) procedures for repairs.

MICRO NOTES is the section on configuring various printers, terminals, and disk drives to run with our system.

A CP/M Manual is included, separately.

Included with each system are two disks "A" and "B" which contain the CP/M operating system and disk utilities.

PLEASE READ THIS MANUAL BEFORE USING YOUR COMPUTER. YOU SHOULD BE FAMILIAR WITH THE CONTENTS OF THIS MANUAL BEFORE TRYING TO USE YOUR COMPUTER SYSTEM. THE SECTIONS WITH AN "*" SHOULD BE COMPLETELY UNDERSTOOD BEFORE ATTEMPTING ANY USE OF YOUR COMPUTER.

Some of the utility programs will only read upper case characters so please use upper case, only, to avoid confusion.

Quotation marks ,"", as used in this manual are intended only to draw attention to a particular piece of information. They don't have to be typed as part of a command line or drive designation.

Whenever you change a switch setting, change a baud rate, or anything else that may affect operation of your computer, terminal, or printer, turn them off and back on again. These devices read this information when turned on.

BACKUP PROCEDURES *** IMPORTANT TO DO THIS FIRST THING ***

Place your system disk "A" in A drive, insert a blank disk in "B" drive; type "backup". This is an automatic program which will give you an exact duplicate of your system disk, ie, copy "A:" to "B:". After the first copy is completed, you may replace the disk in "A" with the "B" master, and place a blank disk in "B" drive, type return and an exact copy of "B" will be made.

After these backup disks are made, remove your master A and B disks to a safe place. At present the Backup submit data files are for B in drives. Mini's can be backed up by using the DFDCO DCOPY program sequence or the PIP program.

US MICRO SALES

CHAPTER ONE

INTRODUCTION

INTRODUCTION

The difference between a computer user and a computer professional is similar to the difference between a first year automobile driver and a stock car racer: although both operate similar machines, one does so with style and efficiency, knowing the strengths and weaknesses of the device and maximizing its efficiency while the other simply drives from one place to another. Since you have invested in a U.S. Micro Sales computer system, we want to help you derive the maximum power from you machine by discussing its potential and its drawbacks and advising you on proper operating procedures.

Regardless of your experience with computers, you'll find that the value of your computer system will be greatly enhanced if you take the time to study this overview.

WHAT'S IN THIS BOX?

FUNCTIONAL DEFINITION

A computer is a tool with which you impose order on a set of data through the implementation of preinstalled intelligence. Now that we've defined the computer, let's define the definition.

A computer is a machine that reads to and writes from memory, nothing more. A computer operator can put information into or take information out of that memory, nothing more. The key to successful operation of a computer lies in the nature of the information you put in and take out of the computer. For example, you may put into memory a system of filing names and addresses that say: If a name begins with "A", put it at the top of the list; if a name begins with "B", put it after the names that begin with "A" and so on. Once the file system is installed in memory, you may enter a list of names and instruct the computer to order that list of names according to the system you previously installed. Your file is then stored in memory alphabetically. When you want to extract those names, they will be given to you in alphabetical order.

Although the system of entering commands and data is a little more complex than just described, all you have actually done is write to and read from the computer's memory. However, order, (alphabetical) has been imposed on a set of data (names) by implementing preinstalled intelligence (the file system).

An important feature of current computer technology is the fact that it is not necessary for the computer user to create the intelligence system he needs to order his data. Prepackaged application programs that are the fruit of many years of other people's labor are widely available, and can save the user many hours of work while allowing him the ability to keep his data in a form that is efficient and universally legible. Why is it necessary for data to be understandable to those other than the collector of that data?

Consider the dilemma of Izzy Tyke, sole proprietor of His Owne Bicycle Shoppe. Izzy has been doing quite well in business for the past twelve years and would like to buy the storefront next door in order to expand his business. He hires an accountant to go over his financial records to see if he has enough money to buy the extra space. The accountant comes to the store and Izzy shows him the financial records--a huge cardboard box stuffed full of invoices, check stubs, receipts, and assorted other material, including a lunch pail that Izzy misplaced in 1964. The cardboard box is a very convenient method of recordkeeping for Izzy, but the accountant refuses the assignment of looking over the records.

Izzy then decides it would be easier to borrow the money than to sort out the material in the box, so he goes to the local bank. The bank refuses Izzy the loan on the grounds that the condition of his financial records do not inspire confidence in Izzy's character or his ability of repay the loan. So Izzy loses the opportunity to buy the storefront.

Izzy is convinced that he must keep his records in a more formal manner, and considers several methods of doing so. He could go to night school and take a course in bookkeeping, but the late nights and homework assignments may affect his salesmanship during the day; besides, there's no guarantee that Izzy will be a good bookkeeper even if he passes the course. He could hire a bookkeeper--but can he find a good one and does he have enough money for that?

If Izzy buys a computer and some accounting software, he has at his disposal all the procedures and formality necessary to keep his books in perfect order. The computer will guide him through the steps involved in maintaining records--all Izzy has to do is plug in the numbers the computer asks him for.

Through the use of the computer, the bicycle shop owner's book are in perfect order without the necessity of months of study or the expense of an accountant's time. The computer has imposed order on Izzy's finances using the preinstalled intelligence of the accounting software package.

The useful applications of a computer's ability to read and write from memory are wide and varied. Any task that is made up of step by step, orderly processes and that is of a receptive nature will be completed more quickly and accurately through the use of a computer than it would be by a human being. However, there are projects which are actually impeded when a computer is applied to the job.

MISUSES OF A COMPUTER

Any task that is not done more than once, and any task which is subjective rather than objective would not benefit from the use of a computer.

A personal computer enthusiast, trying to justify the expense of a personal computer to his wife, often waxes eloquent on the ease a computer will bring to the kitchen. "You can keep all your recipes on computer" he'll explain. "So convenient."

"They're perfectly convenient in the recipe file, and I can prop an index card up on the back of the counter, which I couldn't do with a computer," she'll reply.

"But you could print out the recipe when you wanted to use it, and besides, what about converting the amounts of each ingredient--the computer will do that for you when you want to increase the recipe for a party."

"We never have parties," will be the retort. "Besides, if I have a recipe that calls for one egg for four servings and I want the dish to serve ten people, won't the computer just tell me to add two and a half eggs? Where does that get me?"

The woman will win the argument with three salient points. The purchase of a computer or the development of a software program to do a task that must be done only rarely is a waste of effort and money, since the time involved in amassing the equipment will frequently exceed the time involved in doing the task itself. Secondly, the portabilty and convenience of her present file system exceeds the portability and convenience the computer can give her. Finally, the act of cooking is a subjective experience; the proportions of ingredients depend upon one's personal taste, the freshness of the ingredients and so many factors that a computer's value in accurately estimating the proportions is almost null.

A computer should also not be used as a crutch or scapegoat. Your machine is a finely tuned instrument and will occasionally go out of tune. Be prepared: Back up your data, have alternate methods of dealing with emergencies, be patient when your computer needs repairs. Remember that A) you are accomplishing much more with the help of this tool than you ever could before and, B) that you only get out of a computer what you put into it. A computer only very rarely makes mistakes, a computer operator errs much more frequently.

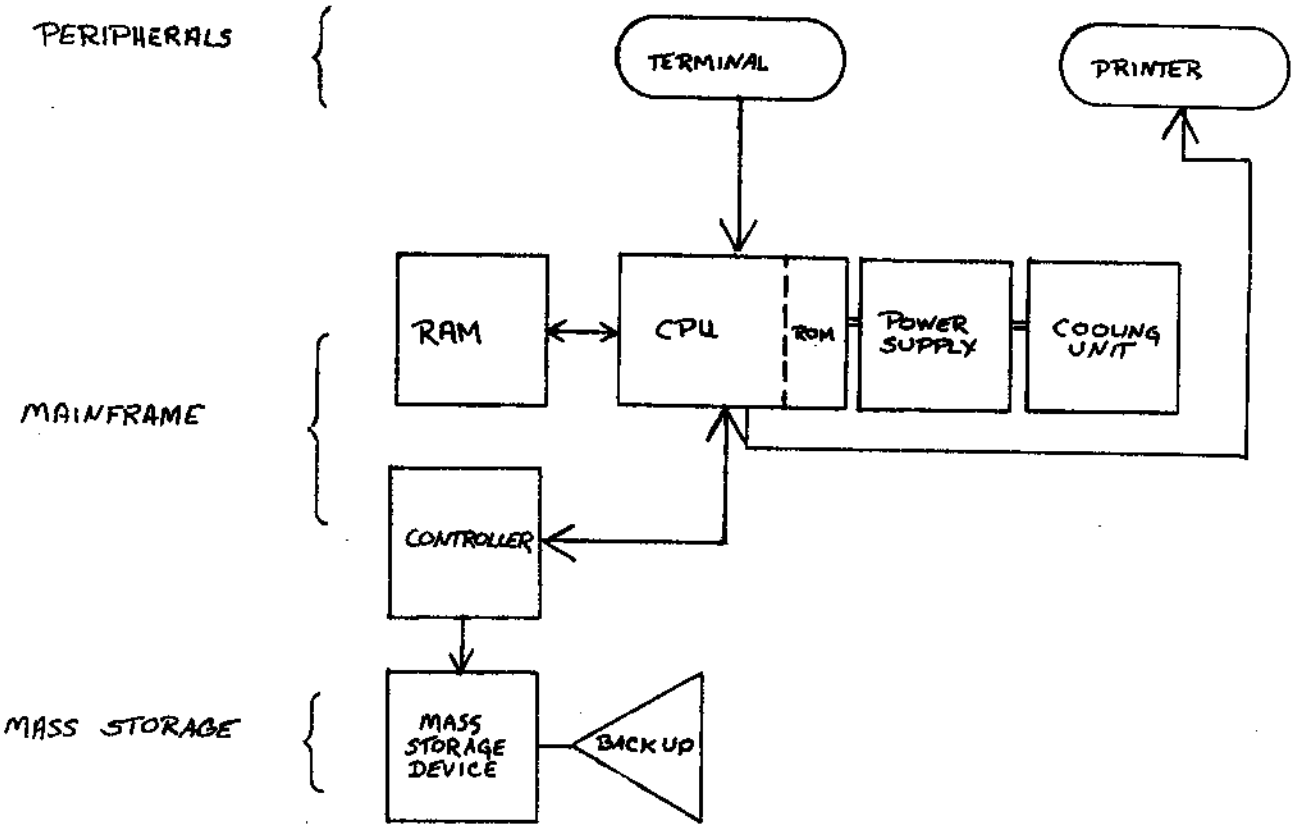
PHYSICAL DEFINITION

THE HARDWARE (Illustrated on page 4)

As we mentioned earlier, a computer is a machine that reads and writes from memory. The component that makes this possible is the CENTRAL PROCESSING UNIT (CPU). The CPU is the most active element in your system, directing and pacing the flow of information to and from various other parts of the system and participating in the functions of all parts of the system.

The information that the CPU handles is located in SYSTEM MEMORY, which can be designed in a number of way: READ ONLY MEMORY (ROM), PROGRAMMABLE READ ONLY MEMORY (PROM), which can be written to initially, and only read thereafter, ERASABLE PROGRAMMABLE READ ONLY MEMORY (EPROM), which can be erased and written to under special conditions, and RANDOM ACCESS MEMORY (RAM), which can be written to and read from at will.

BASIC COMPUTER HARDWARE



Information stored in ROM is the most easily accessible to the CPU, PROM and EPROM are less quickly accessible, while RAM is least accessible. The cost of system memory is directly correlated to the speed of access. The speed and expense of all memory is relative; however; RAM can be accessed by the CPU in a time span measured in nanoseconds (1/1,000,000,000 second), and can cost several hundred dollars for enough space to store a small file. Most computer systems, ours included, use ROM for a small portion of information (see software section) and RAM for the bulk of the information needed by the CPU.

If all the information in a computer was stored in ROM or RAM, the cost of the system would far outweigh any efficiency considerations, making the computer virtually unusable. Therefore, only the information currently in use by the CPU is stored in RAM. Other information is located in MASS STORAGE.

The most common types of mass storage in use today are FLOPPY DISK, HARD DISK, and MAGNETIC TAPE STORAGE. Floppy disks are small, inexpensive circles of magnetic material that can hold the equivalent of a filing cabinet of information. Hard disks are larger, inflexible units that can hold several libraries' worth of information. The size and capacity of magnetic tape is variable.

Each system of mass storage incorporates a mechanism to locate the required piece of information and make it available to the CPU. The ease and speed with which the information in mass storage is accessible is a function of the locating mechanism and the type of mass storage. Information stored on magnetic tape is least accessible because the tape must wind to the appropriate space in which the information is stored. Information on floppy disk is quickly available because of the size of the disk and the mechanism which rotates the disk. Hard disk storage is the optimal medium between the accessibility of information on floppy disk and the flexible capacity of tape.

The mechanical devices, called DRIVES, that wind the tape or revolve the disk, locate the information and make it available to the processor are extremely slow in comparison to the speed at which the CPU operates. When the CPU requires information that is located in mass storage, it is ready to process that information within nanoseconds. It may take several seconds, however, for the mechanical device that controls the storage unit to locate the information. Therefore, an intermediary between the mass storage device and the processor is needed: this intermediary is the CONTROLLER.

The controller is activated by the CPU whenever information from mass storage is needed. It in turn notifies the storage mechanism to locate the information, receives it from storage and notifies the CPU that the information is available for processing. Under such conditions the CPU is free to function on other tasks while the information is being retrieved, and the likelihood of the CPU picking up inaccurate information in its haste to process is eliminated.

Information can be transmitted from an outside source, such as a computer operator or another computer through the use of an INPUT DEVICE. A MODEM is a device that allows input from one electronic device to another.

A TERMINAL allows communication between a person and a computer. A computer terminal looks like a typewriter with a video screen attached, but the similarity between them ends with appearance. A COMPUTER TERMINAL IS NOT A TYPEWRITER. A computer terminal is more flexible than a typewriter, allowing you to correct mistakes, insert words, and change the locations of entire paragraphs before you send the information to memory. However, a missed or inaccurate stroke on a typewriter keyboard results in a misspelling on a sheet of paper; an error on a terminal, if transmitted to memory, can result in a command to the CPU that will seriously affect your data. The terminal is an integral part of the entire computer system, and must be treated with care and respect.

Occasionally it will be necessary for you to make the information in your computer available to people who do not have access to your system. Since it is inadvisable to carry your computer around with you in the trunk of your car or to entrust it to the United States Postal Service, a means of liberating the required data from the system is desirable. The most common method of doing so is through a printer. A printer takes information from the computer and prints it on paper. The paper can then be taken off the machine and carried around in a convenient briefcase or sent through the mail.

PERIPHERALS such as terminal and printers are hooked up to the central processing unit through COMMUNICATIONS or INTERFACE PORTS. These ports act as translators between the CPU ad the peripheral, making sure that the signals given out by the CPU are understandable to the peripheral and vise versa.

Since the computer is run by means of electricity, the smooth and even transmission of electrical power through the system is important. The POWER SUPPLY located in your computer takes the electrical impulses from your wall outlet and monitors their even transmission through the system. The COOLING UNIT in your system maintains a steady temperature inside the system for efficient operation.

In order of importance, the essential parts of your computer system are: The CPU, the system memory, the controller, mass storage, power supplies and cooling units, and input/output peripherals. The order in which these elements are likely to give you trouble is exactly the reverse; the more mechanical devices fail long before the electronic devices will.

THE SOFTWARE

You can think of your computer hardware as different parts of a mechanical brain and of the software as the processes that utlilize the physical elements. Just as there are several layers of human intelligence, there are layers--intelligence levels--of software in your computer system. These levels are identified as the system monitor, the operating system, the high level language

and the application package.

The most elementary level of software is the SYSTEM MONITOR. Like the subconscious portion of your intelligence that is constantly monitoring your physical condition and surroundings, the computer's system monitor, located in ROM, surveys the different elements of the system and verifies that everything is in working order. It also serves as a link between the hardware and the next layer of software: the operating system.

Just as common experience allows people to communicate with one another by giving them a universal method of understanding, the OPERATING SYSTEM establishes standardized protocols of operation for computer systems. Having a common means of operation enables your system to operate with software that has been developed on other computers. U. S. Micro Sales supplies CP/M, operating systems for use with its computers. These systems, developed by Digital Research in Pacific Grove CA, are in common use; most application packages are accessible to these operating systems.

The next layer of intelligence is the HIGH LEVEL LANGUAGE, which utilizes the methods of operation set up by the operating system to form a direct method of communication between the computer and the user. It applies definition and language to the processes of the computer system. When the operator communicates to a computer in high level language, he or she can direct the processes of the system.

The translation between computer language and English, French, or another human language occurs in the APPLICATION PACKAGE. The application package contains instructions to the computer that will enable it to complete a specific task and guides the user through his part in transferring information to the system.

SYSTEM STRUCTURE

At U. S. Micro Sales we use different combinations of hardware and software to configure a system that will meet the specific needs of the user without waste or limitation.

A SINGLE-USER SYSTEM generally consists of one CPU, two to four K(kilobytes) of ROM that contain a system monitor, 64K RAM for system memory, two to four interface ports enabling you to connect peripherals to your system, and a CP/M operating system.

The mass storage requirements of a single-user system are usually met through the use of floppy disks. While these elements suffice for the needs of the average user, systems frequently provide extra space to accommodate additional memory and interface capability.

Since U. S. Micro Sales' CPU can process the commands of a single-user with time left over, it is possible for more than one operator to utilize a single CPU. In a MULTI-USER SYSTEM, several input terminals share the processing time of the CPU, system memory, mass storage, and any peripherals available.

Sharing is made possible through the use of an MP/M operating system, which divides the system memory and processing time between work stations. In order to make the distribution as efficient as possible, a multi-user system is broken into divisions of ports, users, and tasks. There may be four ports of entry on the computer system, meaning there are four terminals hooked up to the system. Although only four people can operate with the system at any given time, there may be sixteen users who maintain files on the system. When an operator sits down at a terminal, he or she will gain access to a specific file by asking for it by user number. For example, a company's purchasing records may be filed under user number 12. A user can sit down at any terminal and ask for the user 12 files when he needs information from the purchasing records.

In a common multi-user system the number of tasks that can be performed by the computer at any given time corresponds to the divisions of memory (memory banks) in use at the time. If a printer is printing a file while an operator is entering another file, the computer is processing two tasks.

Under certain conditions a standard multi-user system is not sufficient to meet the needs of the users. Some application packages, for example, take up more than a reasonable share of CPU time. Unequal CPU requirements slow down the processor in its round from task to task; and short processes may be lengthened by waiting for the CPU. Occasionally, too, it may be efficient for the system to be multi-tasking--not to share processing time but to process tasks simultaneously. In such environments a NETWORK system is suitable.

A networking system differs from standard multi-user configuration in that each work station has its own processor, system memory, and interface ports. These individual computer systems work independently of one another but are linked to a central station (host) so that, although each station may have its own files and storage capacity, they may share data and expensive options such as printers and mass storage devices. These communication links are made through both hardware (cables) and software.

A primary benefit of a networked system of hardware and software is the fact that an existing system can be expanded to include more work stations or peripheral devices without major revisions to either current hardware or software. The computer system is as flexible as possible.

USING YOUR COMPUTER

Before you even take the computer out of the packing material, look over the manual provided for your system. The manual will instruct you in setting up your system for operation. Make sure that the trip from our plant to yours did not jar loose any connections in the system. TURN ON THE COMPUTER.

Once power is supplied to all parts of your computer system, your system monitor will immediately begin diagnostic checks of the computer system. Your terminal will display the sign on message and the symbol F800, which indicates that your system

memory is in good order. Any message other than F800 indicates that a memory error has occured.

Your next contribution to the successful operation of your computer is to insert the disk containing the system into the drive. On your system disk are the instructions necessary for your computer to function.

The disk's label should be on the right hand side of the disk as it enters the drive when using Tandon drives, to the left hand side of the disk as it enters the drive when using other drives, and facing up when using mini drives. The notches in the disk always go to the back.

When using 8" disks you must use a write protect tab in order to write information onto the disk. When using 5" mini disks the reverse is true. You must remove the write protect tab in order to write onto the disk. Close the drive enclosure latch. Press the RETURN (or NEW LINE) key on your terminal.

Press down and hold the CONTROL key on the terminal and strike the letter C in order to bring up (boot) the operating system from the floppy disk. If you wish to boot the operating system from a location other than the floppy disk, a prompt other than CONTROL C is necessary; consult the operating manual for that location.

Watch the video screen for messages from the operating system. If an error message is displayed on the screen, your system is not ready for operation; STOP. It may simply be that you inserted the disk in backwards. Correct the problem and retype CONTROL C (or whatever brings up your particular medium).

When the operating system is in good working order, you will receive a prompt message, meaning "go ahead". Consult the manual for your particular operating system to determine the correct prompt and further instructions.

USAGE CONSIDERATIONS

Since you have invested a considerable amount of time and money in this computer system, you will want to protect that investment from inadvertent depreciation. The most effective way to do this is by ensuring that your data is not forever destroyed by an interruption in power or through an inconsiderate user on a multi-user system resetting the central system. There are obviously a limited number of ways in which you can prevent city wide blackouts or discourtesy; we suggest you BACK UP YOUR DATA i.e., make copies of your computer files.

When and how should you back up your files? It depends upon your circumstances and the value of your data: in general, you should make a copy of your file whenever it would take longer to recreate the file than to back it up or whenever the monetary value of your information (either intrinsic or in time spent) reaches or is increased by $100 or more. If your environment is such that you are likely to be interruped often, however, you may wish to back you data more frequently.

There are two basic methods of backing up data, the streaming file and the file managed methods. In a streaming file backup, all the information in any given system is automatically copied at a scheduled time. The file managed method gives each user the resonsibility of making back up copies of his or her own data. Each has its advantages and disadvantages; your choice will depend on your requirements.

We have attempted to give you some brief tips on the most effective use of your computer system, but true proficiency will come with careful study of your manual and "hands on" experience with your system. So, go to it, admire the efficiency of your system and enjoy the freedom computerization gives you.

GLOSSARY

Application Package: A unit of software that instructs the computer in the processes needed for a particular task.

Central Processing Unit(CPU): The element of the computer system that processes information between the other system components.

Communication Port: See interface port.

Controller: The component which mediates between the CPU and the mass storage device.

Cooling Unit: A device, usually a fan, which maintains a steady temperature inside the computer.

Drives: Mechanical devices that locate information in mass storage units.

EPROM: Eraseable Programmable Read Only Memory.

Floppy Disk: An inexpensive type of mass storage.

Hard Disk: A type of mass storage that has great capacity.

High Level Language: A method of communication between the user and the computer system.

Host: The central work station or main system of a multi-user computer system.

Input: As a verb, the act of transmitting information to the computer system; as a noun, the information placed in the computer system.

Input Device: The component of the system used for transmitting information to the computer.

Interface Ports: The elements of a system which allow the user to attach peripheral devices to the system.

Kilobyte: A unit of measurement (1000 bytes) for computer memory.

Magnetic Tape: A type of mass storage.

Mass Storage: A method, or device, for storing large amounts of information in a system.

Memory Bank: In a multi-user system, the part of system memory reserved for a specific user.

Modem: An input device for transmitting information from one electronic or mechanical device to another.

Nanosecond: A unit of time measurement: 1/1,000,000,000 second.

Operating System: A software subsystem.

Output: As a verb, the act of transmitting information from the computer system to a peripheral; as a noun, the information extracted from the computer.

Output Device: The component of the system that receives the information from the computer.

Peripheral: Element of the computer system that is not specifically necessary to the operation of the CPU.

Power Supply: Device which transmits electrical power to the computer system.

Preinstalled Intelligence: A set of instructions for the completion of a task that is filed in the computer's memory.

PROM: Programmable Read Only Memory

RAM: Random Access Memory

ROM Read Only Memory

System Monitor: The most basic software subsystem.

Terminal: See Input Device.

CHAPTER TWO

INSPECTION

UNPACKING

We have shipped your S100-4 in a special carton with what, we feel, is adequate foam packing surrounding all 4 sides. If after you receive your computer you should note any physical damage to the carton or any internal damage to the computer itself please notify the carrier, as US MICRO SALES is not responsible for shipping damage. In the case of United Parcel Service, you may call the local UPS office to file a damage claim. UPS will send a representative to survey the damage. UPS will then settle the claim. Please save the carton and all packing materials in case you ever need to return the computer.

INSPECTION

You may inspect the insides of the computer by laying it down on either side and removing the six screws on the bottom which hold the case to the main frame. Gently spread the sides of the cover and slip it off the base plate. You may now inspect for any internal shipping damage, or loose cables or boards that may have jarred loose in shipping.

DISKETTES

SOFT SECTORED IDENTIFICATION

SINGLE SIDED

The S100-4 uses standard 8 in. SOFT SECTORED diskettes. If diskettes are not labeled to tell you what type it is the following will help you indentify them.

The small hole near the center is an access hole for drive read electronics it is located at 1 O'clock on the disk (single sided disks). If the diskette is rotated in the jacket by gently grasping the film between two fingers and turning 360 degrees a smaller hole can be seen on the diskette. If there are many small holes, you have a HARD sectored diskette and it WILL NOT OPERATE with the S100-4.

DOUBLE SIDED

The second type of diskette is double sided. If you have a double sided system you must have a double sided diskette in order to read and write to both sides. A single sided diskette will work but only one side will be utilized.

The access hole will be at approximately 2 O'clock, (down to the right more with the label facing you). A single sided drive cannot read a double sided diskette since data is store alternately on the sides. One side is not filled and then the other.

DISK DRIVE

Your drives have been shipped with internal cardboard head protectors, you must remove these inserts before applying power. If your drives are made by Tandon, (slim line with the closing lever at the top) the disks are to be inserted with the labels facing to the right and the notches to the back. This is different from other models used in XOR systems in the past. If your drives are made by Mitsubishi, the disks are inserted with the labels to the left.

If your S100-4 has the Mini 5 in drives, A drive is on top, and the disks are inserted with the labels up. All other functions are the same as 8 in.

DRIVE NOTES (DISK CAPACITY WITH DIFFERENT FORMATS USING "DFOCO" TO FORMAT DISKS)

STANDARD 8" DRIVES

FORMAT B:
Standard 3740 IBM single density/single side 128 bytes 26 sectors per track.
Capacity is 241K.

DFORMAT B:
128 bytes per sector 51 sectors per track, double density, single sided.
Capacity is 474K.

DFORMAT B: SIZE 512
512 bytes per sector 16 sectors per track, double density, single sided.
Capacity is 596K.

DFORMAT B: SIZE 512 DBL
512 bytes per sector 16 sectors per track, double density, double sided.
Capacity is 1212K

MINI DRIVES

DFORMAT C: MINI 48

128 bytes per sector, 30 sectors per track, double density, single sided.
Capacity is 169K.

DFORMAT C: MINI 48 SIZE 512

512 bytes per sector, 10 sectors per track, double density, single sided.
Capacity is 181K.

DFORMAT C: MINI 48 SIZE 512 DBL

512 bytes per sector, 10 sectors per track, double density, double sided.
Capacity is 362K.

DFORMAT C: MINI 96 SIZE 512

512 bytes per sector, 10 sectors per track, double density, single sided.
Capacity is 366K.

DFORMAT C: MINI 96 SIZE 512 DBL

512 bytes per sector, 10 sectors per track, double density, double sided.
Capacity is 750K.

TERMINAL

The CPU is shipped with the "B" terminal port set to 9600 baud. You must remove the cover of your system in order to change the baud rate unless you have software to do it, or your terminal has the capability to set different baud rates. See your terminal manual for this information. The baud rate for this port is the lower 4 switches of the 8 position dip switch located in the lower right corner of the CPU board, (switches 5,6,7,and 8.) Note, for 9600 SW 5 is on 6,7,8, are off. The CPU will support operation at 19,200 baud, if your terminal will, you may set the CPU to 19200 by setting all 4 switches to the off or left position. (See the section on baud rates for complete selection.)

The terminal is connected to the "B" port, which is the lower of the two serial ports on the back of the computer. For most terminals The only pins that need to be connected in the terminal cable are 2, 3, and 7. If you have a standard RS-232 cable with pins 1-8 and 20 connected you may have to disconnect pins. We have noticed some difficulty with different terminals when more than 2,3,and 7 are used.

INITIAL POWER ON

The on/off switch is located at the rear of the computer on the right hand side. Upon initial power on, a sign on message should appear on the terminal screen and a HEX number should appear, F800, this denotes that all power on and memory checks are functioning normally. If any other number appears, please refer to CHAPTER 5, for trouble shooting procedures. At this time you may also perform some monitor routines to verify the operation of the monitor. The drive light on "A" will light up (the drive on the left) and the drive motor will start up. If you are not familiar with computers and do not understand the section MONITOR COMMANDS you may skip it at this time.

MONITOR COMMANDS

DUMP

D (DUMP) - The dump command will accept 4 hex bytes, jump to the next field, accept 4 more hex bytes and then display all of the memory locations between those two addresses. If you should wish to enter the numbers without leading zeros, you may do so by hitting a carriage return. For example, you could dump location 2 to location 8 in the computer by typing D2<cr> followed by 8<cr>.

LOAD

L (LOAD) - The load command will accept one 4 byte address and then display the contents of that memory location on the screen. The prompt character will allow you to replace what is in that location of memory with the data that you type onto the screen. If you merely want to look at system memory, you can enter a carriage return or a series of carriage returns. The memory locations will not be modified, but will only be displayed on the screen in sequential manner.

FILL

F (FILL) - The "FILL" command accepts a 4 byte (starting) address, moves to the next field, accepts a second 4 byte (ending) address, moves to the next field and accepts a 2 byte set of data. At this point, the "FILL" command will automatically be executed, filling all system memory between the starting address and the ending address with the data character set.

MOVE

M (MOVE) - The "MOVE" command operates in the same manner as the "FILL" command with the exception that the 4 byte addresses are, respectively, the address of the source data and the address of the memory location to which the source data is to be moved. The 2 bytes which are entered next indicate the size (number of bytes in hex) of the block of memory to be moved.

VIEW

V (VIEW) - The "VIEW" command upon receiving a 4 byte starting memory location will display sixteen lines of ASCII data (640 bytes) on the CRT screen. Typing carriage returns following the initial display causes the next sequential 640 byte blocks to appear.

G (GO)

G (GO) Enter destination address.

H (HEX)

H (HEX) Hex String Locate, enter starting address, ending address string to locate.

X (EXAMINE)

X (EXAMINE BANK) For selecting a certain bank to write to in multi user systems.

DISK DRIVE BOOT UP

FLOPPY SYSTEMS

Insert system disk "A" in drive A, the drive on the left, with the label facing to the right if Tandon drive, to the left if Mitsubishi, close the door, reset and type a control "C", (when typing a "control C" the control key and the C key must both be held down). The system should boot up to an A>. At this time type "D" the screen should display a directory of the utilities on disk "A".

Insert disk "B" in drive B and type a "B:", then "D" a directory of disk B should display on the screen. If either disk does not boot or display these preliminary directories, please try the following: Reset the computer, open the door and type a control C. You should hear the drive trying to load the head 5 times, and then the error message "drive not ready" should appear on your terminal screen, this denotes that the drive would probably load if the door were closed. Close the door and try to boot, if the error message "no system" comes on the screen this means that there is no valid system on the system tracks and your computer will not boot.

Other errors that may appear are "10" which means read ID not found, check your disk format or try to validate the disk, it may not be compatible with the system or be a defective disk. 08, which is not a fatal error, and denotes not enough time to load the head, try to reboot. CRC not found generally means a totally bad disk. For further trouble shooting refer to Chapter Four. If your S100-4 has 5 1/4 in mini drives they will be booted up in the same manner, except that the label is face up. Drive A is normally the upper drive.

HARD DISK SYSTEMS

When using a hard disk system you boot with a Control "A" "B" or "C" to boot from the hard disk, (depending on the size of your system), or a control "F" to boot from the floppy that is part of the hard disk system.

DISK UTILITIES

The "A" disk contains 32 utility programs, the programs on this disk are the tools and utilities of CP/M (e.g. PIP, DDT, ED, ASM, SUBMIT). The 42 programs on the "B" disk are the subroutines, assembly files, and the equate tables with which the operating systems is generated and/or modified. Also contained on the "B" disk are the Help files, a useful program for the first time computer user. A more detailed description of the files on the disks can be found in this manual under "EXPLANATION OF DISK FILES". Please note that if you plan to be doing any custom modification of the BIOS, you will require a MACRO assembler, since our BIOS has been assembled with MACRO.COM. There are MACRO assemblers available from a number of sources.

DFOCO.COM

FORMATTING WITH DFOCO

The program Dfoco is the XOR fast copy, validate, and formatting program. Any command you wish to function double density must be preceded by a "D", ie, dformat, dcopy, dvalidate. The default is to single density IBM 128 format. There is a set of instructions on the screen after you type dfoco. The most common use of DFOCO is for formatting new disks. We will review that command line here.

NOTE: MAKE SURE THAT YOU PUT A COLON ":" AFTER THE DRIVE NAME EXACTLY AS THE EXAMPLES BELOW INDICATE OR YOU WILL FORMAT YOUR MASTER DISK IN "A" DRIVE AND ERASE ALL FILES ON THE DISK, OR YOU WILL GET AN ERROR MESSAGE OR ? FROM CP/M IF INSTRUCTIONS ARE NOT FOLLOWED EXACTLY IN DCOPY OR DVALID.

As an extra precaution while formatting a disk it is wise to remove your original disk from A drive after giving the formatting command line below. The program is loaded into memory so there is no need for the original disk to be in the drive.

Type DFORM B: SIZE 512. This will format the disk in drive "B" 512 byte sectors, single sided, double density.
DFORM B: SIZE 512 DBL will format "B" double sided.

COPYING WITH DFOCO

Dcopy is the copy program, and will copy track-for-track "A" to "B", including the system. To make a copy of "A" to "B",

Type DCOPY A: TO B: SIZE 512 for single sided disks
DCOPY A: TO B: SIZE 512 DBL, for double sided copy.

This will copy all information from "A" to "B".

For mini drives the format command line might be

DFORM B: SIZE 512 MINI48, OR DFORM B: SIZE 512 MINI96
or
DFORM B: SIZE 512 MINI96 DBL for double sided.

If you get the error message "FORMATTING ERROR DRIVE B", check to see if your disk is write protected, inserted incorrectly, or the wrong type of disk.

VALIDATING WITH DFOCO

This portion of DFOCO checks to see that the recording surface of a disk is completely intact before using the disk. Validating a disk consists of reading each sector on a disk and verifying that the crc is correct.

The command lines follow the same format as the lines used in copy and format.

CHAPTER THREE

GENERAL OPERATING PROCEDURES

S100 POWER SUPPLY

The S100 power supply consists of a power transformer, two bridge rectifiers, one 52,000 ufd capacitor and two 10,000 ufd capacitors. The specifictions of the bus voltages are plus 11 volts, plus 16, minus 16. The power is supplied to the bus via black, red, white, and yellow wires, please refer to internal view for wire locations. The bus sub assembly AC is connected to the main AC at connector located the right rear of the bus sub assembly, refer to diagram for voltage check point.

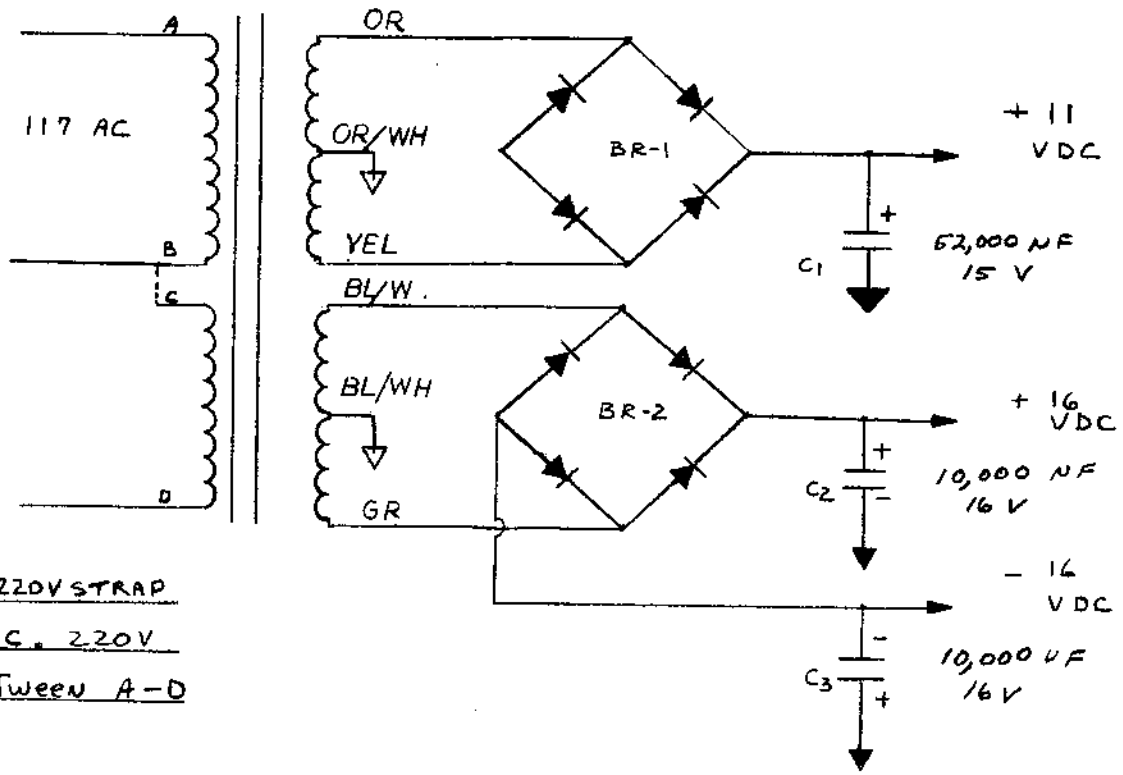
S-100-4

PARTS LIST BUS SUPPLY

T-1	TRANSFORMER	I-8000-35
BR-1,BR-2	DIODE BRIDGE	I-3001-06
C-1	CAP LYTIC 52,000 ufd 15V	I-3001-42
C-2,C-3	CAP LYTIC 10,000 ufd 16V	I-3001-10
PCB	PRINTED BOARD	I-3001-31

10-1088-B

T-1



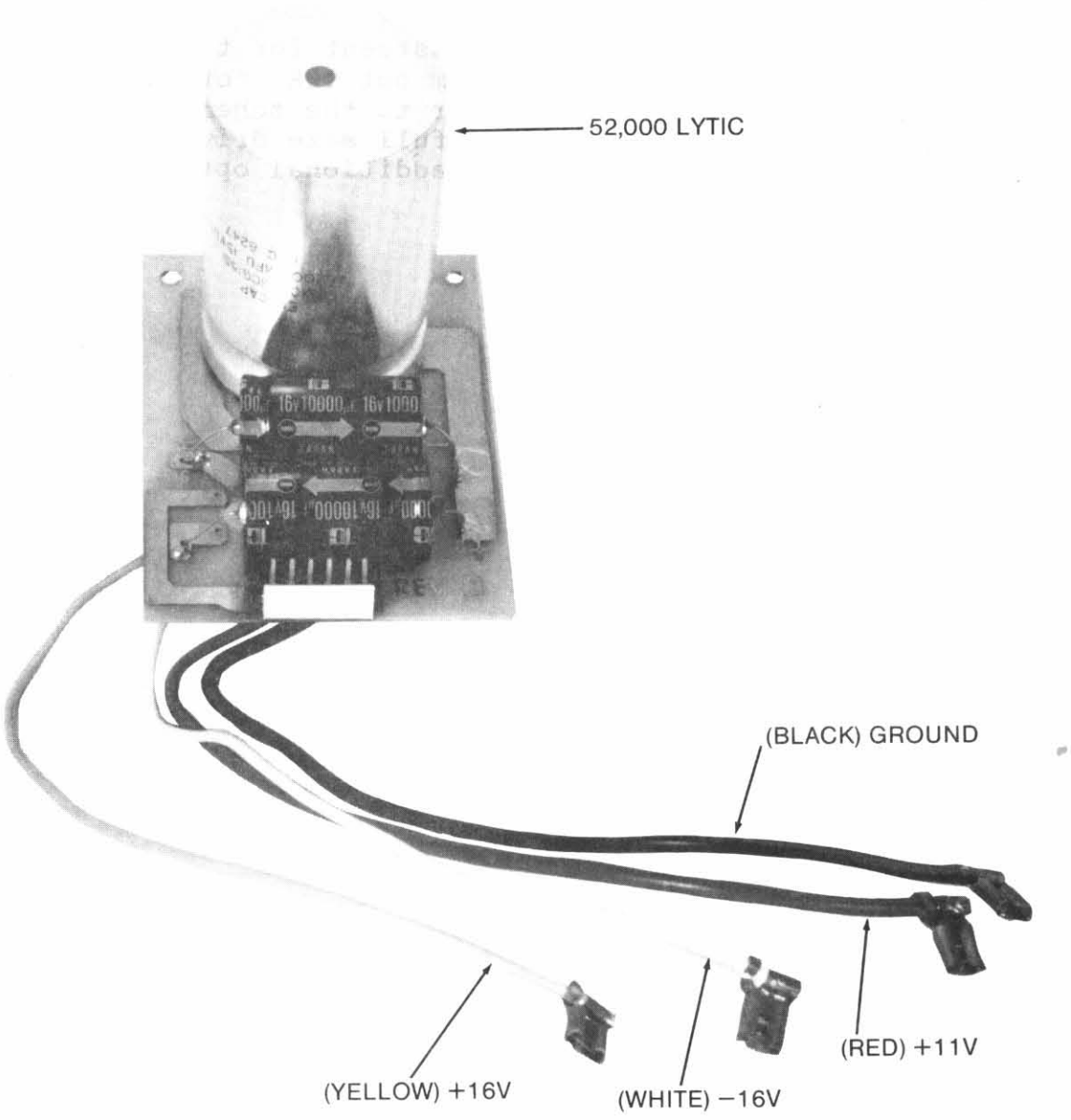
FOR 220V STRAP

B-C. 220V

BETWEEN A-D

SCALE:	APPROVED BY:	DRAWN BY PWS
DATE: 2/25/83		REVISED
S-100-4 BUS SUPPLY		DRAWING NUMBER

11X17 PRINTED ON NO. 1000H-10 CLEARPRINT FADE-OUT



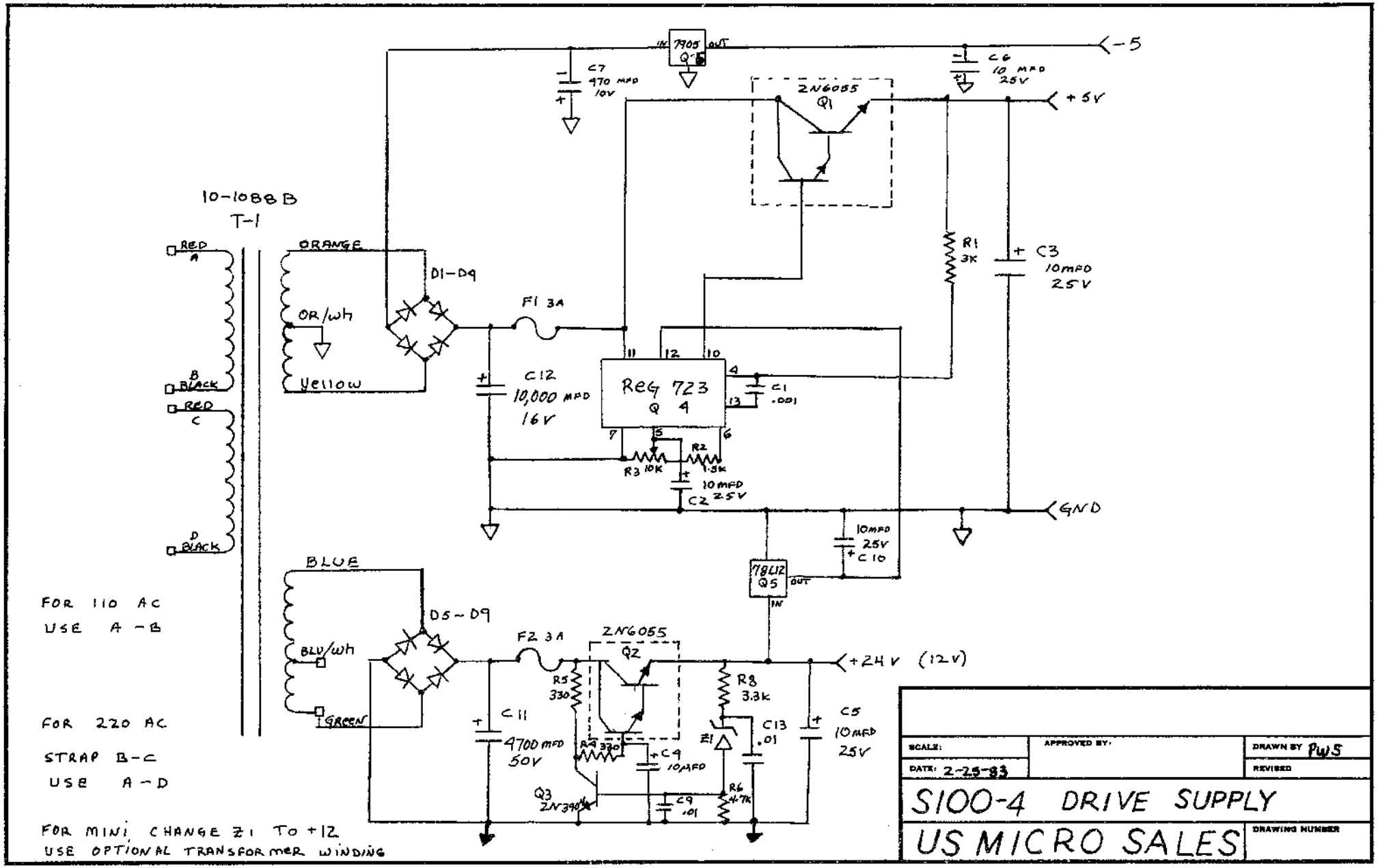
S-100-4 BUS POWER SUPPLY

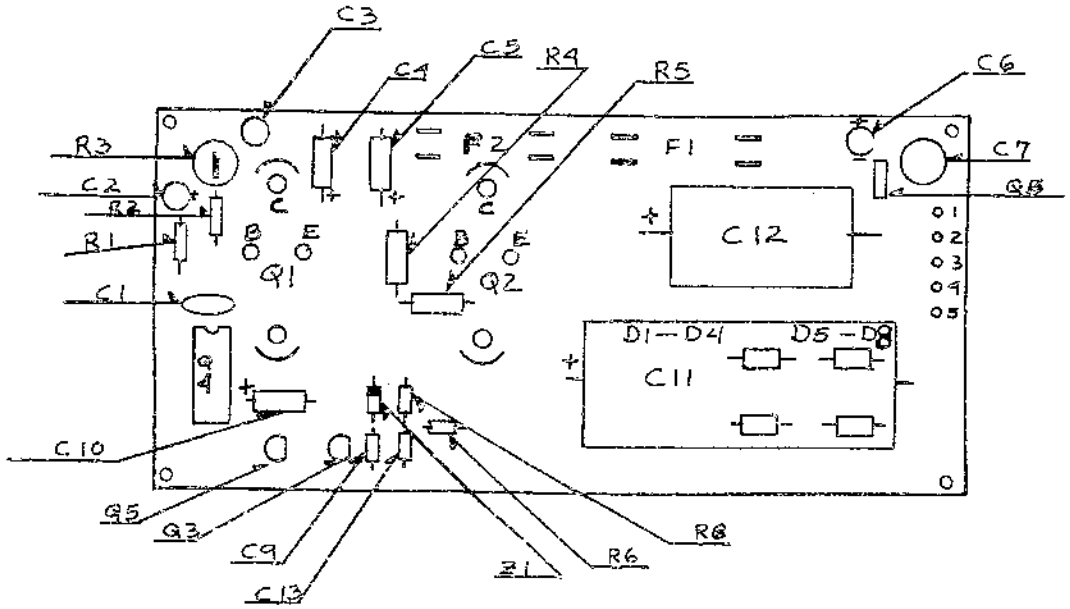
DRIVE POWER SUPPLY

Drive power is supplied by the circuit board mounted on the back panel, refer to the internal view. The power supply supplies plus 24 at 4 amps, and plus 5 at 3 amps. There is also an optional minus 5 at one amp, which is not required for the Tandon slim line drives.

If your S1ØØ-4 has the MINI drive option, the power supply will be jumpered to provide plus 12 volts at 4 amps, for the Mini drives. There will also be a different drive DC cable for the Minis.

The drive supply has an adjustment for the plus 5 volts in the upper left corner, note trim pot 1ØK for adjustment. For detailed trouble shooting, refer to the schematic. Your S1ØØ-4 can be operated with one 8 in. full size drive such as Shugart 8Ø1, 851, or Qume DT-8, with the additional optional AC harness.


10-1088 B
T-1
RED A
BLACK B
RED C
BLACK D
ORANGE
OR/wh
Yellow
D1-D9
F1 3A
C12
10,000 MFD
16V
Reg 723
Q 4
C1
.001
R3 10K
R2
1.5K
C2
10 MFD
25V
R1
3K
C3
10MFD
25V
C7
470 MFD
10V
7905
Q6
2N6055
Q1
C6
10 MFD
25V
+5V
-5
GND
10MFD
25V
C10
78L12
Q5
BLUE
BLU/wh
GREEN
D5-D9
F2 3A
2N6055
Q2
+24V (12V)
R5
330
R9 330
C9
10MFD
C11
4700 MFD
50V
Q3
2N3904
C9
.01
R6
4.7K
R8
3.3K
Z1
C13
.01
C5
10MFD
25V
FOR 110 AC
USE A-B
FOR 220 AC
STRAP B-C
USE A-D
FOR MINI CHANGE Z1 TO +12
USE OPTIONAL TRANSFORMER WINDING
SCALE:
APPROVED BY:
DRAWN BY PWS
DATE: 2-25-83
REVISED
S100-4 DRIVE SUPPLY
US MICRO SALES
DRAWING NUMBER

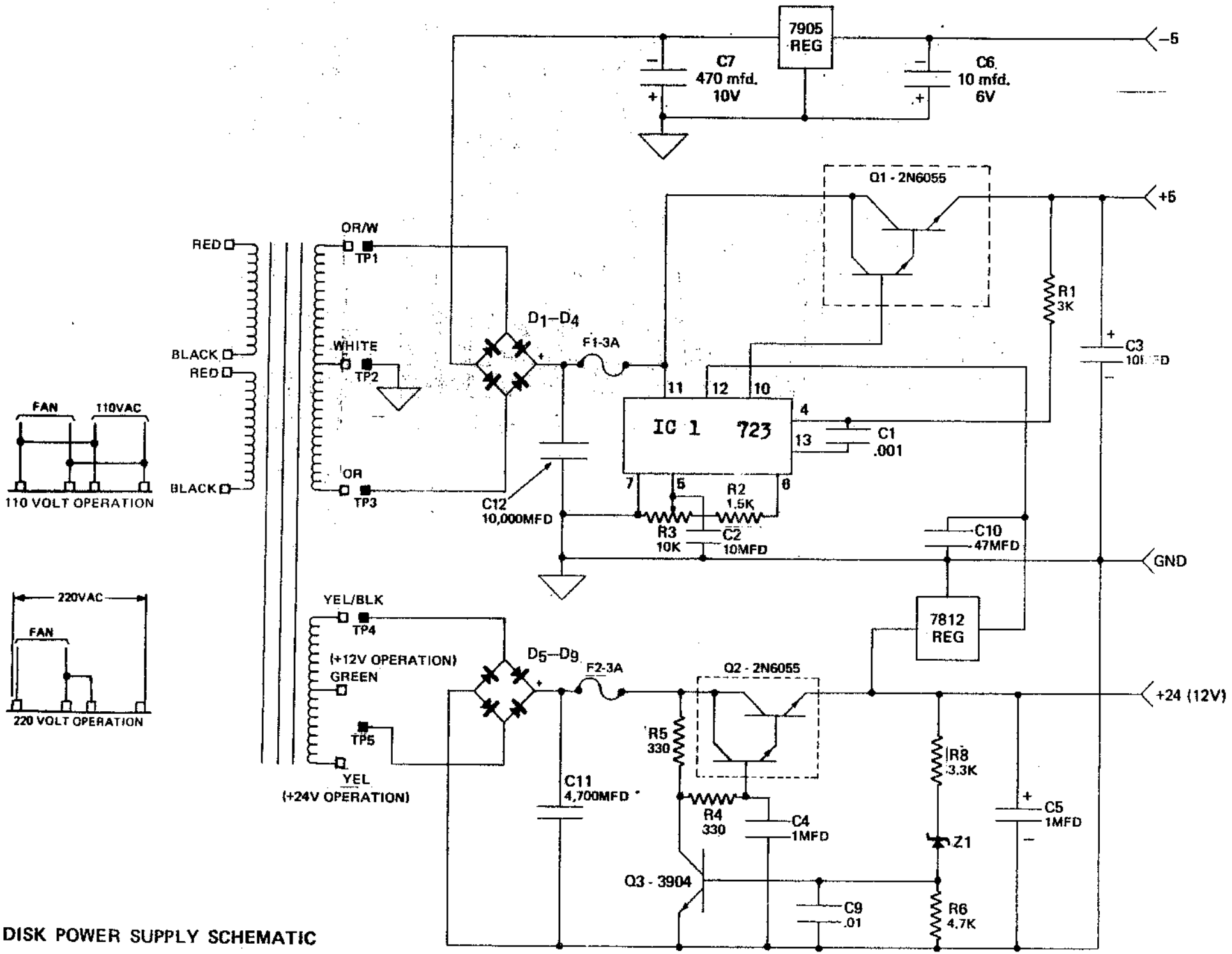


SCALE: 1 : 1	APPROVED BY:	DRAWN BY: PWS
DATE: 2-24-83		REVISED

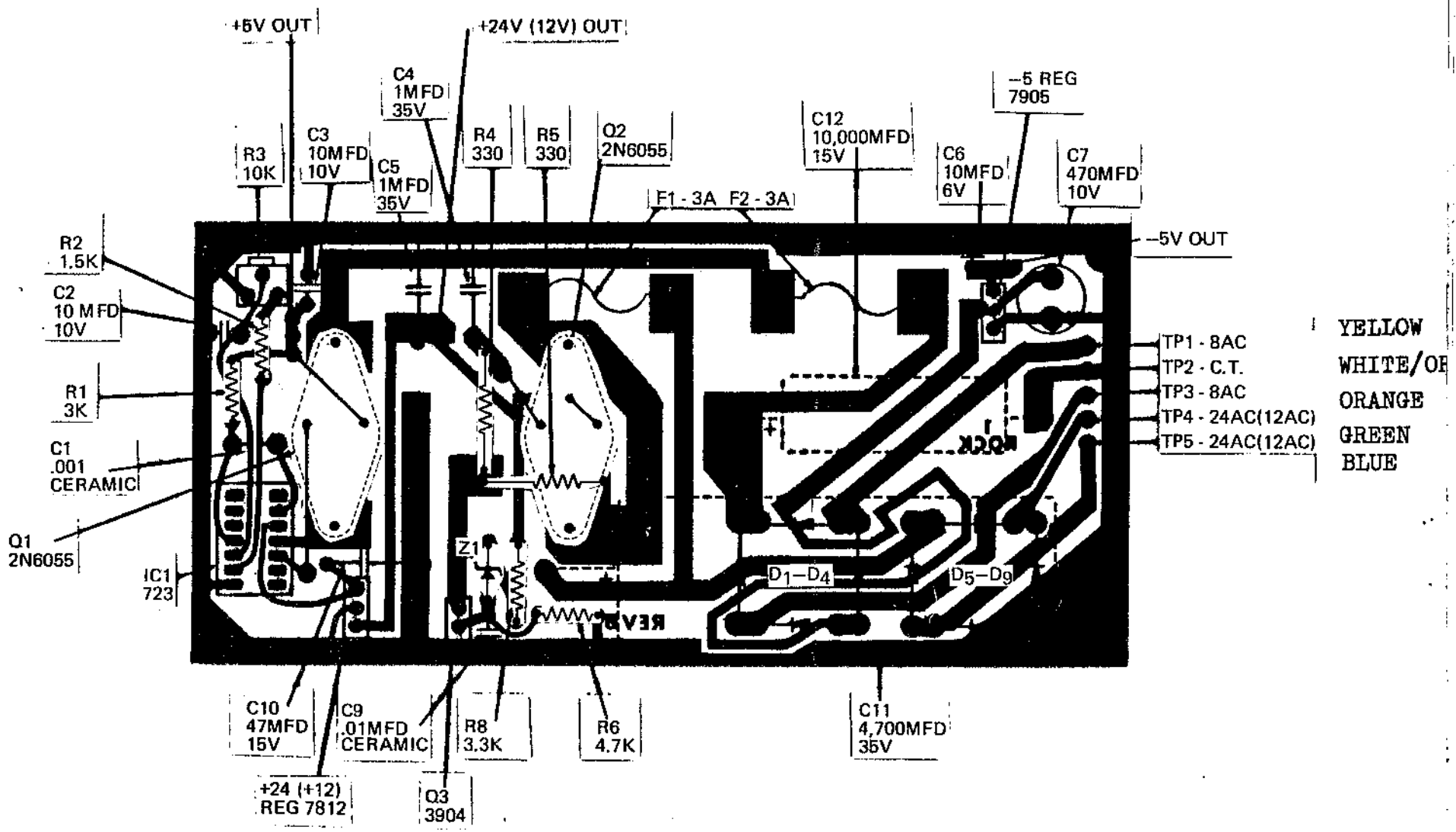
DRIVESUPPLY PARTS LAYOUT

US MICRO SALES

DRAWING NUMBER



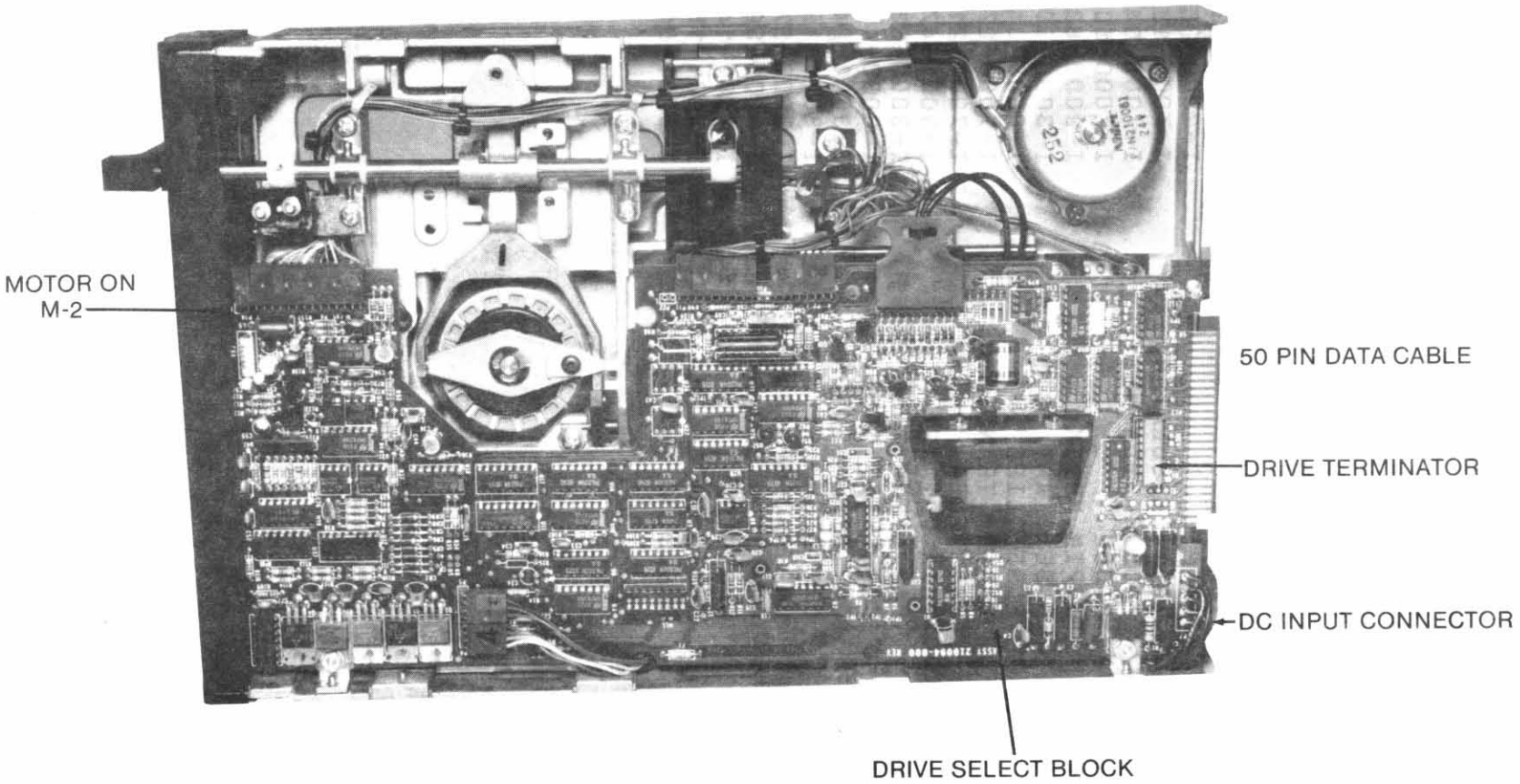
DISK POWER SUPPLY SCHEMATIC



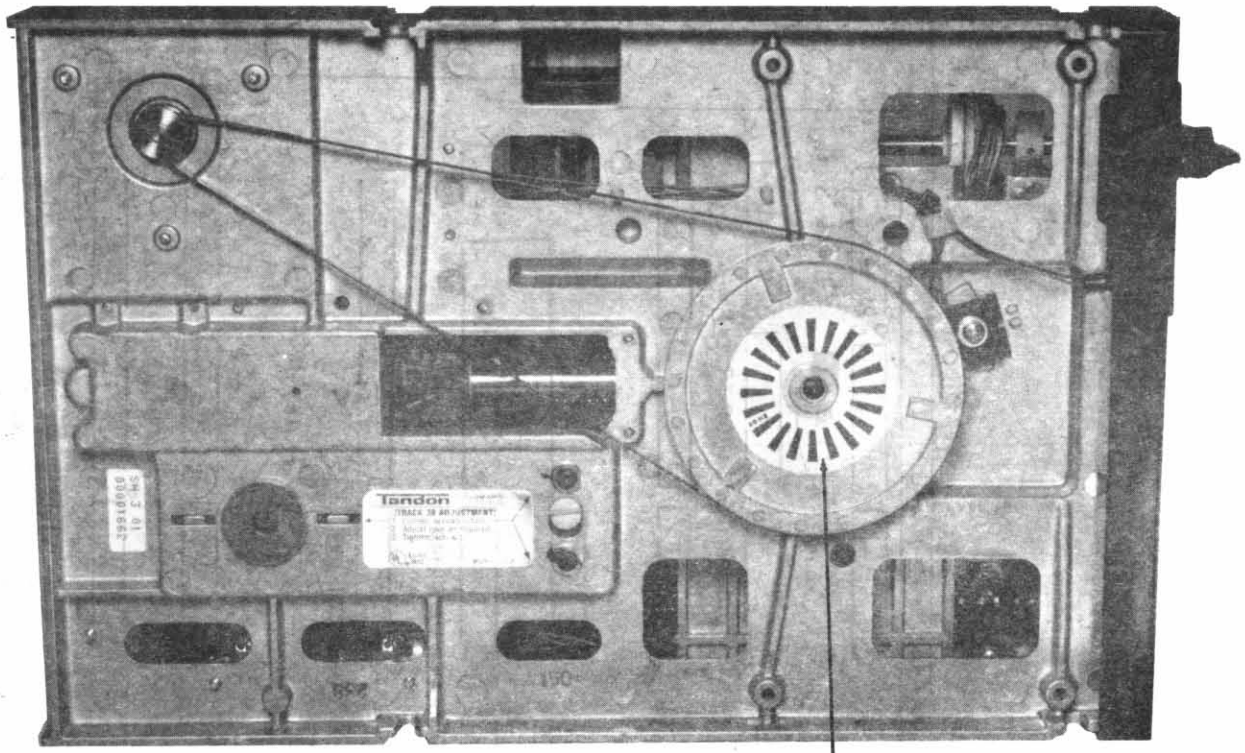
DISK POWER SUPPLY PICTORIAL

PARTS LIST

LOCATION	DESCRIPTION	PART NO.
T1	TRANSFORMER	I-8000-35
PCB	P/C BOARD	I-3000-32
Q1,Q2	2N6055 TRANSISTOR(2)	I-7000-35
C12	CAP LYTIC 10,000 UFD 16V	I-3001-10
C11	CAP LYTIC 4,700 UFD 50V	I-3001-03
Q4	IC 723	I-7400-03
SOCKET	14 PIN	I-2000-05
Q5	78L12 REGULATOR	I-7000-13
Q6	7905 REGULATOR	I-7000-04
D1-D4,D5-D8	DIODE	I-7000-50
CONNECTOR	5 PIN MOLEX	I-2000-83
F1,F2	FUSE 3 AMP (2)	I-3000-80
	FUSE CLIPS (4)	I-0000-04
Q3	2N3904 TRANSISTOR	I-7000-27
Z1	24V ZENER	I-7000-21
R3	TRIM POT 10K	I-3001-47
C2,C3,C6	CAP LYTIC 10MF 25V R	I-3000-63
C4,C5,C10	CAP LYTIC 10UF 25V A	I-3000-41
C1	CAP DISK .001UF	I-3001-24
C9,C13	CAP DISK .01	I-3001-19
C7	CAP 470 MF 10V R	I-3000-87
R4,R5	RESISTOR 330 OHM 1 WATT	I-3001-29
R2	RESISTOR 1.4K OHM 1/4 W	I-3001-14
R1,R8	RESISTOR 3K OHM	I-3001-15
R6	RESISTOR 4.7	I-3001-01

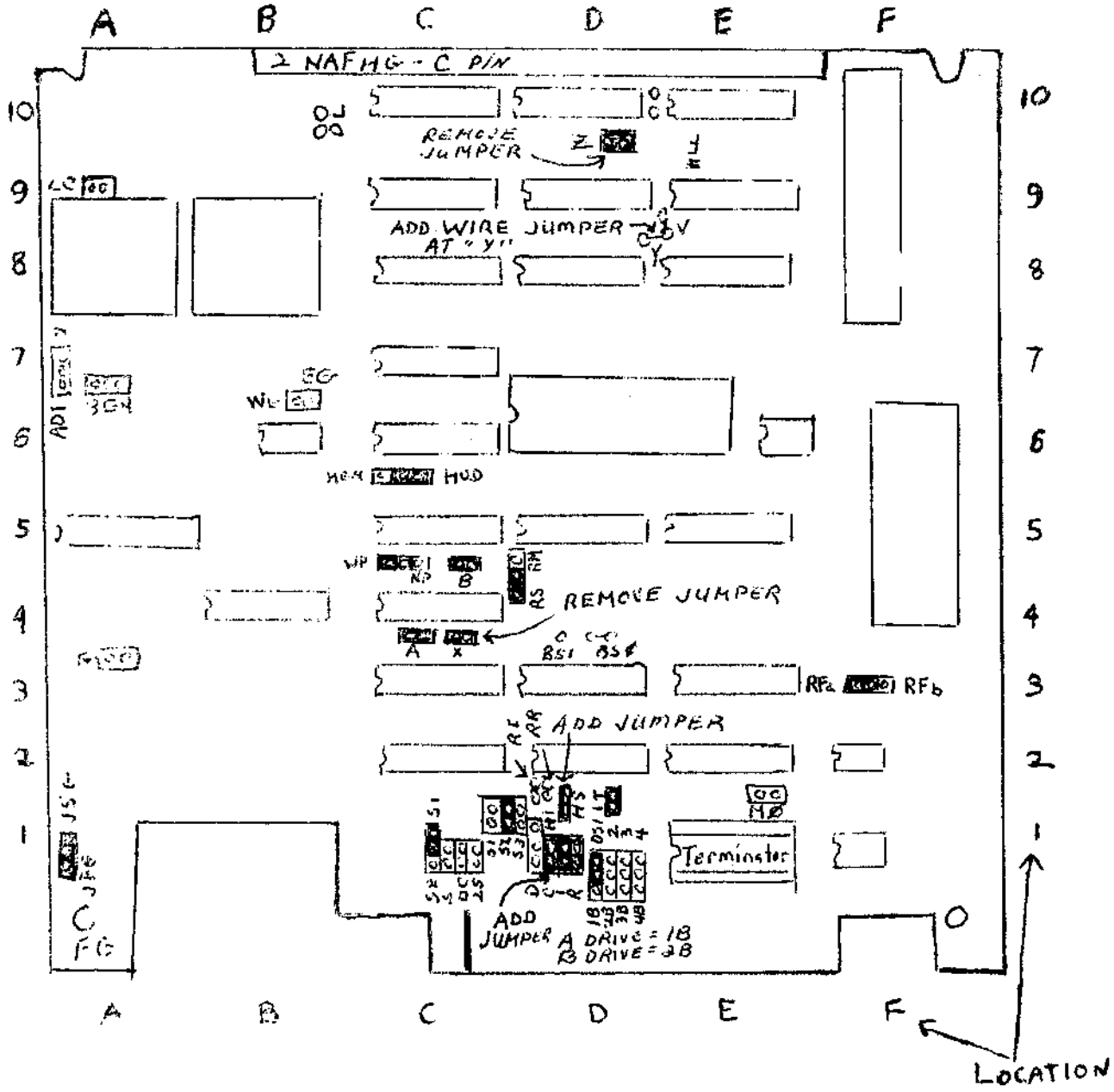


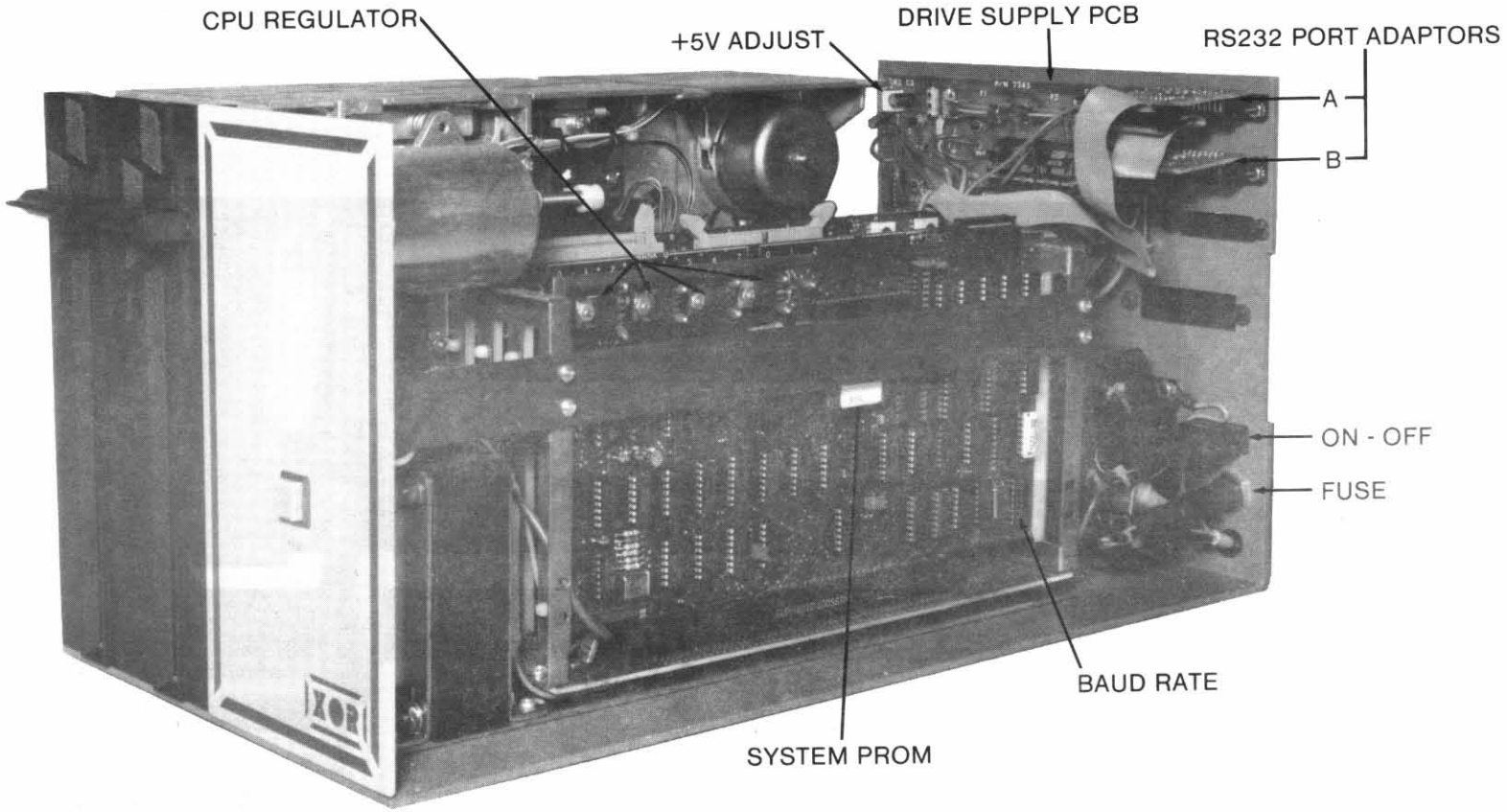
TANDON DRIVE SIDE VIEW



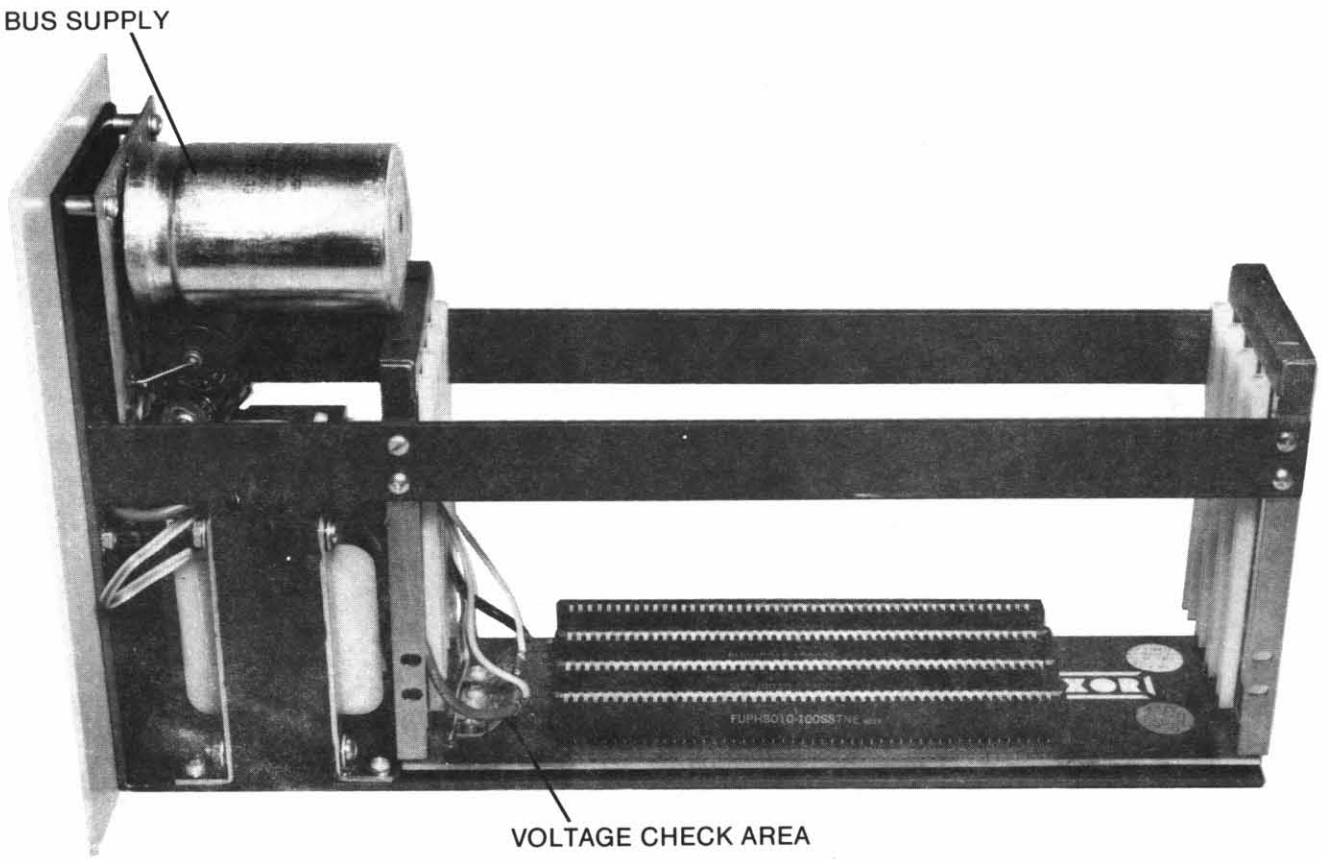
TANDON DRIVE SIDE VIEW

MITSUBISHI JUMPERING





S-100-4 INTERNAL VIEW



S-100-4 4 SLOT SUB-ASSY

BOARD REMOVAL

Refer to internal view for location of the three computer circuit boards. Boards may be removed by gently pulling up on them evenly, be sure do turn off power before removing any of the boards. When installing boards, make sure they are evenly seated in the bus connectors.

INTERNAL CABLES

Refer to internal view for location of the internal cables. Note the location of the optional internal parallel cable. It can be installed in location noted. The "A" paddle card is located to the rear of the computer, top card, to enable optional printer jumpers to be installed without removing the card.

DRIVE JUMPERS

If your S100-4 has the Tandon thin line drives, refer to Tandon Drive circuit board picture for jumper locations. You will note the location for drive select, optional m-2 jumper motor on from drive select, and motor speed adjust. No other jumpers are required.

MITSUBISHI JUMPERING (8" THIN LINE)

See drawing in this chapter on a previous page for jumper locations.

BAUD RATE SELECT

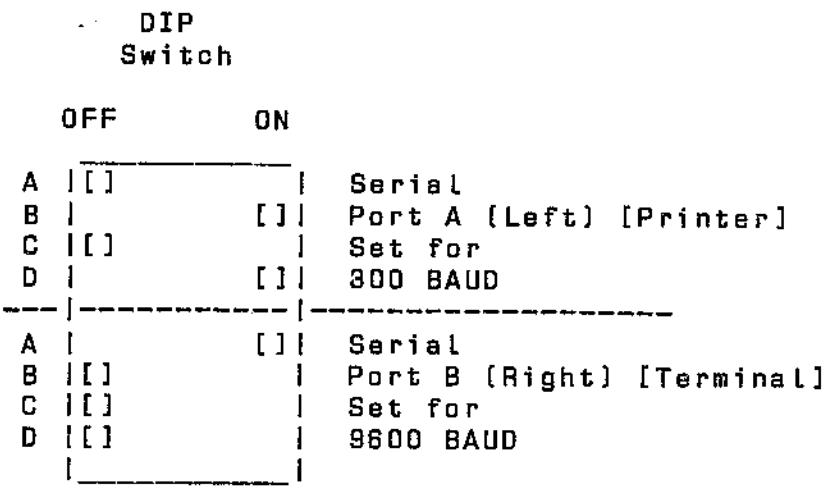
Refer to internal view for the location of the BAUD Rate switch on the CPU board. As shipped from the factory both ports are set at 9600 Baud.

SERIAL I/O BAUD RATE SELECT

The 8 position DIP switch at the lower right hand corner of the board is broken into two 4 bit sections. The upper 4 bits select the IO baud for the left 8251 and the lower 4 bits select the baud for the right. We connect the left 8251 to the "A" paddle card and the right one to the "B" paddle card. The paddle cards are mounted to the rear panel and make strapping adjustments easier. The "A" port is committed in the CP/M bios software to the printer, and the "B" port to the CRT Terminal.

BAUD RATE SWITCH SETTINGS CPU BOARD

The switches are used in a binary pattern to set the rates as follows:



X = O F F O = O N

Baud	D	C	B	A	
50	O	O	O	O	(00H)
75	O	O	O	X	(01H)
110	O	O	X	O	(02H)
134.5	O	O	X	X	(03H)
150	O	X	O	O	(04H)
300	O	X	O	X	(05H)
600	O	X	X	O	(06H)

Baud	D	C	B	A	
1200	O	X	X	X	(07H)
1800	X	O	O	O	(08H)
2000	X	O	O	X	(09H)
2400	X	O	X	O	(0AH)
3600	X	O	X	X	(0BH)
4800	X	X	O	O	(0CH)
7200	X	X	O	X	(0DH)
9600	X	X	X	O	(0EH)
19200	X	X	X	X	(0FH)

N O T E :
Make sure when using the above chart that the positions we show correspond to the type of switch you have on the board. Some models of switches have the "ON" to the opposite side.

XOR DISK UTILITIES "A"

ASM.COM	DI.DAT	M.COM	STAT.COM
BACKUP.COM	DIAGNOSE.COM	M1.COM	SUBMIT.COM
BK.DAT	DSKTYP.COM	M2.COM	SURVEY.COM
CPM61.COM	DSYSGEN.COM	MOVCPM.COM	SWORM.COM
D.COM	ED.COM	PASSCHK.COM	WORM.COM
DDT.COM	ERASE.COM	PIP.COM	XSUB.COM
DDUMP.COM	PRINT.COM	WORM48.COM	
DFOCO.COM	LOAD.COM	PRINTER.COM	

XOR DISK UTILITIES "B"

5MSAFMT.COM	CBASIC2.HLP	DSYSGEN.COM	
ALGOLM.HLP	CBOOT.ASM	EXAMPLE.HLP	PASCAL.HLP
ASM.HLP	CPM.HLP	FLOP.ASM	PASSCHK.COM
BACKUP.COM	CXLST.ASM	FORTRAN.HLP	PIP.COM
BK.DAT	CXLST.DOC	HELP.COM	PRINTER.COM
BLK.ASM	D.COM	HELP.HLP	PRINTER.ASM
BLKEQU61.ASM	DATA.ASM	IO.ASM	PRM185.ASM
BLKSYS61.HEX	DDUMP.COM	M.COM	SURVEY.COM
BLKSYS61.SUB	DFOCO.COM	MAC.HLP	Z80.LIB
C.HLP	DI.DAT	MACRO.LIB	
CBASIC.HLP	DIAGNOSE.COM	MBASIC.HLP	

FILE EXTENTIONS

Files with the extention ".COM" are command files. They are programs that are ready to run by just typing the file name. Example: DFOCO.COM will run on your system by just typing "DFOCO", it is not necessary to type DFOCO.COM.

Files with the extention ".ASM" are files that are the original source files that the programmer writes in assembly language code.

Files with the the extention ".HLP" are explained below.

Files with the extention ".LIB" are library files used with a Macro Assembler.

Files with the extention ".SUB" are submit files.

Files with the extention ".DOC" are document files and contain information to be dumped to a printer or using the TYPE command in CP/M. Example: "TYPE CXLST.DOC"<CR>

NOTE: Files with WD or W prefix are for Western Digital Hard disk Systems.

Some of the files on our system disks are for experienced computer users. If you don't understand a file skip it for now. However, file explanations with an "*" after the name need to be understood by even inexperienced users. If you are an inexperienced user please read these file explanations thoroughly. If after reading them you still can't understand them please call Customer Service at (714) 898-5525, or perhaps have someone with more experience help you.

EXPLANATION OF DISK FILES

BACKUP:COM *

Will help first time users make that initial important backup of their CP/M source disks. BACKUP should be the FIRST program that you run after receiving your computer. The SOURCE disk (the disk you want to copy from) goes in drive "A" and a BLANK destination disk (BLANK disk you want to copy to) goes in drive "B "; Type "BACKUP" BACKUP will format the destination disk and copy A to B. Backup is intended for use with our operating system only. It can be used to back up disks that are single sided, double density, 512 byte sectors only. It can't be used to backup single sided disks to double sided disks as it will not format both sides of the double sided disk. To format and copy double sided, double density, or single sided single density disks use DFOCO and PIP.

DIAGNOSE.COM

An automatic, NON-DESTRUCTIVE system test utility that will test system memory and both drives. It should be run before drive "B" has been accessed. Put a disk in drive B to run this test. The program runs a memory test and then goes into DFOCO and validates the disk in drive B.

The test takes about 5 minutes to run and assures everything is in good shape to run your software. Data is output to a system printer so you need not watch the screen. (Got to keep up with IBM you know!) If you don't have a printer hooked up at this time you can still run this utility but you must watch the screen to get the output. If any error messages are generated refer to the appropriate section of this manual.

HELP.COM

Will aid first users of CP/M, BASIC, and many other run time programs. Simply type HELP CPM <CR> or HELP MBASIC or whatever ???.HLP program libraries appear on your current distribution disks. To see what they might be, type D *.HLP <CR>.

SURVEY.

This program looks over all I.O. ports and reports what is being used. Interesting to use when you want to add something else to the system and want to avoid clashes. (why not ?)

DFOCO:COM *

DFOCO is a fast format and copy routine which allows the user to copy and format in both single and double density and allows different sector sizes to be utilized. (128, or 512 bytes per sector). See Chapter Two for specific instructions.

M, M2

M and M2 are non destructive memory tests which can be left to run for long periods of time on their own. M will not restart from the beginning once it completes a pass, but will continuously run random number test. (See Chapter four in this manual for more detailed instructions.)

WORM, WORM 48

WORM and WORM48 are effective memory tests which runs freely within RAM. They are DESTRUCTIVE memory tests. (See Chapter four in this manual for more detailed instructions.)

DDUMP:

DDUMP is the disk read utility The user can dump a specific track and sector of the diskette as well as perform edit operations.

This program is an improved DUMP utility for CP/M. Any CP/M file can be DUMPED to the screen in a format similiar to that used by the DDT DUMP command. In addition, any sector or group of sectors may be DUMPED in the same format. DDump should be used for single and double sided disks.

OPERATION

The program may be run either by typing DDUMP or DDUMP followed by the file name or track and sector. Note: The format is quite free. Spaces are usually ignored. They are only required after the words track and sector or T and S, and after the word DDUMP>

If DDUMP is typed the program responds with a heading followed by '*' and waits for more input. Operation in this mode is similiar to other utilities like PIP or DDT.

The operation desired may then be typed in as follows:

```
DDUMP FILE.NAM
DDUMP A:FIL.NAM
DDUMPB:FIL.NAM
```

or DDUMP may be typed separately as:

```
DDUMP
*FILE.NAM
*B:FIL.NAM        (The * is a program prompt)
```

The program may also be used to DUMP disk sectors directly, DUMP any CP/M eight sector group.

FILL

Fill will allow you to fill a certain area of a disk with any character you wish. Within DDUMP *, type FILL. The program will prompt you with Drive to fill?, Track?, Starting sector?, ending sector?, and character to fill.

EDIT

A limited editing feature is included in DDUMP, which allows you to change data on the disk. The edit feature works as follows:

Any single sector on either drive may be edited by requesting display of the sector followed by EDIT.

DUMP B: TRACK 4 SECTOR 2 EDIT

The requested sector will be displayed followed by an edit prompt

EDIT-

Enter the address of the first BYTE to be changed. The program will respond by typing back the address entered and the present contents of that address. To change the contents of the address enter the new BYTE followed by a carriage return. The program will display the next address and its contents. To stop entering data type a period. The program will redisplay the sector showing the changes made. The edit feature works almost exactly like the S entry in DDT> typing only a carriage return omits entry.

Typing a period merely redisplays the sector from memory; it does not cause it to be written back on the disk. When editing is complete, redisplay the sector by typing a period and type either

WRITE	(writes the sector back on disk)
STOP	(stop editing without writing on disk)

All edit entries must be made in HEX. Entering non HEX characters results in an error message. The permissable address range is 0000 to 007F. Larger addresses give an error message.

The edit feature should be used with caution since it is possible to edit CP/M to "death" by changing a single byte. One occasional valuable use is to restore files that have been accidently erased. Erasing a file using the ERA command does not erase the data from the disk, but only enteres an E5 into the first Byte of he directory. To restore a file, display the directory, i.e., T 2 S 5. Find the sector containing the name of the file, and change the E5 to 00 and write the sector back onto the disk. This will restore the file if none of the sectors in the file were changed after the file was erased

DSYSGEN: *

DSYSGEN is used to copy a developed system onto the system tracks of a disk (hard disks as well as floppys).

(More information concerning DSYSGEN can be found in the section entitled DSYSGEN in this manual.)

D

: D is a directory utility which will print to the console all files on disk in alphabetical order and their file size. At the end of the directory the total number of files and their total size is also printed to the console. Other drives can be referenced for example:

"D"<CR>, shows a directory of currently logged drive.

"D B:"<CR>, shows directory of files on drive B.

"D B:*.ASM"<CR> shows all the .ASM files on drive B.

DSKTYP: *

DSKTYP is a disk identification program. The program asks the user which drive to check, once answered the program will print to the console what type of diskette is in the specified drive. The program asks for the drive to be tested and then replies with the type of diskette in the drive. This is used to see if your disks are compatible with each other for functions such as DCOPY in which both disk formats must be the same.

DDT:

DDT is a utility which has many features one of which allows the user to read .COM and .HEX files into RAM for execution. Under DDT the user may edit, examine, or link .COM or .HEX files or make small routines for test or other purposes. If under DDT you wish to save an edited program, use the CP/M SAVE NN FILENAME.TYPE command. (NN being the number of records to be saved)

(More information concerning DDT can be found in DIGITAL RESEARCH'S "CP/M MANUAL in the DYNAMIC DEBUGGING TOOL (DDT)" Chapter.)

ED:

ED is a source editor for all source files.

(More information concerning ED can be found in DIGITAL RESEARCH'S CP/M MANUAL in the chapter "ED: A CONTEXT EDITOR FOR CP/M DISK SYSTEM".)

ASM:

ASM is a 8080 source code assembler. This utility makes a .SYM .PRN .HEX file from .ASM files.

(More information concerning ASM can be found in DIGITAL RESEARCH'S "CP/M MANUAL in the chapter entitled ASM.)

LOAD:

LOAD takes the .HEX files developed from a source file and makes a .COM for execution of the file.

STAT:

STAT is a utility which will print to the console the size of any file or the amount of storage remaining on the disk. Example:

"STAT"<CR> "STAT B:"<CR>
"STAT *.*"<CR> "STAT B: STAT.COM"<CR>

[More information concerning STAT can be found in DIGITAL RESEARCH'S CP/M MANUAL in the chapter USER'S GUIDE FOR CP/M OWNERS]

PIP: *

PIP is a copy utility which will copy disk to disk from one to all files on the source disk.

Example:

"PIP"<CR>
* [This means you are in the PIP program and is a response from the program.]
"PIP B:=A:PIP.COM"<CR> Copies the file PIP.COM from the disk in drive A to the disk in drive B.

"PIP B:=A:*.*"<CR> Copies all the files from drive A to drive B>

"PIP A:=B:*.*"<CR> Copies all the files from drive B to drive A.

[More information concerning PIP can be found in DIGITAL RESEARCH'S CP/M MANUAL in the chapter entitled USER'S GUIDE FOR CP/M OWNERS.]

SUBMIT:

SUBMIT is a special utility which allows console input simulation so that long tedious steps which have to be repeated quite often can be done by typing a one line command. Example submit file.

```
DDT
IEXAMPLE.HEX
R
GO
SAVE 1 EXAMPLE.COM
```

XSUB:

XSUB extends the power of SUBMIT to include line input to programs as well as the console commands, the XSUB when included must be in the first line of the sub file.

[More information concerning XSUB can be found in DIGITAL RESEARCH'S "CP/M MANUAL in the chapter entitled USER'S GUIDE FOR CP/M OWNERS".]

MACRO.LIB & Z80.LIB

MACRO.LIB & Z80.LIB are the library files for most standard Z80 Macro assemblers.

```
BLKSYS61.SUB:
     BLKSYS61  is the file used to develop 8" &  5" disk  systems
     with BLOCKING/DEBLOCKING MULTI SECTORS.

BLKEQU61.ASM:
     Following is an example of an equate table.

          ;EQU
          TITLE 'XOR STANDARD BIOS VS 2.22 02/20/83'
;
;************************ SYSTEM SIZE ***************************
;
;       MSIZE IS THE EFFECTIVE SIZE OF YOUR SYSTEM AFTER ACCOUNTING
;       FOR CBIOS AND THE HOST BUFFERS. THE VALUE COMPUTED IS USED
;       AS THE NUMERIC VALUE 'NN' IN YOUR MOVCPM SEQUENCE:
;
;               E.G.    MOVCPM  NN *
;
        MSIZE   EQU     60
;
;*****************************************************************
;*****************************************************************
;       SYSTEM GENERATION EQUATES
;
TRUE    EQU     OFFFFH                  ;DEFINE VALUE OF TRUE.
FALSE   EQU     NOT TRUE                ;DEFINE VALUE OF FALSE.
;
;******** FLOPPY RELATIVE EQUATES ********************************
;
ONEFLP  EQU     TRUE                    ;IF ONE FLOPPY
TWOFLP  EQU     FALSE                   ;IF TWO FLOPPY
TREFLP  EQU     FALSE                   ;IF THREE FLOPPY
FORFLP  EQU     FALSE                   ;IF FOUR FLOPPY
;
MAXI8   EQU     TRUE                    ;TRUE IF STANDARD 8" FLOPPY
;
MINI48  EQU     FALSE                   ;TRUE IF MINI DISK DRIVE 48TPI
MINI96  EQU     FALSE                   ;TRUE IF MINI DISK DRIVE 96TPI
;
SEKRATE EQU     00                      ;00 = 3MS,|01 = 6MS,|02 = 10MS,|
;                                        QUME,850 |801      |03 =15MS   |
;                                        MINIS    |         |           |
SLIMLINE EQU    FALSE                   ;TRUE IF HALF HI DRIVES
;
;******** HARD DISK RELATIVE EQUATES *****************************
;
ONEHD   EQU     FALSE                   ;TRUE IF 5,10 MEG
TWOHD   EQU     TRUE                    ;TRUE IF 16,20 MEG
TREHD   EQU     FALSE                   ;TRUE IF 24,30 MEG
FORHD   EQU     FALSE                   ;TRUE IF 40+ MEG
;
HD      EQU     TRUE                    ;TRUE IF WESTERN DIGITAL
;
;******** SYSTEM CONFIGUIRATION EQUATES **************************
;
MMPM    EQU     FALSE                   ;IF MP/M SET TRUE
;
MLDR    EQU     FALSE                   ;IF M/PM LOADER SET TRUE
XMLDR   EQU     FALSE                   ;IF M/PM LOADER W/O BOOT
;
MDISK    EQU    FALSE                   ;TRUE IF MDISK
```

```
;
DUAL     EQU     FALSE                   ;TRUE IF DUAL SPINDLE DRIVE (PERSCI)
;
DBLOCK   EQU     TRUE                    ;TRUE FOR MULTISECTOR OPERATION
F256     EQU     FALSE                   ;TRUE FOR 256 SECTOR FLOP
F512     EQU     TRUE                    ;TRUE FOR 512 SECTOR FLOP
MAXHST   EQU     512                     ;SIZE OF BLOCKING BUFFER
;
SIDE2BIT EQU     FALSE                   ;SIDE TWO COMPARE BIT (NORMALLY OFF)
;
```

IO.ASM:
IO is the basic INPUT/OUTPUT routine used within the BIOS.

FLOP.ASM:
FLOP is the driver used for all the floppy drives.

BLK.ASM:
BLK is the BLOCKING/DEBLOCKING MULI SECTOR routine.

DATA.ASM:
DATA is the common data file which contains all of the necessary tables for the operation of the BIOS.

CBOOT.ASM:
CBOOT is the cold boot loader for all systems.

MDISK

MDISK is now with us. - WHAT IS MDISK you ask? It is a kind of cache memory system that is CP/M oriented. It takes the place of the "D" drive and is as large as your pocket book. For all intents and purposes it is a disk drive. Only it stores it's data in RAM. It can be expanded in 48K increments to about 500K. If you do a lot of assembler or compiler work and can think of several hundred better things to do than sit waiting for the processor to complete its task, this may be useful to you.

Typical performance increases over our floppy times will be in excess of 100 per cent. (That means you will only have to sit half as long.) Those of you who are familiar with our system will realize that as we are already the fastest around, this is some real improvment. Comparing it to an Apple or an Orange is a joke.

MDISK will assemble a 20K assembly source program producing a 30K .PRN file and associated .HEX and .SYM files, also reading in two 20K MACRO LIB files in 21 seconds ! Our Apple took 3 1/2 minutes and our Plastic Shack 2 min and 14 secs to do similar tasks. Unfortunetly the Orange was in peels by the time we got to it so no testing could be done. Loading a large .COM file like MBASIC (28k) takes .68 sec. Actually hard to measure. It's fun impressing your friends with it. See MDISK in Appendix of this manual for modfication information. Call your nearest U. S. Micro Sales office for more information on this option.

DSYSGEN

One of the more common functions you will be performing is the transfer of the operating system from one disk to another. This can be easily accomplished with the Dsysgen program. All XOR systems are organized in the following manner: Tracks 0-1 are reserved for the operating system. Track 2 is the directory. Tracks 3-77 are for data.

The formatting process must be performed first. This process completely blanks a disk and then places sector marks on the disk where the data is later to be written. The operating system is written next using DSYSGEN. REMEMBER, first format a disk with DFOCO, then type DSYSGEN, Answer (n) and (n) to the first two questions that come on the screen. A table will then appear with a sub-line asking "CODE BYTES FOR SOURCE DISK?". Usually you will type 1A, (the system disks we distribute with our systems are 1A) which signifies a 512, single sided, double density source disk. The other common code byte is 9A for a 512 double sided, double density, source disk.

The next question will be enter source drive, which will normally be A, hit a <cr>. A message will appear at bottom of the screen, at this point hit a "return".

The same table will re-appear and you will enter the code byte for the destination disk, usually either 1A, or 9A, and then enter the destination drive, usually B, hit <cr>, and wait for a short period, a complete message should appear, type a control C and you will be back in CP/M.

The preceeding procedure has transferred the operating system from A to B. You should now be able to remove the disk from drive B, do a reset, insert it in drive A and again boot up.

If you should ever see the error message, "type of source disk and destination disk do not match, do you wish to continue?" type "N", (this is a fatal error, you will destroy your operating system if you continue). You are probably trying to copy a single sided system to a double sided formatted disk. The program will restart, re-check the formats and try again .

Another item to be noted, all XOR systems are compatible with standard 128 single density, however there is not enough room on the system tracks of a single density disk to place the system. You must always boot up on a Double density disk in "A" drive. Single density files may then be transferred from "B" to "A" with the PIP program.

MODIFYING AND GENERATING CP/M SYSTEMS

The CP/M operating system is composed of several parts: the BDOS (Basic Disk Operating System), the BIOS (Basic Input Output System), the CCP (Command Control Processor), and the BOOT (Cold Boot Loader).

In the US Micros Sales system, the programs BOOT and BIOS are broken into several parts that are concatenated at the time that the system is built into one large module. The reason this is done is that fewer base modules need to be maintained to support all of the varied disk systems. Also, most larger multiuser modules would not fit in the system under the editor.

This BIOS system is intended to be used with SUBMIT modules that bear the name of the object BIOS produced. For example, BLKSYS61.SUB contains the following:

```
PIP
BLKSYS61.ASM=BLKEQU61.ASM,   IO.ASM,   CXLST.ASM   FLOP.ASM,
BLK.ASM, DATA.ASM, XBOOT.ASM
```

To concatenate this module, type: SUBMIT BLKSYS61 <CR>.

The PIP program picks out the necessary modules from the disk you have reserved for systems and creates the correct BIOS. The MACRO assembler will then assemble it for you.

Maintaining operating systems is a problem in that often minor "fixes" need to be added to them and having a dozen or so "versions" around means that not all of them will get the latest updates.

One of the greatest advantages of this system is that you only maintain one set of basic modules. In fact, we recommend that you keep only one backup copy of the disk containing these modules. In that way, you can be sure that the software you are building is the latest revision.

Modifications you wish to make should be added by putting conditional assembly flags around the code that is optional and establishing a flag in the main xxxEQU61.ASM header file. This keeps confusion and multiple copies to a minimum. Also, if you need to see if a certain group of files are present you can type: "DIR *.SUB" and just the system building files will appear. This is a real time saver when dealing with a hard disk that can display 4 or 5 screens of directory!

Programs you will need on the system disk to assemble a system:

1. ALL NECESSARY ... .ASM
2. CUSTOM BUILT ...SYS.SUB
3. SUBMIT.COM
4. MACRO.COM
5. MACRO.LIB
6. Z80.LIB
7. MOVCPM.COM
8. ED OR POLYVIEW [Polyview is HIGHLY recommended over ED]
9. DSYSGEN.COM

STEP BY STEP

A - MODIFICATION ***

The first thing to do is to edit the appropriate xxxEQU61.ASM and set all the equates to suit the configuration of the system you desire.

B - EXAMINATION ***

Next, type the ...SYS61.SUB file and look at the subparts needed to concatenate the final BIOS. Then Type DIR *.ASM and see if all the correct files are present.

C - CONCATENATION AND ASSEMBLY ***

If they are, type SUBMIT ...SYS61 The final product will be a ...SYS61.HEX file.

D - GENERATING CP/M ***

Type "MOVCPM 61 *"

The program MOVCPM.COM will create the BDOS for you. Usually, this needs to be done only once. Spend some time and make several of the common system sizes (e.g. 63K, 62K, 48K, etc.). When the MOVCPM has completed its job, type: "SAVE 34 CPMXX.COM" where XX is the system size.

E - PUTTING SYSTEM ON SYSTEM TRACKS ***

This is the job of DSYSGEN.COM. When you load DSYSGEN, it will ask you if the system has a file on disk. Answer 'N'. Then it will ask you if you want to build a system. This time, answer 'Y'. DSYSGEN will then ask you for the name of the CP/M file and then the name of the BIOS file. It will fetch the data that you have prepared and put it in the correct places in preparation for installation on the disk of your choice.

The next thing that will appear on the screen is a large table which has at the left of it some code bytes that will be written to the last byte of the first sector of the disk chosen.

At this time, the system you have created can be put on any of the disk formats specified in the table. Of course, the hardware must be compatible with the type of media you have picked and the disk must have been formatted with a format compatible with your choice (i.e. you could not put a 512 SKEW system on a 128 byte, double density disk.)

It should be noted that you need not put the system on a disk at this time. In fact, the computer system on which the operating system was created need not even be capable of writing to the drive type that the program you have built is designed for. You can type a control 'C' in answer to the "DESTINATION DRIVE" question and then type: "SAVE xx xxxCPMxx.COM" (the x's are unique system identifiers). The prepared operating system can be transported to the desired system via the floppy disk and read in using the first option on DSYSGEN (The one which asks if the system is a file on disk). For more information on how to use the DSYSGEN utility, refer to that section in this manual.

A third method for transferring operating systems is achieved by answering 'N' to both of the first questions DSYSGEN asks. DSYSGEN will then ask for the codebytes of the source disk you are going to take the operating system from. Then it will ask for the drive. From that point on you can proceed just as if you had constructed a system or read it as a file from disk.

The programmer must make sure that the operating system put on the system tracks will function properly. Very little error checking can be done in this process. It is extremely easy to make a "fatal" error. One of the most common is assembling a system that is too large to fit on the system tracks.

The best we can suggest for checking the load size is to go ahead and try to put the system on the disk. The DSYSGEN program will report to the screen the system size, load address, ending address and BIOS jump table adress for the current system. Also it will see if the system will fit on the system tracks of the media you have selected.

Use the following as a guide for how large systems may get:

PROGRAM	SIZE	TRACKS REQUIRED	IMAGE LOAD ADR
COLD BOOT	80H	1	900H - 97FH
CCP	800H	16	980H - 117FH
BDOS	E00H	28	1180H - 1F7FH
BIOS	F80H	31	1F80H - 2F00H
	2600H	76	900H - 2F00H

F - SYSTEM TRACKS AVAILABLE ON VARIOUS MEDIA ***

MEDIA TYPE	TRK-0	TRK-1	TRK-2	TOTAL
5" 128 DD	18	30	30	78
5" 512 DD	18	35	35	88
8" 128 SD	26	26	--	52
8" 128 DD	26	51	--	77
8" 512 DD	26	64	--	90

Note that these values are relative to 128 byte blocks. That is to say, if you multiply the total on the right by 128, the result is what DSYSGEN will record on the system tracks.

If your system exceeds the 76 track guideline used in the example for using DDT to check your system size, you will have to adjust the upper boundary accordingly. Simply add the system size to the image base address and look with DDT at the resulting RAM location.

You also can dump the system tracks into RAM after writing them by re-entering DSYSGEN and letting it get the system by specifying the drive at the prompt "SOURCE DISK?". Exit and type: "SAVE 40 (40 may not be enough) xxCPMxx.COM". Remember, the 40 is PAGES so a SAVE 40 = 40 X 256 = 10,240 or 2800H. If your system is very large, you will have to do some math.

G - DESTINATION DISK PARAMETERS ***

After you specify a destination drive, a large menu will fill the screen. You will be prompted to choose the type of media that you wish to write the system to. The DSYSGEN program is quite universal in that it can service all the system types U S Micro supports. Be sure the computer system and media you are writing to are capable of supporting the operating system you are putting on them. No error checking will be done.

Occasionally, a message will appear that says "CODE BYTE FOR OPERATING SYSTEM AND MEDIA DO NOT AGREE, CONTINUE?" This is caused because the formatting program (DFOCO) has installed what it thinks is the correct code byte for this system in the last byte of the boot sector (7FH). DFOCO is usually correct. If you get this message, go over what you are doing once again, you probably will find something wrong. You may override the warning and write the operating system to the disk.

DETAILED DSYSGEN OPERATING INSTRUCTIONS

DSYSGEN is a program designed to put the CP/M, operating systems on the system tracks of a floppy or hard disk mass storage unit.

The C/PM operating system consists of a cold boot loader, the CCP (Command Control Processor), BDOS (Basic Disk Operating System) and the BIOS, (Basic Input - Output System).

On a floppy disk, the operating system resides on the first two tracks of the disk. The monitor PROM that signs on immediately after a reset contains a short boot routine that reads the first sector into memory at 0000H and jumps to 0000. The cold boot loader, as it is called, then proceeds to read in all of C/PM and put it where it belongs in the system memory. The cold boot loader then jumps to the cold boot entry point in the BIOS and initializes the I/O and completes the sign on.

To prepare for putting the system on the disk, an image of the final operating system must be assembled in RAM. Two separate programs must be prepared.

The first is the C/PM BDOS and CCP. It is prepared by using the MOVCPM utility on your C/PM distribution disk. When you are sure of the size of the system simply type: "MOVCPM <size> *". There will be a short delay and then a message will appear saying "Type SAVE 40 C/PMxx.COM" where xx will be the size.

The other program is a little more difficult in that you must correctly set some "equates" at the beginning to configure it to operate the hardware you are running. In the appendix, you will find some examples of single user, multi user, network and hard disk configurations that should be of help in determining the right way to set up the BIOS. You will notice that the BIOS is now broken into several subparts. The parts are explained as follows:

I/O = Cold boot loader, console input and output, common drive select routines, logical unit map, miscellaneous routines and messages needed by all configurations. I/O must be included in all system configuations.

CXLST = Printer driver, [There are several versions for commonly-used printers such as Centronics, Diablo, etc.]

FLOP = Floppy disk drivers.

BLK = Blocking and De-blocking drivers for use with sector sizes greater than 128.

DATA = Disk parameter tables, skew tables, data storage and disk drive buffers.

XBOOT = Cold boot sign on code that gets overwritten by the directory buffer and de-blocking buffer.

The parts of the BIOS are put together using the concatenation feature of PIP. To make the system simply choose the appropriate xxSYS.SUB file that assembles the configuration you need and type "SUBMIT xxSYS . The MACRO assembler is required along with MACRO.LIB and Z80.LIB to construct most modules.

The equates in IO should be modified using a text editor like the one supplied on your distribution disk called ED.COM. ED is difficult to use. We recommend, for assembly language work, that you purchase Polyview by MICRO CONCEPTS in Fullerton, Ca. Word Star by Micro Pro would be an acceptable substitute, but is not as easy to use as Polyview on assembly formats.

The size of the system can be adjusted by changing the MSIZE equate in the BIOS. This number should always be the same as the size you used to create the C/PM BDOS.

Once you have the CP/M image saved on disk and have modified the equates correctly to configure the BIOS to your hardware, run the SUBMIT program on the xxSYS.SUB which links together the SUB modules to create the final BIOS and assemble the whole thing.

At this point, we will assume you have both CPMxx.COM and xxSYS.HEX on the same disk with DSYSGEN.COM. Notice that

there is no longer a separate BOOT.HEX file. It is included in the IO section of the BIOS. There is also no need to find the 'BIAS' values to tack onto the BIOS, the DSYSGEN program figures all of that out for you.

When DSYSGEN signs on it will ask if the system you wish to install on the drive exists as a xxxxx.SYS file on the disk already. If you are sure to use the current configuration again, it would be wise to save it after building it with DSYSGEN as a file. Then you need only answer 'Y' to "IS THE SYSTEM ON THE DISK". This saves a few steps. If you are supporting several configurations of mini and 8" drives, various printers, etc., you could keep one diskette with DSYSGEN and all the system files on it. Then putting them on the drives is a snap.

For the moment, we will assume the system has to be built. Answer 'Y' to the query: "DO YOU WANT TO CONSTRUCT A SYSTEM". DSYSGEN will ask for the drive and file name for both C/PM and what is called BOOT + BIOS. DSYSGEN will ask for a destination drive, confirm it, then display a rather large menu.

This menu is a guide for the code bytes stored in the last byte of the first sector of all drives. The appendix explains the meaning of each bit in the code byte, if you are interested. Other details are included for your information. This data was taken from a listing of DSYSGEN, so it is in rather raw form.

Whenever possible, it is advisable to choose the "SKEW" option. Many companies are currently raving about their 'four times faster' C/PM. Optimizing the skew factor is all that is required to multiply disk performance [You should try the double-sided 512 byte 8" configuration if you would like to see a floppy perform like a hard disk].

Using the DFOCO [for Double density FOrmat and COpy] utility, you should have already prepared your disk with the correct format. After answering with the correct code byte, DSYSGEN will write the system onto the disk. If the code byte on the disk and the code byte you have chosen do not agree, the following message will appear: "The new system type and the destination disk format do not match. Do you want to continue [Y or N] ?". This may or may not be ok. DFOCO does not know what you will use for a code byte and has some fixed ideas about what it puts on the disks. Situations such as putting a code byte for an 8" floppy disk on a hard disk drive are incorrect, but choosing a skew code when DFOCO has not put one there [or vice versa] is ok. Presently, skew codes are automatically put on 512 byte sectored disks by DFOCO because we assume you are after the speed and the extra space which that format provides. On other formats such as 128 byte, double density, skew is not assumed because you may have compatability problems with existing disks. In any case, DSYSGEN will overwrite whatever code byte is there if you tell it to.

After writing the system out, DSYSGEN will state that the function is complete and ask if you want to do another disk or hit 'return' and re-boot. Upon being re-booted, it will display a "SAVE" message with a size that has been calculated for the

number of bytes in your current system size. If you use this option, you can avoid going through the whole system building process again by simply using the image off disk.

Some attempts are made in the DSYSGEN program to aid you in building a system that will not overwrap FFFF and destroy the boot program that is loading the system. If DSYSGEN detects that your system is too large for the memory size you have chosen, it will tell you so. If the system will not fit on the system tracks of the disk you are using it will notify you of this, as well. In the latter case, DSYSGEN will trim the system to fit [not doing so would hang the disk controller].

PRINTER PORTS [PARALLEL AND SERIAL]

CXLST.ASM

A parallel printer driver has been installed in the bios CXLST.ASM. This driver can be used for Centronics type cable interfaces. [See section entitled ENGINEERING NOTES at the back of this manual for parallel cable wiring.] Three methods may be used to "turn on" this driver. As shipped the bios drives the serial port "A" on the CPU with all CP/M list outputs. To switch all output to the parallel port on a temporary basis you can set a byte in memory at EE33H to a 05H. This can be done with DDT or BASIC with "POKE" instruction. This memory can be calculated for different system sizes by picking up the the bios jump table and can be calculated for different system sizes by picking up the warm boot entry address at memory location 1 and 2, and adding 30H to that address. [30H = 48 decimal]

USING DDUMP TO CHANGE BYTE OF SYSTEM DISK

A second method, which is permanent for the disk that the change was made on and all copies of that disk is to use the system utility DDUMP.COM to modify the byte on the system tracks of the floppy. You will find the bios jump table on track 1 sector 20.

```
DDUMP <CR>              [OPERATOR INPUT]
*                       [PROGRAM RESPONSE]
T 1 S 20 EDIT <CR>      [OPERATOR INPUT]
- EDIT                  [PROGRAM RESPONSE]
33 <CR>                 [OPERATOR INPUT]
0033 00                 [PROGRAM RESPONSE]
05 <CR>                 [OPERATOR INPUT]
0034 00                 [PROGRAM RESPONSE]
 . <CR>                 [OPERATOR INPUT] TERMINATES EDIT
WRITE <CR>              [OPERATOR INPUT] WRITES YOUR EDIT TO DISK
^C                      [OPERATOR INPUT] RETURNS TO CP/M
```

Obviously if you should want to switch back to serial output, the same byte should be set to a "0".

USING MACRO ASSEMBLER TO CHANGE BIOS JUMP TABLE

A third method is to use a text editor to modify the bios source code module IO.ASM which contains the bios jump table. You will need the Digital Research MAC assembler to do this. It may be purchased from your closest U S MICRO SALES OFFICE.

PRINTER.COM

PRINTER.COM will select the printers by simply typing PRINTER 3 (for example). PRINTER.COM can also change the baud rate that is supplied to the respective printer. The default is to printer 0, and outputs to the serial driver connected to the "A" paddle card.

PRINTER.COM also will send either single characters or a continuous string so that system handshaking can be tested. BEFORE you try to send data to your printer, run PRINTER.COM in the test mode to see if the status bits are set correctly. This will save an enormous amount of time in getting things to run.

Just typing "PRINTER" will tell you what printer is currently selected.

PRINTER T (TEST MODE)

PRINTER.COM has a "TEST" mode which has several useful routines which can save many hours of frustration when trying to get your printer running.

Type "PRINTER T<CR>

A menu will then come on the screen.
(A spacebar will return you to menu in most instances. A Ctrl C will return you to CP/M.)

"P" = Select new Printer
"B" = Select new Baud Rate
"T" = Manual Output Mode (Characters sent from keybord, ESC terminates)
"A" = Auto output mode (String sent until space bar hit)
"S" = Display printer status byte

"P", "B", "T", "A" OR "S" ?

The "P" option will respond with "Printer" ?
You must enter the number of the printer you want to use, i.e "1", which could be a printer hooked up to the parallel port.

THE "B" Option will respond with

1 = 300 baud
2 = 600 baud
3 = 1200 baud
4 = 1800 baud
5 = 2400 baud
6 = 3600 baud
7 = 4800 baud
8 = 9600 baud
9 = 19200 baud

Select baud rate ->

Respond with the number, i.e., 1, 3, 7, of the baud rate that you want to select for the printer selected. In order to check that the baud rate option works properly you may set the baud rate to a slow baud rate of 300 and use the "A" option explained below. The characters are automatically generated at a very slow speed. Reset the baud rate to the original number your printer uses, and select the "A" option again and see the difference.

The "M" Option will respond with a blank line. You must manually input characters which will be output to the printer and echoed onto the screen. Hit ESC to terminate this test and return to the menu.

The "A" option will send a continuous string of ASCII characters to the printer and the terminal until the space bar is hit. If the printer is not ready a "printer not ready" message will appear on the screen after a short pause.

The "S" option will respond with a screen showing what good status bits for parallel, 8251, SIO, and the printer currently selected should look like.

```
PARALLEL Status Bits
1 X 0 1 X X X X = Good Status
W   B 0
A   U N
I   S L
T   Y N

8251 Status Bits
1 X X X X 1 X 1 = Good Status
D S F O P T R T
S Y E E E X X X
R         E R R

SIO Status Bits
X X 1 X 1 1 X X = Good Status
B T C S D T I R
R X T Y T X N X
K U S N R R T R

1 0 0 0 0 1 0 1 = Status Byte for printer 0
```

In the above example the bottom line, the Status Byte for the printer selected is printer 0 and the port being used is the 8251. Read down the columns from the good status line under 8251 Status Bits and compare with the Status Byte for printer 0. 1's and 0's must match down, X's are "I don't care" and a 1 or 0 in that column doesn't matter.

If you can't go through these programs without the console output freezing or the Status bytes matching up, check to see that the resistors are installed properly on the A paddlecard. If this doesn't cure the problem check your cables to make sure that the pins are in the proper places for your particular printer and that the dip switches are set properly on the printer.

When using the parallel printer port, baud rate is not a factor. The status bytes will not match until the printer is on line. If the status bytes do not match, check your cable wiring, check your switch settings on your printer, make sure that you have the right printer number selected, and that the bit in the sofware at track 1 sector 20 line 33 is set to 05.

CUSTOM PRINTER.COM PROGRAMS

Custom PRINTER.COM type programs can be written and renamed DIABLO.COM or MX80.COM or TI810.COM (for example). These can be very simple programs that merely modify one or two cells in system memory.

The memory cell 30H bytes past the warm boot entry in the jump table is where the currently logged printer is kept. Bytes at 31H,32H and 33H offset from warm boot are the baud rate bytes for the cpu baud rate generator, serial board 1 and 2 respectively.

The system can handle 10 serial ports and 1 Centronics type port with parts available from your USM SALES OFFICE. A0 at offset 30H from warm boot will select channel "A" serial port on the cpu. This is printer # 0. CXLST always initializes to this printer.

Printers 1, 2, 3 and 4 are expected to be on an optional serial expansion board that is available from your U.S. MICRO SALES OFFICE. Printer 5 is expected to be the parallel port on the CPU. An example of a program that would select printer #3 and set the baud rate to 1200 baud is as follows:

```
ORG 100H

START:
        MVI  A,03H          ; printer select
        LHLD 1              ; get warm boot address
        LXI  D,30H          ; offset
        DAD  D              ;
        MOV  A,M            ; set printer
```

The baud rate port on the CPU is at I.O. port location 0BH. A slight complication arises in that you probably would not wish to change the baud rate at which the system terminal is running. In this case you would have to read the CPU baud rate switch and ORI the upper 4 data bits on to your new lower 4 bits before re-programming the baud rate generator. Look at how things are done in PRINTER.ASM as an example if you have any problems.

An easy way to see if you are sending information to the printer is to type a "CTRL P", then type "D" or "DIR" and see if your printer responds by typing the directory of the disk. If there is no response from the printer read through the different sections on printer hookup and see if you can find the problem.

PRINTER NOTES

SOME TIPS ON HOOKING UP PRINTERS

Almost all serial printers use four basic lines. Our computers "look" like modems in terms of RS-232 specifications. That is because originally terminals attached themselves to modems that in turn talked over phone lines to mainframes. When cheap Microcomputers came on the scene it was logical to make them plug directly into the terminals.

The minimum lines needed to maintain communication are Transmit, Receive, Logic Ground, and Frame Ground. These are on a DB-25 connector on pins 3,2,7 and 1 respectively.

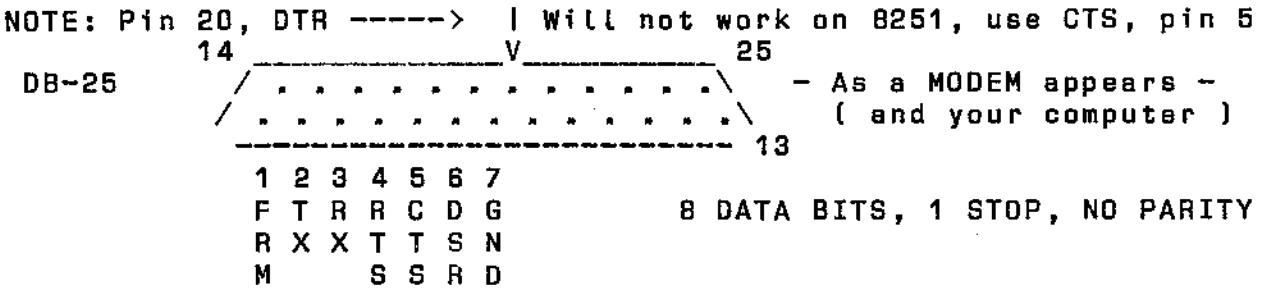
These terms only hold true if you are a modem. DB-25 connector pin assignments should always be referred to as if the modem was the subject. Therefore if pin 3 is "Transmit", if you are a terminal, you should receive on pin 3.

There are other signals on a DB-25 RS-232 serial connector that are standard. These signals were originally intended for modem use and their names reflect these intentions. They are; CTS (Clear to send), RTS (Request to send), DSR (Data set ready), DTR (Data terminal ready).

These "secondary signals" as they are called are used to inform the terminal user when the computer and transmission equipment can send data.

When attaching a printer, we use the principal signals to convey data in both directions and the secondary signals to "handshake". To handshake means to inform each other when you are prepared to communicate. It's rather like picking up the phone after hearing it ring and saying "Hello". Then the other person identifies himself, and so on. Humans "handshake" in many ways that are not readily apparent. Facing someone and nodding your head to start a conversation is "handshaking".

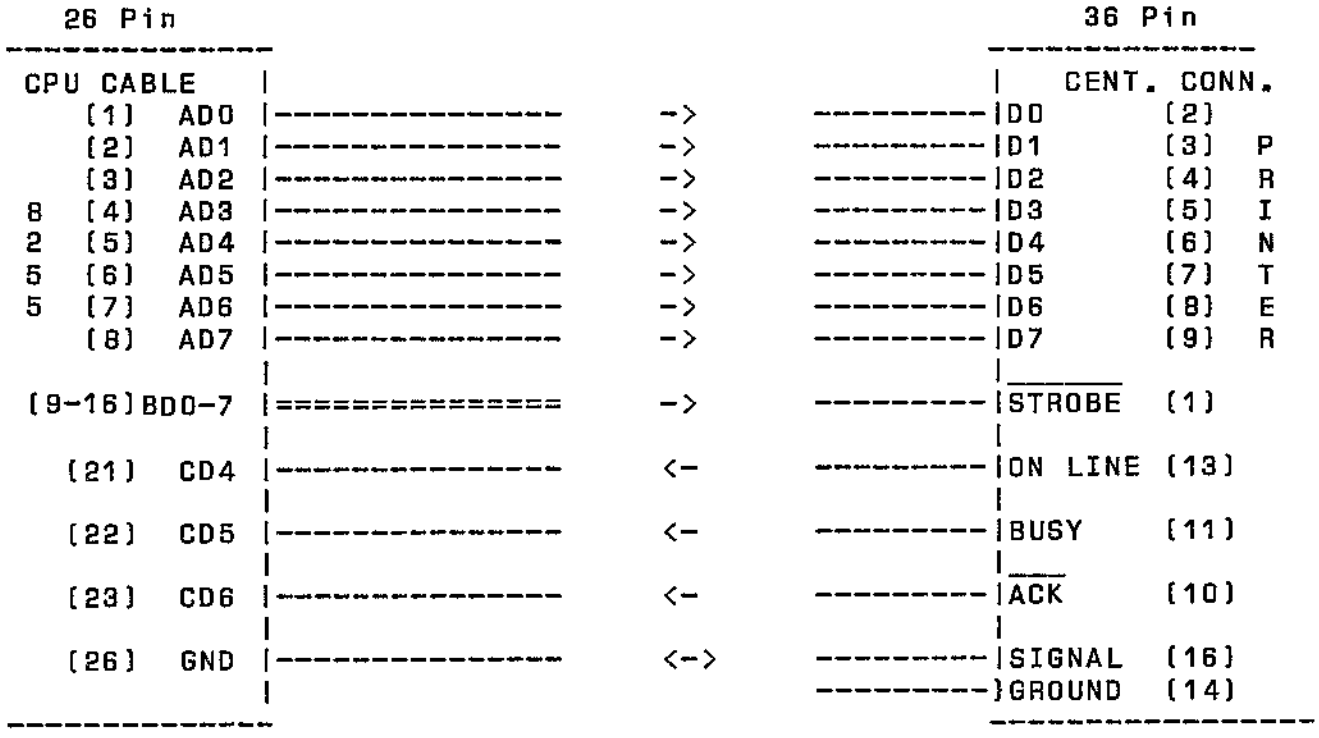
On our Paddle cards at the back of the computer are two resistors. They are called "pull up" resistors and must be installed if the serial port handshaking lines DSR and CTS are not to be used. These resistors can be anything from 1K to 10K. If buffer full handshaking is to be used, the correct line must be located which indicates that status on the printer you are using. The resistor "pulling up" the status line you wish to use must be removed (either can be used), and a jumper soldered between the RS-232 line and place where the resistor was. The other available handshaking line can be used for ON LINE/ OFF LINE status or ??. But for any transmission to take place both serial units must be at the same baud rate and both handshake lines must be acive (high).



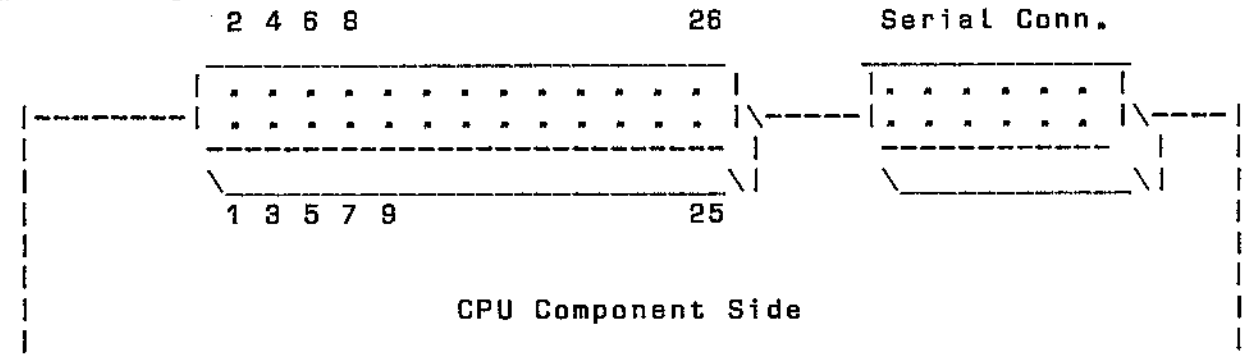
PARALLEL CABLE WIRING

This cable is used for Centronics interface printers. It uses a 8255, PA0-7 are used for data transfer, PB0-7 are tied together for data strobe PC6 for ACK from printer.

NOTE: This cable is available from your U S MICRO SALES SALES OFFICE.



CPU 8255 connector pinout looking from front with edge connector at bottom.



CHAPTER FOUR

TROUBLE SHOOTING AND SERVICE POLICY

MONITOR AND SIGN ON

If upon turn on there is no sign on message, check the following, (1) Is the proper RS-232 cable installed on Port (B (the lower port)? (2) Is the Baud rate set correctly on both CPU and the terminal? (3) Are all 3 of the computer boards seated properly in their sockets?. (4) Is the internal serial cable connected to the serial port on the CPU board?. If your computer still does not sign on you can shut off the power, remove the CPU board and check it for any obvious defect such as loose ic's or optional jumpers placed wrong.

MEMORY CHECKS

Each time the computer signs on, a check of all available free memory is performed. The correct ending address for a successful menory check is F800. If any other address is displayed this indicates a problem and further checks should be made before attempting to boot up. Reset more than once and notice if the same address is displayed every time. This may indicate which block of memory is malfunctioning.

Typical memory failures are caused by loose memory ic,s dirty contacts on the memory board, or possibly intermittent contacts on a particular slot of the 12 slot mother board. Try the memory board in another slot, and also reseat all ics on the memory board.

MEMORY TESTS

M AND M2

M AND M2 ARE EFFECTIVE QUICK CP/M ORIENTATED MEMORY TEST PROGRAMS THAT SHOULD BE READILY AVAILABLE DURING THE NORMAL COURSE OF USE OF ANY MICRO SYSTEM.

BIT SHORTED:

FILLS TEST AREA WITH FF'S AND CHECKS FOR FF'S
FILLS TEST AREA WITH 00'S AND CHECKS FOR 00'S

BIT SHORTED:

ROTATES A BIT FROM LSB TO MSB FILLING TESTED MEMORY EACH TIME, CHECKING ONE BIT AT A TIME

ADDRESS SHORTED:

FILLS ALL MEMORY WITH 55 HEX THEN WRITES AN AA HEX AT 0000 (OR THE LOWEST ADDRESS TESTED). IT THEN TESTS THE REST OF MEMORY FOR 55'S. THEN IT CLEARS LOCATION OF THE AA AND WRITES IT INTO 0001. THEN 0002, 0004, 0008, ETC. SETTING A NEW ADDRESS BIT HIGH EACH TIME AND TESTING ALL OF MEMORY. IF ANY ADDRESS BIT IS SHORTED TO ANOTHER, THE TEST WILL FIND AN "AA" IN A LOCATION OTHER THAN WHERE IT WROTE ONE. THIS TEST TAKES THE MOST TIME AND IS RUN LAST.

RANDOM NUMBERS:

A RANDOM NUMBER ROUTINE GENERATES AN EIGHT BIT NUMBER PATTERN AND WRITES IT THROUGH ALL TEST MEMORY. IT THEN RE-INSERTS THE SAME SEED TO THE ROUTINE AND TEST READS THE MEMORY. A NEW SEED IS GENERATED AND THE EXERCISE IS REPEATED WITH A NEW PATTERN. THIS TEST CONTINUES, REPORTING EACH PASS UNTIL ABORTED WITH THE SPACE BAR.

The first test (M) when run in its fundamental mode (executed under CP/M by typing M (cr) then (cr) (cr) in response to the start and stop questions,) will calculate the system size and begin a typical pattern of tests to uncover the most common problems first and the most uncommon ones last.

Typing a 'P' along with the address in the address field will PAUSE the test program after the memory fill passes. After the operator has waited an appropriate amount of time he may hit (cr) to continue the test. This feature will test for the existence of Phantom-bits. These are memory cells that change after being left un-accessed for a period of time. Initiating the test with M<sp>R<cr> will exclude the address and data tests and drop immediately into the random numbers test.

M AND M2 (which take quite some time) may be skipped and the random numbers test entered directly by typing M R at the time of program invocation. Phantom bits may be located by typing a 'P'in the first address field. After filling memory with a test pattern, the program will halt until you press a key. You may leave the computer for several hours, if you wish, the program goes on. If memory has changed, it will report the error. For CPM users who want just a quick 'security blanket' test, CR,CR in response to the address requests will automatically test the TPA without destroying BIOS. Upon hitting 'SPACE' warm boot will get you back into CPM.

WORM AND WORM48

WORM and WORM48 are effective memory tests which run freely within RAM. These memory tests are destructive to the operating system. WORM is generally used in single user systems with 64K of RAM. WORM48 is generally used in multi-user systems with more than one 48K memory board. This program starts in bank 0 and runs until it reaches the top of the first bank, then switches to the next bank of memory until it reaches the last bank and then starts again with bank 0. WORM48 is faster than WORM and has a screen report which tells the user the address, the bank, and the pass count the program is on. When using WORM48 the program will ask the user for number of memory banks to be tested, the user should answer with the total number of banks within the unit, minus one (the program counts the memory banks starting with 0). The number the user inputs can be less but never greater than the total number of banks in the unit.

WORM is designed to find memory cells that cannot stand rapid cycle time demands placed on them by some of the Z80 block move and math routines. While these chips will pass all standard memory tests for hours on end, they randomly fail during program execution time for seemingly unexplained reasons. The reason is that there is a difference between a chips ACCESS time and its

CYCLE time. We generally only rate a memory board by its access time, (i.e. 450ns or 250ns.)

Worm starts itself at the load address and relocates itself repeatedly, reporting its current location periodically. It 'tests' by simply moving itself and constantly doing instruction fetches. A RAM failure is evidenced by the program crashing. The last reported address on the CRT should be interpreted to be the bank in which the errant chip resides. Binary replacing of chips, one half at a time, watching to see when the problem moves to the new bank, will uncover the bad device.

CPU CHECKS

Very little trouble is experienced with the CPU. Improper jumpering of the 2/4 Mhz can cause non double density operation. If you are having trouble with one serial channel, you can exchange the 8251 and/or the 1488/1489 chips to either serial channel for troubleshooting purposes. For a completely inoperative CPU, a check of the onboard regulators, and a look at the CPU clock signals and the Baud rate clock would be the first items to check. All IC's on XOR boards are socketed for ease of troubleshooting.

DISK CONTROLLER CHECKS AND ERROR MESSAGES

The XOR ver 1.85 prom has internal fault messages which will be displayed on the screen if the following occurs:

For no system " NO SYSTEM" will be displayed, for a Read ID or CRC error, DISK ERROR will be displayed. Try another disk with a known good system .

If you attempt to boot up with the door open the message "DRIVE NOT READY" will be displayed.

The error code 10 means that READ ID NOT FOUND, either the controller cannot read a valid sector on the disk or it is not there in the first place.

The error message 08 means that sufficient time has not been given for the head to load and to read a valid track, generally you can reboot sucessfully.

CRC error means that the proper Cyclical Redundancy Checks have not been made, this can be caused by bad diskette, malfunction in the controller, or incorrect speed of the drive.

In XOR systems with the Tandon thin line drives, the speed can be checked by looking at the large belt spool on the side of the drive under a floursecent light. The strobe lines should be stationery. Refer to fig for the location of the motor speed adjustment.

An error code of DRIVE NOT READY can be caused by not enough time for the motor to get up to speed. This is sometimes caused by belt slippage. Belt dressing from your auto parts store that is usually used on slipping car fan belts, will cure this problem. Remove the belt and place on a piece of newspaper. Spray the inside of the belt and allow to dry before replacing.

POWER SUPPLY CHECKS

Your S100-4 is has two internal power supplys. One supply provides unregulated +11 VDC and +/- 16 VDC for the bus. Refer to fig for the voltage measuring points. The second supply mounted on the rear panel provides regulated +24VDC and +/-5 VDC for the drives. Refer to Fig for the voltage measuring points. Note that the +5 is adjustable. These voltages should remain steady under load, and any deviation would indicate some malfunction of the supply itself. Check for any broken leads on the large filter caps, or loose screws on the regulator transistors, note there are two fuses on the board.

SERVICE POLICY

We would hope that your XOR would never require service, however, we feel that with a thorough reading of the manual most problems will be resolved. Should you feel the need to consult with our Customer Service personnel, they will be happy to answer your questions. Please call the number (714-898-5525) during normal business hours.

If you should require service on your XOR it will be performed at the plant facilities in Huntington Beach, or at an authorized XOR Service Center.

Equipment will be accepted for service only after you have been assigned a "Return Material Authorization Number", RMA. This number may be obtained by calling the Customer Service Hot Line 714-898-5525. The following information will be required:

The purchase date
The serial number
The problem

All shipments received without an RMA will be returned to the sender.

Warranty (6 months parts/labor, from the date of purchase) repairs will be made at no charge for parts and/or labor for XOR hardware only. Merchandise such as drives, terminals, and printers sold by US MICRO SALES as part of their systems will be sent back to the manufacturer for repair. Repair and freight charges for non-XOR merchandise will be billed to you by US MICRO SALES. All warranties are void if any portion of your computer system is altered by anyone other than factory authorized personnel.

Incoming freight MUST BE PREPAID. US MICRO SALES will not accept incoming freight which is marked COLLECT or COD. Shipping charges for the return of repaired equipment to you that is under warranty will be prepaid by US MICRO SALES except in cases where you specify method of shipment other than the one chosen by US MICRO SALES. All return shipping charges for equipment that is no longer under warranty are the responsibility of the party who sent the equipment for repairs.

SUGGESTIONS

If you should have any suggestions regarding the use of this manual, or have any corrections or additions, we would be happy to hear from you. Please address your correspondence to:

U S MICRO SALES
Tech/Man Dept
15392 Assembly lane
rev 030883 Huntington Beach, CA 92649

XOR