

SECTION 13

# SERVICE MANUAL

**PEDAL SOLD**  
**FOR UNIT**  
**RT, RT-2, & RT-3**  
**CONSOLES**



HAMMOND ORGAN COMPANY  
DIVISION OF HAMMOND CORPORATION

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The Model RT Hammond Organ console is similar electrically to the Model CV console, but differs in the following respects:

1. The console woodwork is larger and somewhat different in design.
2. The pedal keyboard is concave, with 32 pedal keys.
3. The pedal solo unit is added to provide deep and rich pedal tones desired by the concert organist.

The Model RT-2 console includes the above features and also has the selective vibrato system as used in Model C-2.

The Model RT-3 Console is similar to Model RT-2 with the addition of the percussion feature.

### PEDAL SOLO UNIT

The pedal solo unit incorporated in these consoles provides a series of bright pedal solo tones in addition to the usual pedal accompaniment tones available on other models. The pedal solo tones, generated by a vacuum tube oscillator circuit, are controlled by a volume control knob and eight tilting stop tablets, of which one turns all the pedal solo tones on or off and the others provide various pitch registers and tone colors. The pedal solo unit is independent of the electromagnetic tone wheel generator and can be turned off without affecting the remainder of the organ.

Only one pedal solo note will play at a time (if two pedals are depressed at a time, only the higher one plays) but this does not affect the foundation or accompaniment tone controlled by the two pedal drawbars. It is possible, therefore, for the left foot to play a bass accompaniment note set up on the pedal drawbars, while at the same time the right foot plays a pedal solo note (the accompaniment tone on this higher note being masked by the high solo quality).

The pedal solo unit is designed as a part of these consoles, and because of mechanical limitations it is not adaptable to any other model.

**NOTE:** Pedal solo generators of all types have slightly different electrical circuits but are interchangeable in all RT series consoles. Type RTA was used in all Model RT and some Model RT-2 consoles. Types RTB and RTC were originally used only in Model RT-2. Types RTD and RTE have improved components - but no change in circuits.

### HOW THE PEDAL SOLO UNIT WORKS

All notes of the pedal solo unit are controlled by a two-triode vacuum tube master oscillator circuit operating at audio frequencies from 523 to 3136 cycles per second, corresponding to 1 foot pitch. Thus the master oscillator operates over the full pedal keyboard range of 32 notes. Each time a pedal is depressed, its tuning contact tunes the oscillator to the pitch associated with the corresponding key in this 32 note range.

The output of the oscillator is fed into a series of five cascaded frequency dividers, each of which divides its input frequency by two and thus produces a note an octave lower than its input frequency. The five dividers thereby provide pitches of one, two, three, four, and five octaves below the pitch of the oscillator. In this way, when the oscillator is tuned to some given note, each divider produces a note in exact octave relation to the oscillator, thus forming a series of six notes having exact octave relationships. The particular frequency divider or dividers selected for sounding through the amplifier and speaker system of the organ will depend upon which of the stop tablets are used.

A control contact under each pedal causes the control tube to transmit the signal to the amplification system with a controlled rate of attack.

## COMPONENTS OF THE PEDAL SOLO UNIT

Electrically the pedal solo unit is very similar in principle to the Hammond Solovox, Model L, although there are, of course, many differences. It employs tuning coils, tuning adjustment knobs, a master oscillator, and frequency dividers similar to those in the Solovox, and the stop tablets are similar in function to the register controls of the Solovox.

The pedal solo generator is a chassis which looks like an amplifier and contains the master oscillator, five frequency dividers, an amplifier, a control tube, and a power supply. It is located directly above the pedal switch assembly, near the left side of the console as viewed at the rear.

The tuning coil assembly contains 32 adjustable inductance coils, which tune the master oscillator to the frequencies of the 32 pedal notes. It is mounted above the pedal switch assembly, near the right side of the console as viewed at the rear.

The control panel, with eight stop tablets and a volume control knob, is mounted at the right end of the lower manual.

The pedal switch has nine contacts under each pedal key. One is used for tuning the pedal solo unit, the second serves to key the amplifier and make the pedal solo note sound, and the other seven carry harmonics from the main (tone wheel) generator to the pedal drawbars as in the B and C series consoles.

## WIRING DIAGRAMS

In studying the operation of the pedal solo unit, refer first to the block diagram (figure 1) and second to the more detailed schematic circuit (figure 2, 2B or 2C). The schematic diagram of the console, apart from the pedal solo unit, is the same as for the Model CV, C-2, or C-3 console, shown in section 2. Actual connections between the pedal solo unit and other parts of the console are shown in the wiring diagram in section 2.

### The Oscillator

The 32 coils which tune the audio frequency oscillator are shown in figure 2. When the lowest "C" note is played (this pedal has no tuning contact), all 32 coils are connected in series to form the tuning inductance of the oscillator. When any other pedal is depressed, its tuning contact shorts out some of these coils (making less total inductance) and thus tunes the oscillator to the higher pitch associated with that note. If two pedals are depressed at the same time only the higher pitched of the two will sound.

### Frequency Dividers

Each divider includes three triodes. One acts as a driver and pulse rectifier, supplying sharp and narrow negative pulses to actuate a symmetrical feed-back tripping circuit comprising two triodes. Either one (but only one) of these two triodes can be conducting at a time, for by drawing plate current it holds the other in a cut-off condition.

Suppose, for example, that the first triode is conducting and the second is cut off. Now a negative input pulse impressed on the grids of both triodes will not affect the second one, which is already cut off, but will cut off the first. This produces a positive pulse at the plate of the first triode, which is applied to the grid of the second

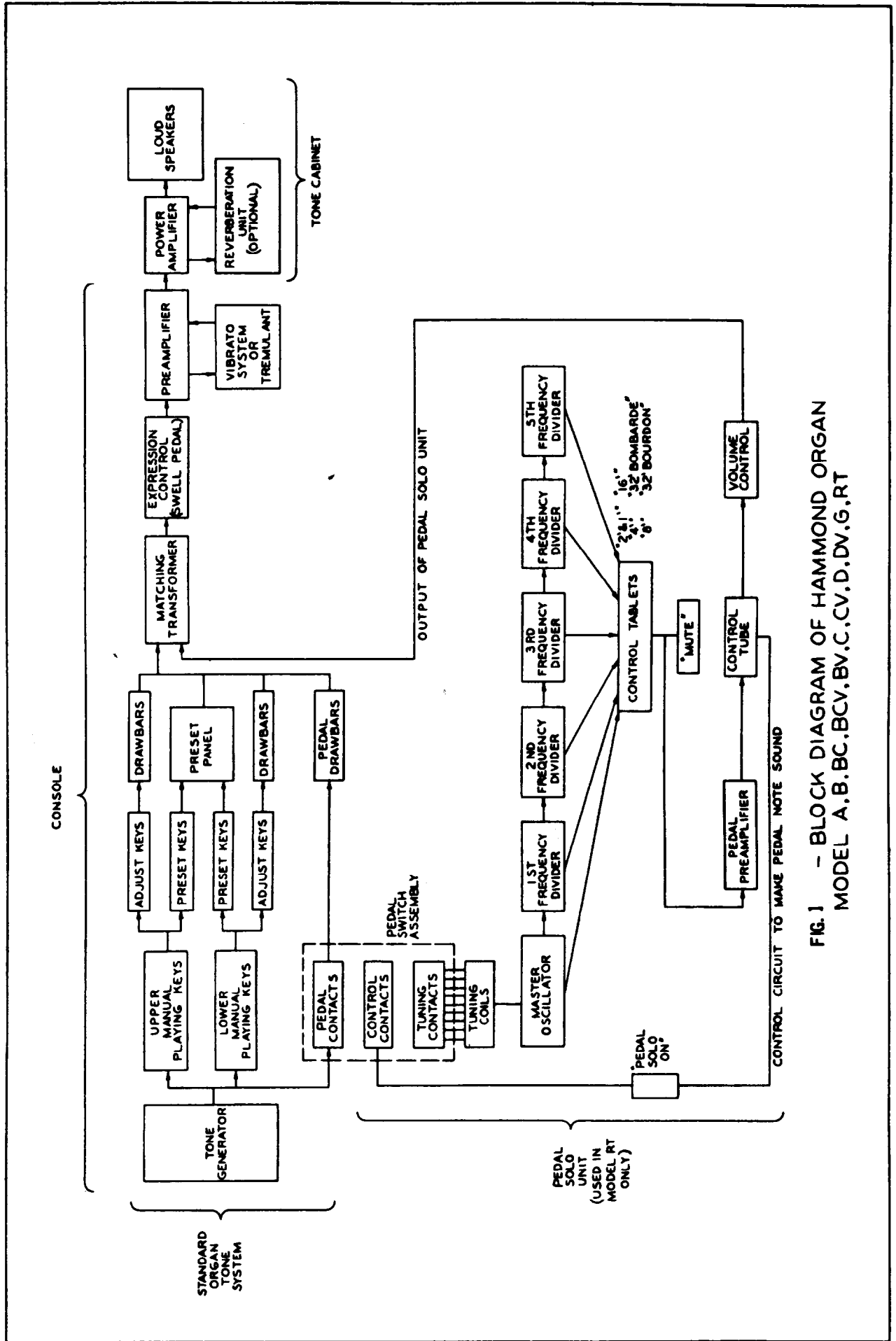


FIG. 1 - BLOCK DIAGRAM OF HAMMOND ORGAN MODEL A.B.BC.BCV.BV.C.V.D.DV.G.R.T

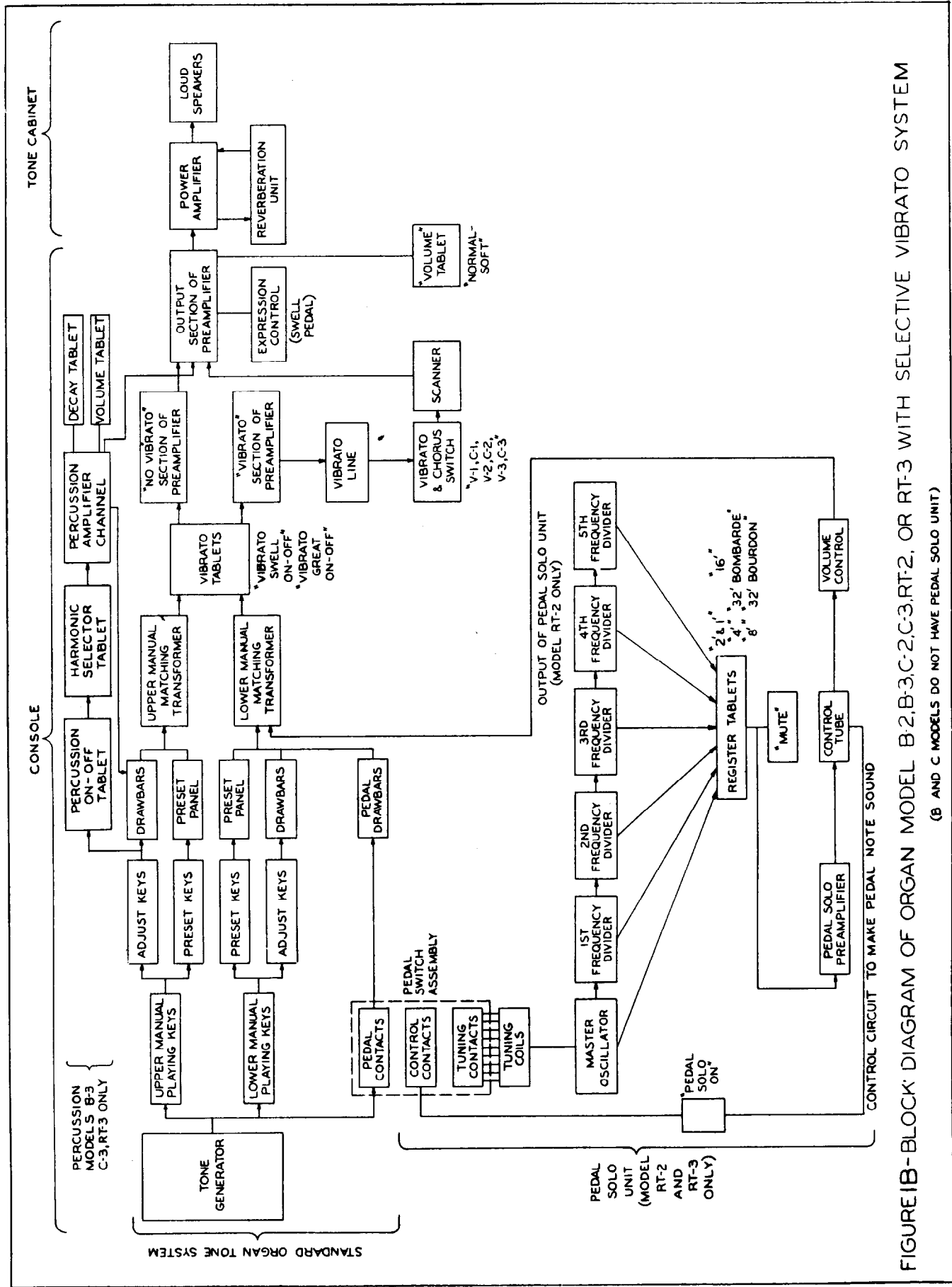


FIGURE 1B - BLOCK DIAGRAM OF ORGAN MODEL B-2, B-3, C-2, C-3, RT-2, OR RT-3 WITH SELECTIVE VIBRATO SYSTEM

(B AND C MODELS DO NOT HAVE PEDAL SOLO UNIT)

triode through its feedback connection. The second triode then suddenly conducts current, producing a negative pulse at its plate. This negative pulse, applied to the first triode grid through its feed-back connection, insures that the first triode remains cut off. The situation is now exactly reversed, with the first triode cut off and the second conducting.

The next input pulse will act on the second triode, cutting it off again and making the first conductive; and thus two input cycles are required to produce one out-put cycle. Each frequency divider circuit therefore divides its input frequency in half, producing an output signal one octave lower than the preceding divider. One triode plate of each divider stage furnishes a signal of rectangular wave shape to the following driver tube, and output signals are taken from the driver and divider plates as indicated in figures 2, 2-B and 2C.

This divider circuit is capable of operating satisfactorily with wide variations in voltage, input frequency, and values of components, and therefore is remarkably stable and requires no adjustments.

### Stop Tablets

From the preceding, we see that whenever any one of the three G pedals, for instance, is depressed, the frequency dividers, together with the oscillator, provide a series of six G notes in exact octave relations. The particular divider whose output is to sound is selected by the stop tablets: 2' & 1', 4', 8', 16', 32' BOMBARDE and 32' BOURDON. Thus the stop tablets act as register controls to shift the pitch range of the pedal solo unit to five different positions. If two or more of these controls are turned on simultaneously, a composite tone will be heard, consisting of the output of several dividers simultaneously sounding in their octave relations. (A tablet is "on" when the white dot is visible.)

### Note With Regard To The 32-foot Stops

In playing, care must be exercised by the organist in using the 32' BOURDON and 32' BOMBARDE pedal stops. They are useful in permitting the player to obtain deep bass notes in the second octave of pedals. As the player descends into the first octave of pedals, he will find that the B, A#, A, and G# pedals have a definite pitch like the higher pedals. However, below the G# pedal, it becomes difficult to ascribe a definite pitch to these 32-foot tones. When a 32-foot stop is registered in concert organ music, it will be found that the pedals required will rarely be lower than the G pedal in the first octave. Therefore, do not use the 32-foot pedal stops indiscriminately for ordinary bass purposes where the 16-foot tone is desired. The 32' BOURDON stop produces an effect which is mostly "felt" as a very low bass undulation when playing low in the first octave of pedals. The 32' BOMBARDE is always used in conjunction with other higher pitched stops. When played by itself in the lower half of the lowest octave of pedals, the effect is of such low pitch as to be of little use musically.

### "MUTE"

Pressing the mute tablet shunts a small condenser across the signal circuit to reduce the intensity of the higher frequencies. This is effective on all the pedal solo stops to make the tones more mellow.

### "PEDAL SOLO ON"

This tablet, connected in series with the keying contacts in the pedal switch, turns on and off any solo combination set up on the other tablets. It may thus be used as a preset control for the pedal solo unit.

### Volume Control

The volume knob on the control panel is used to balance the pedal solo tones with the rest of the organ. The over-all volume of the entire organ, including the pedal solo unit, is controlled by the expression pedal.

### Control Tube

The push-pull control tube, a double triode, is normally cut off by a large negative bias applied to its grid circuit. When any pedal is pressed its control contact grounds this bias circuit (if the "PEDAL SOLO ON" tablet is "on"), thereby removing the bias and causing the note to sound. A condenser and resistor, C81 and R112, make the tonal attack smooth. The control tube is connected to an output transformer whose secondary feeds the pedal solo signal through the volume control to the organ preset panel, where it is combined with the other tones of the organ.

### Tuning

All notes of the pedal solo unit are simultaneously tuned by adjusting two tuning knobs located on the pedal solo generator. These change the frequency of the master oscillator by shunting small additional capacitors across the main tuning condenser.

To tune the pedal solo unit to the organ, proceed as follows:

- (a) Press only the "4", "MUTE", and "PEDAL SOLO ON" tablets and hold down the middle D# pedal. The pedal drawbars must be pushed in, and the vibrato should be off.
- (b) Pull out only the first white drawbar for either manual and press the corresponding preset key. Hold down the D# key above the middle C, with the drawbar and the volume control knob set to give approximately equal volume.
- (c) Set the "fine tuning" knob on the pedal solo generator to its center position and adjust the "rough tuning" knob to the point which brings the two notes most nearly in tune (slowest beat between them). Then adjust the "fine tuning" knob to make the beat as slow as possible. While it is generally not possible to tune exactly to zero beat, the accuracy of tuning provided will be found to be sufficient.
- (d) The organist may prefer to have the pedal solo generator tuned slightly sharp to increase the "chorus effect" between it and the main tone generator. To tune it sharp, turn the "fine tuning" switch counterclockwise one step.

Note: Never tune on the lower pitch registers (especially the 32-foot range) where the pitch acuity of the ear is insufficient for accurate tuning. If the 4-foot stop is tuned as directed above, all other registers will be in tune because they are locked by the frequency dividers to exact octave intervals.

### Wiring of Pedal Switch

The nine contacts of each pedal key make contact with nine busbars extending the length of the pedal switch assembly. One set of contacts and the corresponding busbar, used for tuning the pedal solo unit, are wired to a terminal panel on top of the pedal switch, where the tuning coil cable connects. The other eight sets of contacts are wired to the main tone generator as indicated in the pedal wiring chart in the section on manuals and pedals, although only seven sets are actually used to carry tones from the main generator to the pedal drawbars.

The contacts of one set (the one marked "12th harmonic" in the wiring chart) are used as control contacts for keying the pedal solo unit. The fact that they are connected to ground through the pedal switch wiring and the tone generator wiring does not



affect their use for this purpose, since the keying circuit impedance is high by comparison. The busbar for these contacts is wired to a terminal on top of the pedal switch to which the white keying wire from the pedal solo control panel connects. These contacts are wired to the main tone generator in the usual way in order that they may supply the 12th harmonic in case special circumstances make it desirable to omit the pedal solo unit. In this case a green wire from the pedal resistor panel on the manual assembly (it will be found wrapped around the pedal switch cable) is connected to the busbar terminal on top of the pedal switch (see wiring diagram in section 2). The pedal tones will then be identical to those on the B and C series organs.

### TUBE SOCKET VOLTAGES For Pedal Generator Stamped "Type RTA"

For voltages of other models see corresponding schematic diagrams.

These readings are taken with a 1000-ohms-per-volt meter having three scales of 50, 250 and 1000 volts. All voltages are taken with 117 volt line, and deviations of as much as 20 per cent may be caused by line voltage variations. The "PEDAL SOLO ON" tablet must be "on", and other tablets may be either on or off. No pedal should be depressed unless specified. The negative lead of the voltmeter is connected to ground except as noted. See figure 5 for terminal locations.

Connect Positive Voltmeter lead to:	Meter should read (volts)	Meter Scale	This shows voltage of:
" + 290"	290	1000	1st Filter Capacitor
" + 270"	270	1000	2nd Filter Capacitor
" + 120"	120	250	3rd Filter Capacitor
" + 20"	20	50	Divider Bias
Ground (neg. to "-37")	37	50	Control Tube Bias Supply
Tube VI (term. #3)	190	1000	Master Oscillator Plate (1st section)
Tube VI (term. #8)	8.5	50	Master Oscillator Cathode (1st section)
Tube V2 (term. #2)	230	1000	Master Oscillator Plate (2nd section)
Tube V2 (term. #3)	3.5	50	Master Oscillator Cathode (2nd section)
Tube V2 (term. #5)	180	1000	Oscillator Rectifier Plate
Tube V2 (term. #6)	2	50	Oscillator Rectifier Cathode
Tube V3 (term. #2)	75	250	Driver Plate
Tube V3 (term. #5), V6 (term. #3), V8 (term. #2 & #5)	95	250	Driver Plates
Tube V4, V5, V7, V9, V10 (term. #2 and #5)	55 to 75	250	Divider Plates
Tube V12 (term. #3)	120	250	Preamplifier Plate
Tube V12 (term. #8)	4	50	Preamplifier Cathode
Tube V13 (term. #2 and #5)	120	250	Control Tube Plates

Connect Positive voltmeter Lead to:	Meter Should Read (volts)	Meter Scale	This shows Voltage of:
Same, any pedal pressed	105	250	Control Tube Plates
Tube V13 (term. #3)	0	50	Control Tube Cathode
Same, any pedal pressed	3	50	Control Tube Cathode
Tube V11 (term. #8)	290	1000	Rectifier Cathode

### AC VOLTAGES

Heater voltage to all tubes except V11	6 V. RMS
Rectifier tube V11 heater voltage	5 V. RMS
V11 term. #4 or #6 to "-37"	280 V. RMS
AC ripple across 1200 ohm resistors R99, R100, R101 (connect a 1/4 mfd. condenser in series with meter)	Less than 2 V. RMS
AC ripple across 5000 ohm resistor R105 (connect a 1/4 mfd. condenser in series with meter)	Less than 1 V. RMS

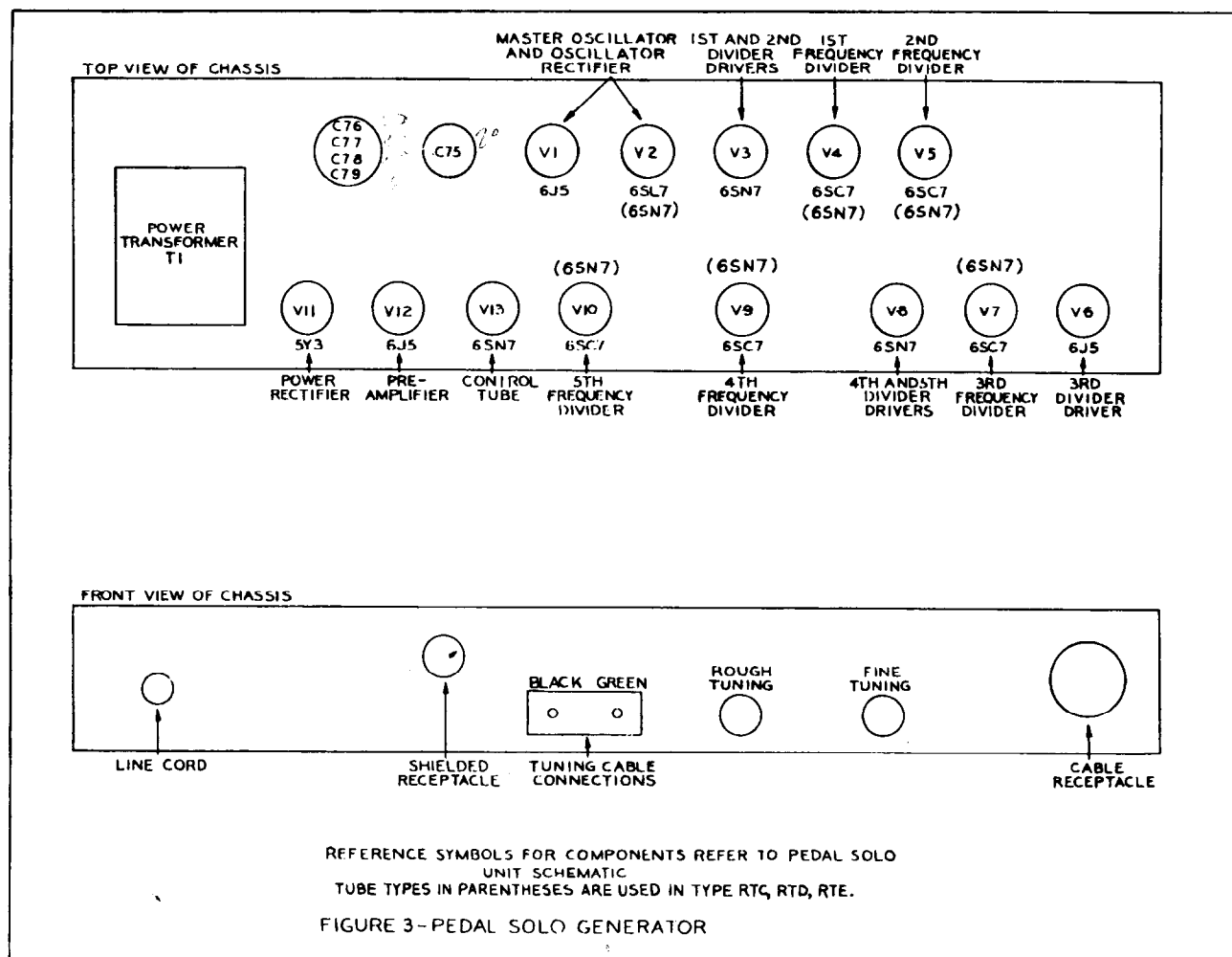
### PRACTICAL SERVICE SUGGESTIONS

The following suggestions cover possible troubles in the pedal solo unit only. Suggestions for the standard organ system will be found elsewhere in the service manual.

Any trouble in the organ ahead of the matching transformer will not affect the pedal solo unit, but trouble following the transformer will affect both systems equally.

Pedal solo unit does not play. First make sure that the tubes are lighted, all controls are in playing position, and the rest of the organ plays normally. Several possible causes of trouble are listed below in order of probability.

- (a) Tubes. The tubes are all standard radio types and can be tested in the usual way. Figure 3 shows their locations in the pedal solo generator.
- (b) Loose cable connector. See that the 15 Pole plug and the shielded plug are inserted tightly into the pedal solo generator.
- (c) Keying circuit. A dirty contact in the "PEDAL SOLO ON" tablet or a defective connection in any part of the keying circuit will prevent removal of the cut-off bias when a key is played. If this is the trouble, grounding pin 15 of the cable plug will make a pedal note sound. The following section, "Procedure for Removing Parts", tells how to reach and clean the tablet contacts.
- (d) Amplifier or oscillator circuit. The amplifier circuit is conventional in most respects, and voltage measurements will generally serve to identify any trouble. Failure of the master oscillator will make the pedal solo unit fail to play, and voltage readings will be helpful in this case also. Figures 4, 4A, 4B show the locations of all components, and a chart at the end of this section gives their characteristics.

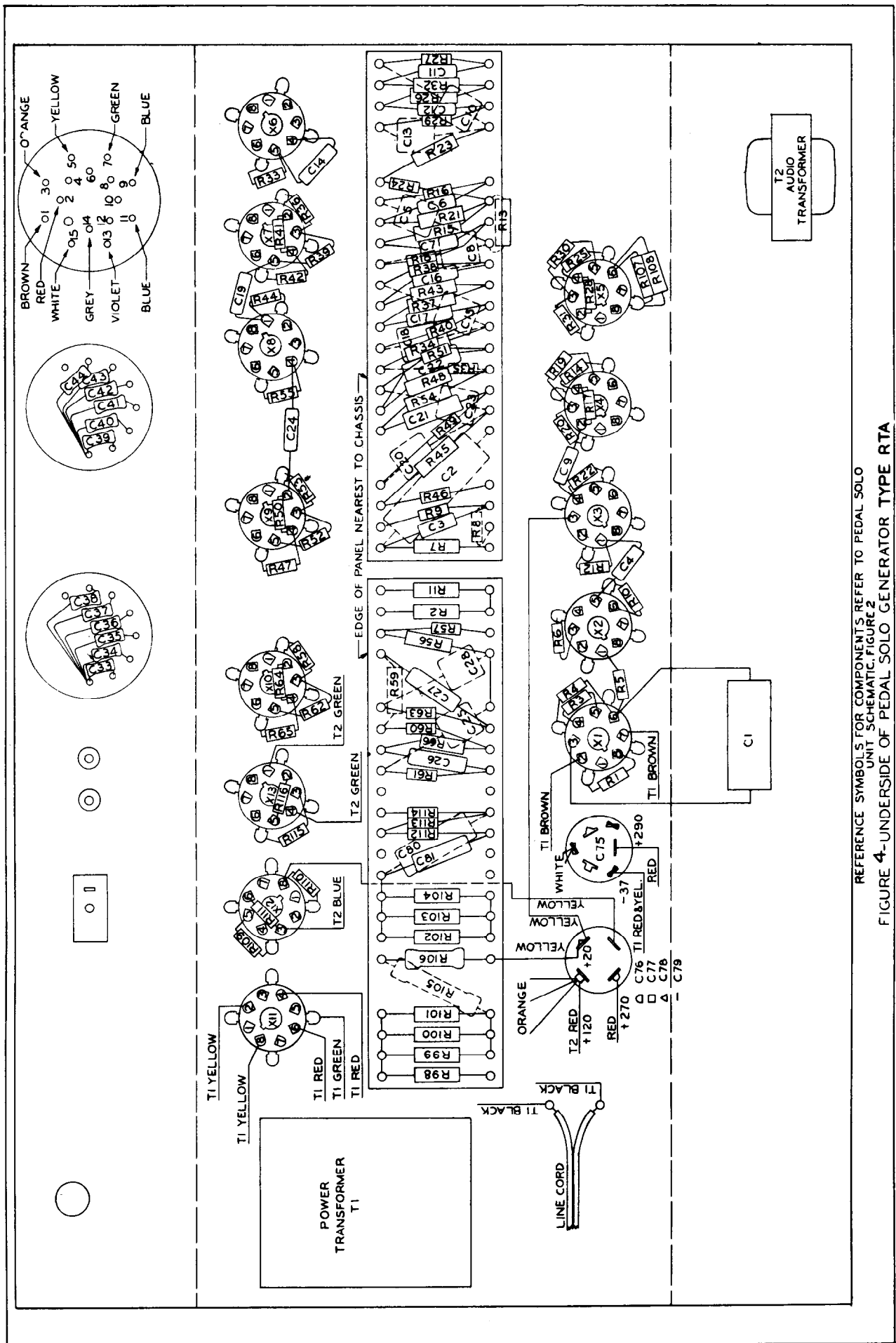


Pedal solo note does not sound on one pedal (with any combination of control tablets). The control contact of that pedal is probably dirty and can be cleared by adjusting the pedal busbar shifter as described in the section on manuals and pedals. The same trouble may appear as an irregular sputtering or crackling of a single pedal note.

This effect may also result from an open circuit in the pedal wiring, the pedal-to-main-generator cable, or the main generator wiring, since the control circuit is completed through the main generator.

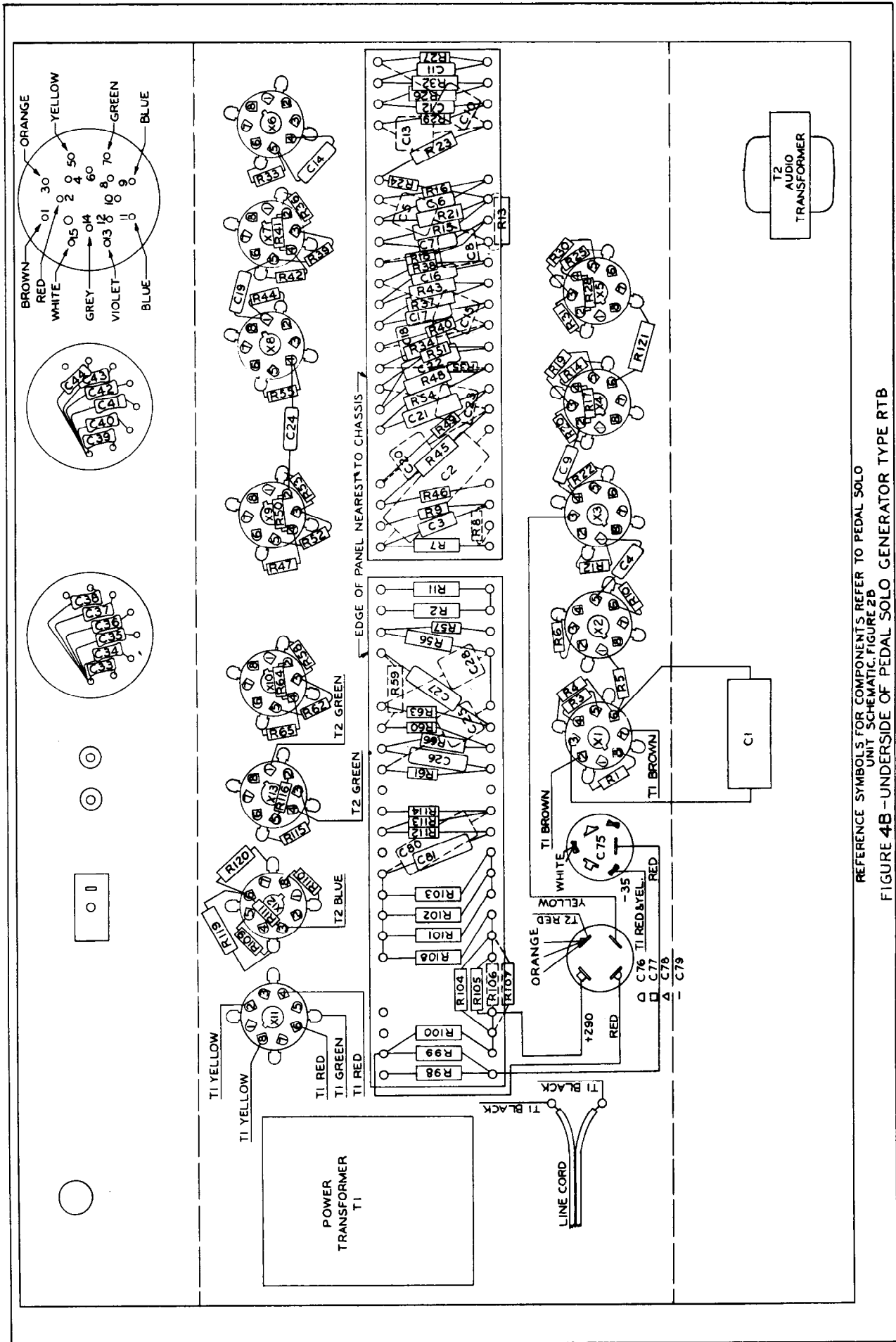
All pedals fail to play on one stop tablet. If all other tablets play correctly, the signal from the oscillator or one frequency divider is not reaching the amplifier. This may be due to a loose cable plug, a broken wire, or a dirty contact on the tablet. In the latter case, refer to the following section, "Procedure for Removing Parts". The schematic diagram, figure 2, indicates which cable wire and frequency divider correspond to each tablet. Figure 5 identifies the tablets and electrical components in the control panel.

All pedals play the wrong pitch (or do not play at all) on one or more low pitched stop tablets. One frequency divider is not operating correctly, in which case all dividers below it will also fail. A cathode-ray oscilloscope connected from ground to the plate of any divider tube should show a rectangular wave, while the plate of any divider driver tube should show a very sharp and narrow negative

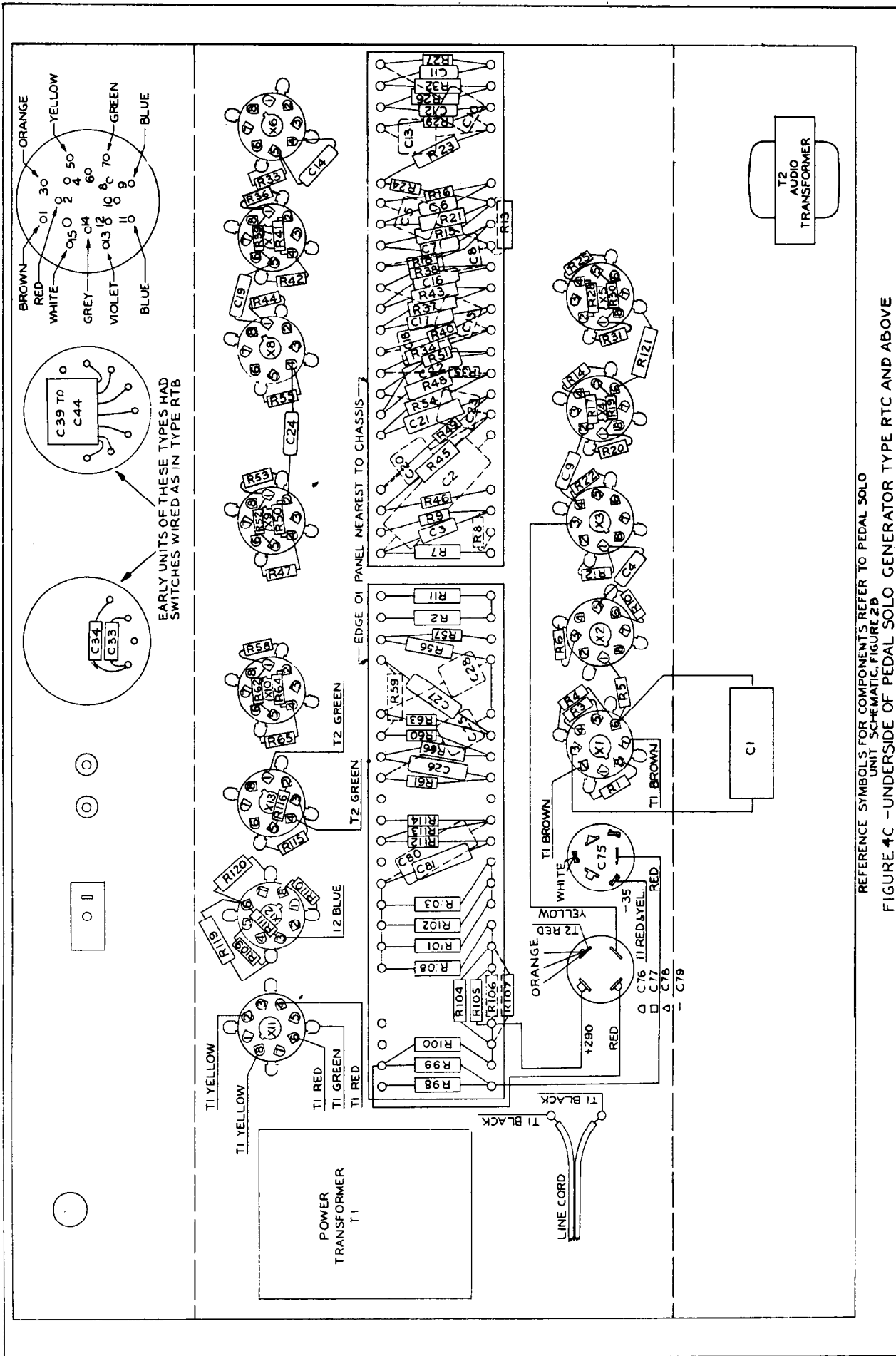


REFERENCE SYMBOLS FOR COMPONENTS REFER TO PEDAL SOLO  
 UNIT SCHEMATIC, FIGURE 2

FIGURE 4-UNDERSIDE OF PEDAL SOLO GENERATOR TYPE RTA



REFERENCE SYMBOLS FOR COMPONENTS REFER TO PEDAL SOLO UNIT SCHEMATIC, FIGURE 2B  
**FIGURE 4B - UNDERSIDE OF PEDAL GENERATOR TYPE RTB**



REFERENCE SYMBOLS FOR COMPONENTS REFER TO PEDAL SOLO UNIT SCHEMATIC, FIGURE 2B  
 FIGURE 4C - UNDERSIDE OF PEDAL SOLO GENERATOR TYPE RTC AND ABOVE

pulse. If electrolytic capacitor C78 is open or very low in capacity, all the dividers may fail to operate.

**Key thumps or clicks.** If capacitor C 81 is open, there will be a loud thump each time a pedal is played.

**Hum.** An excessive 120 cycle hum in the output will result from failure of one of the filter capacitors C75, C76, C77 and C78

**Tuning of individual notes.** The individual note tuning system consists of 32 small inductance coils, each of which is adjustable by moving the coil on its iron core. This tuning system is very stable because it has practically no aging effect and is very insensitive to ordinary humidity and temperature changes. However, after long use under adverse climatic conditions it is possible that some pedal solo notes may not be exactly in tune with each other.

Always tune first with the tuning knobs as indicated above. Keep in mind the fact that it is generally desirable to have the pedal solo unit slightly out-of-tune with the organ. If you are sure some notes actually require tuning, proceed as follows:

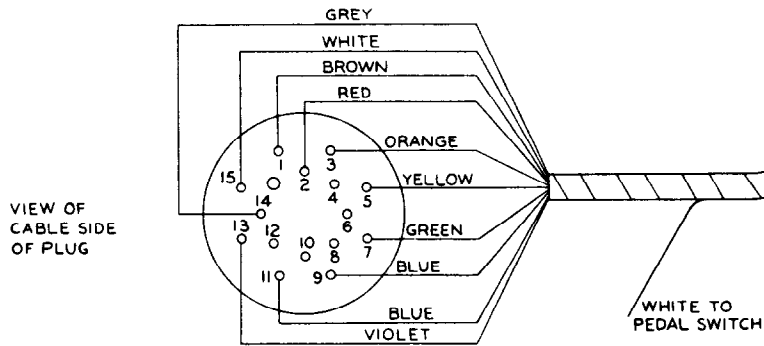
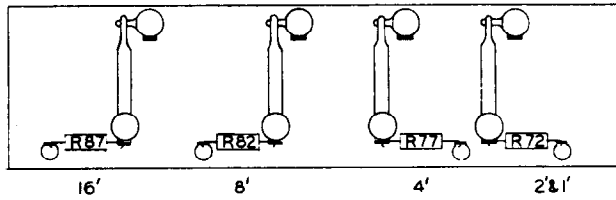
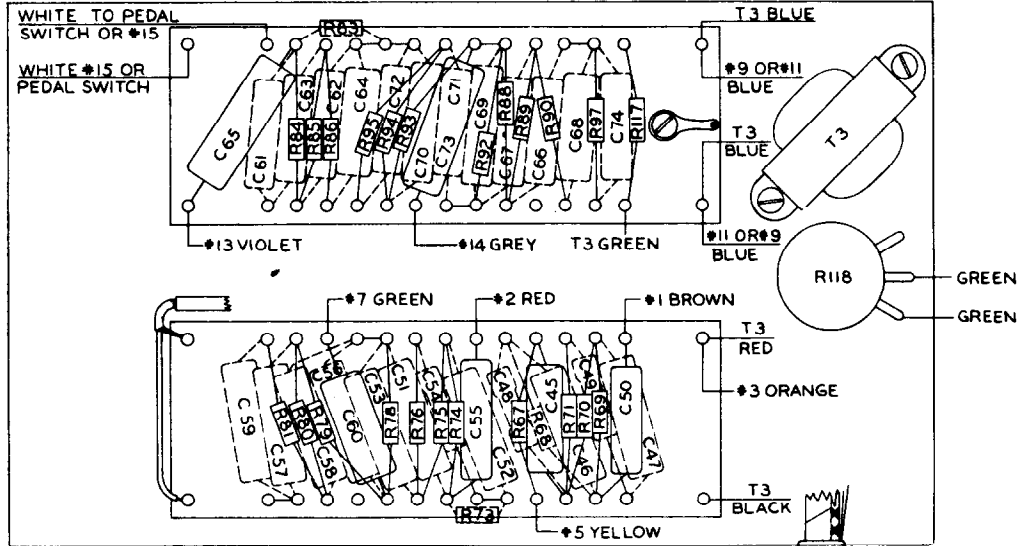
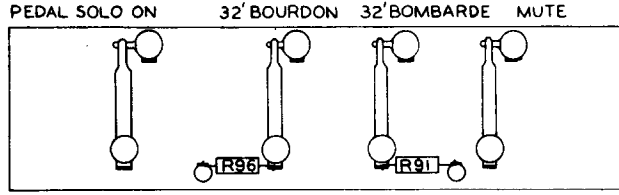
- (a) Disconnect the two cable leads from the G-G terminals on the preamplifier and ground the two wires. Connect one set of oscilloscope plates (either horizontal or vertical) to one G terminal and ground.
- (b) Connect the other set of oscilloscope plates to ground and to pin 3 of V6 through a blocking condenser.
- (c) Remove the cover of the tuning coil box at the rear of the console, exposing the numbered tuning coils. The wiring diagram shows the location of these coils. Set the fine and rough tuning knobs to their center positions.
- (d) Push in the pedal drawbars, turn the vibrato off, and turn all pedal solo tablets off. Using only the first white drawbar on either manual, hold down the second key G key from the top. Hold down the highest pedal.
- (e) Loosen the clamping screw on coil 32 and slide the coil carefully forward or backward until the note is in tune as indicated by the oscilloscope wave pattern standing still or moving no more than one cycle in two seconds. Tighten the clamping screw.
- (f) Release key and pedal and press adjacent F # key and pedal. Adjust coil 31 in same way. Repeat for all other pedals and coils in chromatic order downward. It is important to start with the highest pedal and progress downward one pedal at a time because the tuning of the lower notes is dependent upon all of the higher coils. Each pedal adds an increment of inductance in series with all coils above it, and adjusting any single note will detune all those below it.

**Note:** From the above you can see that tuning the individual notes is a long and tedious process and must be done with extreme care. It should not be undertaken unless you are absolutely certain that the tuning error is great enough to interfere seriously with playing the organ.

## PROCEDURE FOR REMOVING PARTS

### To remove Control Panel and Clean Contacts

1. Remove four screws holding music rack and place it on top of console.
2. Remove two hex head manual bolts exposed when music rack is removed.
3. Remove two large hex head manual bolts located on underside of generator shelf near rear.
4. Remove two screws passing up through right-hand chassis block of lower manual into control panel.



REFERENCE SYMBOLS FOR COMPONENTS REFER TO PEDAL SOLO UNIT SCHEMATIC, FIGURE 2

FIGURE - UNDERSIDE OF PEDAL SOLO CONTROL PANEL



5. Remove one screw holding angle bracket to bottom cover of control panel.
6. Tilt upper manual upward and slide control panel assembly through opening toward back of console.
7. Remove bottom cover of control panel.
8. Remove four wood screws holding wood frame work to chassis of control panel.
9. Remove knob and loosen nut which holds volume control.
10. Tip wood frame up and slide back until rear wooden strip clears tablet identification strip.
11. Slide pivot rod out of tablet assembly and remove tablets.
12. Remove four #3 screws holding tablet assembly to chassis of control panel, and tilt assembly up. Contacts are now visible and can be cleaned by wiping gently with a cloth.

**ELECTRICAL PARTS LIST FOR PEDAL SOLO GENERATOR  
CONDENSERS**

<u>REFERENCE SYMBOL</u>	<u>CAPACITY</u>	<u>VOLTAGE</u>	<u>TYPE</u>	<u>PART NUMBER</u>
C75	20 mfd.	400	Electrolytic	AO-21325-0
C76	20 mfd.	300		
C77	80 mfd.	150	Electrolytic Used in Generator "Type RTA" only	AO-21326-0
C78	30 mfd.	50		
C79	30 mfd.	15		
C76	40 mfd.	400	Electrolytic Not Used in Generator "Type RTA"	AO-19131-1
C77	20 mfd.	350		
C78	20 mfd.	350		
C79	6 mfd.	200		

**WIRE WOUND RESISTORS**

<u>REFERENCE SYMBOL</u>	<u>OHMS</u>	<u>WATTS</u>	<u>PART NUMBER</u>
R 105 } Used in Generator	{ 5000	10	AO-19124-72
R 106 } "Type RTA" only		{ 4500	5

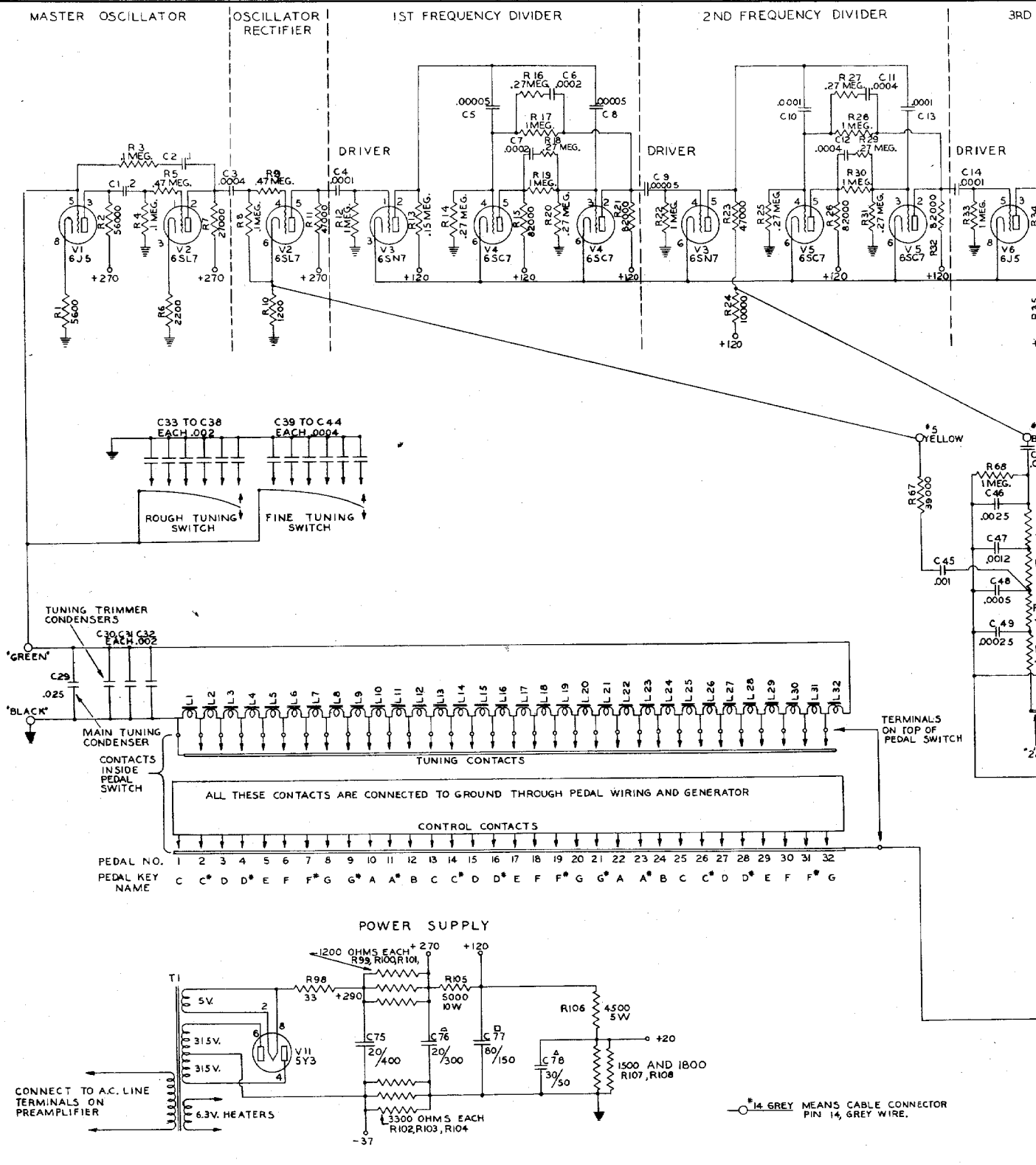
**VARIABLE RESISTOR**

<u>REFERENCE SYMBOL</u>	<u>OHMS</u>	<u>PART NUMBER</u>
R 118	250	AO-20293-20

**TRANSFORMERS**

<u>REFERENCE SYMBOL</u>	<u>FUNCTION</u>	<u>PART NUMBER</u>
T 1	Power 115V. 60 cy.	AO-21320-1
T 1	Power 115V. 50/60 cy.	AO-21320-2
T 1	Power 230V. 50/60 cy.	AO-21320-3
T 2	Audio	AO-21306-0
T 3	Output	AO-21229-0





MODEL RT CONSOLES NO. 1000 TO 1201  
 MODEL RT-2 CONSOLES NO. 1300 AND ABOVE

FIGURE 2  
 SCHEMATIC - PEDAL SOLO UNIT - MODE  
 PEDAL SOLO GENERATOR TYPE

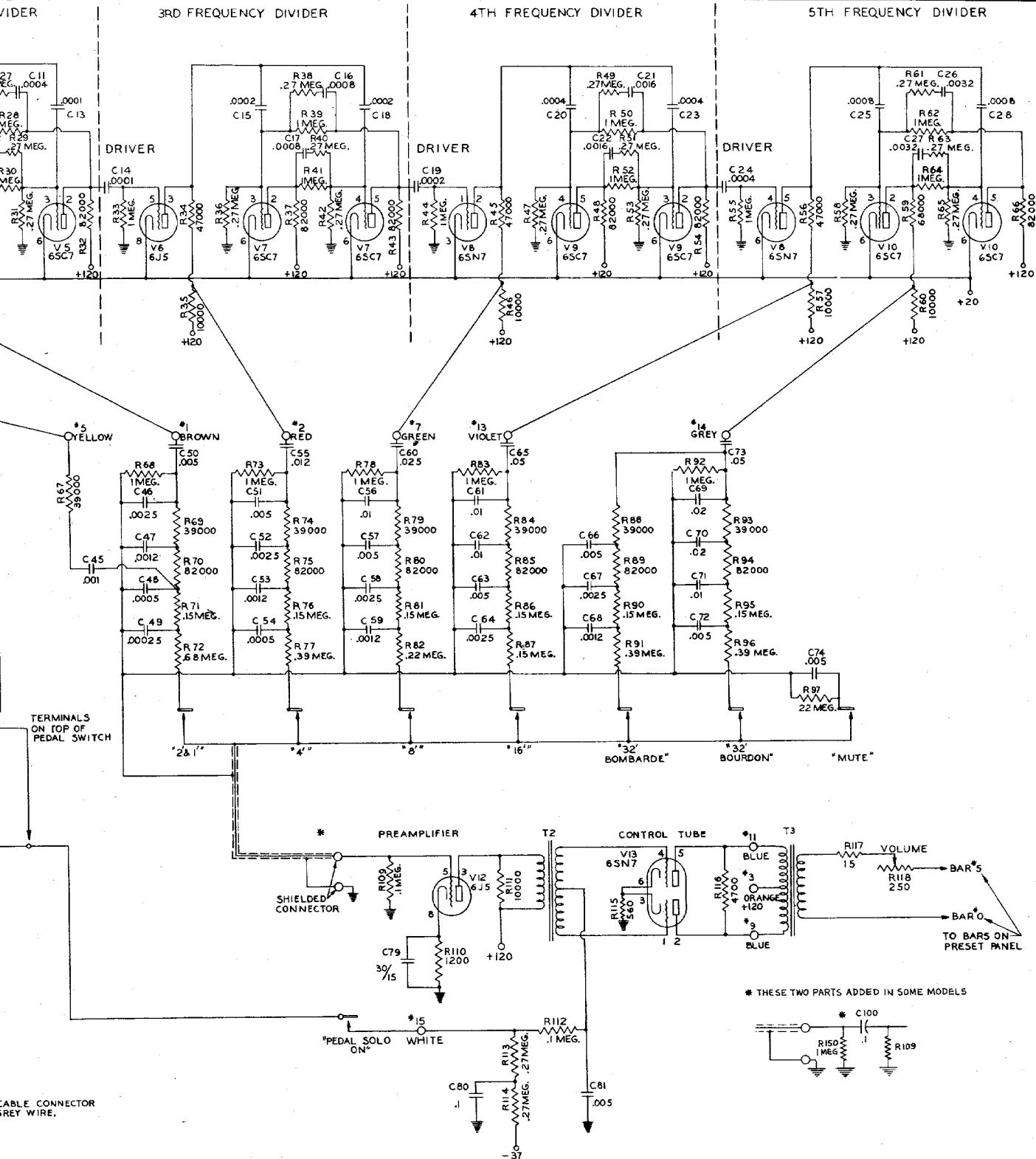
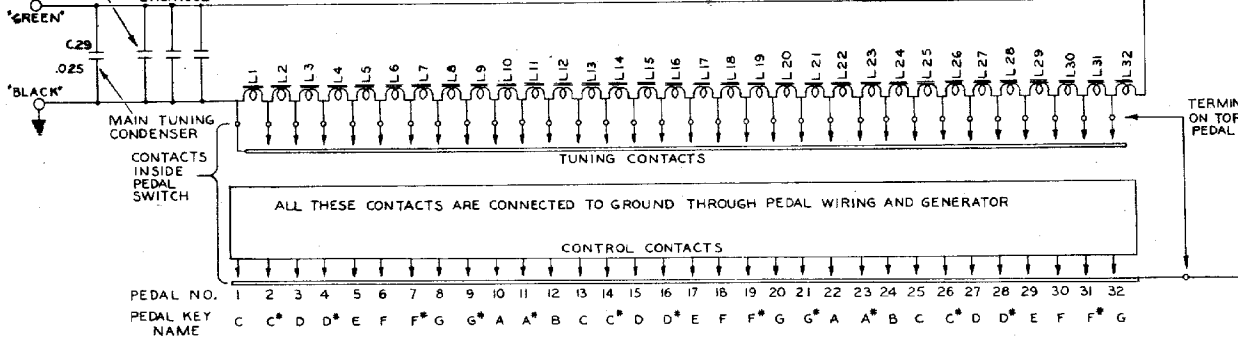
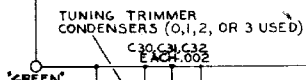
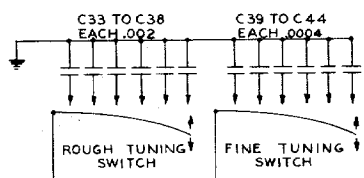
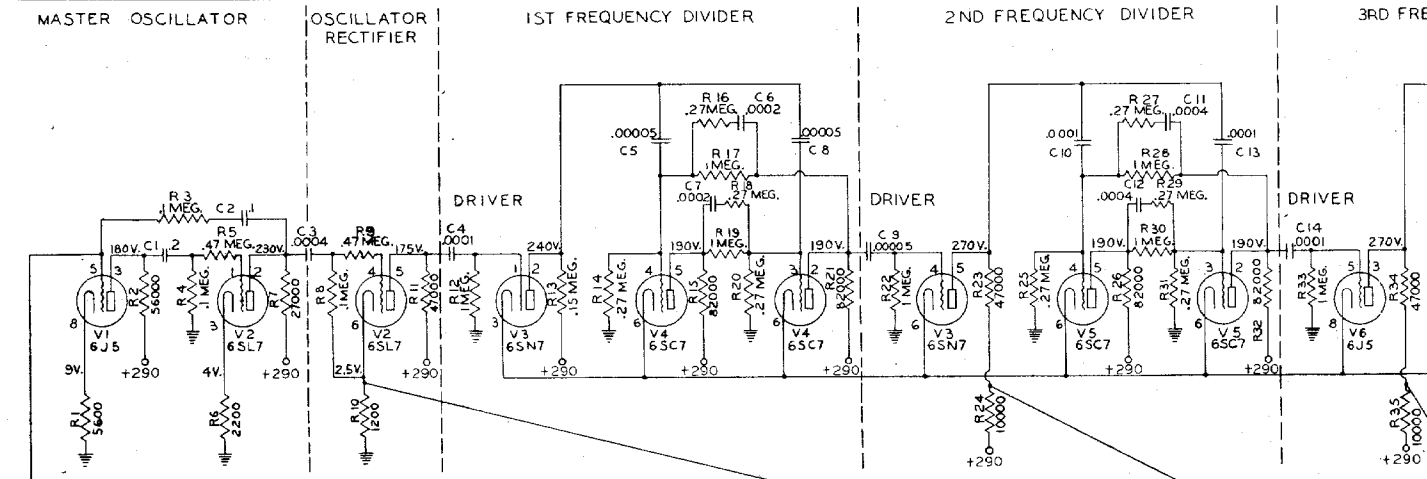
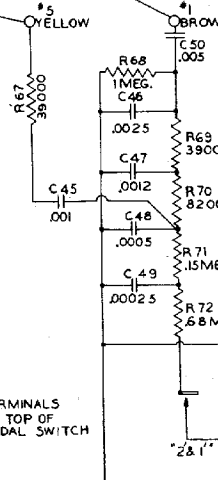


FIGURE 2  
 SOLO UNIT - MODEL RT CONSOLES  
 GENERATOR TYPE RTA



PEDAL NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
PEDAL KEY NAME	C	C*	D	D*	E	F	F*	G	G*	A	A*	B	C	C*	D	D*	E	F	F*	G	G*	A	A*	B	C	C*	D	D*	E	F	F*	G



**POWER SUPPLY**

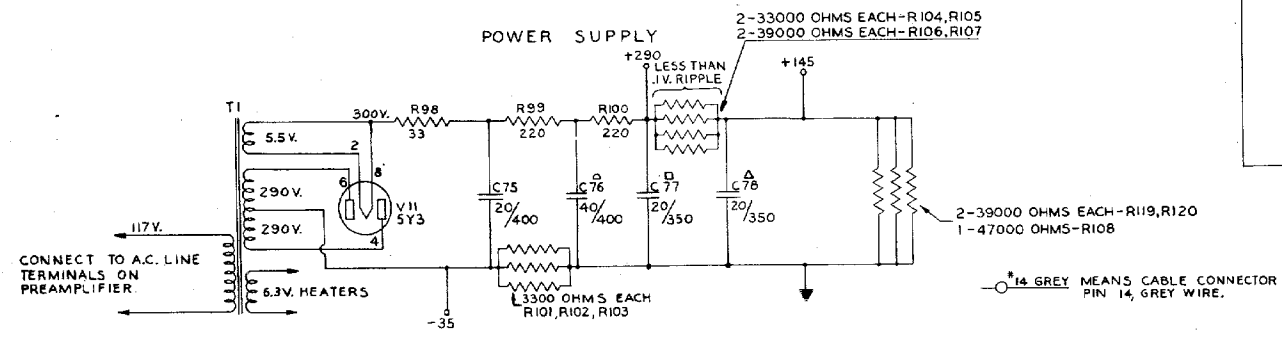


FIGURE 2B  
SCHEMATIC - PEDAL SOLO UNIT - TYPE R  
MODEL RT-2 CONSOLES  
NO. 1362 AND ABOVE

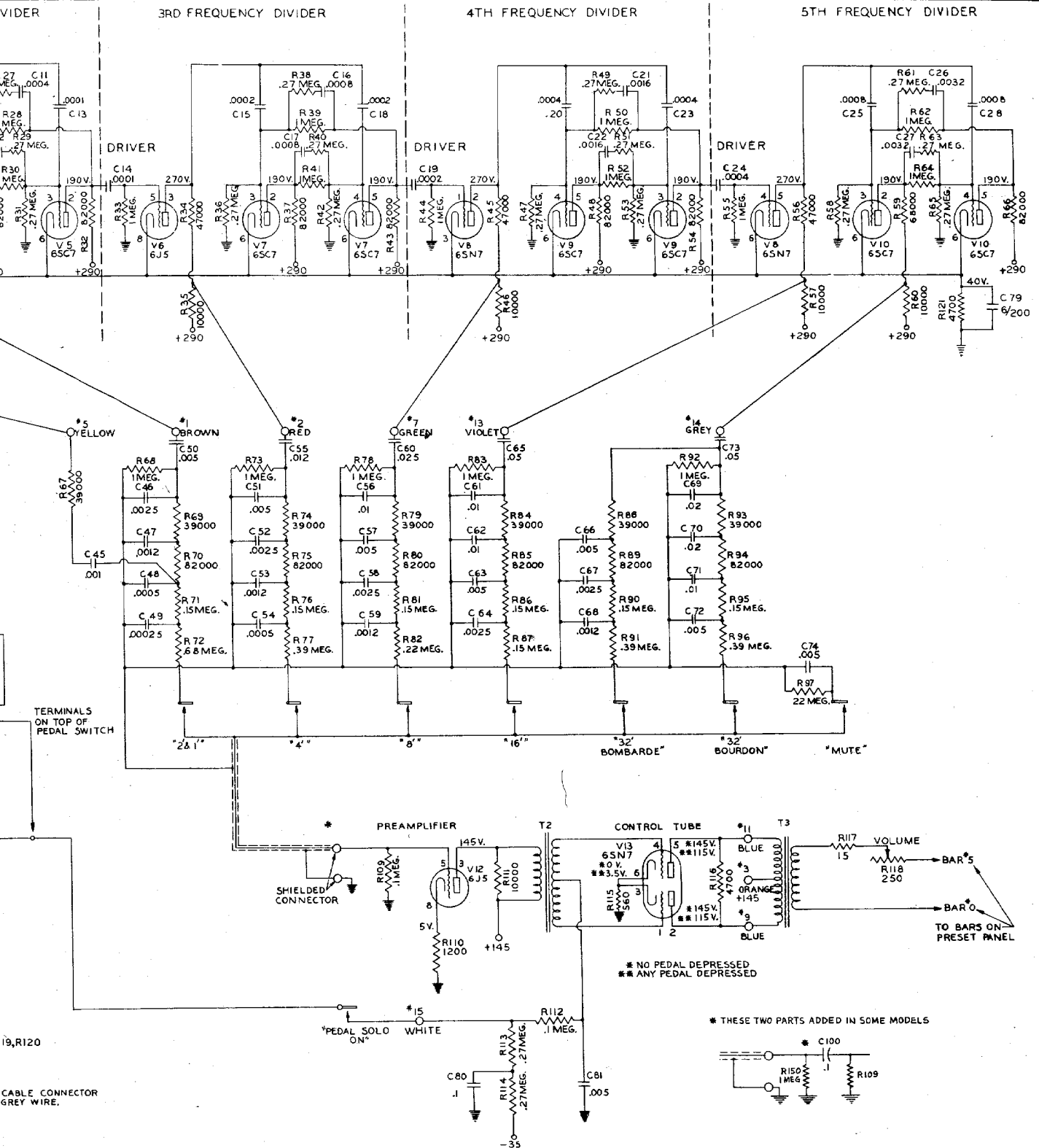


FIGURE 2B  
SOLO UNIT - TYPE RTB  
- RT-2 CONSOLES  
1362 AND ABOVE

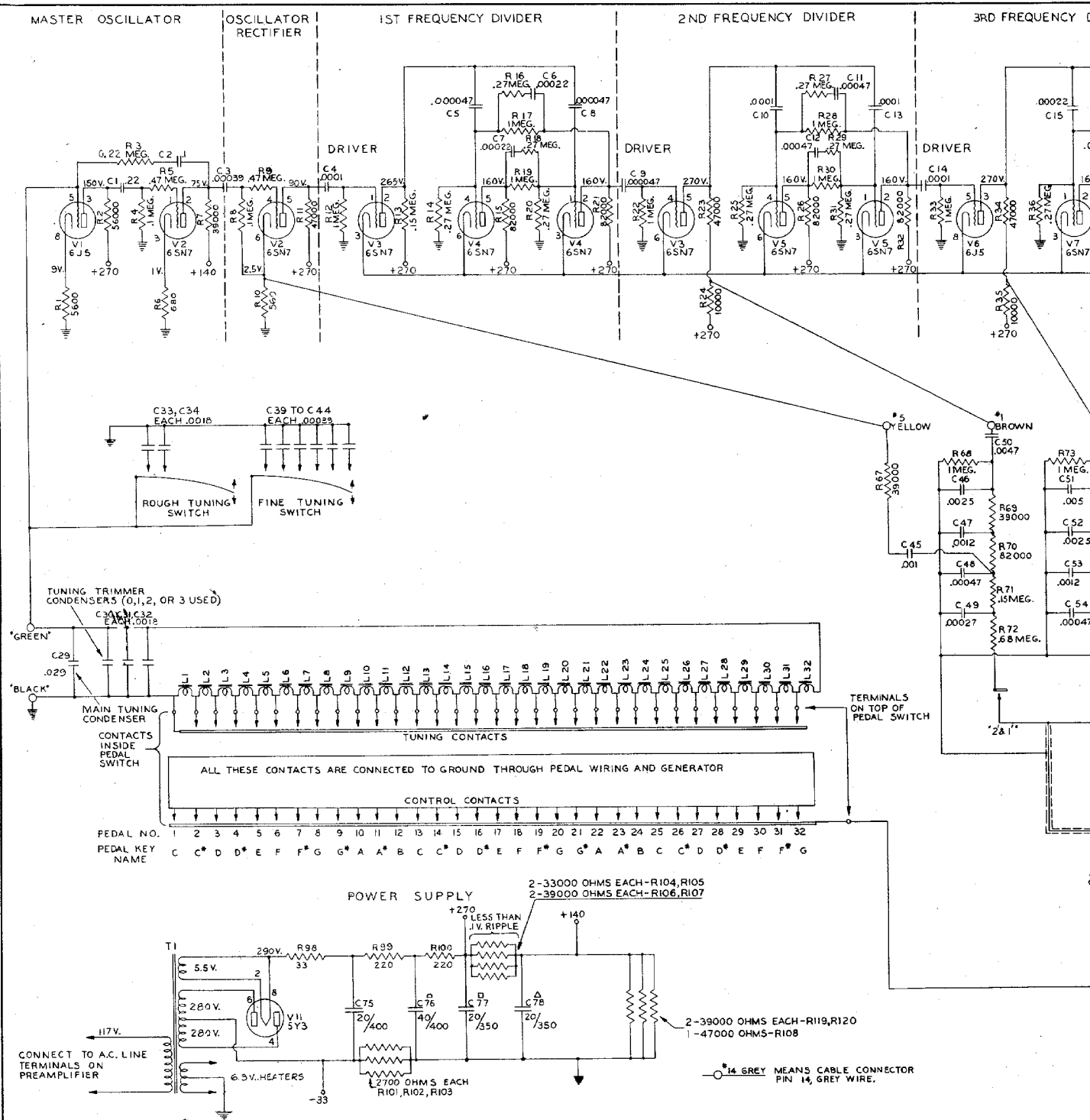


FIGURE 2C  
SCHEMATIC - PEDAL SOLO UNIT - TYPES RTC,R  
MODEL RT-2 AND RT-3 CONSOLE

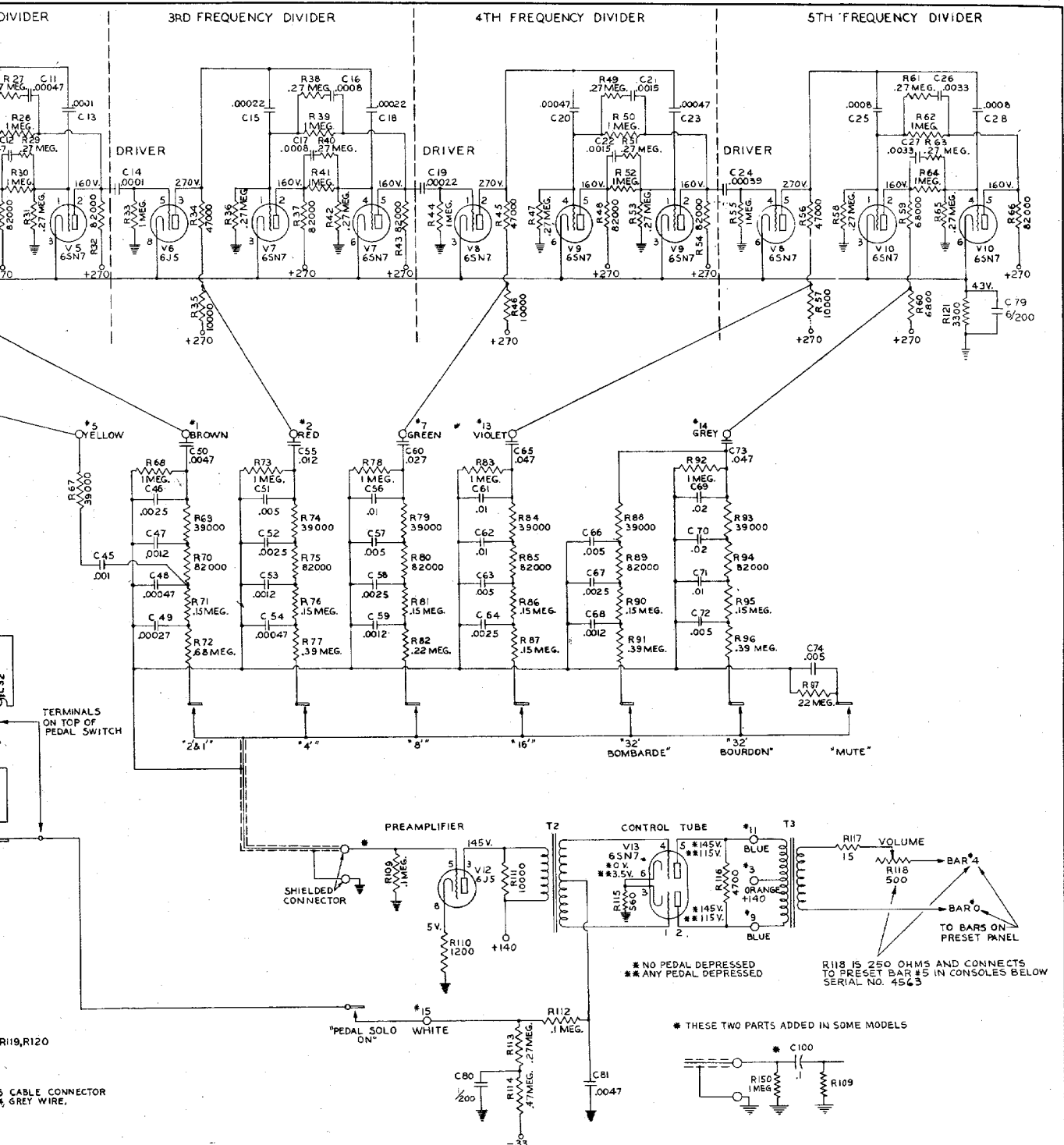


FIGURE 2C  
SOLO UNIT - TYPES RTC, RTD, RTE  
EL RT-2 AND RT-3 CONSOLES