Watt Blocks may also be ganged in parallel to provide greater than 100 ma. at a given voltage. Figure 9 shows (a) two Watt Blocks paralleled for +18v. @ 200 ma. and (b) two Watt Blocks paralleled for +9v. @ 200 ma. and -9v. @ 200 ma.

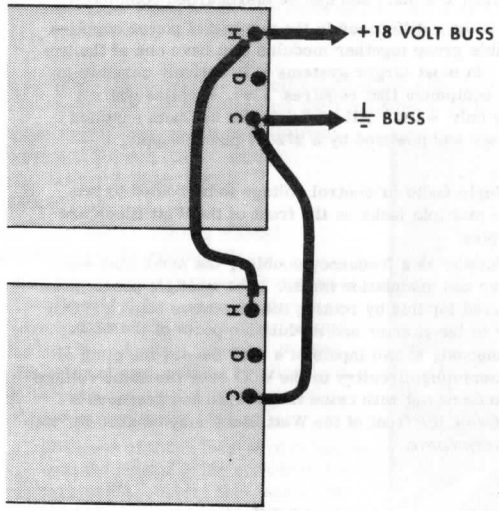


figure 9a

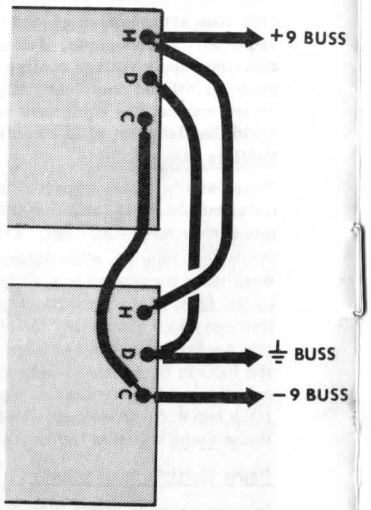


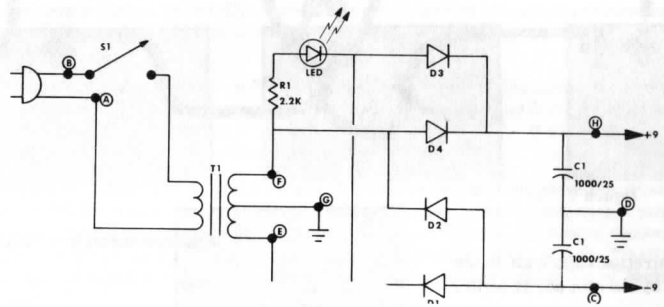
figure 9b

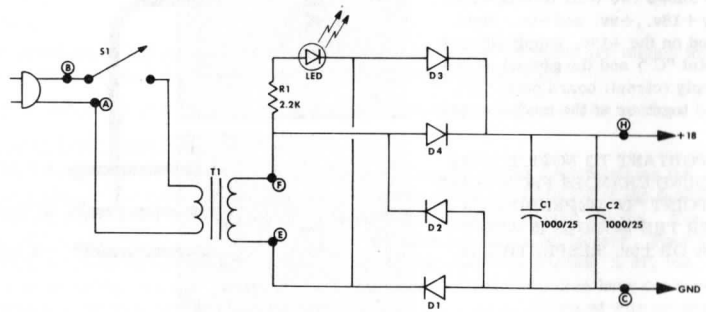
DESIGN ANALYSIS

In both +18 and ± 9 volt configurations the circuitry of the Watt Block is a full wave rectifier bridge. In the ± 9 volt version the center tap of the transformer becomes the ground point with filtering capacitors C1 and C2 distributed above and below ground.

In the +18 volt version the filter capacitors C1 and C2 are paralleled across the voltage output and one side of the secondary becomes ground.

Resistor R1 serves as a current limiter for the Light Emitting Diode power indicator.

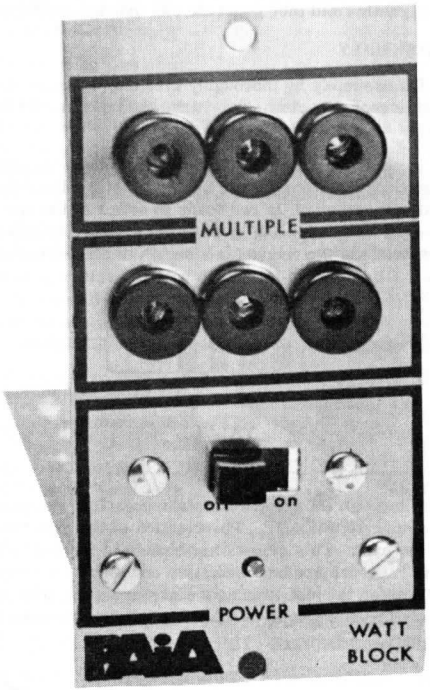




PAiA ELECTRONICS, INC.

4770

WATT BLOCK



As synthesizer systems expand, a point is reached at which a single power supply can no longer provide the energy necessary to run the equipment. This usually results in excessive oscillator drift, "pops" from switching transients appearing on the audio output lines and other problems.

The 4770 Watt Block solves this problem by providing a low cost module that can be easily wired to provide either the ±9v. or +18v. supplies most commonly used by PAIA equipment. The presence of power at the rear connections is shown directly by a Light Emitting Diode indicator on the front panel. Multiple pin jacks and miniature phone jacks are also provided on the front panel.

SPECIFICATIONS

POWER REQUIREMENTS:	117 v. 50/60 Hz.
POWER OUTPUT:	+9v. @ 100 ma. −9v. @ 100 ma. or +18v. @ 100 ma.

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SOLDERING

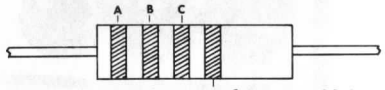
Use care when mounting all components. Use only rosin core solder (acid core solder is never used in electronics work). A proper solder joint has just enough solder to cover the round soldering pad and about 1/16 inch of the lead passing through it. There are two improper connections to beware of: Using too little solder will sometimes result in a connection which appears to be soldered but actually there is a layer of flux insulating the component lead from the solder bead. This situation can be cured by re-heating the joint and applying more solder. If too much solder is used on a joint there is the danger that a conducting bridge of solder will flow between adjacent circuit board conductors forming a short circuit. Unintentional solder bridges can be cleaned off by holding the board up-side down and flowing the excess solder off onto a clean, hot soldering iron.

Select a soldering iron with a small tip and a power rating not greater than 35 watts. Soldering guns are completely unacceptable for assembling transistorized equipment because the large magnetic field they generate can damage solid state components.

CIRCUIT BOARD ASSEMBLY

( ) Prepare for assembly by thoroughly cleaning the conductor side of the circuit board with a scouring cleanser. Rinse the board with clear water and dry completely.

Solder resistor R1 in place according to the parts placement designation printed on the circuit board and assembly drawing figure 1. Note that the fixed resistor is non-polarized and may be mounted with either of its two leads in either of the two holes provided. Cinch the resistor in place prior to soldering by putting its leads through the holes and pushing it firmly against the board; On the conductor side of the circuit board bend the leads outward to about a 45° angle. Clip off each lead flush with the solder joint as the joint is made.

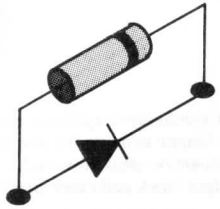


silver or gold disregard this band

DESIGNATION	VALUE	COLOR CODE A-B-C
( ) R1	2200	red-red-red

Install the diodes D1 through D4. The diodes are polarized components and must be correctly oriented in order to operate properly. Polarization of the part will be indicated by a colored band on one end of the part. This orientation method is related to the schematic symbol used in the drawing below. Diodes are heat sensitive and may be damaged if allowed to get too hot while soldering. To be on the safe side heat sink during the soldering operation by grasping the lead being soldered with a pair of needle-nose pliers at a point between the circuit board and the body of the part.

DESIGNATION	TYPE NO.
( ) D1	1N4001
( ) D2	1N4001
( ) D3	1N4001
( ) D4	1N4001



Transformer T1 has two black primary leads and three colored secondary leads.

IF THE PRIMARY AND SECONDARY LEADS COME FROM THE SAME SIDE OF THE TRANSFORMER cut the two yellow secondary leads to a length of 1-3/4 inches and carefully strip 1/4 inch of insulation from the ends.

IF THE PRIMARY AND SECONDARY LEADS COME FROM OPPOSITE SIDES OF THE TRANSFORMER cut the two red secondary leads to a length of 3/4 inch and carefully strip 1/4 inch of insulation from the ends.

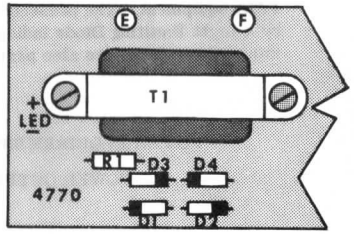


figure 1

( ) Use two 4-40 X 1/4 inch machine screws and two 4-40 nuts to mount the transformer to the circuit board. The secondary leads that were cut above should come from the side of the transformer closest to circuit board points "E" and "F".

( ) Solder one secondary lead to point "E".

( ) Solder the other secondary lead to point "F".

( ) With the circuit board oriented as in figure 1, cut the left black primary lead to a length of 2 inches and the right primary lead to a length of 3 3/4 inches. Carefully strip 1/4 inch of insulation from each of these leads.

( ) Solder the 3 3/4 inch primary lead to circuit board point "A" as shown in figure 4.

Allow the center tap secondary lead and the shorter black primary lead to remain free. No connection will be made with these wires at this time.

There are two flea clips on the circuit board that in a later step will be used to mount the Light Emitting Diode (LED). Solder these clips in place at this time. Note that when properly installed, the upright portions of the "U" shape of this clip will be pointing toward the closest edge of the circuit board.

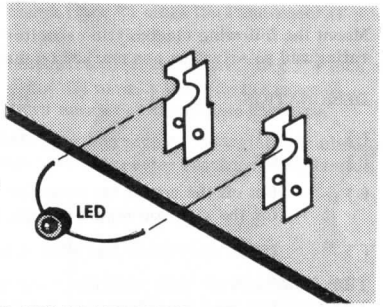
( ) Install the two LED supporting flea clips.

Prepare to mount the Light Emitting Diode. First examine this part carefully and note that one of the leads is marked with a color band. This color band marks the anode of the LED and when this component is properly installed its anode band will be on the flea clip that enters the plus hole on the circuit board. Note that the leads on the LED are fragile - excessive handling will fatigue the leads and cause them to break.

Observe that the rear side of the case of the LED is flat, while the front side is roughly dome shaped. In a later step the front dome shaped side of the package will match up with a hole in the front panel.

( ) Bend the leads of the LED loosely back. DO NOT use pliers to form a right angle bend in the leads.

( ) Place the LED in the flea clips so that it is projecting beyond the front edge of the circuit board. The leads should be parallel to the surface of the circuit board with their ends even with the rear edge of the flea clips. Make sure that the lead with the color band is in the clip marked "+".



( ) Carefully solder the leads of the LED to the flea clips.

THIS COMPLETES PRELIMINARY ASSEMBLY OF THE 4770 WATT BLOCK. IF THE MODULE IS TO BE USED AS A±9 VOLT SUPPLY, PROCEED AS IN SECTION "A". IF THE MODULE IS TO BE USED AS AN+18 VOLT SUPPLY, PROCEED AS IN SECTION "B".

The first step in both sections will be to mount the electrolytic capacitors. Note that the operating voltage (v.) specified for a capacitor is the minimum acceptable rating. Capacitors supplied with specific kits may have a higher voltage rating than that specified and may be used despite this difference. For instance, a 100 mfd. 25v. capacitor may be used in place of a 100 mfd. 10v. capacitor without affecting the operation of the circuit.

Electrolytic capacitors are polarized and must be mounted so that the "+" lead of the capacitor goes through the "+" hole in the circuit board. In the event that the "-" lead of the capacitor rather than the "+" lead is marked it is to go through the unmarked hole in the circuit board.

SECTION "A" ± 9 VOLT ASSEMBLY DETAILS

For the assembly steps in section "A" refer to figure 2A.

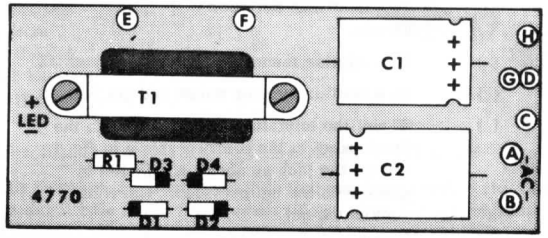


figure 2A

Mount the following electrolytic capacitors and solder them in place. The value, voltage rating and polarization are marked on the body of the part.

DESIGNATION		DESCRIPTION
( )	C1	**1000 mfd. 16v.**
( )	C2	**1000 mfd. 16v.**

( ) Cut the secondary center tap lead of T1 to a length of 3 1/2 inches, strip 1/4 inch of insulation from the lead and solder to circuit board point "G".

( ) Mount and solder flea clips at points "H" ("+" 9), "C" ("-" 9) and D (gnd ⏚).

SECTION "B" + 18 VOLT ASSEMBLY DETAILS

Refer to figure 2B.

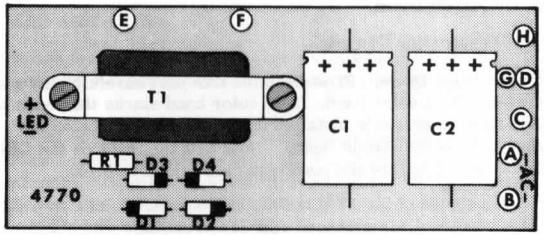


figure 2B

Mount the following electrolytic capacitors and solder them in place. The value, voltage rating and polarization are marked on the body of the part.

DESIGNATION		DESCRIPTION
( )	C1	**1000 mfd. 16v.**
( )	C2	**1000 mfd. 16v.**

( ) Cut off the center tap secondary lead of the transformer T1. It is needed only for the ± 9 volt output configuration.

( ) Mount and solder flea clips at points "H" ("+" 18) and C (gnd ⏚).

THIS COMPLETES THE ASSEMBLY OF THE 4770 CIRCUIT BOARD. TEMPORARILY PUT THE CIRCUIT BOARD ASIDE AND PROCEED TO THE FRONT PANEL ASSEMBLY.

Place the front panel face down on a soft rag to prevent marring the finish.

( ) Place a red pin jack (J1) in the hole provided as shown in figure 4 and fasten in place with a tinnerman nut as shown in detail figure 3. Press the tinnerman nut down firmly.

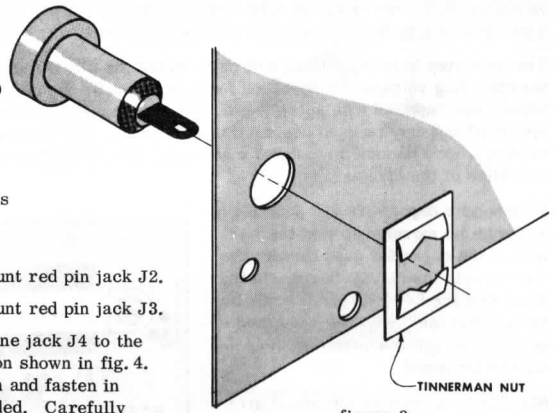


figure 3

( ) In a similar manner mount red pin jack J2.

( ) In a similar manner mount red pin jack J3.

( ) Mount the miniature phone jack J4 to the front panel in the position shown in fig. 4. Orient the jack as shown and fasten in place with the nut provided. Carefully tighten the nut.

( ) In a similar manner mount miniature phone jack J5.

( ) In a similar manner mount miniature phone jack J6.

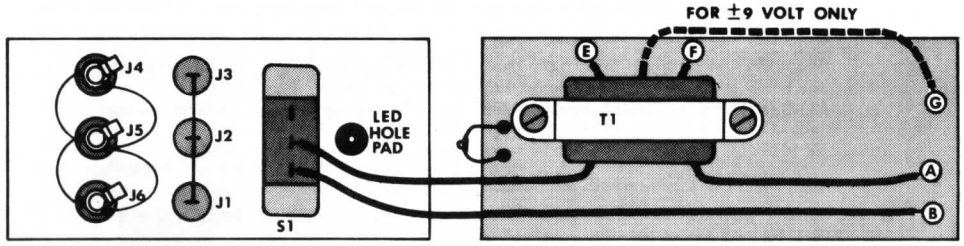


figure 4

( ) Using a 1-1/2 inch length of the bare wire provided make the common connections between pin jacks J1, J2 and J3, as shown in figure 4. Solder all connections.

( ) Using a 1 1/2 inch length of bare wire make the common connections between the top lugs of miniature phone jacks J4, J5 and J6, as shown in figure 4. Solder all connections.

( ) Using a 2 inch length of bare wire, make the common connections between the ground lugs of miniature phone jacks J4, J5 and J6, as shown in figure 4. Solder all connections.

( ) Using two 4-40 X 1/4 inch screws, two 4-40 nuts and two lock nuts, mount the slide switch S1 in the position shown in figure 4. Make sure that the points of the 4-40 nuts do not interfere with the travel of the slide inside the switch.

( ) Bend the terminals of switch S1 down to an angle of about 45°. This helps insure that the terminals of S1 will not touch transformer T1 when the front panel is installed.

( ) Prepare a 4 3/4 inch length of the insulated wire provided by stripping 1/4 inch of insulation from each end. "Tin" each end of the wire by twisting the exposed strands tightly together and melting a small amount of solder into the wire.

( ) Solder one end of the wire prepared in the previous step to the bottom terminal of S1 as shown in figure 4. In a later step this wire will connect to the circuit board.

( ) Fasten the two "L" brackets to the front panel using one 4-40 X 1/4 inch machine screw, one 4-40 nut and two lock nuts on each bracket as detailed in figure 5. Note that the unthreaded hole on the "L" bracket is used in this operation. DO NOT COMPLETELY TIGHTEN THESE SCREWS AT THIS TIME.

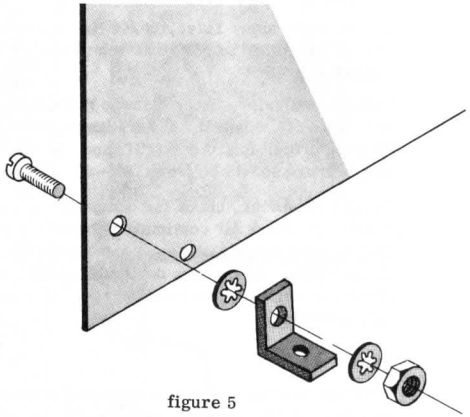


figure 5

( ) An insulating "dot" has been provided to prevent the leads of the Light Emitting Diode from shorting against the front panel. Remove this dot from its cardboard backing and apply to the rear of the front panel so that the hole in the dot is centered over the LED hole in the front panel. (see figures 4 and 6.)

THE FRONT PANEL MAY NOW BE BOLTED TO THE CIRCUIT BOARD AS FOLLOWS:

( ) When mounting the circuit board to the front panel note that the dome front of the LED is designed to fit into the small hole in the front panel. To most easily accomplish this, "cock" the circuit board in relation to the front panel and pass one 4-40 screw through the circuit board into the threaded hole in the "L" bracket as shown in fig. 6. DO NOT COMPLETELY TIGHTEN THIS SCREW.

Pivot the circuit board toward the front panel and make sure that the LED engages the front panel hole. The leads on the LED may be slightly long causing them to bend slightly but this springing action is useful in holding the lamp securely in the hole.

When the hole in the circuit board aligns with the threaded hole in the "L" bracket fasten the two together with the remaining 4-40 X 1/4 inch machine screw.

AT THIS POINT THE 4 SCREWS JOINING THE FRONT PANEL AND CIRCUIT BOARD MAY BE TIGHTENED COMPLETELY.

MAKE THE FINAL FRONT PANEL CONNECTIONS AS FOLLOWS:

A 1 inch length of large diameter insulation has been provided for use as insulation on the terminals of slide switch S1. Cut this tubing into two identical lengths. Stretch the diameter of each section by slipping it over the jaws of a pair of needle-nosed pliers and spreading the jaws.

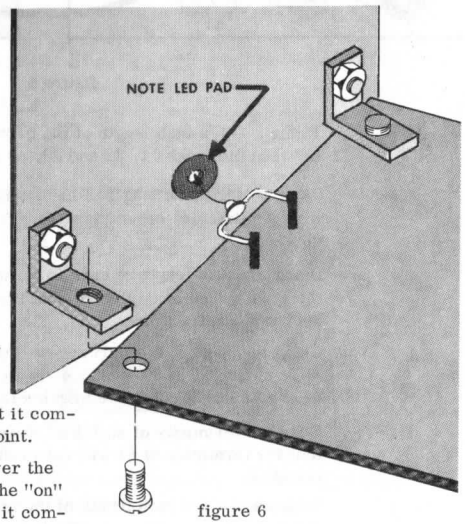


figure 6

( ) Slide one of these lengths of tubing on onto the unused primary lead of transformer T1. Solder this lead to the middle terminal of slide switch S1. Slide the tubing up to the switch so that it completely covers the lug and the solder joint.

( ) Slide the second piece of this tubing over the length of insulated wire coming from the "on" side of S1. Slide the tubing up so that it completely covers the solder lug. Solder the free end of this wire to circuit board point "B" as shown in figure 4.

THIS COMPLETES ASSEMBLY OF THE WATT BLOCK MODULE.

TESTING

Temporarily apply 117v., 50/60 Hz. power to the rear circuit board connections marked "a.c." and slide the power switch to the "on" position. Observe that the LED front panel indicator lights.

Using a voltmeter, check that the proper voltages are present at the connectors on the rear edge of the board. If wired as a ± 9v. supply there should be from 9v. to 11v. between circuit board point "H" and "D" and between "D" and "C". If wired as a +18v. supply there should be from 18 to 22 volts between "H" and "C".

Using an ohmeter, check for continuity between all three of the front panel pin jacks. Similarly, check for continuity between the miniature phone jacks by inserting a phone plug in each of the jacks and checking for zero resistance between the center conductors of each jack. Also check continuity of the grounding terminals of the plugs. Finally, check for infinite resistance between the center conductor and grounding lug of each phone jack individually.

USING

All PAIA synthesizer and synthesizer related modules use either ± (plus and minus) 9v. supplies, + 18v. supplies or both ± 9 and + 18 volt supplies together.

For those modules that use all three supply voltages two Watt Blocks must be used.

To determine power requirements:

The instruction manual for each PAIA module includes as part of the specifications the power requirements for that module. The sum of the currents drawn by all of the modules connected to a single voltage supply on a 4770 Watt Block must not exceed 100 ma. For example; 2720-2 VCO's are specified to pull 25 ma. each from a ± 9v. supply. Four of these oscillators may be powered from a single Watt Block wired to provide ± 9v, but there can be no further modules powered from this supply. These supplies have conservative specifications so current drains up to the full rated 100 ma. can be tolerated with no problems.

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Some modules have the designation "current sink" as a specification for current drain from one of the voltage supplies. This means that current is returned to the supply from this input and the specified current may be subtracted from the calculation of total current demand. In most cases this current is small (less than 1/2 ma.) and can be disregarded completely.

Judicious arrangement of modules can make a difference in the number of power supplies required. For example, if at all possible group together modules that have one of the two common supply voltage configurations. In most larger systems it is entirely possible to have one cabinet completely filled with equipment that requires ± 9v. supplies while a second cabinet has equipment requiring only +18v. All modules that use both supplies could then be grouped in a controller case and powered by a 2720-7 power supply.

Multiple Jacks.

There will be times when you want a single audio or control voltage to be routed to two different places at the same time. The multiple jacks on the front of the Watt Block are intended to meet this need. Two examples:

(1) When using the 4710 Balanced Modulator as a frequency doubler, the same sine wave input must be applied to both the carrier and modulation inputs. The multiple phone jacks on the front of the Watt Block may be used for this by routing the sine wave source (VCO) into one while connecting the other two to the carrier and modulation ports of the 4710.

(2) Applying a control voltage simultaneously to two inputs of a VCO causes the pitch of the VCO to be raised an octave. The summing circuitry in the VCO sees the same voltage at two inputs, sums the two together to come out with twice the voltage and produces a pitch twice the frequency. The tip jacks on the front of the Watt Block may be used for this in the same way that the phone jacks were above.

Using Multiple Watt Blocks

In most cases multiple Watt Blocks will be used to supply two different voltages. Line cords need not be duplicated when using more than one Watt Block. The circuit board pads that connect to the AC power line have multiple holes so that modules may be ganged together as shown in figure 7 below. GROUND NOTE: When using several cabinets of modules with several sets of power supplies, it is important that ALL supplies have common grounds. Without connected grounds, the voltages in various cabinets will have no reference to each other.

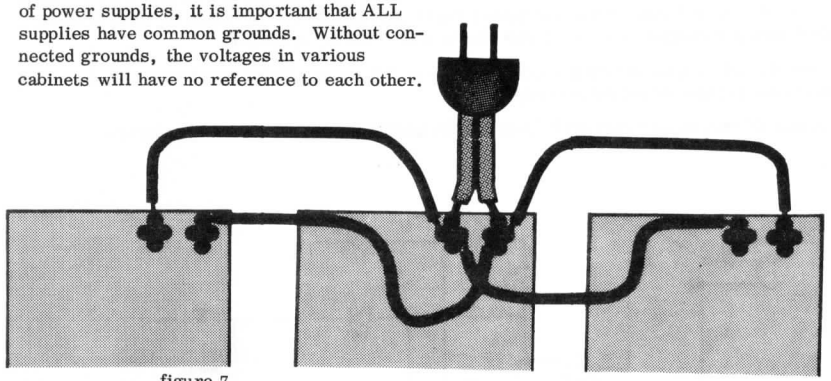
figure 7

In this configuration each Watt Block is controlled by its own power switch.

Figure 8 shows two Watt Blocks wired to supply +18v., +9v. and -9v. Note the ground on the +18v. supply (circuit board point "C") and the ground on the +9v. supply (circuit board point "D") are wired together at the modules themselves.

IT IS IMPORTANT TO NOTICE THAT THE GROUND CHANGES FROM POINT "C" TO POINT "D" DEPENDING ON WHETHER THE MODULE IS WIRED FOR +18v OR ±9v. RESPECTIVELY.

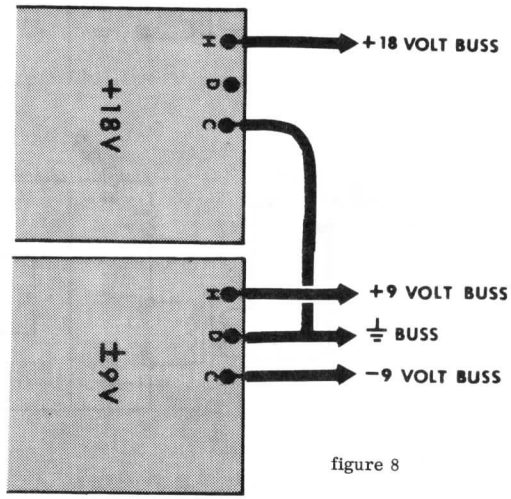

figure 8