

Assembly Instructions MF-68 Disk System

The MF-68 Disc System is a dual mini-floppy disc system designed for a SWTPC 6800 Computer System.

The MF-68 consists of three major parts: the controller, the chassis and power supply and the drives themselves. The drives come pre-assembled and require only minor jumper changes to be used. The power supply is assembled partially on a small printed circuit board and partially thru point to point chassis wiring. The controller is assembled entirely on a 5 3/4" x 5" circuit board that will plug into an I/O slot on the computer's mother board. Connection between the controller and the drives is made via a 34 conductor ribbon cable.

When assembling the unit, work first on the controller board, then the power supply and finally the drive programming and chassis assembly.

When the MF-68 disc system is being assembled, work on only one part or board at a time. The MOS integrated circuits supplied with this kit are susceptible to static electricity damage and for this reason have reason have been packed with their leads impressed onto a special conductive foam or possibly wrapped in a conductive foil. In either case, do not remove the protective material until told to do so later in the instructions.

Controller PC Board Assembly

NOTE: Since all of the holes on the PC board have been plated thru, it is only necessary to solder the components from the bottom side of the board. The plating provides the electrical connection from the "BOTTOM" to the "TOP" foil of each hole. Unless otherwise noted, it is important that none of the connections be soldered until all of the components of each group have been installed on the board. This makes it much easier to interchange components if a mistake is made during assembly. Be sure to use a low wattage iron (not a gun) with a small tip. Do not use acid core solder or any type of paste flux. We will not guarantee or repair any kit on which either product has been used. Use only the solder supplied with the kit or a 60/40 alloy resin core equivalent. Remember all of the connections are soldered on the bottom side of the board only. The plated-thru holes provide the electrical connection to the top foil.

- () Before installing any parts on the circuit board, check both sides of the board over carefully for incomplete etching and foil "bridges" or "breaks". It is unlikely that you will find any, but should there be, especially on the "TOP" side of the board, it will be very hard to locate and correct after all of the components have been installed on the board.
- () Attach all of the resistors to the board. As with all other components unless noted, use the parts list and component layout drawing to locate each part and install from the "TOP" side of the board bending the leads along the "BOTTOM" side of the board and trimming so that 1/16" to 1/8" of wire remains. Solder.

- () Install all of the capacitors on the board. Be sure to install the electrolytic and tantalum capacitors exactly as shown on the component layout drawing. Solder.
- () Install the transistor and diodes on the board. The diodes must be turned so the banded end corresponds with that shown on the component layout drawing, and the transistor must be turned to match the outline on the component layout drawing as well. Solder.
- () Starting from one end of the circuit board install each of the three, 10 pin Molex female edge connectors along the lower edge of the board. These connectors must be inserted from the "TOP" side of the board and must be pressed down firmly against the board. Make sure the body of the connector seats firmly against the board and that each pin extends completely into the holes on the circuit board. Not being careful here will cause the board to either wobble and/or be crooked when plugged onto the mother board. It is suggested that you solder only the two end pins of each of the three connectors until all have been installed at which time if everything looks straight and rigid you should solder the as yet unsoldered pins.
- () Insert the small nylon indexing plug into the lower edge connector pins indicated by the small triangular on the "BOTTOM" side of the circuit board. This prevents the board from being accidentally plugged on incorrectly.
- () The 34 pin ribbon cable connector should now be attached to the board. Install the connector from the "TOP" side of the board and orient the connector such that the pins face the top edge of the board. Solder.
- () The crystal should now be installed on the board. Bend the crystal's leads at a 90° angle approx. ~ inch from its body and mount from the top side of the board. After soldering fasten the crystal to the board using a short piece of stripped wire by passing the wire through the two holes next to the crystal.
- () Install all integrated circuits, except IC1, IC12 and IC13. As each one is installed, make sure it is down firmly against the board and solder only two of the leads to hold the pack in place while the other IC's are being inserted. Do not bend the leads on the back side of the board. Doing so makes it very difficult to remove the integrated circuits should replacement ever be necessary. The semicircle notch, dot or bar on the end of the package is used for orientation purpose and must match with the outlines shown on the component layout drawing for each of the IC's. After inserting all of the integrated circuits, go back and solder each of the as yet unsoldered pins.
- () Install integrated circuit IC13 and its heatsink on the circuit board. This component must be oriented so its metal face is facing the circuit board as is secured to the circuit board with a #4-40 x 1/4" screw, lockwasher and nut. The three leads of the integrated circuit must be bent down into each of their respective holes. The hole on the heatsink should be positioned to allow maximum contact area between the regulator and the heatsink. Solder.

NOTE: MOS integrated circuits are susceptible to damage by static electricity. Although some degree of protection is provided internally within the integrated circuits, their cost demands the utmost in care. Before opening and/or installing any MOS integrated circuits, you should ground your body and all metallic tools coming into contact with the leads thru a 1 M Ω 1/4 watt resistor (supplied with the kit). The ground must be an "earth" ground such as a water pipe, and not the circuit board ground. As for the connection to your body, attach a clip lead to your watch or metal ID bracelet. Make absolutely sure you have the 1 Meg Ω resistor connected between you and the "earth" ground, otherwise you will be creating a dangerous shock hazard. Avoid touching the leads of the integrated circuits any more than necessary when installing them, even if you are grounded. The tip of the soldering iron should be grounded as well (separately from your body ground) either with or without a 1 Meg Ω resistor. Most soldering irons having a three prong line cord plug already have a grounded tip. Static electricity should be an important consideration in cold, dry environments. It is less of a problem when it is warm and humid.

- () Install MOS integrated circuits IC1 and IC12 following the precautions given in the preceding section. As each is installed, make sure it is down firmly against the board before soldering all of its leads. Do not bend the leads on the back side of the board. Doing so makes it very difficult to remove the integrated circuits should replacement ever be necessary. The "dot" or "notch" on the end of the package is used for orientation purposes and must match with that shown on the component layout drawing for each of the IC's .
- () Working from the "TOP" side of the circuit board, fill in all of the feed-thru's with molten solder. The feed-thru's are those unused holes on the board whose internal plating connects the "TOP" and "BOTTOM" circuit connections. Filling these feed-thru's with molten solder guarantees the integrity of the connections and increase the current handling capability.
- () Now that all of the components have been installed on the board, double check to make sure all have been installed correctly in their proper location.
- () Check very carefully to make sure that all connections have been soldered. It is very easy to miss some connections when soldering which can really cause some hard to find problems later during checkout. Also look for solder "bridges" and "cold" solder joints which are another common problem.

Since the circuit board now contains MOS devices, it is susceptible damage from severe static electrical sources. One should avoid handling the board any more than necessary and when you must, avoid touching or allowing anything to come into contact with any of the conductors on the board.

- () Now that the controller has been finished, assemble the power supply using the P-200 MF instruction set.
- () Now that the power supply has been assembled you are ready to program and install the drives. The mini-floppy drives come pre-assembled and tested and require no circuit modifications to work in an MF-68 System. The drives do need to be programmed, however, to allow multiplexing of the drive select signals to selectively enable multiple drives. Carefully remove both drives from their boxes and turn the drives so that the edge connectors are nearest you and so that the belt and pulleys are on the bottom. Immediately above J2 on the bottom right hand edge of the board you will notice the wording

MINI
25060-1

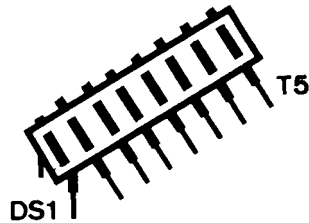
or

MINI
25060-2

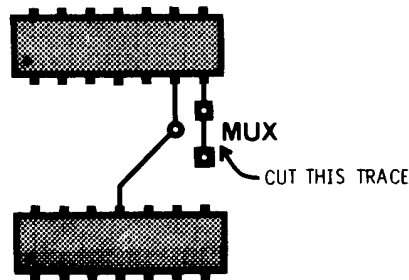
The number -1 or -2 denotes the circuit board revision number follow the correct instructions below for the drives you have.

25060 -1 boards (Both drives must be -1)

- () At the bottom left corner of the board you will notice what looks like an IC made up of jumpers in a socket. On one of the drives remove the jumper block with a screw driver and bend upward (straight out) the pins that go to terminals DS2, DS3, T1, T2, T3 T4 and T5. Do not break off these pins. Replace the jumper block in the socket. This jumper will select this drive for DRIVE #0, the -lowest number and most dominant give in the system. As a double check the only position that should have a connected jumper is DS1.

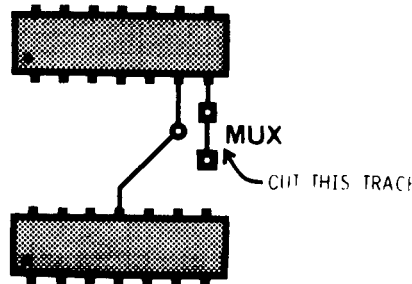


In the center of the board you will notice two small connected pads marked MUX. This small trace should be cut with a knife or razor blade.



This drive is now programmed as DRIVE 0

- () On the other drive bend straight the pins going to DS1 and DS3 - all others should be left as they are to complete the jumpering of DS2, T1, T2, T3, T4 and T5. Re-install the jumper block. In the center of the board you will notice two small connected pads marked MUX. This small trace should be cut with a knife or razor blade.

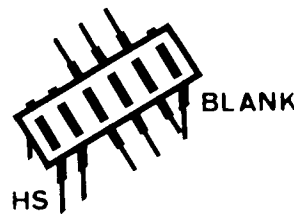


This drive is now programmed as DRIVE #1.

- () Go on to the final assembly instructions.

25060 -2 boards (Both drives must be -2)

- () At the bottom left corner of the board you will notice what looks like an IC made up of jumpers in a socket. On cane of the drives remove the jumper block with a screwdriver and bend upward (straight) the pins that go to terminals DS2, DS3, and MX. not break these pins off. Re-install the jumper block into the socket. As a double check the jumper block should have pins inserted only in terminals DS1, HS and the unlabeled pin. There should be nothing plugged into the HM position.

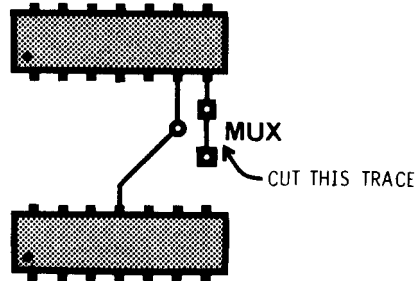


Directly above this jumper block you will notice what appears to be a 14 pin IC in a socket. This is not an IC but is an array of pull-up resistors. Carefully remove this array from its socket using a small screwdriver. This array should not be reinstalled. This drive is now programmed as DRIVE 0.

- () On the other drive bend straight the pins going to DS1, DS3, and MX. Re-install the jumper so that HS, DS2 and the unlabeled pin have jumper pins installed.
- () Go on to the final assembly instructions.

Combination of one 25060-1 and one 25060-2 Board.

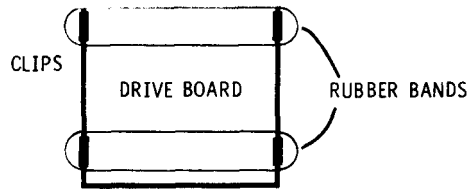
- () If you have one -1 board and one -2 board a combination of the above instructions should be followed. First take the -2 unit and turn it so that the edge connectors are nearest you. At the bottom left corner of the board you will notice what looks like an IC made up of jumpers in a socket. Remove the jumper block with a screwdriver and bend upward (straight out) the pins that go to terminals DS2, DS3 and MX. Replace the jumper block in its socket. Directly above the jumper block you will notice what appears to be a 14 pin IC in a socket. This is not an IC but is an array of pull-up resistors. Slide a screwdriver under this array and remove it. It should not be re-installed. This drive is now programmed to be DRIVE 0.
- () Now take the -1 drive and bend up pins DS1 and DS3. Re-install the jumper block. You will notice in the middle of the board two small connector pads marked MUX. This trace should be cut with a knife or razor blade.



- () This drive is now programmed as DRIVE 1.

FINAL ASSEMBLY

- () Some drives have the printed circuit board held in place with four metal spring clips. If yours is of this type use two rubber bands for each drive to help the retaining clips hold the board in place.



- () Now that both drives have been programmed you are ready to install them in the chassis. DRIVE 0 should be installed first nearest the power supply. The drive should be installed so that the jumper block is toward the TOP of the chassis. Connect the power supply connector to J2 of the drive and mount the drive from the bottom of the chassis using two 6-32 X 1/4 screws.
- () Connect the other power supply connector to J2 of DRIVE 1 and install this drive next to the first. Again orient the drive so that the jumper block is toward the top. Use two 6-32 X 1/4 screws to secure the drive.
- () Insert the 1 1/2 inch hole bushings in the rear of the chassis. Install the bushings from the outside of the chassis.

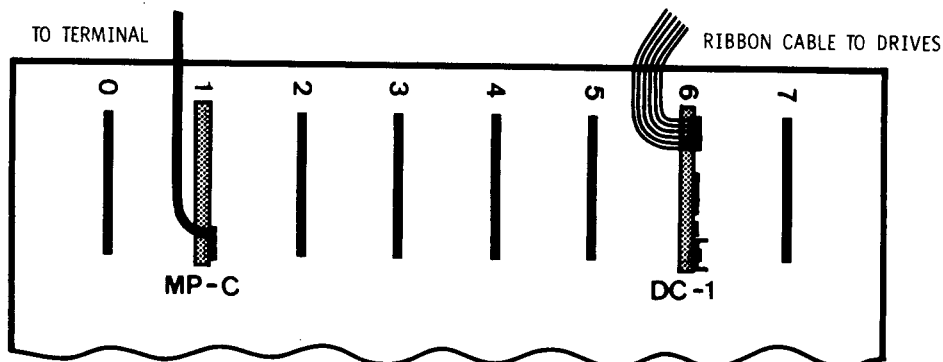
- () Run the ribbon cable thru the 1 1/2 inch hole bushing nearest the edge of the chassis so that both edge type connectors are inside the chassis.
- () Install the 2 Tinnerman nuts to the chassis for cover mounting.
- () Connect the two edge connectors on the ribbon cable to the drives. The connectors must be installed so that pin #1 is toward the top of the chassis.
- () The front panel piece should now be installed on the chassis using 6-32 x 3/8 screws, lockwashers and nuts.
- () This completes the assembly of the disk system. Before the cover is installed or power is applied you should re-check all assembly steps.

Computer Interconnection

- () In order for the MF-68 to work properly with an SWTPC 6800 computer one minor modification needs to be made to the mother board. Power down the computer and carefully remove the mother board. With a short length of wire connect the two end pins of I/O socket #5. This will connect the #5 chip select line to UD3. When connecting the wire route it around the PC support on the bottom of the board to prevent it from being cut. Re-install the mother board when finished.



- () The disk controller board should now be plugged onto I/O slot 6 on the computer's mother board.
- () Connect the ribbon cable to the connector on the controller board. If the connector supplied on the cable does not have an indexing pin install the connector so that the cable runs toward the back of the board.



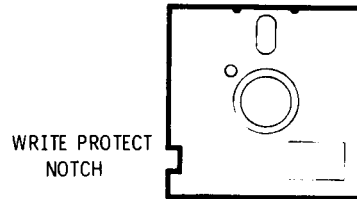
SWTPC 6800 Computer System Mother Board

- () This completes the interconnection of the MF-68 and the computer system. The disk system is now ready for checkout.

Checkout and Use

At least 16K of memory must be installed in the computer.

- () After connecting the disk to the computer you are ready to use the MF-68. If at any time the disk fails to operate as described, power down the system and re-check all assembly.
- () Power up the MF-68 unit. Nothing should happen at this point.
- () Power up the computer system. At this time the drive's heads will be stepped to the TRACK 0 position (if not already there) and the DRIVE 0 head load LED should come on.
- () Load the small boot program into memory.
- () Write protect the supplied diskette by placing a small piece of tape around the square notch on the side of the diskette.



- () Install the diskette into DRIVE 0 so that the write protect notch is at the bottom. Be sure to close the door on the drive.
- () Set the computer's program counter to 0100 and type G. Both drives should start up and the operating system contained on the diskette should be loaded into memory. If everything is operational the computer should respond with SWTPC READY. At this point you are in the disk operating system. If the system does not boot up correctly reset the program counter to 0100 and again type G. If, after several tries, the computer fails to respond with ready then the system is not operating properly. If this is the case refer to the In Case of Problems section.

Using the Disk System

The ME-68 Minifloppy Disk System is designed to be as straightforward and easy to use as possible. There are certain things that the user must be aware of, however, for correct operation.

All memory in the system (16K minimum) must be operational for the disk to operate properly. If any doubt exists run the ROBIT, MEMCON and CDAT diagnostics to verify correct operation.

Diskettes should always be inserted with the WRITE PROTECT notch nearest the LED's on the drive and with the label outward. Having this notch closed with a piece of tape will prevent the disk from being written on. Leaving the notch open will allow write privileges.

The LED's on the drives are head load lights and are activated only when the head for a particular drive is loaded on a diskette. They are not power indicators.

The disk controller has been designed to load the head and turn on the drive motors only when necessary. When the computer requests data from the disk the motors will activate and the correct head will load. After the information has been retrieved the head will un-load, and after approximately 20-30 seconds, the motors will turn off. During this off state it is normal for the DRIVE 0 LED to be activated.

Just like cassette tapes, diskettes are made of magnetic materials and can be erased by stray magnetic fields. Also, it is an excellent idea to back-up all important disks on a spare diskette. The following precautions should be followed concerning diskettes:

1. Return the diskette to its storage envelope whenever it is removed from a drive.
2. Keep diskettes away from magnetic fields and from ferromagnetic materials which might become magnetized. Strung magnetic fields can distort recorded data on the disk.
3. Replace storage envelopes when they become worn, cracked or distorted. Envelopes are designed to protect the disk.
4. Do not write on the plastic jacket with a lead pencil or ball-point pen. Use a felt tip pen.
5. Heat and contamination from a carelessly dropped ash can damage the disk.
6. Do not expose diskette to heat or sunlight.
7. Do not touch or attempt to clean the disk surface. Abrasions may cause loss of stored data.

The MF-68 uses the ENABLE line from I/O position 5 as a control line. Care should be exercised when using I/O slot 5 for other devices. A parallel printer interface will work correctly on slot 5 with DOS.

Parts List - DC-1 Disk Controller

Resistors

____ R1 4.7K Ω 1/4 watt resistor
____ R2 1M Ω 1/4 watt resistor
____ R3 750K Ω 1/4 watt resistor
____ R4 150 Ω 1/4 watt resistor
____ R5 150 Ω 1/4 watt resistor
____ R6 150 Ω 1/4 watt resistor
____ R7 150 Ω 1/4 watt resistor
____ R8 4.7K Ω 1/4 watt resistor
____ R9 4.7K Ω 1/4 watt resistor
____ R10 680 Ω 1/4 watt resistor
____ R11 100 Ω 1/4 watt resistor
____ R12 4.7M Ω 1/4 watt resistor
____ R13 1K Ω 1/4 watt resistor

Capacitors

____ C1 0.01 uF disc capacitor
____ C2 0.01 uF disc capacitor
____ C3 0.01 uF disc capacitor
____ C4 0.1 uF disc capacitor
____ C5 0.1 uF disc capacitor
____ C6 20 pF disc capacitor
____ C7 0.1 uF disc capacitor
____ *C8 100 uF @ 16 volt electrolytic capacitor
____ C9 0.1 uF disc capacitor
____ *C10 22 uF @ 6.3v tantalum capacitor
____ C11 0.1 uF disc capacitor
____ C12 0.1 uF disc capacitor

Semiconductors

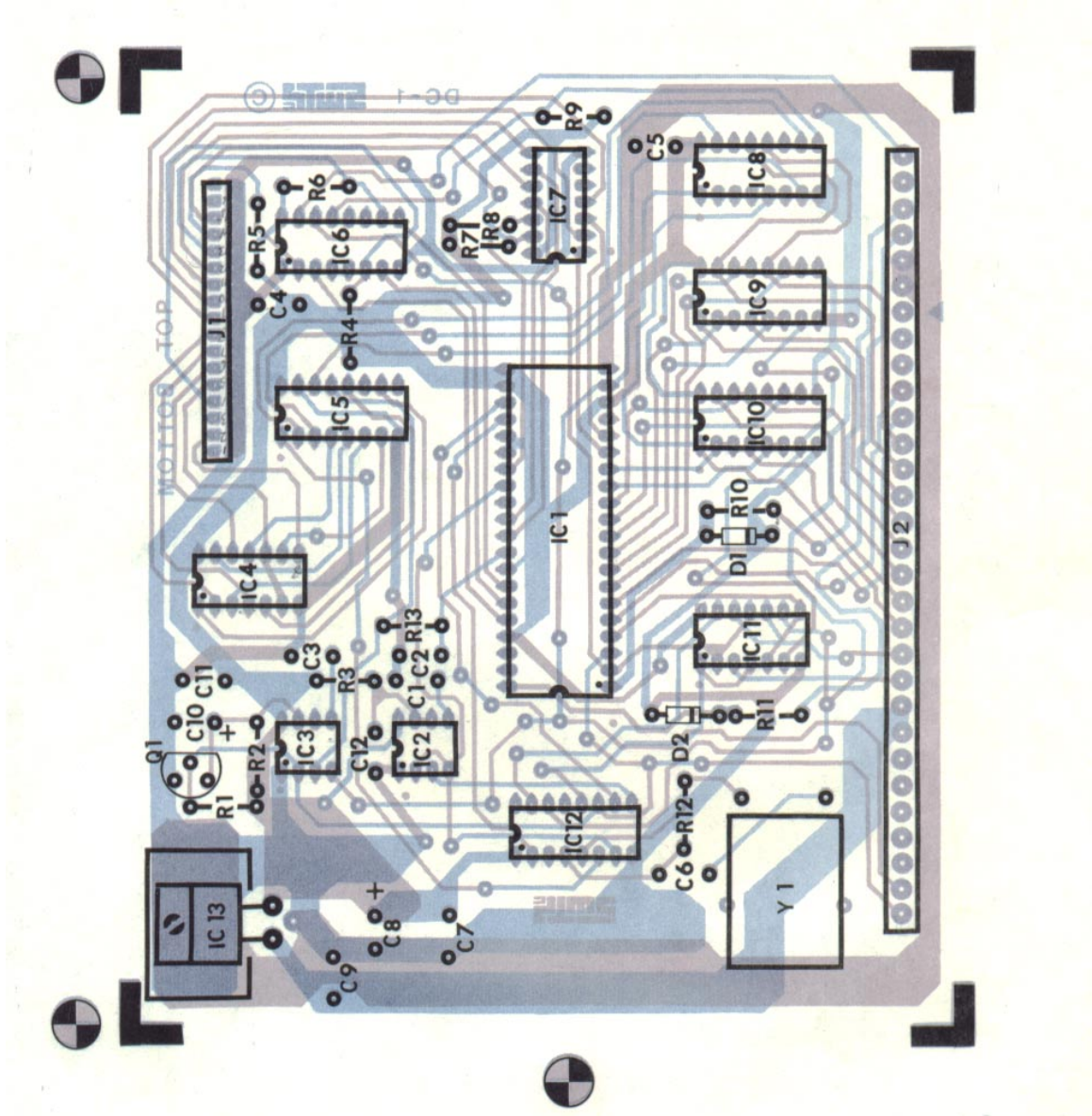
____ *D1 1N4733 5.1 v zener diode
____ *D2 1N4742 12 v zener diode
____ *Q1 SS 1122 silicon transistor

Integrated Circuits

____ *IC1 1771 Disk controller (MOS)
____ *IC2 555 timer
____ *IC3 555 timer
____ *IC4 7407 open collector hex buffer
____ *IC5 74LS139 Dual 2 to 4 decoder
____ *IC6 DM8097/74367 hex bus driver
____ *IC7 7406 open collector hex inverter
____ *IC8 74175 Quad D flip-flop
____ *IC9 DM8835 Quad bi-directional transceiver
____ *IC10 DM8835 Quad bi-directional transceiver
____ *IC11 74LS00 Quad 2 input NAND gate
____ *IC12 4049 (MOS) Hex inverter
____ *IC13 7805 5 volt regulator

Misc.

____ Y1 1MHz Crystal



P-200 MF Power Supply

The P-200 Power Supply is a fixed voltage power supply designed to be used with several SWTPC kits. The P-200MF version is supplied with those parts required to power the MF-68 Dual Floppy Disk System. The P-200 MF provides the following outputs:

- +12 VDC \pm 5% @ 3.0 amps
- + 5 VDC \pm 5% @ 3.0 amps

The power supply consists of the 3 1/8" W X 3 3/8" L X 3 3/4" H power transformer, two large 2" diameter filter capacitors, 3 1/4" W X 4" L circuit board and three regulator transistors. The design utilizes integrated regulators for adjustment free outputs and built-in overload protection. The power supply may be operated from 120 or 240 VAC, 50 to 60 Hz power systems.

PC Board Construction

- () Clean the copper foil side of the circuit board with a piece of Scotchbrite® (available at most hardware stores) to remove any oxidation.
- () Attach all of the resistors to the circuit board. Use the parts list and the component layout drawing to locate the proper position for each part. As with all components unless otherwise noted, mount each flush with the top of the board, bend the leads parallel to the board on the foil side and trim so that 1/16" to 1/8" of wire remains. Solder.
- () Attach all of the diodes to the circuit board. Be sure the banded end of each diode matches with the outline shown in the component layout drawing.
- () Using some #18 gauge buss wire install jumpers in the two locations indicated with the number "12". Solder. Make sure NO jumper is installed in the "24" position. Use the component layout drawing for reference.
- () Attach the twelve pin Wafercon connector to the circuit board. Be sure to orient the connector as shown in the component layout drawing. Solder.
- () Complete the first half of steps 1 thru 12 of the wiring table. Cut each wire to the specified length and attach and solder it to the specified point on the circuit board from the top side. Do not connect the other ends of the wires to their destination terminations yet.
- () This completes the circuit board assembly. Check to make sure that all connections have been soldered and that there are no cold solder joints. Also make sure that all components have been installed correctly as called for in the instructions. Take note that there are many power supply components not used in the P-200MF version of the kit. Install only those components listed in the parts list.

Attaching the Connector to the Power Transformer

Cut all of the power transformer secondary leads to a 7" length and strip the ends of the wires so that only 1/8" protrudes beyond the insulation. Attach and solder the specified connector pins to each of the leads using the table below for reference. Use the connector reference sheet contained within this instruction set if you have any problem distinguishing between the connector pins. Do NOT insert the connector pins into the connector shell until told to do so later in the instructions.

| <u>Transformer Secondary Wire</u> | <u>Connector pin Gender</u> | <u>Connector Pin #</u> |
|-----------------------------------|-----------------------------|------------------------|
| yellow | female | 1 |
| green-white | female | 2 |
| green-yellow | male | 3 |
| green | female | 4 |
| blue-white | male | 7 |
| brown | female | 9 |
| blue | female | 10 |
| blue | female | 11 |
| brown | male | 12 |

- () Take note that the back side of the male connector shell is numbered. Using the previous table, carefully insert each of the specified connector pins into the correct numerical position of the connector shell. Insert the pins from the back or numbered side of the connector and be careful not to make a mistake. The pins cannot be removed without destroying them once they have been pressed into place. This completes the transformer connector assembly.

Power Supply onto chassis assembly

- () Snap the four nylon printed circuit board mounts onto the chassis in the positions corresponding to the mounting holes on the circuit board.
- () Attach the clamps for electrolytic capacitors C3 and C4 to the chassis using #6-32 X 1/4" screws, lockwashers and nuts. Orient the clamps as shown in the chassis pictorial. Leave the mounting screws loose until the capacitors have been installed as called for later in the instructions. Attach a ground lug under the C4 capacitor clamp screw nearest the front of the chassis.
- () Attach lug strip LS-1 to the chassis using a #6-32 X 1/4" screw, lockwasher and nut. Orient the lug strip as shown in the chassis pictorial
- () Attach fuseholder F1 to the chassis with a #6-32 x 3/8 screw, lockwasher and nut. Orient the fuseholder as shown in the chassis pictorial.
- () Using a pair of pliers crimp the strain relief onto the line cord at a point about 8" from the end of the line cord and insert the compressed strain relief and line cord assembly into the 1/2" hole provided on the rear of the chassis from the outside of the chassis, then release.
- () Now insert electrolytic capacitors C3 and C4 into their clamps. Use the parts list and chassis pictorial to determine position and orientation. Install them exactly as shown in the pictorial. These capacitors are polarized so the + terminal must be positioned as shown in the drawings. Secure the capacitors with #6-32 X 1/2" screws, lockwashers and nuts.

- () Tighten all of the capacitor clamp mounting screws.
- () Using #10-32 X 1/4" screws attach three terminal lugs to the (+) terminal and five terminal lugs to the (-) terminal of capacitor C3. Also attach two terminal lugs to the (+) terminal and six terminal lugs to the (-) terminal of capacitor C4. Use the chassis pictorial to show proper orientation.
- () Orient the power transformer so the nine wire secondary side is nearer the left side of the chassis and secure with four #8-32 X 3/8" screws, flatwashers and nuts.
- () Remove the precoated insulators from their packages and place over the pins on the bottom of regulator transistors Q3, Q4, and Q5.
- () Install transistors Q3, Q4 and Q5 onto the chassis in the appropriate set of holes from the outside of the chassis. Be sure you have put the right transistor in the right set of holes. Secure each transistor with #6-32 X 3/8" screws, insulated shoulder washers, ground lugs and nuts. NOTE: The case of each power transistor is electrically a transistor junction and hence must be electrically isolated from all other electrical junctions including the chassis. The mounting screws are electrically connected to each transistor case and you must be sure, the screws do not contact the chassis as they pass through. Keep in mind also that the wire leads of each power transistor must be centered in the large holes through which they pass. The mounting screws must be tightened evenly and with enough pressure to slightly compress the transistor insulators. The entire bottom of the transistor case must be in solid contact with the insulator for good heat transfer.
- () Orient the printed circuit board as shown in the chassis pictorial and snap it onto its mounts.
- () For American standard 120 VAC line operation complete steps 13 thru 16 of the wiring table. For European standard 240 VAC operation complete steps 17 thru 20 of the wiring table.
- () Now go back and complete the second half of wiring steps 1 thru 12. When attaching the wires to the regulator transistors Q3, Q4 and Q5, slip a 1" piece of heat shrinkable tubing over each of the wires to be attached first. Solder the wire directly to the transistor pin, slip the heat shrinkable tubing over the exposed connection and shrink the tubing with the heat from your soldering iron.
- () Complete wiring steps 21 thru 35 of the wiring table. Wiring steps 11, 12 and 30 thru 35 require that the female connector pins be snapped into the specified connector shell. Be very careful not to interchange the wires and follow the precautions given for the transformer connector.
- () Go back and double check all wiring steps and solder connections for correctness and completion. Even a simple mistake can cause costly damage to your power supply.
- () Plug the twelve pin male connector attached to the power transformer's secondary leads onto the twelve pin receptacle on the power supply printed circuit board. Be sure to orient the connector correctly. It will fit only one way.
- () Install fuse F1 into the fuseholder.

- () Without having anything plugged onto power connectors J0 or J1 and after making sure these connectors are not inadvertently touching anything they shouldn't be, plug the line cord into a wall outlet and turn the power switch ON.
- () Using the metal chassis as a ground reference measure the following voltages on the two power connectors listed below. If you find that any of the voltages do not measure as specified, immediately remove power and recheck all wiring and solder connections.

Connectors J0 and J1

| Pin # | Voltage | Tolerance |
|-------|---------|------------|
| 1 | +12 VDC | <u>+5%</u> |
| 2 | 0 VDC | <u>+5%</u> |
| 3 | 0 VDC | <u>+5%</u> |
| 4 | + 5 VDC | <u>+5%</u> |

- () If everything checks out as called for then remove power, unplug the unit and go back to the main disk assembly instructions for final assembly and checkout. Once you are convinced that the power supply is working as it should be use the wire ties supplied with;-the kit to bundle the wires where necessary.

Parts List P-200 MF Power Supply

Resistors

| | | |
|-------|----|-------------------------------------|
| _____ | R1 | 240 ohm 1% resistor or 243 ohm 1% |
| _____ | R2 | 2030 ohm 1% resistor or 2000 ohm 1% |
| _____ | R3 | 240 ohm 1% resistor or 243 ohm 1% |
| _____ | R4 | 2030 ohm 1% resistor or 2000 ohm 1% |

Diodes

| | | |
|-------|------|---------------------------|
| _____ | D1* | 1N5402 high current diode |
| _____ | D2* | 1N5402 high current diode |
| _____ | D3* | 1N5402 high current diode |
| _____ | D4* | 1N5402 high current diode |
| _____ | D5* | 1N4003 diode |
| _____ | D6* | 1N4003 diode |
| _____ | D7* | 1N5402 high current diode |
| _____ | D8* | 1N5402 high current diode |
| _____ | D9* | 1N5402 high current diode |
| _____ | D10 | 1N5402 high current diode |
| _____ | D11* | 1N4003 diode |

Capacitors

| | | |
|-------|-----|--|
| _____ | C3* | 20,000 mfd @ 25 VDC electrolytic capacitor |
| _____ | C4* | 29,000 mfd @ 15 VDC electrolytic capacitor |

Regulators

| | | |
|-------|-----|----------------------------|
| _____ | Q3* | LM323 +5 VDC regulator |
| _____ | Q4* | LM317 adjustable regulator |
| _____ | Q5* | LM317 adjustable regulator |

Misc.

| | | |
|-------|-----|---|
| _____ | T1* | Power transformer 50-60 Hz Primary: 120/240 VAC Secondaries: 12 VAC @ 1.5 amp 12 VAC @ 1.5 amp 7 VAC @ 3 amp 24 VAC @ 200 ma |
| _____ | F1 | 2 1/2 amp slo-blo fuse |

All components flagged with a (*) must be oriented as shown in the component layout drawing and pictorials.

| WIRE | | | FROM | | | TO | | |
|-------------------|---------|-------|-----------|----------|--------|------------|----------|--------|
| STEP | LENGTH | GAUGE | PART | TERMINAL | SOLDER | PART | TERMINAL | SOLDER |
| 1 | 8 1/2 " | #18 | PC board | A | yes | C3 lug | (+) | yes |
| 2 | 7" | #18 | PC board | B | yes | Q4 | B3 | yes |
| 3 | 6 1/2" | #18 | PC board | C | yes | Q4 | B1 | yes |
| 4 | 9" | #18 | PC board | D | yes | Q5 | C3 | yes |
| 5 | 8" | #18 | PC board | E | yes | Q5 | C1 | yes |
| 6 | 9" | #18 | PC board | F | yes | C4 lug | (+) | yes |
| 7 | 11" | #18 | PC board | G1 | yes | C3 lug | (-) | yes |
| 8 | 9" | #18 | PC board | G2 | yes | C4 lug | (-) | yes |
| 9 | 9" | #18 | PC board | G3 | yes | C4 lug | (-) | yes |
| 10 | 10" | #18 | PC board | +5 | yes | Q3 | A2 | yes |
| 11 | 17" | #18 | PC board | +5 | yes | female pin | J0 #4 | yes |
| 12 | 20" | #18 | PC board | +5 | yes | female pin | J1 #4 | yes |
| 120 VAC OPERATION | | | | | | | | |
| 13 | 5" | - | T1 | Black | - | LS-1 | A | no |
| 14 | 5" | - | T1 | White | - | LS-1 | A | no |
| 15 | 5" | - | T1 | Blk-Wht | - | F1 | A | no |
| 16 | 5" | - | T1 | Blk-Red | - | F1 | A | yes |
| 240 VAC OPERATION | | | | | | | | |
| 17 | 5" | - | T1 | Black | - | LS-1 | A | no |
| 18 | 5" | - | T1 | White | - | LS-1 | C | no |
| 19 | 5" | - | T1 | Blk-Red | - | LS-1 | C | yes |
| 20 | 5" | - | T1 | Blk-Wht | - | F1 | A | yes |
| 21 | - | - | line cord | A | - | LS-1 | A | yes |
| 22 | - | - | line cord | B | - | S1 | A | yes |
| 23 | 10" | #18 | S1 | B | yes | F1 | B | yes |
| 24 | 4" | #18 | C3 lug | (-) | yes | C4 lug | (-) | yes |
| 25 | 9" | #18 | C4 lug | (-) | yes | Q3 | A4 | yes |
| 26 | 10" | #18 | C4 lug | (+) | yes | Q3 | A1 | yes |
| 27 | 11 1/2" | #18 | C3 lug | (+) | yes | Q4 | B2 | yes |
| 28 | 13 1/2" | #18 | C3 lug | (+) | yes | Q5 | C2 | yes |
| 29 | 8" | #18 | C3 lug | (-) | yes | Gnd lug | - | yes |
| 30 | 18" | #18 | C3 lug | (-) | yes | female pin | J0 #3 | yes |
| 31 | 15" | #18 | C3 lug | (-) | yes | female pin | J1 #3 | yes |
| 32 | 18" | #18 | C4 lug | (-) | yes | female pin | J0 #2 | yes |
| 33 | 15" | #18 | | | | | J1 #2 | yes |
| 34 | 18 1/2" | #18 | Q4 | g4 | yes | female pin | J0 #1 | yes |
| 35 | 17" | #18 | Q5 | C4 | yes | female pin | J1 #1 | yes |

IN CASE OF PROBLEMS

If your MF-68 fails to operate properly we suggest that you first go back and double check all parts. Be sure that they are turned as shown on the drawings and that they are the correct part number. The majority of problems turn out to be incorrect assembly. Using the printed pattern as a guide look over the board for solder bridges. Accidental solder bridges are the second most common problem in kits that are returned for repair. Be sure that all jumpers called for are in place and that all connections have been soldered.

If you suspect that the "Shugart" SA-400 drive unit itself is not working properly, remove the drive and return it to us for testing. Do not attempt to adjust, or repair the drive unit. Special equipment and tools are required and considerable damage can be done by attempting to work on these units without proper training.

REPAIR SERVICE

If you have a problem that you cannot solve, the kit may be returned for factory service. Please return the entire* kit (Chassis, case, PC boards, cable, drives, etc.) Be sure to include the supplied diskette containing FDOS.

*Remove the power transformer. This reduces postal costs and damage. Selected individual boards may be returned but in most cases it is best to send the entire unit. Do not remove the boards from the drives themselves and send them in. Repairs are performed for a flat labor charge per board plus parts and postage.

| <u>CIRCUIT</u> | <u>Labor Charge</u> |
|----------------------------|-----------------------------|
| Controller board and cable | \$16.00 |
| Power supply | \$10.00 |
| Disk drives | Depends on individual drive |

If we find that the board, drive or complete unit is functional as received and does not require service, the Checkout Charge is \$10.00.

A confirmation sheet will be sent upon receipt of the kit. Please do not ask for an estimate or a detailed report on exactly what was done in repairing your unit as we cannot provide this service.

It is not necessary to enclose any funds with the kit, you will be billed for authorized repairs.

ADDITIONAL DISKETTES

Additional diskettes are available at \$5.50 ea. Part # FD-M

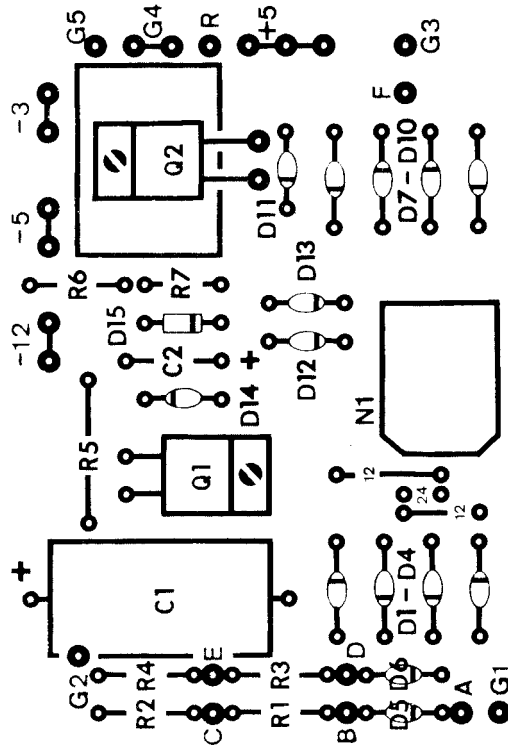
SHIPPING INSTRUCTIONS

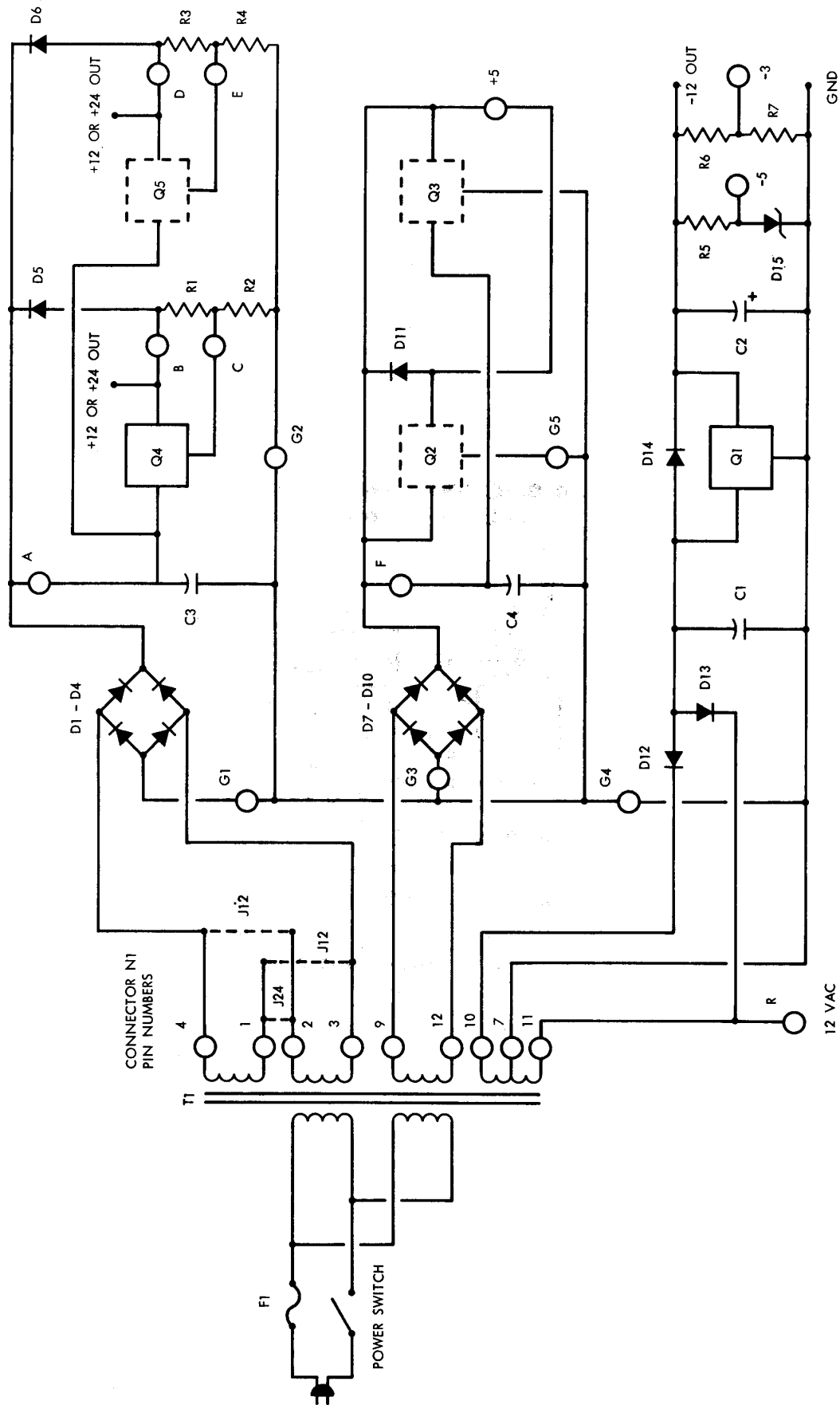
Pack in a large carton with at least 3 inches of padding on all sides. Do not attempt to return the kit in the original box. We will not service a kit if there is any postal damage until the claim is settled.

Include all relevant correspondence and a brief description of the difficulty.

Ship prepaid by UPS or insured Parcel Post. We cannot pick up repairs sent by bus.

Ship to: Southwest Technical Products Corp.
Repair Department - Digital Group
219 W. Rhapsody
San Antonio, Texas 78216





SCHEMATIC P - 200 POWER SUPPLY

12 VAC
60 HZ REFERENCE