

TRI - DELT
SOPHISTICATED ELECTRONICS
PRESENTS

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MODEL RAILROADER'S TAT IV TRANSISTOR THROTTLE
ASSEMBLY INSTRUCTIONS

In the TAT IV kit, Tri-delt is making available to the hobbyist what is perhaps the finest and most sophisticated throttle ever built. Its development has spanned several years, numerous prototypes have been assembled, and evaluated, and the country's most talented and respected authorities have contributed. Linn Westcott, editor of the Model Railroader, has been the prime mover of the project, has published several articles on the subject, and with his permission a reprint of one of them is enclosed. Since these instructions will be limited to the assembly of the kit, it is recommended that the MR reprint be reviewed for theory and operation of the TAT IV Electronic Throttle.

The Tri-delt kit of the TAT IV Throttle includes a second brake system. This consists of the older style simulated air brake with an APPLY, HOLD, and RELEASE position. The brake is normally in the RELEASE position for running. The control is depressed momentarily to the APPLY position and then allowed to return to the central HOLD position. The RATE of deceleration is a function of how long the control is held in the APPLY position. When RELEASED, the train will continue to coast at this new speed. The train may thus be "played" to a smooth stop through a series of brake applications. In contrast to the modern sophisticated Self-Lapping Brake, this simpler type is prototypical of older style locomotives and traction equipment. It may be used independently or in conjunction with the Self-Lapping Brake, or it may be omitted entirely. Items in the Parts Lists identified with an asterisk are a part of the Tri-delt Air Brake.

Before beginning actual construction, let us discuss a few basic building principles. Perhaps the only new technique for the average modeler is soldering of printed circuit boards. This is a simple process if one will remember the following rules:

1. Semiconductor components can be damaged by excessive heating.
2. Sufficient heat must be applied to the circuit board to make the solder flow freely.

While these two rules may sound contradictory, they are indeed quite compatible. A small pencil iron of forty watts or less is the best tool. The tip should be clean and tinned. A small sponge moistened with warm water will do this cleaning job well. Small diameter rosin core solder, as furnished with this kit, should be used. Acid core solder or flux should never be used on electronic work. The iron should be placed on the p.c. board conductor adjacent to the component lead to be soldered. The solder should be applied to the p.c. board conductor adjacent to the iron and the component lead. The iron should be held against the board (or moved slightly about the area) until the solder flows smoothly about the component lead and the p.c. board pad.

See Figure 1. When the smooth flow has occurred, the iron should be immediately removed. A good technique to help prevent overheating of transistors and diodes is to solder one lead of *each* component first. Then go back and solder a second lead of *each* component. Repeat until complete. Thus, each component is allowed to cool while the others are being soldered, and the maximum temperature reached by each component will remain considerably lower. The printed circuits supplied with this kit are on high quality glass boards. They may discolor when heated excessively, but this will not affect performance.

The resistance in ohms is shown on each resistor by coded color bands. The band nearest the end of the resistor represents the first digit of the resistance value. The second color band represents the second digit. The third color band defines the number of zeros following the first two digits. The fourth color band, usually silver or gold, defines the resistor tolerance, and for this application will be ignored. The color code is as follows:

0 - black (BLK)	5 - green (GRN)
1 - brown (BRN)	6 - blue (BLU)
2 - red (RED)	7 - violet (VIO)
3 - orange (ORN)	8 - gray (GRY)
4 - yellow (YEL)	9 - white (WHT)

Thus, a resistor banded (from the end) red, green, orange has a value of 25,000 ohms, written 25K.

Except for the main power leads, which are AWG #16 and identified in the instructions, all wiring of the kit should be done with AWG #22 or smaller stranded hook-up wire. Wire of this type may be obtained from any electronic supply outlet. No wire is supplied with the kit, since quantity requirements will vary with each installation dependent upon location and arrangement of the sub-assemblies.

There are four sub-assemblies involved in construction of the TAT IV:

1. Plug-in printed circuit board B, containing the circuitry associated with the TAT III portion of the kit.
2. Plug-in printed circuit board C, containing the pulse production, control, and squelch circuitry.
3. Printed circuit board A, containing those components directly associated with the Self-Lapping Brake control switch.
4. The Power Amplifier, with components mounted on an extruded heat sink.

Assembly procedure is given in step-by-step instructions. Each step should be completed and checked off before proceeding to the next step.

THE TAT III TRANSISTOR THROTTLE

OUR TAT III TRANSISTOR THROTTLE KITS BEGIN WHERE OTHER (AND IN MOST CASES HIGHER PRICED) TRANSISTOR THROTTLES LEAVE OFF. WITH ITS MANY FEATURES, THE TAT III IS THE ULTIMATE IN SCALE MODEL TRAIN CONTROL.

SIX POTENTIOMETERS ARE PROVIDED FOR A FINE ADJUSTMENT ON EACH OF THE FOLLOWING CONTROLS:

- | | |
|---------------------|----------------------|
| * THROTTLE | * BRAKE RATE |
| * SMOOTH START | * LOAD COMPENSATION |
| * ACCELERATION RATE | * VOLTAGE REGULATION |

A D.P.-D.T. CENTER OFF SWITCH IS ALSO PROVIDED FOR THE SMOOTH START FEATURE. THIS ALLOWS 60 P.P.S. - 120 P.P.S. OR NO PULSE AT THE FLIP OF A SWITCH.

A SIX POSITION ROTARY SWITCH IS PROVIDED TO GIVE REALISTIC STARTING AND STOPPING CONTROL. THESE POSITIONS ARE AS FOLLOWS:

- | | |
|-----------|-----------------------|
| * BOOSTER | * SERVICE BRAKE |
| * RELEASE | * QUICK SERVICE BRAKE |
| * LAP | * EMERGENCY BRAKE |

MODEL RAILROADER FOR OCTOBER 1965 HAD AN INTERESTING ARTICLE ABOUT WALK AROUND TRAIN CONTROL WHICH THE TAT III IS WELL SUITED FOR AND EASILY ADAPTED TO.

THE FOLLOWING IS A COMPLETE LIST OF COMPONENTS FOUND IN ALL THREE KITS AVAILABLE, WITH THE EXCEPTION OF THE PRINTED CIRCUIT BOARD WE OMITTED IN KIT # 2.

RESISTORS:

$\frac{1}{2}$ watt
5-1K
2-10K
2-2.2K
2-100K
1-10 ohm
1-330 ohm
1-100 ohm
1-2.7K
1-6.8K
1-56 Ohm
1 watt
1-560 ohm
5 watt
1-1 ohm

POTENTIOMETERS:

2-1K
2-10K
1-25K
1-100K

CAPASITORS:
1-250mfd 25 w.v.
1-1000mfd 25 w.v.
1-0.1mfd any voltage
1-10mfd 50 w.v.

DIODES:

1-1N91
3-1N2859

DIAGRAM

WIRE:
20 COLORS

PARTS LIST

TRANSISTORS:

1-2N441 (Q1)
2-2N1924 (Q2&3)
2-2N3053 (Q4&5)

SWITCHES:

1-Rotary
1-D.P.-S.T.
2-D.P.-D.T.

HEATSINKS:

1-Large
1-Small

MOUNTING HARDWARE

PRINTED CIRCUIT BOARD

TAT III PRICE LIST

FIBERGLAS PRINTED CIRCUIT BOARD as advertised, sent postage paid. - - -\$3.95

When ordering any of the following parts, please include \$.50 for postage and handling. Sorry no C.O.D. Please send check or money order. Address all orders to: HARRY WEISKOPF

55 OAKWOOD DRIVE
WANAQUE, NEW JERSEY. 07465

RESISTORS:

$\frac{1}{2}$ watt. Any ohms.	-\$.15
1 watt. 560 ohms.	.25
5 watt. 1 ohm.	.50
25 watt. 10 ohm. Adjustable.	1.30

CAPASITORS:

0.1 mfd. Any voltage.	.35
10 mfd. 50 w.v.	.75
250 mfd. 25 w.v.	1.25
1000 mfd. 25 w.v.	2.50

DIODES:

1N91.	1.25
1N2859.	.45

SWITCHES:

D.P.-S.T.	1.20
D.P.-D.T. Center off.	1.35
Bat type handles on above.	
6 position rotary.	1.25
11 position rotary.	2.30

POTENTIOMETERS:

1 K.	-\$ 1.75
10 K.	1.75
25 K.	1.75
100 K.	2.25
All pots to be wire wound and 2 watts or more.	

TRANSISTORS:

2N441.	2.40
2N1370.	.85
2N1374.	1.25
2N1924.	1.85
2N2270.	2.25
2N3053.	1.35

MISC:

Heatsink for Q-1.	.90
Mounting hardware for above.	.35
Heatsink for Q-2.	.40
Hookup wire, 20 colors 2' long.	1.00
Extra diagram and parts list.	.25

All parts are AMERICAN MADE and of the finest quality available.

* * * * *

TAT 3 also available in kit form. These kits will be sent postage paid.

KIT # 1: All components as required including switches, heatsinks, color coded wire, instruction sheets and PRINTED CIRCUIT BOARD. Knobs for pots and rotary switch have been omitted so that you may match knobs already on your control panel.

KIT # 2: Same as KIT # 1. Less PRINTED CIRCUIT BOARD.

KIT # 3: Prewired kit. Kit contains all potentiometers required, instruction sheets and prewired PRINTED CIRCUIT BOARD, complete with 20 color coded 18" leads attached.

KIT PRICES: KIT # 1. @ \$39.95 or two for \$74.90
 KIT # 2. @ \$36.00 or two for \$67.00
 KIT # 3. @ \$44.95 or two for \$84.90
 These kits DO NOT contain power supplies.

* * * * *

PRINTED CIRCUIT BOARDS ETCHED TO YOUR SPECIFICATIONS AVAILABLE

Send accurate full sized drawing of printed circuit including hole positions and we will etch and drill board. MAXIMUM SIZE: 4.75" X 7.25"

PRICES. \$.15 square inch for one board. \$.12 square inch for two or more.

MINIMUM ORDER: \$5.00. Board will be sent postage paid.

SECTION 1
ASSEMBLY OF PRINTED CIRCUIT BOARD B

- () 1. Open the plastic bags containing P.C. board B and its components, and check each part against the Parts List.
- () 2. Place the circuit boards, circuit side down, on two blocks of wood as shown in Figure 2.
- () 3. Bend the resistor leads 90° so that they are parallel and one-half inch apart as in Figure 3.
- () 4. Referring to Figure 4, insert the following components into the board with the leads hanging through:
- | | | | | | |
|---|------|-------------|--|------|-------------|
| (<input checked="" type="checkbox"/>) R2 | 220 | RED-RED-BRN | (<input checked="" type="checkbox"/>) R20 | 1K | BRN-BLK-RED |
| (<input checked="" type="checkbox"/>) R3 | 10K | BRN-BLK-ORN | (<input checked="" type="checkbox"/>) R21 | 100 | BRN-BLK-BRN |
| (<input checked="" type="checkbox"/>) R13 | 1K | BRN-BLK-RED | (<input checked="" type="checkbox"/>) R38 | 470K | YEL-BLU-YEL |
| (<input checked="" type="checkbox"/>) R14 | 220 | RED-RED-BRN | *(<input checked="" type="checkbox"/>) RX1 | 2.2K | RED-RED-RED |
| (<input checked="" type="checkbox"/>) R16 | 6.8K | BLU-GRY-RED | *(<input checked="" type="checkbox"/>) RX2 | 100 | BRN-BLK-BRN |
- () 5. Insert the two potentiometers, RR and RL, in their assigned locations.
- () 6. Note that the transistor leads are indexed such that they can be inserted flush with the P.C. board only one way. Insert the following:
- | | |
|---|---|
| (<input checked="" type="checkbox"/>) Q3 - 2N1303 | (<input checked="" type="checkbox"/>) Q5 - 2N1302 |
| (<input checked="" type="checkbox"/>) Q4 - 2N1302 | *(<input checked="" type="checkbox"/>) QX1 - 2N1303 |
- () 7. OBSERVE POLARITY and insert diode X3 in its proper place. The banded end mounts away from the edge of the P.C. board.
- () 8. Place the foam side of the furnished padded block on top of the components you have inserted into the P.C. board. Secure the block and the P.C. board together with rubber bands. This assembly may now be inverted without the components falling out.
- () 9. Lay the assembly on the bench with the leads sticking up. With a small pair of diagonal cutters, clip each lead off approximately 1/16 inch above the P.C. board surface. You are now ready to solder.
- () 10. Review the soldering instructions in the introduction, and solder all the resistor leads to their pads (20 places).
- () 11. Now solder the transistor and diode leads (14 places). Be sure to remove the iron as soon as the solder has flowed on the P.C. board conductor.
- () 12. Now solder the potentiometers in position (6 places).
- () 13. Remove the foam pad from the P.C. board.
- () 14. Insert C3 (.0022 mfd) in its proper position, turn the board over, clip the leads, and solder (2 places).
- () 15. Insert C4 (.5 mfd) in its proper position, turn the board over, clip the leads, and solder (2 places).
- () 16. OBSERVE POLARITY and insert C1 (250 mfd 25V) and CX1 (250 mfd 25V) in their proper position, turn the board over, clip the leads and solder (4 places).

This completes the assembly of plug-in circuit board B. Rosin flux residue may be cleaned off the board with a small brush and denatured alcohol.

SECTION 2

ASSEMBLY OF PRINTED CIRCUIT BOARD C

- () 1. Open the plastic bags containing P.C. board C and its components, and check each part against the Parts List.
- () 2. Place the P.C. board, circuit side down, on two blocks of wood as shown in Figure 2.
- () 3. Bend the resistor leads 90° so that they are parallel and one-half inch apart as in Figure 3.
- () 4. Referring to Figure 5, insert the following resistors with their leads hanging through the appropriate holes:

(<input checked="" type="checkbox"/>) R23	560	GRN-BLU-BRN	(<input checked="" type="checkbox"/>) R31	1K	BRN-BLK-RED
(<input checked="" type="checkbox"/>) R24	5.6K	GRN-BLU-RED	(<input checked="" type="checkbox"/>) R32	47K	YEL-VIO-ORN
(<input checked="" type="checkbox"/>) R25	560	GRN-BLU-BRN	(<input checked="" type="checkbox"/>) R33	10K	BRN-BLK-ORN
(<input checked="" type="checkbox"/>) R26	270	RED-VIO-BRN	(<input checked="" type="checkbox"/>) R34	1K	BRN-BLK-RED
(<input checked="" type="checkbox"/>) R27	33K	ORN-ORN-ORN	(<input checked="" type="checkbox"/>) R35	39	ORN-WHT-BLK
(<input checked="" type="checkbox"/>) R28	1K	BRN-BLK-RED	(<input checked="" type="checkbox"/>) R36	22	RED-RED-BLK
(<input checked="" type="checkbox"/>) R29	1K	BRN-BLK-RED	(<input checked="" type="checkbox"/>) R37	1K	BRN-BLK-RED
(<input checked="" type="checkbox"/>) R30	10K	BRN-BLK-ORN			

- () 5. Referring to Figure 5, insert the following transistors in their respective positions:

(<input checked="" type="checkbox"/>) Q6	2N1303	(<input checked="" type="checkbox"/>) Q9	2N1303
(<input checked="" type="checkbox"/>) Q7	2N1303	(<input checked="" type="checkbox"/>) Q10	2N1302
(<input checked="" type="checkbox"/>) Q8	RCA 40319	(<input checked="" type="checkbox"/>) Q11	2N1302

- () 6. OBSERVE POLARITY and install diode X4 in its proper holes per Figure 5.
- () 7. Place the foam side of the padded block on top of the components of board C, secure with rubber bands, and invert the assembly.
- () 8. With a small pair of diagonal cutters, clip all the leads off approximately 1/16 inch above the P.C. board.
- () 9. Now solder all the resistor leads to their pads (30 places).
- () 10. Next solder all the transistor and diode leads to their pads (20 places).
- () 11. Remove the foam pad from the board.
- () 12. Referring to Figure 5, insert C7 (.1 mfd) in its proper position, clip the excess leads and solder (2 places).
- () 13. Insert C6 (.5 mfd) in its proper location, clip the excess leads and solder (2 places).
- () 14. OBSERVE POLARITY and insert C5 (250 mfd 25V) in its proper holes, clip the excess leads and solder (2 places).

This completes the assembly of plug-in printed circuit board C. Excess rosin residue may be cleaned off with a small brush and denatured alcohol.

SECTION 3

ASSEMBLY OF PRINTED CIRCUIT BOARD A

This printed circuit board will mount directly on the brake control switch, SB. Therefore, the technique of its assembly will differ somewhat from the previous boards.

- () 1. Open the plastic bags containing P.C. board A and its components, and check against the Parts List.
- () 2. Bend the resistor leads 90° so that they are parallel and 1/2 inch apart as in Figure 3.
- () 3. Hold the board in your hand and insert the following components where indicated from the silk-screened side. An enlarged view is shown in Figure 6.

<input checked="" type="checkbox"/>	R5	4.7K	YEL-VIO-RED	<input checked="" type="checkbox"/>	R9	220	RED-RED-BRN
<input checked="" type="checkbox"/>	R6	22K	RED-RED-ORN	<input type="checkbox"/>	R17	6.8K	BLU-GRY-RED
<input checked="" type="checkbox"/>	R7	4.7K	YEL-VIO-RED	<input type="checkbox"/>	R18	3.3K	ORN-ORN-RED
<input checked="" type="checkbox"/>	R8	1K	BRN-BLK-RED	<input type="checkbox"/>	R22	2.2K	RED-RED-RED

- 4. OBSERVE POLARITY and insert diodes X1 and X2 in their proper places.
- 5. Using the padded block, invert the assembly, DO NOT CLIP the leads, and solder (20 places).
- 6. Referring to Figure 6 and the silk-screened numbers on the component side of the P.C. board, DO NOT CLIP those leads going through terminals Nos. A1, A2, A4, A5 and A6. Clip off all others.
- 7. Referring to Figure 7, bend out hooks on the remaining leads 3/4 of an inch from the P.C. board.
- 8. Orient the P.C. board so that Term. No. A1 is opposite contact 1 of the brake switch, SB. Solder the lead from A1 to SB1 and clip off excess lead.
- 9. Clipping off excess lead, insert each of the following in its corresponding brake switch contact and solder:

<input checked="" type="checkbox"/>	Term. No. A2	<input checked="" type="checkbox"/>	Term. No. A5
<input checked="" type="checkbox"/>	Term. No. A4	<input checked="" type="checkbox"/>	Term. No. A6
- 10. Using resistor lead cutoffs, solder a shorting bus across SB terminals 8, 9, and 10.
- 11. Using resistor lead cutoffs, solder a wire from the bus of step 10 to the inner hole of A12.
- 12. Using resistor lead cutoffs, solder a wire from SB contact 7 to the inner hole of A7.

This completes subassembly wiring of printed circuit board A. Clean excessive residue with a small brush and denatured alcohol.

SECTION 4

ASSEMBLY OF THE POWER AMPLIFIER

The Power Amplifier is assembled on an extruded heat sink. Because improper mounting of the power transistors could cause serious damage, this part of the assembly is done for you.

- (X) 1. Using the two self-tapping screws, mount the terminal strip as shown in Figure 8.
- (✓) 2. Number the terminals from left to right, D1, D2, etc. through D6.
- (✓) 3. Turn the assembly over. Referring to Figure 9, install a #16 wire from the Collectors (solder lugs) of both transistors to terminal D2, inserting the wire in the hollow rivet at D2. Solder (three places).
- (✓) 4. Install a #22 wire from the Base of the 2N441 to the Emitter of the 2N554. Solder at the 2N441 only.
- (X) 5. Install a #22 wire from the Emitter of the 2N554 (solder two wires there) to the hollow rivet at terminal D3. Do not solder at D3.
- (✓) 6. Install a #22 wire from the Base of the 2N554 to the hollow rivet at terminal D4. Solder (two places).
- (✓) 7. Install a #16 wire from the Emitter of the 2N441 to the hollow rivet at terminal D1. Solder at the transistor only.
- (X) 8. Install R1 (4.7 ohms, YEL-VIO-GOLD) between terminals D1 and D3.
- (✓) 9. Using resistor lead cutoffs, mechanically wire R11 (1 ohm 25 watt) to terminals D2 and D6. Solder (two places).

This concludes wiring of the Power Amplifier subassembly.

SECTION 5

INTERCONNECTION OF THE SUBASSEMBLIES

The following operations require the controls identified in the Section 5 Parts List. After checking, the controls are ready for wiring to the other throttle subassemblies.

Physical location of the four subassemblies and the various controls is left to the discretion of the modeler, since each installation will have different requirements. Generally speaking, separation of several feet will have no effect on throttle performance. Of the 13 controls described in the MR Reprint, the throttle RT (with switch RTC), the Lap Brake SB, and the Tri-delt Air Brake SXB (if used) must mount on your Control Panel. The other potentiometers and switches may be mounted elsewhere, but the purist will want them nearby in order to fully enjoy the versatility of this throttle. Potentiometers RR and RL are already mounted on P.C. board B and will rarely require any adjustment. At this time all the components should be physically mounted. All potentiometers and Brake Switch SB require a 3/8" diameter mounting hole. Controls RT, RA, and RP are provided with a locking index pin which will engage a 1/8" hole drilled 7/16" to the right of center of the 3/8" mounting hole as seen from the back of the panel. Brake Switch SB is prevented from turning by installing the star lock washer between the switch and the back of the control panel, and securely tightening the nut. Potentiometers RS and RM have separate shafts which should be snapped into place. These controls have no index and should be installed by tightening their mounting nuts securely. The switches SD and SP fit a 15/32" mounting hole, but will work nicely with a 1/2" hole. The Air Brake, SXB, requires a 1/2" mounting hole and a clear area 1" x 1 3/4" to the right of center as viewed from the back of the panel. The Tri-delt Air Brake control should be mounted so that the RELEASE, or locking position, of the lever is up, and the APPLY, or momentary position, is down. After all controls are mounted, the shafts should be cut off to proper length with a Zona or hack saw. Then install the knobs; bar on Lap Brake SB, large pointer on the Throttle RT, and four small trimmer knobs on RA, RP, RS, and RM. Switches SO and SR are not furnished with the kit, but are shown in sketches for correlation with the Reprint.

Before beginning the interconnection wiring between subassemblies, let us establish terminal identification for the plug-in P.C. boards and their receptacles. With the contact side of the receptacle toward you (right angle legs down and bent toward you), the contacts are numbered from the left starting with No. 1, 2, 3, etc. and preceded by the P.C. board letter, B or C. Refer to figure 10. Printed circuit boards are inserted with circuit side toward you (contact spring wipers pressing on the tinned copper conductors).

Terminal numbers on the round printed circuit board are silk-screened and are identified A1, A2, etc. to A15. Terminals on the Power amplifier you have numbered from left to right D1 through D6.

The receptacles for plug-in P.C. boards B and C should be located in their final positions, but need not be secured down if this will facilitate wiring to the receptacles. The completed P.C. boards B and C should be set aside until the wiring of Section 5 is finished. During these operations, the wires should be orderly routed so that upon completion they may be tied into neat harnesses. Refer to Figure 12 for an overall interconnection diagram and Figure 11 for connections to all controls. Wiring of the controls will require a number of connections to positive and negative 18 VDC. If the power source is some distance from the controls, it is suggested that two reference terminals be established for this purpose adjacent to the controls. Starting with the power wiring, step by step instructions follow:

Use AWG #16 wire for steps 1 through 4

- () 1. Install a wire from the positive (+) terminal of your 18 VDC power source to an input terminal of your reversing switch.

NOTE: The reversing switch SR is not furnished with this kit inasmuch as personal preferences and existing panel controls vary with the individual. Any DPDT switch wired as shown in Figure 11 will suffice.

- () 2. The TAT IV Throttle requires a filtered 18 VDC power source. The filter C2 (1000 mfd @ 25V) is supplied with this kit and must be installed on your existing power

supply. OBSERVE POLARITY and connect C2 to the positive (+) and negative (-) terminals of your 18 VDC power source.

NOTE: If you do not have or cannot obtain an 18 VDC power source, Tri-delt's PS-7 will fill the requirement. The PS-7 will deliver 4 amperes at 18 VDC and is equipped with a self-resetting thermal circuit breaker. List Price \$11.95 FOB San Diego.

() 3. Install a wire from the negative (-) terminal of your 18 VDC power source to terminal D6 and solder. At some convenient location along this wire, you should install R10, the current limiter lamp. Note that the wires should solder to the two solder buttons of the lamp. The shell and flange may be used for mounting, but must be electrically isolated; or the lamp can just hang on the wires.

() 4. Install a wire from terminal D1 (solder) to the other input terminal of your reversing switch.

This completes the wiring with AWG #16. The balance of the connections should be made with AWG #22 or smaller wires.

You are now ready to wire the receptacles. Extreme care must be used to prevent shorting between contact terminals. Strip about 1/4" of the wire, lay it alongside the contact terminal and solder. Sleeving provided with this kit should be cut into 1/2" lengths and slipped over odd numbered terminals after soldering.

() 5. Slip a piece of sleeving on a wire, solder to B1, and slide the sleeving over the terminal.

() 6. Connect the other end of this wire to the positive +18 VDC supply.

() 7. Referring to Figure 11, solder a wire from B2 to terminal 3 of the Tri-delt Air Brake Switch, SXB.

() 8. Connect a wire from terminal 1 of SXB to negative (-) 18 VDC.

() 9. Connect a wire from terminal 4 of SXB to positive +18 VDC.

() 10. Using sleeving, solder a wire at B3 and connect to the center of switch SD.

() 11. Solder a wire at B4 and connect to A15 on SB. The wire should be stripped and inserted through the hole at A15 from the back of SB (component side), and then soldered on the printed circuit side.

() 12. Using sleeving, solder a wire at B5 and connect to negative (-) 18 VDC.

() 13. Solder a wire at B6 and connect to the NORMAL terminal of SD.

() 14. Connect a wire from the NORMAL terminal of SD to the wiper of SB which contacts positions 1 through 6. (See Figure 7). The wire should be inserted through the hole in the center of P. C. board A and then soldered to the wiper terminal.

() 15. Using sleeving, solder a wire at B7 and connect to C14. Solder at C14.

() 16. Solder a wire at B8 and solder the other end at D1.

() 17. Using sleeving, solder a wire at B9 and connect to D2. Solder at D2.

() 18. Solder a wire at B10 and connect to D4. Solder at D4.

() 19. Using sleeving, solder a wire at C1 and connect to positive +18 VDC.

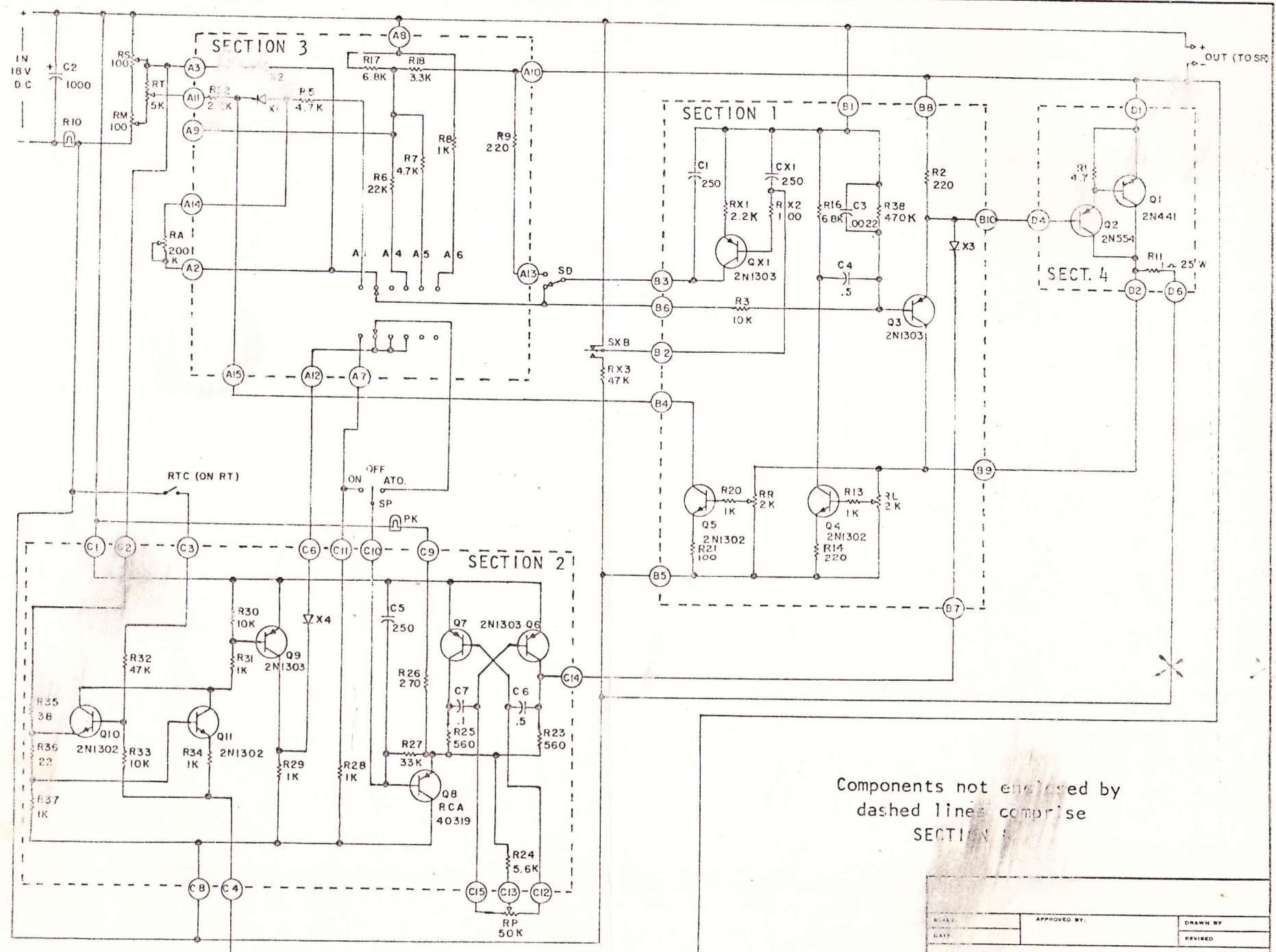
- () 20. Solder a wire at C2 and connect to the wiper (center contact) of RS.
- () 21. Solder a second wire at the wiper of RS and, using the technique of Step 11, solder the other end to A3.
- () 22. Using sleeving, solder a wire at C3 and connect to one side of Switch RTC as shown in Figure 11.
- () 23. Connect the other side of switch RTC to negative (-) 18 VDC.
- () 24. Solder a wire at C4 and connect to D1. At D1 solder two wires and R1.
- () 25. There is no connection at C5. Solder a wire at C6 and, using the technique of Step 11, solder the other end at A12.
- () 26. There is no connection at C7. Solder a wire at C8 and connect to negative (-) 18 VDC.
- () 27. Using sleeving, solder a wire at C9 and connect to one side of the G-O-W lamp, PK.
- () 28. Connect the other side of lamp PK to positive +18 VDC.
- () 29. Solder a wire at C10 and connect to the center terminal of switch SP.
- () 30. Using sleeving, solder a wire at C11 and connect to the "ON" terminal of switch SP.
- () 31. Connect a second wire from the "ON" terminal of SP to A7. Solder at A7 using the technique of Step 11.
- () 32. Connect a wire from the "AUTO" terminal of SP to the wiper of SB which contacts terminals 7 through 12. Insert the wire through the center hole of P.C. board A and solder to the wiper terminal.
- () 33. Solder a wire from C12 to one end terminal of potentiometer RP.
- () 34. Using sleeving, solder a wire from C13 to the wiper (center terminal) of potentiometer RP.
- () 35. Using sleeving, solder a wire from C15 to the other end terminal of potentiometer RP.
- () 36. Solder a wire at A2 and connect to the wiper (center terminal) and one end terminal of potentiometer RA.
- () 37. Using the method of Step 11, solder a wire from A13 to the REVERSE side of Switch SD.
- () 38. Solder a wire from A14 to the other end terminal of potentiometer RA.
- () 39. Solder a wire from A10 to D1.
- () 40. Solder a wire from A8 to positive +18 VDC.
- () 41. Solder a wire from A11 to the wiper (center terminal) of potentiometer RT (throttle).

- () 42. Solder a wire from the low end terminal of RT to the wiper (center terminal) of RS.
- () 43. Solder a wire from the other end terminal of RT to the wiper (center terminal) of potentiometer RM.
- () 44. Solder a wire from the low end terminal of RS to positive +18 VDC.
- () 45. Solder a wire from the other end terminal of RS to the low end terminal of RM.
- () 46. Solder a wire from the other end terminal of RM to negative (-) 18 VDC.

This completes the interconnection wiring of the controls and subassemblies. Before turning the power on, it would be a good idea to recheck all your operations. Review the component locations and color codes on each printed circuit board. Confirm the wiring of the interconnection operations.

When you are satisfied that you have completed each step of the instructions correctly, carefully insert the printed circuit boards into their receptacles. BE SURE the boards are facing the right way -- receptacle spring contact fingers pressing on the circuit side of the boards. Turn the throttle RT to the OFF position. Set RL (on the B board) to extreme counterclockwise position, RR (on the B board) to extreme clockwise position, RS fully counterclockwise, RM fully clockwise, RP fully counterclockwise (no pulse), and RA at about midposition. Re-read Linn Westcott's article describing the operation of the TAT IV. Then you are ready to turn the power on and begin controlling your trains with the most realistic and sophisticated electronic throttle available.

Tri-delt guarantees the components of this kit to be all new hardware free from defects of material and workmanship. Should you experience difficulties in assembly or operation, every effort will be made to correct your problem. DO NOT return hardware to Tri-delt. Write a letter describing your difficulties in the greatest possible detail. You will be advised which pieces, if any, to return for evaluation. Tri-delt cannot be responsible for any hardware returned without direction.



SCALE	APPROVED BY	DRAWN BY
DATE		
REVISED		
TAT IV SCHEMATIC		
FIGURE NO. 13		
DRAWING NUMBER		

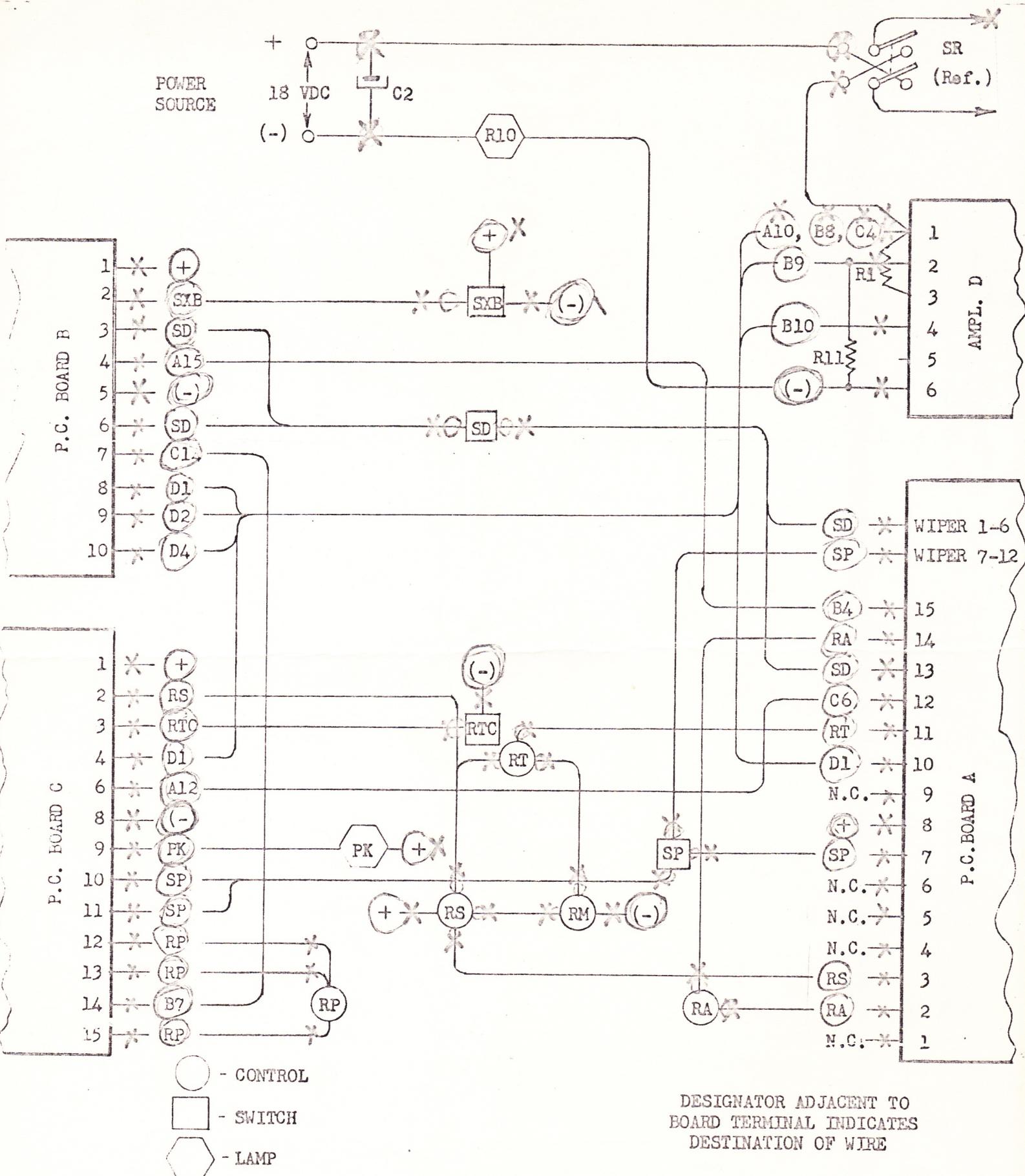


FIG. NO. 12 INTERCONNECTION DIAGRAM



TRI - DELT

SOPHISTICATED ELECTRONICS

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92120

WIRING INSTRUCTIONS FOR THE LA-1 SILICON AMPLIFIER

Wire your Limiting Amplifier LA-1 into your TAT IV assembly exactly as the Section 4 Amplifier is wired. This is as follows:

- ✓1. Connect Terminal D1 to A10, B8, and C4.
- ✓2. Connect Terminal D2 to B9.
- ✓3. Connect Terminal D4 to B10.
- ✓4. Connect Terminal D6 to -18v directly (eliminating R10).

In addition to this standard wiring, do the following:

- ✓5. Connect Terminal D3 to +18v.
- ✓6. Wire the overload indicator (GOW lamp) between D3 and D5.

The LA-1 is preset to limit current flow (and light the overload indicator) at three amperes (the rated maximum). This limit value may be reduced by adjustment of the trim pot on the p.c. board. The LA-1 should be mounted with the fins vertical to permit free air convective cooling.

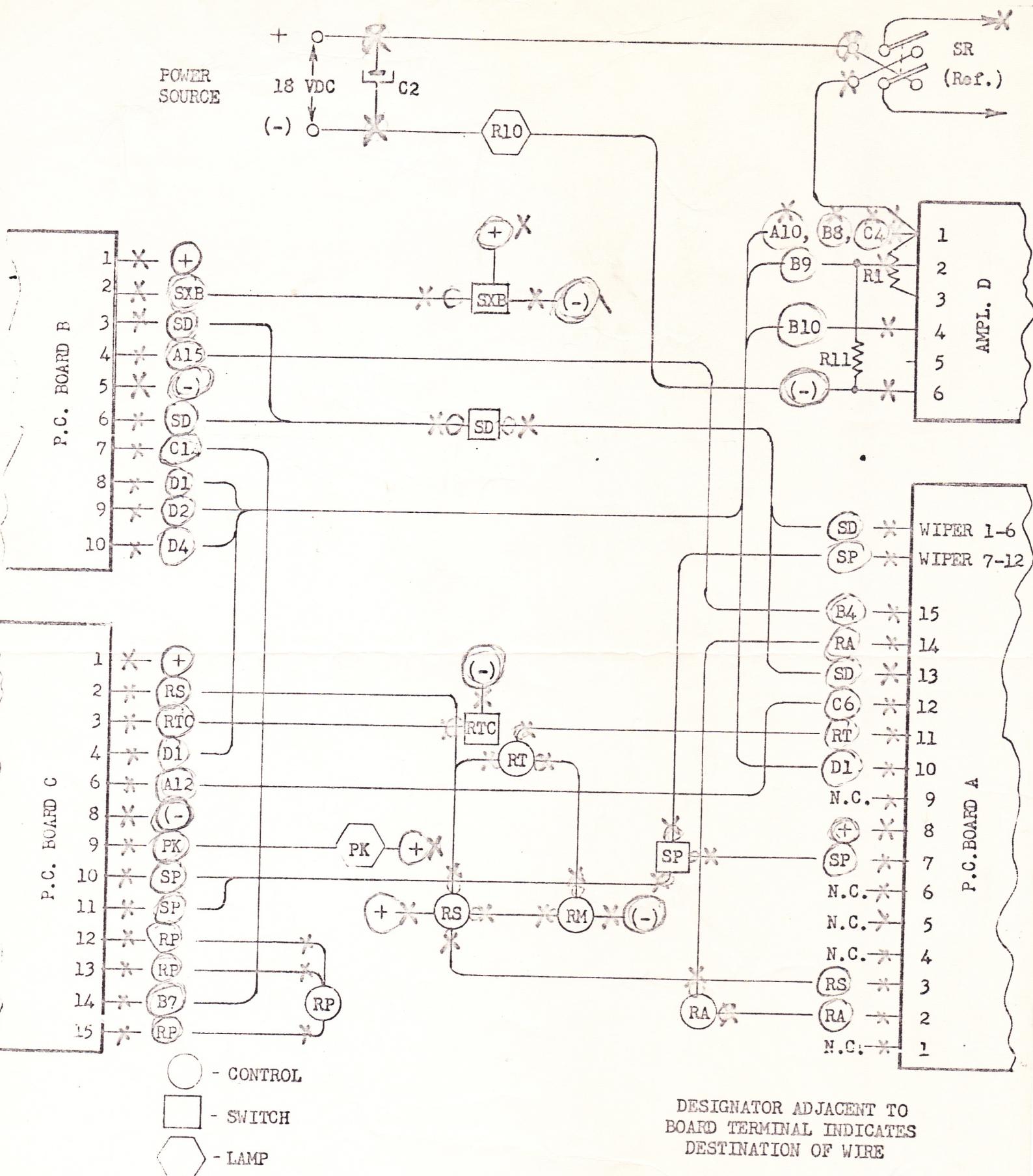


FIG. NO. 12 INTERCONNECTION DIAGRAM

Resistor Color bands

Band nearest end = 1st digit

Second color band = 2nd digit

3rd color band = # of zeros following first 2 digits

Fourth .. " = usually silver or gold - resistor tolerance

0 - Black	5 green
1 - brown	6 blue
2 - red	7 violet
3 - orange	8 gray
4 yellow	9 white

Sunday Sept 19

Homer's