Minivac 601

maintenance manual

SCIENTIFIC DEVELOPMENT CORP.
372 Main Street, Watertown, Massachusetts

MINIVAC 601 has been carefully designed to give consistent and reliable operation. Like any large-scale computer, MINIVAC requires routine maintenance to keep it in top operating condition. This routine maintenance is easy to perform and takes little time. Conscientious maintenance will insure that MINIVAC is always ready for operation.

ROUTINE MAINTENANCE

Cleaning: Keep the computer console clean by carefully wiping it with a damp cloth.

Storage: When the computer is not in use, store the power cord in the compartment under the power panel. Access to the storage compartment is through the three-inch hole in the bottom of the computer.

Program wires should be kept in the transparent bag supplied. Keep the wires free from kinks and knots. When the computer is put away, it should be kept in its cardboard shipping box.

Relay Contacts: Clean the relay contacts by drawing a piece of clean, dry paper between the closed contacts. Do **not** use a cleaning solution. To clean the normally open contacts, gently push the plastic crossbar to the left to close the contacts. Then draw a piece of clean, dry paper between them. The relay contacts will require cleaning once or twice a year.

Oiling: The rotary switch shaft and the motor shaft will require oiling once or twice a year. Remove the bottom panel from the computer by unscrewing the screws from the rubber feet. Place one or two drops of a high-grade, lightweight machine oil (**not** a heavy household oil) on the motor bearings at each end of the motor shaft. Replace the bottom panel.

Remove the pointer knob of the rotary switch and put two or three drops of oil on the bearing. Work the oil into the bearing by turning the shaft back and forth a few times.

Replace the pointer knob and realign it by connecting a light through one of the switch contacts on the rotary switch dial. Adjust the position of the knob on the shaft so the light comes on when the knob is pointing at the connected switch position.

Adjustment and Repair

In addition to routine maintenance, MINIVAC may occasionally require minor adjustment and/or repair. A screwdriver is normally the only tool required for repair. Under some circumstances, however, a soldering iron or a drill may be necessary.

All MINIVAC parts are conservatively designed to give lasting service. The lights are operated at less than their rated voltage to extend their operating life. The transformer and the rectifier are capable of accepting repeated overloads.

The power supply is rated at 1.5 amps continuous with a nominal 12 volts output. All switches are rated at 3 amps; relay contacts are rated in excess of 3 amps. To provide low contact resistance, the rotary switch uses silver-plated circuits. The rotary switch contact fingers are made of berryllium copper; the drive shaft is made of stainless steel running in an oil-impregnated bronze bearing. The drive motor is operated at less than one-third rated voltage.

Should you find that your MINIVAC is not operating properly, check first to see that routine maintenance has been carried out. The following sections describe trouble-shooting and repair techniques for the various parts of the MINIVAC.

Power Supply:

If the power cord is plugged into a live 110-volt AC outlet and the power light does not come on when the power switch is turned on, there may be a fault in the power supply. Proceed with the following steps until the fault is found, then follow the repair instructions:

1. Check to see that a short-circuit is not connected across the power supply terminals (+ and —): remove all pro-

gram wire connections to the power supply terminals.

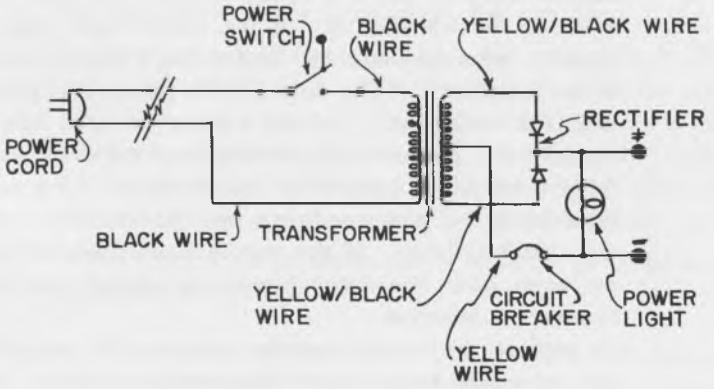
2. Push the circuit breaker button to re-set the circuit breaker if it has "blown."

3. Check to see that power is actually being supplied to the + and — terminals by connecting an output light to the terminals + and — with programming wires. The unloaded power supply outlet voltage should be approximately 13 volts.

4. Check the 110 volt outlet with a lamp or other appliance to see that power is being supplied to the outlet.

5. Unplug the MINIVAC power cord. Remove the bottom panel from the computer by unscrewing the rubber feet. Push the power panel out of the computer console through the holes in the dividing section.

6. Check all power connections to be sure they are secure. The power supply circuit diagram is:



Power Supply Circuit Diagram

7. With the power cord **unplugged,** connect a binary output light between the transformer center top (yellow wire) and the center terminal on the rectifier. Program wires with alligator clips attached are convenient for this purpose.
   Turn the power switch on and plug in the power cord. **Do NOT touch any power supply components while power is connected.** If the binary output light comes on, the trouble is in the circuit breaker, the power light or the power switch. If the binary output light does not come on, the trouble is in the transformer, the rectifier or the power switch.

8. Check the **power light** by connecting a binary output light to the power light terminals. If the binary output light comes on when power is on, the power light is burned out. Remove the burned-out power light and replace it with a new light assembly, connecting the leads to the power supply terminals.

9. Check the **circuit breaker:**
   Connect a binary output light between the + power supply terminal and the circuit breaker terminal which leads to the transformer. If the output light does **not** come on when power is on, the trouble is the transformer or the rectifier. If the output light comes on, proceed with the next step. Connect a binary output light between the + power supply terminal and the circuit breaker terminal which leads to the power light. If the output light comes on when power is on, the trouble is **not** in the circuit breaker. If the output light does **not** come on, even when the circuit breaker is pushed, the circuit breaker is defective.
   To replace the circuit breaker: remove the leads from the terminals; bend up the tabs which hold the circuit breaker in place and remove the defective unit. Insert a new circuit breaker and replace the leads.

10. Check the **power switch** as follows:
    Using program wires with alligator clips, connect the DC output contacts (located **beneath** the power panel) to an output light. Turn power on; if the output light does **not** come on, the power switch is defective.

    To replace the power switch, remove the leads from the terminals and drill out the rivets which hold the switch. Insert a new power switch, fastening it with machine screws and nuts. Replace the leads.

    Check the AC input contacts with an ordinary household lamp. Connect the lamp to the black (primary) transformer leads. It will be necessary to pierce the insulation of one of the leads. After the AC input contacts have been checked, the insulation must be repaired.

    Turn the power switch on and plug the power cord in. Do **not** touch any of the power supply components while the power is connected. If the lamp comes on, the AC imput contacts are in correct working order.

11. Check the **transformer** with an output light. Disconnect the two yellow/black wires from the rectifier.

    Connect an output light between the yellow lead and one yellow/black lead. Turn the power switch on and plug the power cord in. The light will come on if the transformer is operating correctly. Continue the transformer check by connecting an output light between the yellow lead and the second yellow/black lead.

    If the transformer is defective, it must be removed and replaced with a new unit.

12. If the transformer checks out but there is not proper DC output between the transformer center top (yellow lead) and the center terminal on the rectifier, the rectifier is defective and must be replaced.

Program Wires:

The program wires are made to last for the life of the computer if they are properly used. When removing program wires from the computer console, do **not** pull them out by the wire. Grasp the taper pin and remove it from the terminal. Be sure to keep the wires free from kinks and knots.

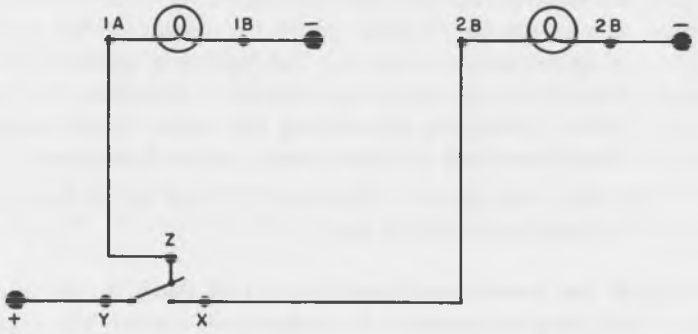
If program wires become lost or damaged, new sets may be purchased from Scientific Development Corporation. (See spare parts list).

Lights:

Check the binary lights and the relay indicator lights by connecting them to the + and — power supply terminals. The lights are conservatively operated and should not require replacement for at least a year. To replace a light, cut the leads ½ inch from the terminal and remove the defective light from the panel. Insert a new light assembly and **solder** the new leads in place.

Pushbuttons:

Check a pushbutton by connecting it in series with two lights as indicated:



Circuit Diagram — Pushbutton Check

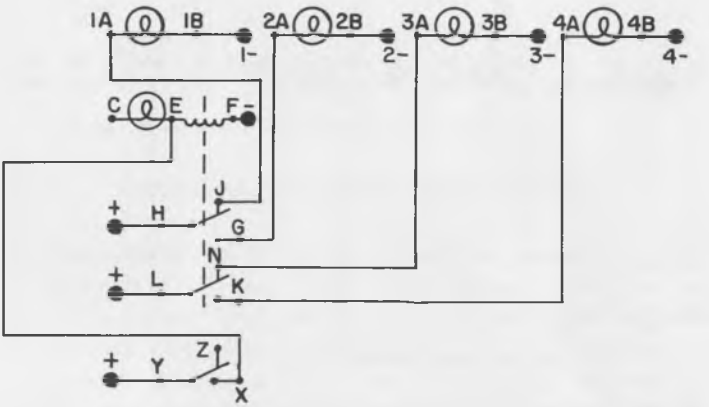
Turn power on. Light 1 should come on. Push the pushbutton. Light 1 should go off and light 2 should come on.

To replace a defective pushbutton switch:

Pull the red plastic button off the pushbutton; unscrew the exposed mounting screw. Cut the pushbutton switch leads (located underneath the console) and remove the unit. Insert a new pushbutton switch, screwing it into place. Solder the new leads in place. Replace the red plastic button on the switch shaft.

Relays:

Check a relay by connecting the coil with power through a pushbutton as indicated:



Circuit Diagram — Relay Check

Turn power on. Lights 1 and 3 should come on. Push the pushbutton. Lights 1 and 3 should go off and lights 2 and 4 should come on.

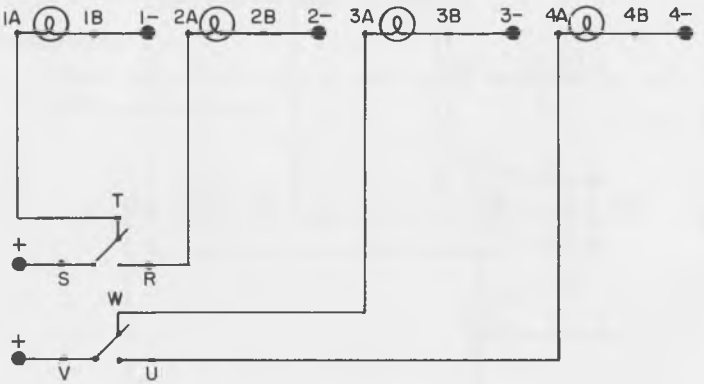
If a relay snaps on and off but does not make proper con-

nection through the relay contacts, the contacts may need cleaning (see routine maintenance). If the switch arms are not meeting the contacts with proper pressure, gently bend the switch arm to increase the contact pressure. The switch arm should engage the normally open and normally closed contacts and should push them slightly as they meet.

To replace a defective relay, disconnect the eight connections to the relay and remove the unit by unscrewing the relay mounting screws. Insert a new relay and replace the eight connectors. To assure proper connection, compare the connections on the new relay with another relay's.

Slide Switches:

Check a slide switch by connecting binary output lights to the terminals as indicated:



Circuit Diagram — Slide Switch Check

Set the slide switch RIGHT. Turn power on. Lights 1 and 3 should come on. Move the slide switch to the LEFT. Lights 1 and 3 should go off and lights 2 and 4 should come on.

To replace a defective slide switch:

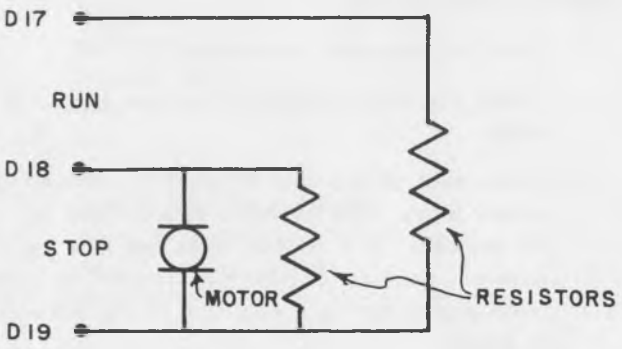
Cut all six connections to the slide switch. Drill out the rivets which hold the unit in place.

Install a new switch with machine screws and nuts.

Solder all connections in place, using other slide switch units as guides.

Rotary Switch:

The circuit diagram for the rotary switch motor drive is:



Circuit Diagram — Rotary Switch Motor Drive

Check the motor drive by connecting power to the RUN terminals (D17 and D18). Turn power on. The rotary switch pointer knob should turn. Reverse the power connections: the pointer knob should turn in the opposite direction. Connect a short circuit across the STOP terminals (D18 and D19): the pointer knob should stop turning.

If the pointer knob does **not** rotate, connect power **momentarily** across the STOP terminals: the knob should turn very rapidly. If the knob **does** turn, the trouble may be a bad connection or an open resistor. If the knob does **not** turn, the trouble may be a bad connection or a defective motor. It is also possible that the motor shaft is not properly en-

gaging the drive wheel. Check the rotary switch by connecting D16 (the switch arm) to + and connecting output lights through the rotary switch contacts, D0 through D15 Check the knob alignment to be sure that the knob has not turned on the drive shaft. If proper contacts are not being made, check the assembly under the panel: the rotary switch contacts may require cleaning.
The rotary switch mechanism is accessible when the bottom panel of the computed is removed. If the motor does not turn the rotary switch:

1. Check all electrical connections.
2. Check the drive wheel to be sure that it is free to rotate.
3. Check each of the two resistors by connecting power across them. The resistors should heat up in about 20 seconds. If a resistor does **not** heat up, it is defective. Replace a defective resistor by cutting its leads and soldering a new unit of the same resistance in place.
4. Check the motor by unsoldering the motor leads and connecting them directly to the power terminals. If the motor does **not** rotate it is defective and must be replaced with a new unit.
5. To assure proper friction drive, adjust the motor bracket and spring the motor shaft against the edge of the drive wheel.

MINIVAC 601 — SPARE PARTS

The following spare parts are available from Scientific Development Corporation for repairing MINIVAC 601:

Part No.	*Description*	*Price*
6431	Circuit Breaker	1.00
6432	Slide Switch	.50
6433	Rectifier	3.00
6434	Transformer	10.00
6435	Light Assembly	1.00
6436	Pushbutton Switch	.75
6437	Relay	6.00
6471	Motor	4.00
6472	Drive Wheel Assembly	2.00
6473	Complete Rotary Switch Assembly	20.00
6490	Set of 100 Programming Wires	12.00
6491	Set of 2 test wires with clips	1.00

6 1.25
2.50
6 3.75

To avoid C.O.D. charges please send check or money order with your spare parts order directly to:

Scientific Development Corporation
372 Main Street
Watertown 72, Massachusetts

There is a handling charge of 25 cents for orders less than $5.00.