MICROMATION

M/NET

INSTALLATION GUIDE

MICROMATION SYSTEM UPGRADE

The M/NET system has undergone some changes since this manual was
written. Most apparent is the re-design of the cabinet bezels.
Behind the frontispiece dramatic changes have been made too. The
computer cabinet is enlarged to allow system expansion to 8
users. In addition, we've changed to Qume double-sided floppy
disk drives and incorporated the 8" Fujitsu Winchester hard disk
drive for a more compact system.

These changes are not addressed in the Installation Guide nor
Operator's Manual. Use this addendum to upgrade these manuals.

NOTE: Although the orientation of the cards within the cabinet
has changed, board cable connections within the computer cabinet
remain the same (e.g., floppy cable to Doubler). The descriptions
for cable connections remain the same for the new cabinets.

PERIPHERAL PREPARATION

HARD DISK PREPARATION

The 8" Winchester-type hard disk drive contains a lock to prevent
damage to the read/write heads during shipment.

> The lock must be released before the system is powered
> up to function properly.

The lock is released via a white plastic bar visible through the
grill work in the front of the cabinet. As you look through the
grill, the bar is set at the factory pointing to the left side of
the drive. To unlock the drive, the bar is rotated to the right.

To unlock the drive

- Rotate the entire cabinet onto its left side (as viewed from
  the front).

- A window has been cut in the base plate for access to the bar.

- DO NOT attempt to shove the bar laterally. The drive casing has
  a small lip to prevent inadvertent movement of the lock.

- Gently pull the bar toward the base plate to clear the lip.
  Notice that if the bar is moved too far outward, the base plate
  obstructs rotation.

- With the bar pulled out slightly, slowly press it clockwise
  toward the top of the window.

**** IMPORTANT ****

Whenever the hard disk is transported (whether in or
out of the cabinet) the lock must be reset. Before
reversing this operation to move the bar back to the
shipping position, run the SHIP.COM program. This moves
the head to the proper position within the drive to
ensure safe shipment. Refer to the READ.ME file on the
distribution diskette for more information.

****

Notice that the storage space on the 8" hard disk is apportioned
to provide three logical drives. This is a change from the con-
figuration of the physical drive stated in the manual - 4 logical
drives. These 3 work spaces are accessed via drive names E:, F:
and G:; each with more than 6.5 megabytes of storage space.

QUME DRIVE PREPARATION

To prevent the read/write heads from contacting and causing
damage during shipment, Qume dual head drives contain a cardboard
insert and a tie wrap.

These must be removed before the drive is powered up.

TIE WRAP REMOVAL

- Remove the 4 cover screws from the bottom of the cabinet and
  slide the cover toward the back enough to expose about 8" of
  the drives inside.

- With a pair of end nippers or other suitable instrument snip
  the tie wrap that secures the door latch. It is located toward
  the front of the cabinet on the left hand side of each drive.

- Replace the cover and cover screws.

The cardboard insert is removed by opening the door. Note that
this can be done only after the tie wrap has been removed. The
insert will pop out. Save this card.

Transporting Qume drives around town should only require re-
installation of the cardboard insert. However, if a drive is to
be shipped it is strongly recommended that the door latch
mechanism be resecured with a tie wrap to prevent damage to the
heads.

SOFTWARE CHANGES

In addition to the changes in the hardware, we've upgraded the utilities provided on the distribution diskette. These changes have removed the necessity for the CP/M for M/NET diskette. All references in the M/NET Operator's Manual to this diskette can be ignored.

Two new utilities are provided on the distribution diskette:

> FDISK.COM
> HDISK.COM

FDISK provides a menu to select diskette formatting and copying. HDISK also provides a menu from which hard disk formatting and other maintenance functions can be selected. These programs replace the COPY.COM, FORMAT.COM (both for floppies), HT6.COM, and HBACK.COM utilities described in the manuals. Both programs are self-explanatory.

Notice that these utilities do run in the multi-user environment. That is, they can be run while other users are on-line. Whereas this is possible, it is not recommended. Since both copying and formatting functions require a large amount of the master processor's time, system response will slow down. (These are not programs that you will be running frequently, however, so this will not affect overall system profoundly.)

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SECTION 1
SYSTEM INSTALLATION

CHAPTER 1: UNPACKING THE CABINETS

The M/NET system is contained in 3 or 4 cartons, depending upon whether the hard disk unit was purchased or not. Two cartons of the same size contain the computer cabinet and floppy disk drive cabinet. The optional hard disk is contained in a similar carton which is longer than the others. The last carton contains the documentation and operating system distribution diskette.

**** IMPORTANT ****

A sticker on the cartons indicates the general procedure for the safe removal of each unit. DO NOT use the bezel on any cabinets for lifting or carrying it. The bezel does not support the weight.

****

After the components have been removed, save the cartons and the packing materials. These MUST be used if a unit is shipped or otherwise transported. In the event the cartons and packing are lost or damaged, request replacements from Micromation.

If you have not already done so, unpack the terminals and printer (if applicable) at this time. These are not provided by Micromation. The cartons should contain cables for connecting the components to the computer cabinet. If they do not, call your dealer and request them. It is recommended that you save these cartons and packing materials also.

All the system components can be moved to the work station(s) at this time. It will not take long to install the system. This may prove easier than performing a partial installation than relocating to the work station to finish assembly.

Each cabinet is unique in appearance. The computer cabinet has a keyswitch and a reset button mounted on the front grill. The back panel has 5 RS-232 connectors, one for up to four terminals and one for a serial interface printer. Two 50-pin cables also exit the cabinet on the right. Notice as well the AC socket and fuse. The features of the back panel are illustrated in Chapter 3.
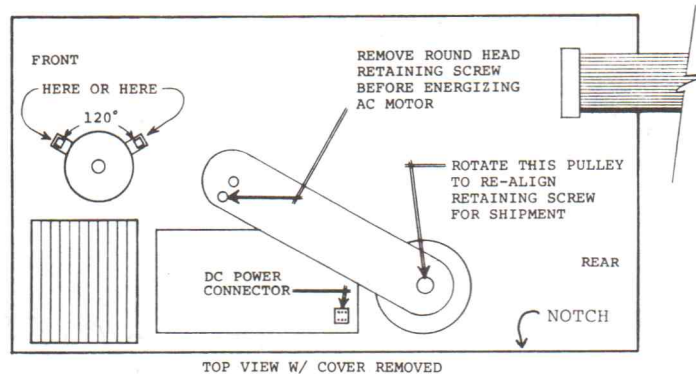
The floppy disk drive cabinet has the same dimensions as the computer cabinet but is readily identified by the two drives. The left drive is named A: and the right B:. The cable that exits the back attaches to the computer cabinet.

The hard disk drive is the longer cabinet with the grill in front. The cable exiting from the back also attaches to the computer cabinet.

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CHAPTER 2 HARD DISK SET-UP

Before the hard disk is plugged in and turned on, a set screw and clamp MUST be removed from the drive mechanism. The only tool necessary to complete this task is a small slot-head screwdriver or a 3/32 allen key. (The screw will have either type head.)

Set the hard disk cabinet on a table and release the four clamps along the sides. Lift the cover off. Figure 2-1 illustrates the location of the two locking devices.

FRONT
HERE OR HERE
120°

REMOVE ROUND HEAD
RETAINING SCREW
BEFORE ENERGIZING
AC MOTOR

ROTATE THIS PULLEY
TO RE-ALIGN
RETAINING SCREW
FOR SHIPMENT

DC POWER
CONNECTOR

REAR

NOTCH

TOP VIEW W/ COVER REMOVED

FIGURE 2-1   STEPPER LOCK & SET SCREW PLACEMENT

The stepper lock clamp (closely resembling a clothespin) is removed by pulling it straight out from the damper. (Note that the clamp may not be in the exact same location shown in the diagram. This is not material.) Save the clamp; if the hard disk needs to be moved, it is essential that the clamp is replaced. Appendix C describes installation.

The retaining screw must also be removed. Notice the location as identified in the diagram and unscrew it. Again save the screw and lockwasher. This, too, must be reinstalled if the hard disk drive is to be moved (see Appendix C).

The cover can be replaced when the two locks have been removed. Before you replace it, however, notice the location of the 6 wires from the power supply. Ensure that they are pushed against the black plastic cover, away from the two aluminum protrusions shown. The casting assists in securing the cabinet top to the chassis. If the wires are caught inbetween, major damage results.

Not all movement of the hard disk requires re-installation of the two locking devices. For instance, if the cabinet is going to be carried from one room to another, it is not necessary to put them in. On the other hand, if the hard disk is to be rolled (as in the RACK) over a rough surface, they should be installed. Appendix C discusses this dilemma and installation procedures.

CHAPTER 3 INTER-CABINET CABLE INSTALLATION

Arranging the Cabinets

**** WARNING ****

Do not use the bezel or handles of any of the units to carry them. Instead, grasp the cabinet by its base to carry it.

****

The computer, floppy drive, and hard disk drive cabinets can be positioned at the work station now. The printer and terminals can be situated as well. We recommend setting up the printer near the computer and peripherals; it will be much easier to connect it this way. The terminals can be placed just about anywhere. The basic installation described below provides instructions for placing them nearby the computer. We realize that this may not be appropriate in many M/NET applications. Appendix A describes the various means for extending the distance between terminal and computer. Refer there when terminal installation instructions are provided below.

The cabinets can be arranged in any fashion desirable with one restriction. **The fans in the back must not be obstructed.** Each component requires proper air circulation without which it will succumb to heat build up. Leave at least 8 inches of free space behind the units for exhaust. (Notice that the hard disk cabinet is longer than the others when creating the space.) If the units are to be stacked, it is also wise to put the hard disk drive, the heaviest of the three, on the bottom.

NOTE: These instructions speak to cable installation in a general sense. If the computer is to be rackmounted or a parallel interface printer is to be installed (requiring re-allocation of the internal 50-pin cables), alternate arrangements may be necessary. Refer to Appendix B for instructions on assembly of the RACK and computer installation therein. Chapters 7 and 8 describe moving the 50-pin cables around to accommodate a parallel interface printer.

Attaching the Inter-Cabinet Cables

Once the cabinets are situated, the inter-cabinet cables can be attached. Figure 3-1 illustrates the back of the cabinets indicating the location and destination of the inter-cabinet cables. These instructions speak to the normal installation. Normal in this context means a serial interface printer is to be installed. (See Appendix D for installing a Texas Instruments model 810, or similar, printer.) If a parallel interface printer is to be incorporated, the 50-pin cables inside the computer cabinet will need to be re-arranged. See Chapter 7 for these instructions before installing the inter-peripheral cables.
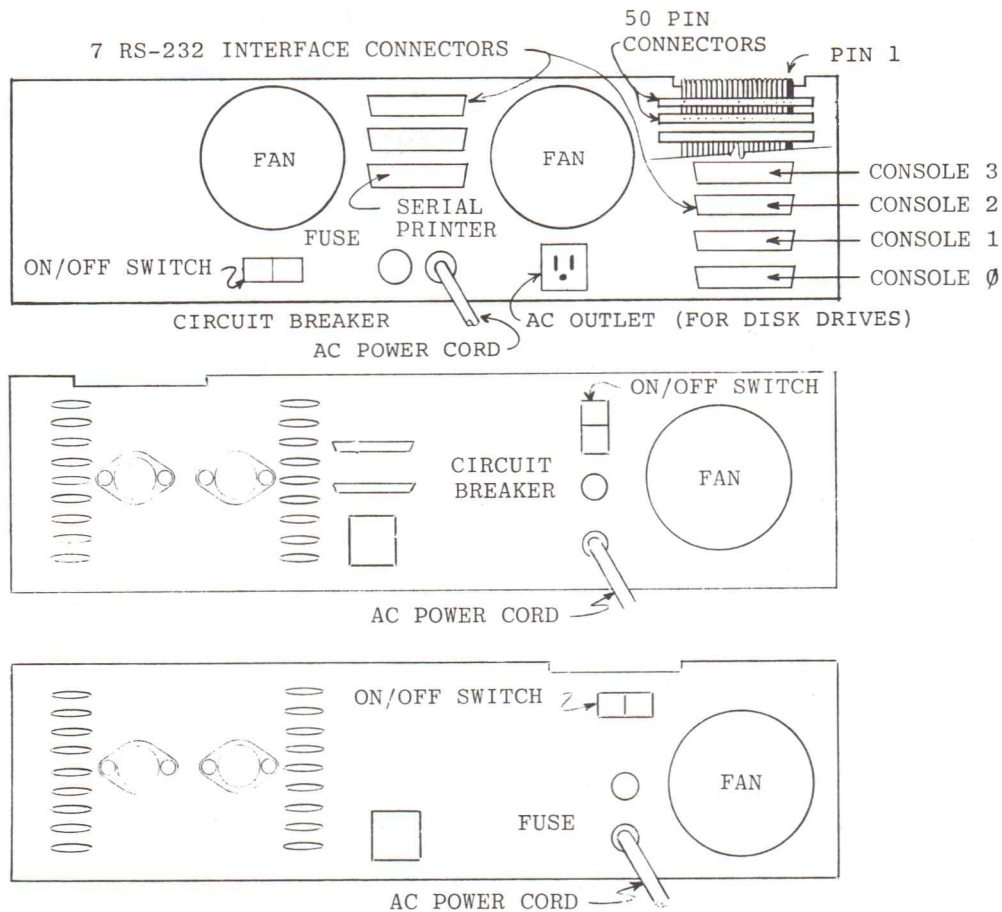
FIGURE 3-1 CABINET BACK PANELS

> Plug the power cord from the floppy drive cabinet into the receptacle on the back of the computer cabinet. Put the power ON/OFF switch for the floppy cabinet in the ON position and the computer cabinet switch in the OFF position. Move to the front of the computer cabinet and rotate the power on/off keyswitch counterclockwise until it stops. This puts it in the OFF position in case it was inadvertently turned on during shipment or assembly.

> Attach the cable from the serial interface printer to the RS-232 type connector labelled PRINT in the middle of the backpanel. Notice that the nature of the male and female connectors prevents misorientation.

The next three instructions describe connecting the 50-pin cables from the peripherals to the computer cabinet. The position of pin 1, indicated by a red line, is important. The cable exiting from the computer has the red line on the right. When inserting the

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cable from the hard disk drive, floppy drives or printer, have the red line from that cable on the right as well. In other words, the red lines must line up.

> Take the 5Ø-pin cable from the hard disk cabinet (if you have one) and attach it to the connector on the computer cabinet back panel labelled HDISK.

> Put the hard disk power ON/OFF switch in the OFF position.

> Attach the cable from the floppy drive cabinet to the computer cabinet connector mounted on the back panel labelled MBOX.

The next to last step is connecting the terminals. The description below addresses connecting the terminals in close proximity to the computer cabinet. Note that the cables are not provided by Micromation. If you need to make some up, refer to Appendix A for a list of the active signals. This appendix also describes various ways to extend the distance between the computer and terminal.

Each terminal is assigned a console number in the M/NET system. This number is indicated by the CONØ - CON3 labels on the back panel RS-232 connectors. There is no significance or hierarchy associated with the numbers, but it may prove convenient to put console Ø next to the system cabinets.

> Attach the cables between the terminals and the computer back panel one at a time. Many terminals have two RS-232 type connectors to choose from (the extra for output to a printer). Refer to that manual for the appropriate one. Notice that the nature of the connector prevents misorientation. As you attach each terminal, you may want to label it with the console number. This may prove helpful until each operator knows their console number. (The console number is used as a reference in several MP/M programs.)

> To complete M/NET installation, plug in the computer cabinet, hard disk cabinet, terminals and printer. All of them probably have 3-prong plugs. DO NOT circumvent these with adaptors unless the adaptor is properly grounded also.

Do not turn on the computer and peripherals now. Refer to the M/NET OPERATOR'S MANUAL for powering up and loading the operating system instructions.

SECTION 2
UPGRADING SYSTEMS

This section has two chapters. Chapter 4 is for upgrading to a M/NET system from a Micromation single user system; Chapter 5 is for upgrading a running M/NET system (primarily adding more users).

CHAPTER 4: UPGRADING FROM A SINGLE-USER TO A M/NET SYSTEM

The basic Micromation system contains a Z-64 processor/RAM card, a DOUBLER floppy disk controller, and the Single I/O card. Optionally, a Hard Disk Controller and Multi I/O card may be installed. The Z-64, DOUBLER and Hard Disk Controller can be upgraded for use in the M/NET system with the changing of a couple of PROMs (which are provided). The Single (or Multi) I/O Board, however, is replaced by the M/NET I/O Board shipped with the M/NET upgrade package. The M/NET upgrade package contains the following parts.

M/NET I/O Board: As just stated, this board replaces the Single or Multi I/O Board currently in your system. It has added components and circuitry to generate interrupts to the master and generate the SP1 - SP8 signals (special S-100 signals used for communication between master and satellite). The four serial ports are used for terminal I/O and the parallel ports are available for installing a Centronics type printer. The serial port on the DOUBLER is used for output to a serial printer instead of the terminal in the M/NET system.

Z-64 Satellite Processor: The basic upgrade kit includes 2 satellite (also called slave) processor boards. These have no equivalent boards in single user systems and replace no components. If you are upgrading to a 3 or 4 user system, 1 or 2 additional satellite boards are provided

Operating System Diskette: The MP/M operating system is provided on the double density diskette shipped with the kit. The O/S and utilities totally replace those you are currently operating under. DO NOT mix and match the utilities provided with each; although the file names are similar, they are not compatible.

Integrated Circuits: Several of the PROMs on the boards have been changed for M/NET. The breakdown by board is as follows.

   DOUBLER - The 2708 PROM at board location 9D and the 74S287 at board location 9C must replace those currently installed.

   Hard Disk Controller - The 74S471 at board location 7D must be replaced with that provided with the upgrade kit. The 2708 PROM at board location 4D must be removed. There is no replacement for this component.

The remainder of this chapter describes making the changes to the components in your single user system. After these changes have been made, proceed through Section 3 for instructions regarding board installation and internal cable connections then skip to Section 1 for the external cable connections.

Before beginning, clear a work space near the system. You will need the following tools.

    A medium size slot-head screwdriver
    A small slot-head screwdrive or similar tool
     like a finger nail file or letter opener
     (for lifting ICs from the sockets)
    Alcohol and cotton swab for cleaning the
     edge connectors
    Some wire nippers to cut jumpers.
    Soldering iron, solder and 1" of insulated,
     30 gauge wire (to solder in a jumper)

To start, turn off the computer power, disconnect all the cables attached to the back panel, and move the computer cabinet to the work space. Remove the cover by placing the unit on its side and unscrewing the four screws from the base. The cover slides off towards the back.
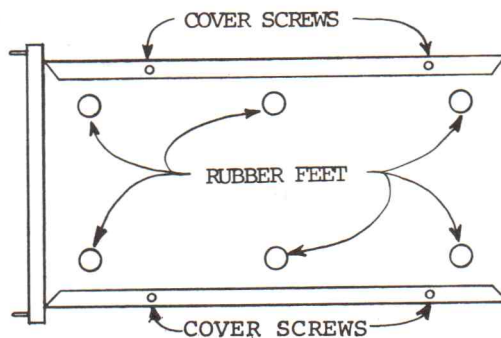
FIGURE 4-1   COVER SCREW PLACEMENT

Once the interior is exposed, disconnect all the cables and remove all the printed circuit boards. If the identity of each board is not apparent to you, refer to Section 3 for a description of them. The remaining paragraphs describe the alterations necessary on a board by board basis.

Z-64

This board will be the master processor board in the system. The first thing to do is check the components on the board. Make all necessary changes as you check them.

- The integrated circuit chip at board location S3, a 74S471 bi-polar PROM, **MUST** be revision 3.1. This is indicated by a paper sticker attached to the device. If the label has any other number, 3 for instance, it must be replaced. Call your dealer for the replacement.

- You must have have the 25LS2513 vector priority interrupt controller at board location AB5. Some early shipments of Z-64s did not include this device (it is included on all boards now though).

- The jumpers at JP4 must be set for 4 MHz operation. The figure below indicates the correct setting. The JP4 jumpers are located right under the device at board location U2. (Note that jumper JP4 was JP7 on Z-64 revisions 2 and 3.)

FIGURE 4-2   Z-64 JP 4 JUMPERS FOR 4 MHZ OPERATION

- Jumper JP1 **MUST NOT** be installed. If it is, remove it. (This jumper enabled the non-maskable interrupt, /NMI, to the Z80A.)

- If there is a PROM installed at board location NP2 (either a 2708 or 2716), it must be removed. The M/NET system cannot accommodate this PROM without substantial alteration to the operating system.

- Jumper JP2 located below and to the right of the device at EF5 must be installed.

- Jumper JP3 located just to the right of JP2 must NOT be installed. Cut it if it is.

This completes Z-64 alterations. You may want to label it indicating that it is the master processor board.

DOUBLER

Two replacement PROMs are provided for the DOUBLER in the upgrade kit.

- The 2708 at board location 9D must be replaced with the 2708 labelled M.1 shipped in the kit. Before removing it, note its orientation with respect to the notch in the ceramic case. This orientation must be maintained when installing the replacement.

To remove the old 2708 slide the small screwdriver (or similar tool) underneath and gently pry upward. To install the new one, align the pins in the hole and press downward. Check to ensure that all the pins went into the holes and did not bend under the chip.

- Use the same procedure to replace the 74S287 at board location 9C. Again, note the orientation of the notch on this device; it must be duplicated with the replacement.

If you have the DOUBLER's WAIT jumper removed (for operation at 2 MHz), you need to install it since the master processor runs at 4 MHz. A plastic enclosed jumper is provided with the board, place it across the pins.
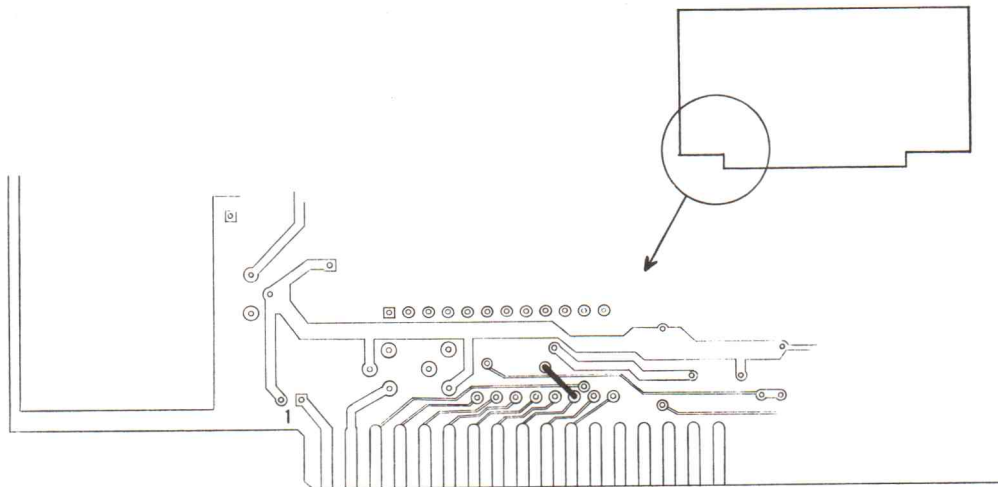
HARD DISK CONTROLLER

The Hard Disk Controller requires a couple of changes: one integrated circuit is removed, one replaced and a jumper must be installed.

First, remove the 2708 PROM at board location 4D; it is no longer necessary. The firmware is replaced by a program in the operating system.

Second, a 74S471 bi-polar PROM is supplied in the upgrade package to replace the device at board location 7D. Remove the original noting its orientation. Insert the replacement with the same orientation (notch to the left). Visually inspect the socket to ensure that all pins are inserted properly; no pins should extend outside the socket or be bent under.

Finally, a jumper needs to be installed to generate an interrupt to the master from the hard disk. The jumper are is located below the PROM at board location 4D. The figure below illustrates that section of the Hard Disk Controller affected and shows the jumper connection.

FIGURE 4-3   HARD DISK CONTROLLER JUMPER PLACEMENT

Cut the 3Ø gauge wire to an appropriate and strip 1/8" of insulation from each end. Prepare each end by dabbing a small bit of solder on it. Insert the jumper wire in the holes shown in the illustration, turn the board over and solder it in with a minimum of solder. Check the solder joints to ensure that there aren't extraneous solder lumps shorting any traces.

This completes the alterations to the reclaimable components of the single-user system. Note that the Multi I/O Board is replaced by the M/NET I/O Board and is longer necessary. Skip to Section 3 at this time to install the boards in the card cage and, subsequently, perform the instructions in Section I for M/NET installation.

CHAPTER 5 UPGRADING A M/NET SYSTEM

To upgrade the M/NET system to add another operator, all that's needed is another satellite processor and terminal with cable. The system can accommodate up to 4 satellites and terminals.

The instructions for accessing the interior of the computer cabinet are in Chapter 6. Once the cover has been removed, return here.

Before inserting the satellite(s), a jumper must be installed to uniquely identify (select) the board for data transfers. Each satellite board currently in your system has this jumper installed. The additional boards must have the jumper so that it doesn't conflict with those numbers. The jumper, labelled JP1, consists of two rows of eight pins and is located at the bottom of the board, just above the S-100 bus fingers, underneath columns D and E (the column letters are located along the top edge of the board). Each pin is identified with a number underneath. A plastic enclosure surrounds the contacts and is mounted across two of the pins. This is more than likely NOT the position necessary.

To select the proper placement for this jumper, count the number of satellite processor boards currently installed in your system; do NOT count the master. The jumper should be placed across the pins (one pin in the top row and one in bottom) correponding to the next number. That is, if there are 2 satellites currently installed, the jumper should be placed across the pins with the 3 silkscreened underneath. If another board is to be installed, the jumper should be placed across the pins identified with a 4.

Before inserting the satellite board into the system, clean the S-100 connector contacts off with alcohol and a cotton swab. This removes any oxidation and dirt that may reside there and interfere with signal transmission.

To physically install the boards into the card cage and mother board, choose an empty slot on the right side (as you view the cabinet from the front) of the card cage. Align the board in the slots in the card cage with the component side facing **down** and push it into the S-100 edge connector. Ensure that the board is pushed all the way in; compare the top edge with the others in the card cage. If you have another satellite to install, repeat the procedure.

There are no other connections to the satellites. The cover can be replaced and the unit moved back to the work station.

To re-install the cables refer to Chapter 3. The additional terminals should be attached to the back panel RS-232 connectors labelled CON2 and, if a fourth satellite was added, to CON3.

The following chapters describe the components of the system. Chapter 6 describes the computer cabinet and includes instructions for its disassembly and re-assembly to gain access to the printed circuits. Note that this is not normally necessary unless a jumper needs to be changed (the baud rate jumpers on the M/NET I/O or Doubler, for instance) or boards need to be added (to add a satellite). Subsequent chapters in this section describe the individual boards, their cable connections and jumper options.

CHAPTER 6: OVERVIEW OF CABINET

The printed circuit (henceforth PC) boards described in the remaining chapters are installed into the mother board in the computer cabinet. The illustrations on the following page are a bird's eye view of the computer cabinet interior and a front view of the card cage indicating the location of the PC boards. If you ever need to install or remove any boards, that page can be removed for your convenience (there's nothing printed on the back).

COVER REMOVAL

There are two ways to access the interior of the cabinet. If the unit is rackmounted, the cover is screwed to the sidewalls of the furniture and the base plate (with all the interior components attached) slides out towards the front. Be careful when you slide it out, however. Notice the cables in back; the base plate will bind if one of the cables gets snagged. Also be careful when pulling it out that you don't slide it too far. Pull it out only as far as is necessary to access the card cage. The remainder of the base plate is occupied by the power supply and should not require your access.

If the cabinets are stacked, the cover is screwed to the base plate. To remove the cover, rotate the cabinet on its side. Be careful with the cables; if the cabinet cannot be rotated without disturbing them, detach each first noting their placement and orientation. The location of the four screws is illustrated in Figure 6-1. After they're removed, grasp the base plate and return the unit to its original position. Slide the cover towards the back to remove it.
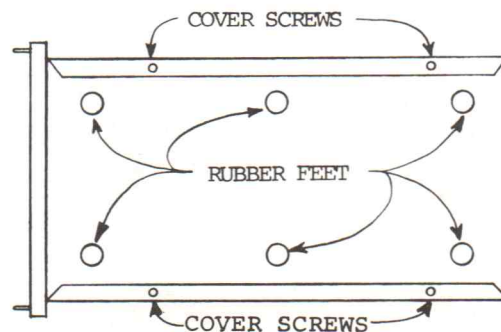

FIGURE 6-1   COVER SCREW PLACEMENT

When the cover is removed the following components are exposed.

MOTHER BOARD, EDGE CONNECTORS AND CARD CAGE: Micromation systems feature a unique S-100 mother board: both sides of the card are used instead of one to maximize space utilization and minimize signal travel distance. There are nine edge connectors (also referred to as slots) soldered to the mother board to receive the PC boards. The card cage has holes for air circulation and grooves to align the boards during insertion. It is important that the boards are in the proper grooves for each edge connector; the board should not bow much once it is inserted (this could cause damage to the solder traces and/or components). When inserting the boards, those that go in on the left side of the card cage (as you view the cabinet from the front) have the component side (the side with the integrated circuits on it) facing up; those that go in on the right have the component side facing down. The edge connectors are slightly offset from the center to prevent putting the boards in upside down. Note that the four connectors on the right are all even-numbered in Figure 6-3; the five on the left odd-numbered.

10-PIN CABLES: There are five 10-pin cables in the cabinet. Four of them are attached to RS-232 connectors mounted along the left edge of the back panel and are labelled CON0 - CON3. These are meant for the cables from the terminals and attach to the M/NET I/O Board. The other 10-pin cable is attached to the RS-232 connector mounted to the middle of the back panel. It is labelled PRINT and attaches to the serial connector on the DOUBLER.

50-PIN CABLES: There are two 50-pin cables provided with the cabinet. In most systems, these will connect the DOUBLER to the floppy disk drives and hard disk controller to the hard disk drives. Alternate configurations are possible for connecting one of the cables to a parallel interface, Centronics-type printer.

RESET CABLE: The three wires from the system reset switch mounted on the front panel connect to the Master Z-64 board. The connector attached to the end of these wires contains 4 holes, one of which is plugged. This key is used to align the connector with the three pins sticking up from the master.

FANS: None of the operations that follow involve the fans but it is very important to ensure that they are not blocked. If you install more or re-arrange some cables, please observe this precaution. A lot of heat is generated by the PC boards and the fans do an exemplary job of removing it, but only if they are not blocked.

POWER SUPPLY: The M/NET system features a constant voltage ferroresonant transformer. This means that a range of input voltages (around 90 - 140 or 200 - 240 for international systems) can be accommodated. The output current rating is around 12 amps of +9 volts and 2 amps of +/-16 volts, well within the demands of all the system components in a four processor (presently the

maximum) system. The nature of the transformer also renders a relatively square wave output. This waveform yields readily to filtering and affects less stress from peak voltages on the rectifying elements than your average sinusoidal waveform. Since the transformer does most of the "work," the support components (bridge rectifiers, filtering capacitors and resonating capacitors) can be reduced in size. None of the operations for disassembling or re-assembling the system involve the power supply; it is factory configured for your system.

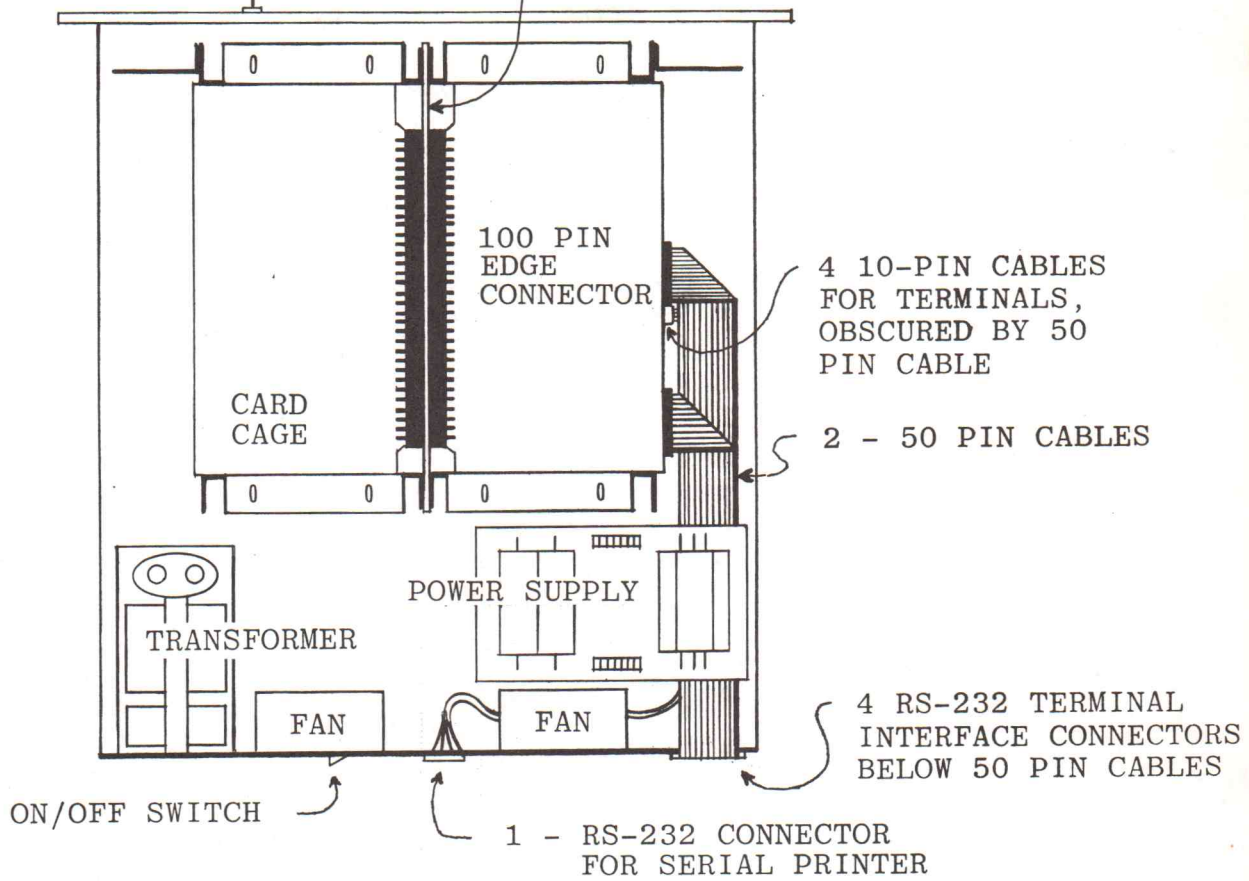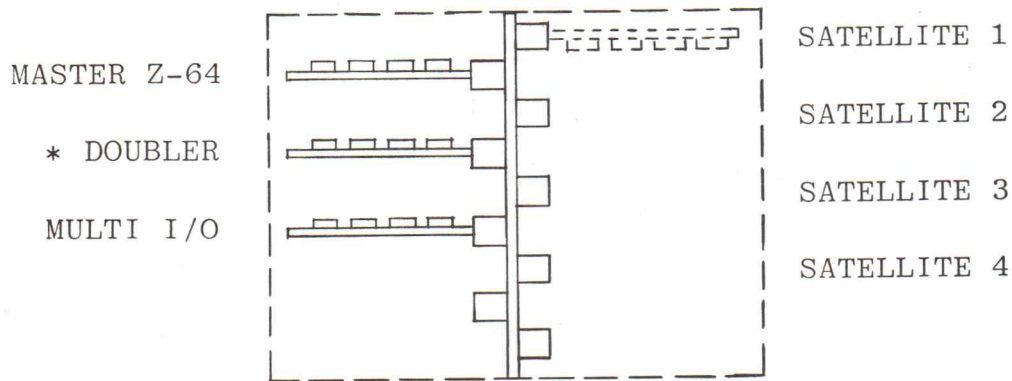KEYSWITCH & RESET BUTTON ⌐   MOTHERBOARD

100 PIN
EDGE
CONNECTOR

4 10-PIN CABLES
FOR TERMINALS,
OBSCURED BY 50
PIN CABLE

CARD
CAGE

2 - 50 PIN CABLES

POWER SUPPLY

TRANSFORMER

FAN   FAN

4 RS-232 TERMINAL
INTERFACE CONNECTORS
BELOW 50 PIN CABLES

ON/OFF SWITCH

1 - RS-232 CONNECTOR
FOR SERIAL PRINTER

FIGURE 6-2   INTERIOR OF COMPUTER CABINET

MASTER Z-64   SATELLITE 1

                              SATELLITE 2
* DOUBLER
                              SATELLITE 3
MULTI I/O
                              SATELLITE 4

*IF HARD DISK USED INSERT HERE
AND MOVE OTHERS DOWN ONE

**FIGURE 6-3   FRONT VIEW OF MOTHERBOARD**

15
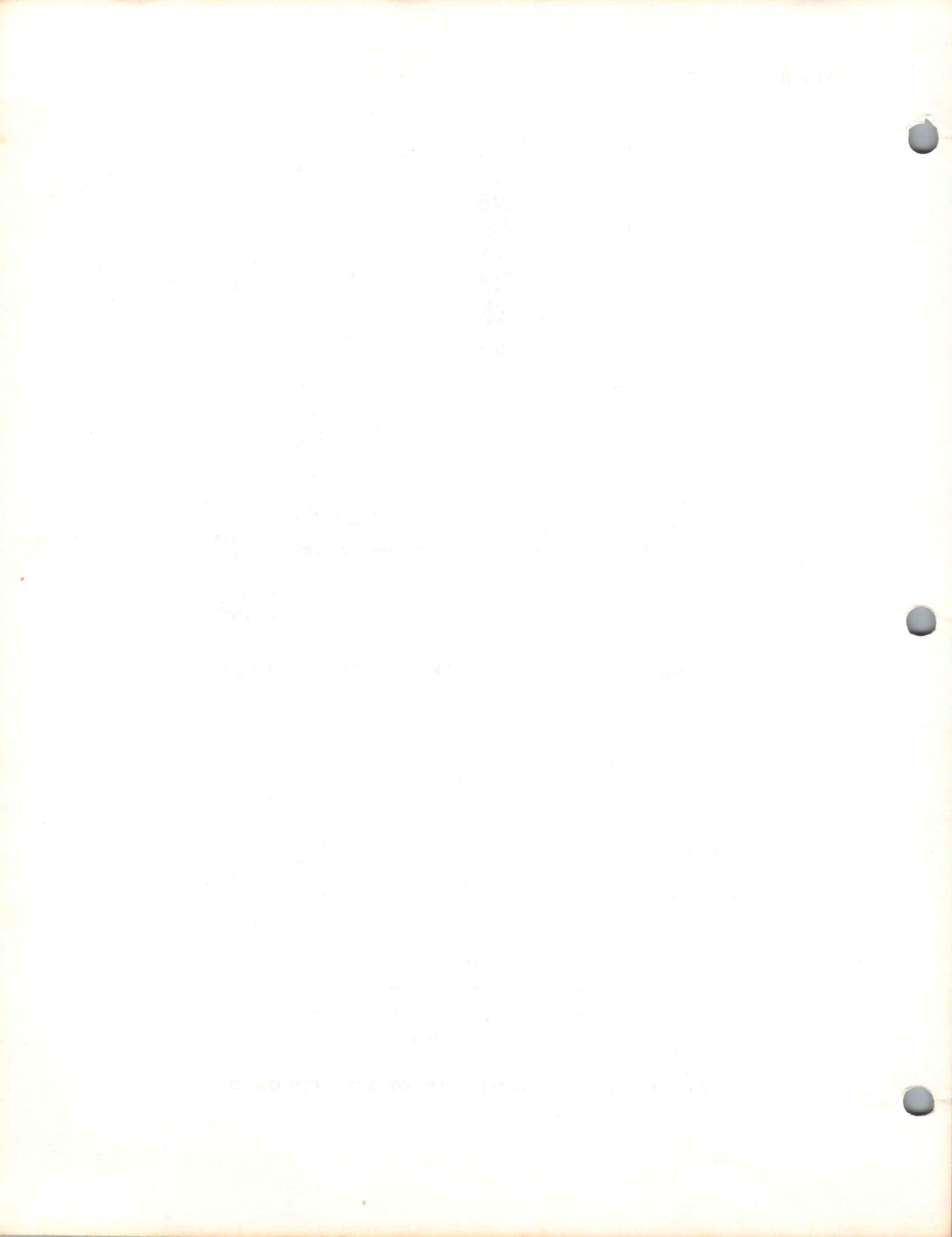
CHAPTER 7: M/NET I/O BOARD INSTALLATION

The M/NET I/O Board is installed in the bottom edge connector on the left side of the mother board, slot number 2. Depending upon how many terminals you have in your M/NET system, 2 to 4 of the 10-pin cables labelled CON0 - CON3 are attached to this board. If you have a printer with a Centronics type parallel interface, one of the 50-pin cables will need to be attached to the 50-pin connector on this board.

If you are installing this board, clean off the S-100 connector fingers with alcohol and a cotton swab. With the component side facing up, slide the M/NET I/O Board into the appropriate card cage slots so that it slides into edge connector #2, the bottom one on the left. Press the board all the way into the connector.

The figure below illustrates the top of the board for cable connections.
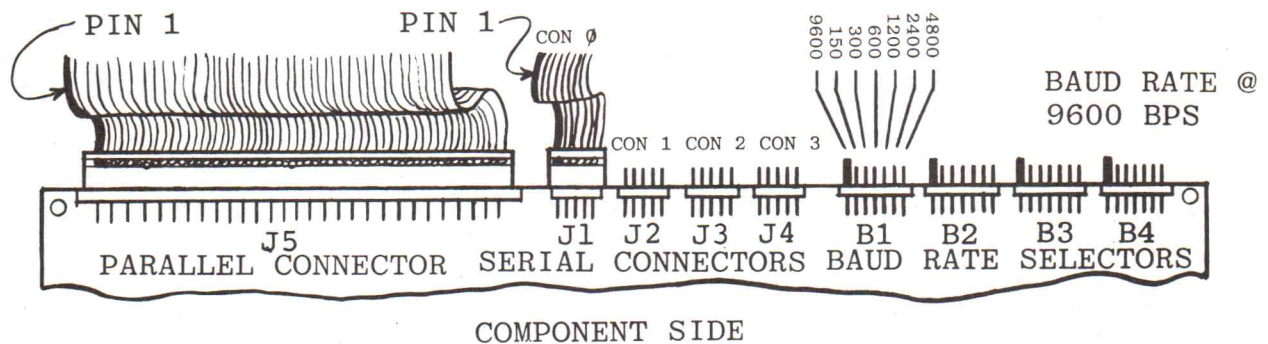
FIGURE 7-1 M/NET I/O CABLE LOCATIONS

The correspondence of cable number to connector is as follows.

Cable	Connector
CON0	J1
CON1	J2
CON2	J3
CON3	J4

If your system has fewer than four terminals, you need only attach as many cables as you have terminals starting with CON0 to J1. (You might as well attach them all though; it doesn't make any difference to the computer.)

The label that identifies the cables covers the groove or carat embossed in the cable connector. However, a red line should be present on the cable. As you look down on the board, the red line should attach to the left side of the connector. If the red line

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is not drawn on the cable, attach it so that the cable label is facing up as illustrated in the figure above.

Each of the serial ports has a baud rate select jumper associated with it. This jumper is in the form of a connector. The series of four 14-pin connector to the right of the cable connectors is used for this purpose. Notice that there are four plastic enclosed jumpers attached to these connectors. Select a comfortable baud rate for data transmission between the computer and terminal (9600 is popular) and place the jumper across the corresponding pins. Use the rates silkscreened on the board for reference.

Once you have installed the jumpers on the board, select the same baud rate on the terminals. These are typically DIP (dual in-line package) switches located somewhere on the terminal. Usually, the only switch put in the ON position is the one for the desired rate. The remainder should be placed in the OFF position.

If you have a Centronics type, parallel interface printer it will be attached to the 50-pin connector on the back panel later on. One of the two 50-pin intra-cabinet cables from the back panel should be attached to the M/NET I/O board now, though. You have two choices: 1) use the cable labelled DDDC which normally goes to the DOUBLER or 2) use the cable labelled HDC which normally goes to the Hard Disk Controller. The following criteria should be used to determine which one.

1) If you purchased a hard disk drive with the M/NET system, attach the cable labelled DDDC to the M/NET I/O Board. Subsequently, the cable exiting the floppy drive cabinet will attach directly to the DOUBLER.
2) If you did not purchase a hard disk drive, use the cable labelled HDC to connect the printer to the M/NET I/O Bd.

**** IMPORTANT ****

These cables should not be attached to the M/NET I/O Board unless they're needed. Otherwise, they should be attached to the DOUBLER and Hard Disk Controller as instructed.

****

Using the criteria above, select either the DDDC or HDC 50-pin cable for connection to this board. It attaches to connector J5 with the same orientation as the 10-pin cables; i.e., the red line should attach to the left side of the connector. Figure 7-1 also illustrates the orientation of this cable.

It is advised that you relabel both ends of the internal cable selected for this purpose. For instance, if the DDDC cable was selected, relabel the connector on the M/NET I/O board PRINT and change the MBOX label on the back panel similarly. Or, the cable called HDC and HDISK should be relabelled.

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CHAPTER 8: DOUBLER INSTALLATION

The DOUBLER normally has two intra-cabinet cables: the 50-pin cable labelled DDDC and the 10-pin cable labelled PRINT. The alternate situation is where the 50-pin cable labelled DDDC is used for a parallel interface printer. This exception will be addressed after the normal; skip to that portion after the 10-pin PRINT cable has been attached below.

If you are installing the DOUBLER, clean off the S-100 connector fingers and, with the component side facing up, slide the board into the card cage so that it will rest in edge connector #4 on the left side of the mother board. Press the board all the way into the edge connector.

Figure 8-1 illustrates the top of the DOUBLER for cable installation.
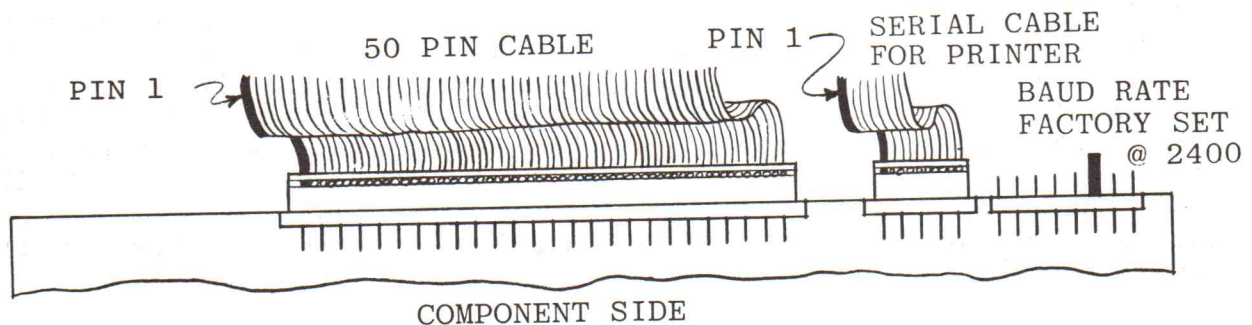
FIGURE 8-1   TOP OF DOUBLER

The 10-pin cable labelled PRINT should be attached to the 10-pin connector on the DOUBLER. If you don't have a serial printer, you can skip this, but, then again, why not attach it. It is easier to do it now than to re-open the cabinet and attach it later. Use the illustration above for cable orientation regarding pin 1. The connection is the same in principle as with the M/NET I/O Board; pin 1, indicated by the red line and/or notch (which may be covered by the PRINT label) should attach to the left side of the connector. Be sure to put the cable on the correct pins; do not put it on the connector used for baud rate selection.

The serial port on this board also features a jumper selectable baud rate. Determine the baud rate of the printer and place the plastic enclosed jumper in the appropriate position; use the baud rates silkscreened on the board for reference. Ensure that the baud rate set in the printer matches that set on the DOUBLER.

NORMAL 50-PIN CABLE INSTALLATION: These instructions should only be used if the 50-pin cable labelled DDDC was **NOT** attached to the M/NET I/O Board.

The 50-pin cable labelled DDDC is used to transmit data between the floppy disk drives and the DOUBLER. Using the figure above as reference, install the cable with the red line attaching to the left side of the connector.

ALTERNATE 50-PIN CABLE INSTALLATION: If the 50-pin cable labelled DDDC was used for a parallel printer (connected to the M/NET I/O Board), you will not be able to use it for the DOUBLER (sound logic eh?). Instead, connect the cable from the floppy disk drive cabinet directly to the DOUBLER.

Place the floppy drive cabinet close to the computer cabinet and unravel the cable, removing the packet containing the bezel handles. Lift the tabs on the two strain relief clamps and remove the bar. Lay the cable from the drives through the cut-out in the top of the back panel and over the two other 50-pin cables. As you lay it under the capacitor board, be careful of the solder joints on the bottom; don't let the cable scrape against them as this may strip the insulation. Install this cable to the DOUBLER with the orientation shown in the figure above; the red line attaches to the left side of the connector. Finally, refasten the strain relief clamps.

Note that the floppy drive and computer cabinets must be moved in tandem once this operation has been performed.

CHAPTER 9: HARD DISK CONTROLLER INSTALLATION

If your M/NET system does not include a Hard Disk Controller, skip to Chapter 10 for master and slave installation.

If you are installing this board, first clean off the S-100 connector fingers. With the component side facing up, align the board in the appropriate card cage slots so that it will reside in edge connector #6 on the left side of the mother board. Press the board all the way into the connector.

Figure 9-1 illustrates the top of the Hard Disk Controller for cable installation.
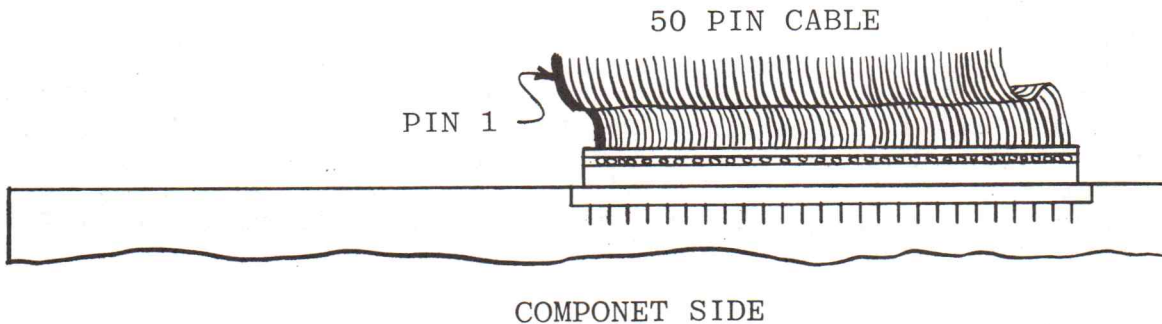
FIGURE 9-1   TOP OF HARD DISK CONTROLLER

Only one cable attaches to the Hard Disk Controller, the 50-pin cable labelled HDC. Using Figure 9-1, install this cable with the red line on the left side of the connector.

CHAPTER 10: Z-64 MASTER AND SATELLITE (SLAVE) INSTALLATION

The last PC boards to be installed in the system are the master and satellites. No cables are attached to the satellites and the Master receives but one, the wires from the system reset switch. Typically, the Master is found in the top connector in the left side of the card cage, #8, and the slaves are all placed in the right side.

If you are installing these boards, clean off the S-100 connector fingers for each. There is one master and 2 - 4 slaves. First, take the Master in hand and align it in the card cage slots corresponding to S-100 edge connector #8. Push it in until it is completely seated.

Before installing the satellites, the wires from the reset switch can be attached. The connector at the end of these wires has four holes one of which is plugged. It attaches to 3 protruding pins located along the top edge of the board about two inches in from the top right corner. Notice that the connector on the Master has a corresponding snipped pin. Figure 10-1 indicates the location of both the connector and the missing pin.
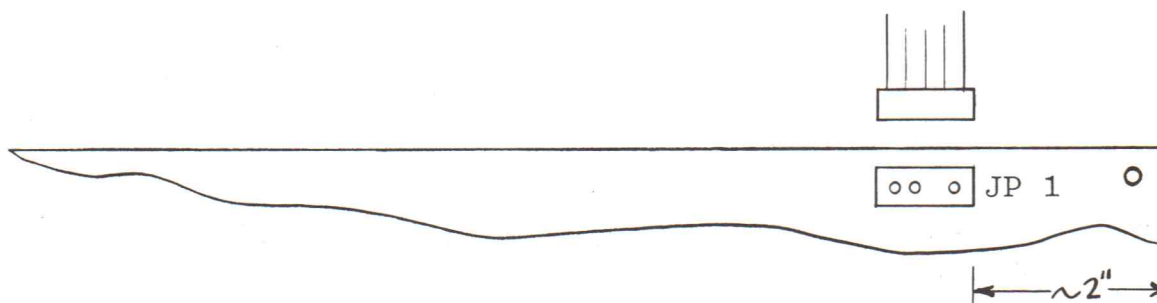

FIGURE 10-1 TOP OF MASTER Z-64

Orient the connector so that the keyed hole lines up with the missing pin and slide it on.

The slaves can be installed now. Any of the remaining edge connectors can be used (all will be on the right side of the card cage. Remember that all boards inserted into this side must have the component side facing down. We recommend against using slot 1, however; air circulation is not the best there.

Before inserting the satellites, you should confirm that they are addressed sequentially. That is, each has a unique identity set via a jumper. The jumper area consists of two rows of 8 pins and is located at the bottom of the board underneath columns D and E (the column letters are indicated along the top of the board)

just above the S-100 fingers. Each column of pins is identified by a number (1 - 8) silkscreened below it. A plastic jumper is placed across the pins in a column to uniquely identify the board. It doesn't matter which slave is number 1, number 2, etc., but no two boards can have the same number. Check each satellite to ensure that this is true. Re-arrange the jumpers if there is a conflict.

With the insertion of the slave processor boards, all the PC boards and internal cables have been installed. Slide the cover back on and, if the unit is not rackmounted, secure it to the base plate with the four screws.

ALTERNATE TERMINAL ARRANGEMENTS

The Terminal Interface

The M/NET system can contain any from a variety of popular terminals. At the back panel three lines are connected: RxD (Receive Data) on pin 3, TxD (Transmit Data) on pin 2 and ground on pin 7. This is sufficient for most terminal I/O. However, if your terminal requires handshaking, for instance, the following table lists the other signals available through the 8251s on the M/NET I/O Board. The four headings describe I/O board signal name, the M/NET I/O Board pin number on the connector, the RS-232 pin number and the equivalent signal name. The conversion from the RS-232 signal lines to the M/NET I/O lines is typically made by the cable within the computer cabinet. The preceding "-" indicates those lines installed at the factory.

M/NET I/O		RS-232C	
Signal	Pin #	Pin #	Signal
-TxD	1	3	RxD
DTR*	6	6	DSR
-GND	2	7	GND
-RxD	9	2	TxD
DSR	5	20	DTR
CTS	7	4	RTS
RTS	3	5	CTS

* This output signal is held high on the M/NET I/O Board.

Refer to the Micromation Multi I/O & M/NET I/O Board Manual for a more complete description of the signals.

Extending Terminal Distance from the Computer

The standard RS-232 interface is rated to transmit data 50 feet over a 24 gauge wire. This is a very conservative value. (In fact, there are instances where data has been transmitted 500' over a line this size.) Although longer distances can be accommodated, there are a number of factors to consider: e.g., external interference, the terminal's line drivers, etc. If your application requires distances exceeding the 50' limit, consult a reputable book on RS-232 conventions and applications.

A5Ø ØØ1 RACK
ASSEMBLY INSTRUCTIONS

NOTE: The plastic insert "nuts" are a one-shot deal. Align the panels carefully before you drive the screws. Aim carefully and get the screw in the hole. If you miss and strike the side of the funnel, you may push the plastic insert down into its mounting hole.

If you do this, use a 1" sheet metal screw (longer than the ones provided) in the damaged insert. It should reach into the hole and pull the insert up into position.

INSTRUCTIONS:

1) Lay the hinged top upside down and folded with the holes facing up.

2) Attach the sides with the black mounting rails toward the front and against the top.

    Note that the side panels align against the front edge, and the back sticks out beyond the end of the side panels.
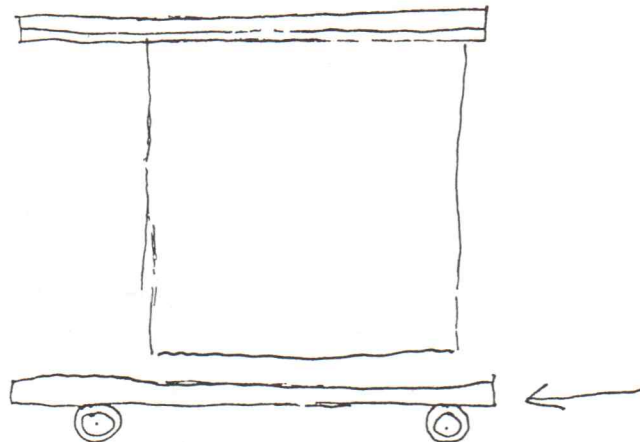

BACK

TOP UPSIDEDOWN

FRONT
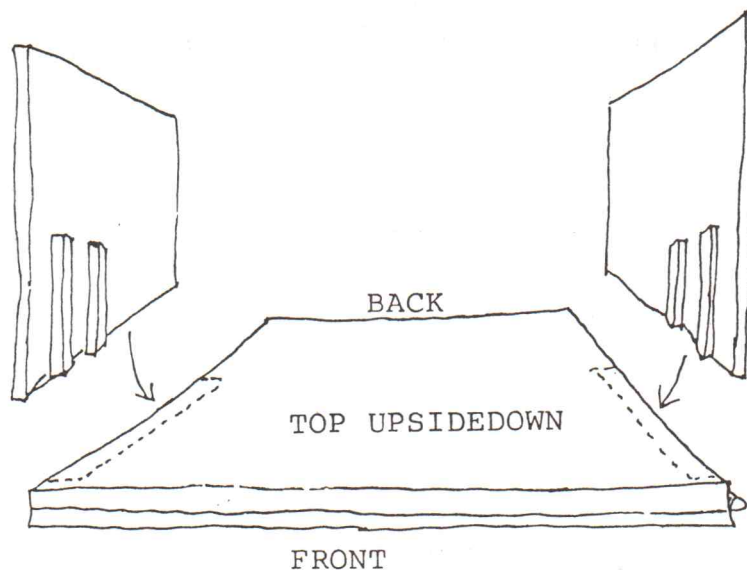
3) Attach the back panel. Note that the single plastic insert (the circle on the drawing below) goes on the inside and up in the air, not toward the top panel.


TOP PANEL
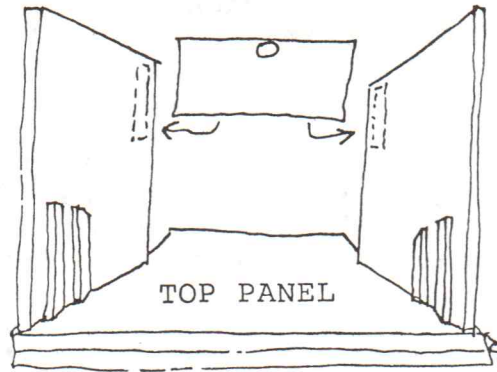
4) Now turn the unit right side up.
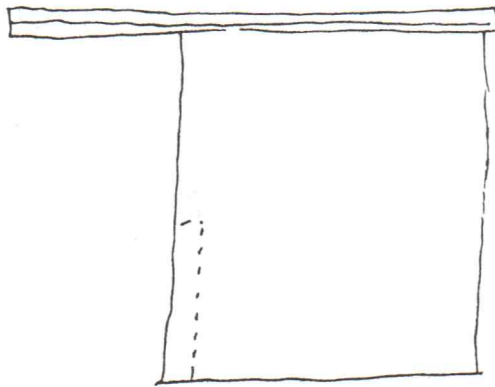
5) Pick the unit up and slide the roller panel under it.

6) Attach the unit to the roller panel and the Rack is complete.

7) The feet must be removed from the computer and floppy disk cabinets or they will not fit into the Rack. To remove them, use a screwdriver to lift an edge then carefully peel off the rubber foot.

8) The black vertical mounting rails on the side panels have pre-drilled holes that match the holes on the computer and disk drive cabinets. To mount the cabinets the covers must be removed from the computer and floppy disk cabinets. None of the interconnect cables should be attached while doing this.

9) Using the flat head machine screws provided, the covers are then mounted in the Rack with the computer on the top set of holes and the floppy disk drive below. Mount the top cover first to allow easy screwdriver access.

10) A kit consisting of four brackets and the necessary fasteners to mount the hard disk in the lowest set of holes is provided. (Skip to step 12 if you do not have a hard disk.) The brackets with the countersunk holes on the inside mount to the Rack. These brackets are mounted as shown in the illustration below. Mount these brackets in the Rack using the flat head machine screws provided.

11) The remaining metal brackets mount on the holes in the frame of the hard disk cabinet. The brackets mount with the bend down as showm below. Use the nuts, bolts, and lock washers provided. Finger access in the drive cabinet is tight when mounting the brackets. You may want to use tape to hold some of the nuts inside the cabinet.

12) With these preparations made the computer components may be inserted from the front to their respective places in the Rack. With the components level and straight, slide them in carefully. If someone helps from behind the Rack, be careful not to smash his fingers when inserting the cabinets.

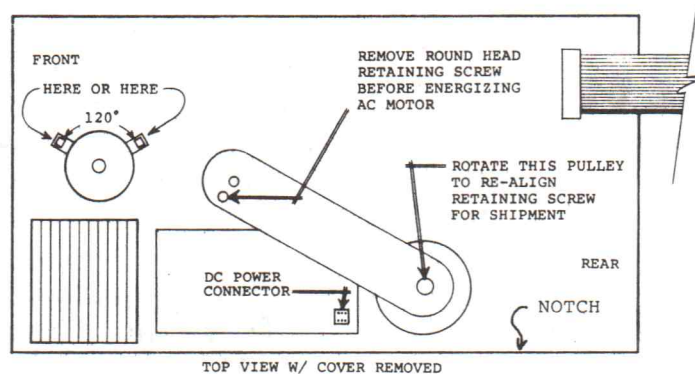13) The interconnect cables may now be connected and the system checked as described in the installation manual.
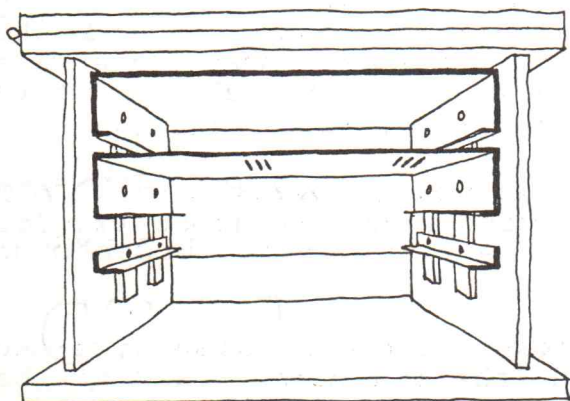
INSTALLING HARD DISK LOCKING DEVICES

To insure the safe transport of the hard disk drive, the two
locking devices removed as part of the initial installation must
be re-installed. Not all movement of the unit requires these
devices. For instance, if the hard disk is carried or rolled in
the RACK from one room to another they need not be put in.
However, if the unit is shipped, rolled over a very rough
surface, or moved in such a manner that it is subjected to
intense vibration, it is necessary to put them in.

There are two locks. Both are illustrated in Figure C-1. The
first is a set screw that prevents the platters from rotating.
The other is a stepper motor lock, similar in appearance to a
clothespin, which prevents the head from moving laterally across
the platter.

FRONT
HERE OR HERE
120°

REMOVE ROUND HEAD
RETAINING SCREW
BEFORE ENERGIZING
AC MOTOR

ROTATE THIS PULLEY
TO RE-ALIGN
RETAINING SCREW
FOR SHIPMENT

DC POWER
CONNECTOR

REAR

NOTCH

TOP VIEW W/ COVER REMOVED

FIGURE C-1 STEPPER LOCK & SET SCREW PLACEMENT

These devices lock the read/write head mechanism in a location of
the platter not used for data storage (the innermost track). Any
head jiggling or bouncing affects only that portion of the
platter leaving the data storage portions untouched. If they are
not installed, the head and platter are free to travel and rotate
with the high potential for scoring the recording surface.

To install the devices, turn off the power, remove the unit from
the rackmount (if it is so mounted) and unlatch the cover. You
will need to power up the drive at one point in the process so
have an outlet nearby.

STEPPER MOTOR LOCK: Before the stepper motor lock can be inserted
the read/write head must be moved to the innermost track of the
platter.

1) Detach the DC power connector shown in Figure C-1 by pushing in on the tabs and pulling up. As you do so, note the location of the round marker at the upper left hand corner (given the perspective of Figure C-1). When the connector is re-installed, this orientation must be maintained.

2) Grasp the plastic cover on opposite sides and pull out and up to remove it.

3) Now that the DC power to the stepper motor is disengaged, turn on the power switch and wait a couple of minutes for the platter to achieve full speed. (You want the platter to rotate so that the head floats while you're manually moving the it.)

4) Rotate the circular top portion (with the four screws) **CLOCKWISE**. This manually moves the head to the inner most track. To check the location of the head, rotate the drive cabinet on its side and watch it as you rotate the motor. There is a damper involved so very slow movements of the motor may not move the head. When the inner track is achieved, the motor will still rotate (because it is dampered), but the head won't move anymore. You will also be able to notice a different feel from the motor when the head is all the way in.

5) When the head is all the way in, the lock can be inserted (the power should still be on). Look at the top of the motor from the back and rotate it until the screws no longer obstruct a path for lock. Slide it in; a small snap is apparent when the clothespin is seated.

6) Replace the cover with the cut-out aligned with the lock.

7) Turn off the power and re-insert the DC power connector. Ensure that the marker that denotes the proper orientation is in the upper left corner when the unit is viewed from the perspective shown in Figure C-1.

SET SCREW: Inserting the set screw is not nearly as involved but there is an important warning. This lock is inserted through a hole in the platter pulley to the chassis. To align the holes, rotate the pulley through the window in the black plastic cover **CLOCKWISE.**

****** WARNING ******

DO NOT, under any circumstances, rotate the pulley counterclock-wise. This is guaranteed to cause damage to the recording surface.

****

When the holes line up, insert the screw and lockwasher.

This completes the operation. The cover can be re-latched. If the

unit is to be transported over long distances, it is strongly recommended that it be packed in the cartons in which it was originally received.

APPENDIX D

INSTALLING A TI 810 PRINTER

The TI 810 is a serial interface printer. In the M/NET system, the cable from the printer is connected to the RS-232 connector on the middle of the back panel labelled PRINT. The destination of the intra-cabinet cable is the serial port of the DOUBLER.

Before this printer is connected to the computer, however, some re-organization of the signal wires is necessary. The table below indicates the connection of three wires from the printer to the DOUBLER. Note that except for the last one listed, these are the standard connections provided with the system.

Multi I/O Pin #	Back Panel Pin #	TI 810 Pin #	Signal Name
1	3	3	TxD to RxD
2	7	7	Ground
5	20	11	Reverse Channel

The Reverse Channel line is used for the /BUSY signal from the printer.

This wire orientation is good for all models of the 810 except the IRC and DNB type. Refer to the printer documentation for the wire connections for these.

The standard cable for a printer has several wires soldered to the connector on the inside of the back panel that must be cut. You will need to open up the computer cabinet to make the changes. Snip all wires not attached to pins 3, 7, and 20 of this connector.

There are a couple of ways to make the wire switch for the last signal. The easiest way is to unsolder the wire attached to pin 20 on the connector inside the back panel and resolder it to pin 11. Alternatively, the cable running between the printer and the back panel connector can be re-configured so that the pin 11 output from the 810 ends up at pin 20 on the back panel. Both options are suitable; select the one that is easiest to implement.

While the computer cabinet is open, refer to the TI 810 documentation and select a baud rate. Set the jumper on the DOUBLER baud rate select connector to match the setting in the printer. When the printer and DOUBLER match, slide the cover back on and re-fasten the screws.

Finally, disable the auto line feed feature in the printer. The 810 documentation will indicate the location of the switch.