

Rodgers

TECHNICAL MANUAL

SPECIFICATION 330

RODGERS ORGAN COMPANY, HILLSBORO, OREGON

T E C H N I C A L M A N U A L

FOR

SPECIFICATION 330

FOR ORGAN SERIAL NUMBER:

In addition to studying, using and referring to this manual, we suggest that you also attend one of the Service Seminars conducted by factory personnel. At these seminars you will have an opportunity to learn more about this organ and other Rodgers organs, and to exchange ideas with other servicemen.

For more information write to:

SERVICE SEMINARS
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DISASSEMBLY PROCEDURES

I. REMOVING THE BACK:

To remove the back, simply remove the five screws. Three of these are at the top edge of the back, and the other two are halfway up the ends of the back. The back will now tilt back and lift out.

II. OPENING THE RACKS:

First remove the back (I. above). Then the outer rack may be opened after removing the screw in the bottom of the rack just to the left of the center. It will also be necessary to loosen the screws at the top center of the outer and inner racks, and swing the catch plate out of the way.

To open the middle rack, first open the outer rack, and then remove the screw in the bottom center of the inner rack and the screw through the bracket at the top right end (viewed from the back of the console) of the rack.

To open the inner rack, first open the outer and middle racks, and then remove the screw in the bottom right end and the screw through the bracket at the top right end (viewed from the back of the console) of the rack.

III. REMOVING THE LID:

Remove three screws in the back about 1/2 inch below the lid, slide the lid forward about 1/2 inch and lift it off.

IV. REMOVING THE ROLL TOP:

To remove the roll top, first remove the lid, then close the roll top, raise the back edge so it clears the track. Then pull it toward the rear of the console and out.

V. ACCESS TO THE KEY CONTACTS:

To gain access to the key contacts, remove the lid, remove the roll top (as per III above), and then lift the stopboard and the keyboard. The stopboard will support itself, and the keyboard will rest against a stop pin when raised to its limit. The Choir keyboard may also be raised and rested against the Great keyboard, but only after removing a screw in the bottom of each key cheek. The Pedal key contacts are magnetic reed switches, and can be reached without opening the organ. To do this remove

the Pedal keyboard by slightly raising the console end of the Pedalboard and pulling it straight out. Next, remove the three screws along the bottom edge of the now exposed contact board, and lay it flat on the floor.

VI. ACCESS TO THE EXPRESSION AND CRESCENDO PEDALS:

First open the racks as described in II above, and then remove the four screws that secure the pedal guard. There are two screws on each side.

INSTALLATION NOTES

ELECTRICAL REQUIREMENTS:

Voltage 117 Vac

Frequency 60 Hertz

Power Consumption (Console only) 100 Watts
(600 Watts with Piston depressed, except on Preset models)

Power Output (for each External Tone Cabinet with
S-100 power amplifier). 100 Watt rms

ELECTRICAL CIRCUITS REQUIRED:

A separate circuit (15-amp, 117 vac) is desirable to avoid possible interference from nearby electrical equipment.

When possible, a second circuit should be provided for the External Tone Cabinets.

Conduit, where Codes require it, should be provided for the External Tone Cabinet cables which carry 15 volts DC. DO NOT PULL AC POWER CABLES THROUGH THE SAME CONDUIT THAT CARRIES THE TONE CABINET CABLES.

The conduit size will be determined by the total amount of cabling that must pass through it, and/or by local building codes. DO NOT use conduit smaller than 3/4", thin wall.

CONNECTING SPEAKERS:

To connect speakers to the 330 organ it is necessary to first remove the back panel. Remove three screws across the top of the back and one screw halfway down on each side. Tilt the back out and lift up and away from the console.

The minimum number of speakers that may be connected to a 330 is two. A W-6-100 is plugged into the socket marked GT-CH FLUTE, and an M-13-100 is plugged into the socket marked SWELL FLUTE. All of the four mixing switches are set in the mixed position.

When Three Speakers are used:

W-6-100 is plugged into the socket marked GT-CH FLUTE
W-6-100 is plugged into the socket marked GT-CH DIAPASON
or
M-13-100

M-13-100 is plugged into the socket marked SWELL FLUTE
The Great Diapason mixing switch is set in the separate position, and the other three are set in the mixed position.

When Four Speakers are used:

P-2-100 is plugged into the socket marked PEDAL
W-6-100 is plugged into the socket marked GT-CH FLUTE
or
M-13-100

W-6-100 is plugged into the socket marked GT-CH DIAPASON
or
M-13-100

M-13-100 is plugged into the socket marked SWELL FLUTE
The Pedal and the Great Diapason mixing switches are set in the separate position, and the other two are set in the mixed position.

When Five Speakers are used:

P-2-100 is plugged into the socket marked PEDAL
W-6-100 is plugged into the socket marked GT-CH FLUTE
W-6-100 is plugged into the socket marked GT-CH DIAPASON
M-13-100 is plugged into the socket marked SWELL FLUTE

M-13-100 is plugged into the socket marked SWELL REEDS AND CELESTE
All mixing switches except the Swell Diapason are set in the separate position.

CHECK-OUT PROCEDURE

SPECIFICATION 330

As soon as possible, the new instrument should be given a complete operational check. The pink card, which is included in the package of materials, is used to check off each phase of the investigation. When completed, please return the card to the factory for evaluation.

This check-out procedure is made part of the manual in order to verify proper operation of the instrument after a move to a new location, or after an extended period of disuse.

I. BEFORE PLUGGING THE ORGAN INTO THE 117-VOLT AC OUTLET.

- A. Be sure all stop tabs are in the off position.
- B. Turn the organ key switch to the off position.
- C. Check to see that the pedalboard is at right angles and seated properly to the organ console. The screw-type levelers on the console can be adjusted to compensate for any unevenness in the floor.
- D. Connect the organ to its speakers. See page

DO NOT ADJUST ANY POTS AT THIS TIME! The organ can be voiced, if required, after the check-out procedure is finished.

II. PLUG THE ORGAN AND SPEAKERS INTO THE 117-VOLT AC OUTLET.

- A. Turn the organ key switch to the on position.
- B. Hold down one key on the Swell Manual and check each stop, one at a time. (Couplers are checked later). Repeat for the Great Manual, Choir Manual, and the Pedal.
- C. The following procedure will check all Diode Gates in the organ. Turn on Main Tremulant to check it also.

1. SWELL MANUAL DIODE GATES

- a. Turn on one of the Swell Manual voices and play each of the 61 Swell keys. Repeat for each stop.

NOTE: Top octave of the 4' Clairon does not sound.

- b. To check the Voix Celeste II, turn the Tremulants off. This voice is derived from the Celeste oscillators which are slightly out of tune with the Main oscillators. The Voix Celeste voice tab pulls in a soft 8' Diapason -- a Main generator voice -- and when heard against the Celeste oscillator, produces a slow, undulating beat.

NOTE: The Celeste rank starts at Note 13 and ends with Note 61.

- c. Check the Plein Jeu III. This stop operates 3 diode gates, generating a tone with three component parts. Play all 61 notes and listen carefully for all three components on each note.
- d. Turn on the 8' Trompette. Turn on the 4' SWELL TO SWELL coupler and play keys 1 through 49. Listen for the Trompette on both 8' and 4' pitches.

2. GREAT MANUAL DIODE GATES

- a. Turn on a Great Manual voice and play each of the 61 Great keys. Repeat for all Great voices.
- b. Turn on the 8' Trompette of the Swell Manual (all other stops off). Turn on the SWELL TO GREAT coupler, and play all 61 keys of the Great Manual.
- c. Turn on the Choir 8' Krummhorn. Turn on the CHOIR TO GREAT coupler and play all 61 Great keys.
- d. Check the Fourniture III. This stop operates three diode gates, generating a tone with three component parts. Play all 61 notes with the Fourniture III stop tab on, and listen carefully for all three components on each note.

3. CHOIR MANUAL DIODE GATES

- a. Turn on a Choir Manual voice and play each of the 61 Choir Keys.

Repeat for all Choir Voices.

NOTE: Top octave of the 1' Fife does not sound.
Top 4 notes of the 1-3/5' Tierce does not sound.

- b. To check the Gemshorn Celeste II, turn the tremulants off. This voice is derived from the celeste oscillators which are slightly out of tune with the main oscillators. The Gemshorn Celeste tab also turns on a soft 8' Diapason -- A Main generator voice -- and produces a slow, undulating beat.

NOTE: The Celeste starts at Note 13 and ends at Note 61.

- c. Turn on the Swell 8' Trompette. Turn on the SWELL TO CHOIR coupler, and play all 61 Choir keys.

4. PEDAL DIODE GATES

- a. Turn on one of the Pedal voices and play each of the 32 Pedal keys. Repeat for all the Pedal voices.
- b. Turn on the Swell 8' Trompette Turn on the SWELL TO PEDAL coupler, and play all 32 Pedal keys.
- c. Turn off the above stops and turn on the Great 8' Principal and the GREAT TO PEDAL coupler. Play all 32 Pedal keys.
- d. Turn off the above stops. Turn on the Choir 8' Krummhorn and the CHOIR TO PEDAL coupler. Play all 32 keys.

D. EXPRESSION PEDALS

To check each of the six separate channels for proper expression, turn on indicated stop, and turn off all other stops. Then operate the indicated expression pedal and listen for a variation in loudness.

1. Great Flute Channel: Turn on the Great 8' Bourdon and operate the Great Expression Pedal.

2. Great Diapason Channel: Turn on the Great 8' Principal and operate the Great Expression Pedal.
3. Pedal Channel: Turn on the Pedal 16' Bombarde and operate the Great Expression Pedal. (The loudness variation for the Pedal is slightly less than that for the Manuals).
4. Swell Flute Channel: Turn on the Swell 8' Hohlflote and operate the Swell Expression Pedal.
5. Swell Diapason Channel: Turn on the Swell 8' Geigen Diapason and operate the Swell Expression Pedal.
6. Swell Reeds Channel: Turn on the Swell 8' Trompette and operate the Swell Expression Pedal.

E. CRESCENDO PEDAL

The pedal to the right is the Crescendo Pedal. It adds stops in a pre-determined order, building a Crescendo sound as it is depressed. Three indicator lights on the stopboard indicate the degree of Crescendo as the Pedal is depressed:

- MP (soft). Lights immediately when Pedal is first depressed.
- MF (medium loud) . . Lights at about the halfway point.
- F (loud). Lights at full Crescendo. (The FF light is the Sforzando (full organ).

1. TO CHECK CRESCENDO

- a. Hold a chord on the Swell Manual. Depress the Crescendo Pedal slowly and listen for the addition of voices, one at a time.
- b. Hold a chord on the Great and repeat a, above.
- c. Hold a chord on the Choir and repeat a, above.
- d. Hold a note on the Pedal and repeat a, above.
- e. If it is suspected that the increase in organ stops is "weak", (suggesting the possibility that a voice, or voices, is not being added), consult the chart shown on page to see which voices are added, and manually add those that are called for before the pedal is depressed to that position. Then remove those voices manually and depress the pedal, listening for the same addition of voices.

F. THE COMBINATION ACTION (Setterboard Type)

The Combination Action Setterboard is located on a drawer under the Choir Manual (bottom manual).

The stops and controls of the organ may be "preset" on the Setterboard by moving the individual switches to the right ("On"). Each manual has four combination settings controlled by pistons under the manuals, as follows.

SWELL MANUAL

1 2 3 4

These pistons control settings on the Swell Manual only.

GREAT AND PEDAL MANUALS

1 2 3 4

These pistons control settings on both the Great and Pedal Manuals.

CHOIR MANUAL

1 2 3 4

These pistons control settings on the Choir Manual only.

MASTERS

1 2 3 4

The four Master Pistons operate all divisional pistons of the same number. Each Master Piston is duplicated by a Toe Stud mounted on the knee panel to the left of the Expression Pedals. (NOTE:) The Piston marked "O" is a cancel piston and cancels all called-up combinations (not the setterboard switches, as these must always be manually changed).

G. COMBINATION ACTION (Capture Type)

The stops and controls of the organ may be "preset" in the capture system by setting the individual stop tabs to the desired position, holding in the "set" piston and depressing the desired piston. The next time the piston is operated the stops will move to the positions previously set. Each manual has its own pistons and there are also independent general pistons. Check to see that all of the pistons "cycle" when held depressed and that they retain their combinations. The cancel piston does not cycle.

H. TREMULANTS

The Main Tremulant has already been checked out. No further check is necessary.

Turn on the Swell Tremulant and perform the following checks:

1. Turn on the Swell 8' Hohlflote and check one note for tremulant.
2. Turn on the Swell 8' Geigen Diapason and check one note for tremulant.
3. Turn on the Swell 8' Trompette and check one note for tremulant.

I. CHIFF

1. Turn on the 8' Gedeckt on the Choir Manual. Play a note in the second octave and notice the absence of Chiff. Turn on the CHIFF tab, and strike the note several times. Each time, the note should begin with the characteristic pipe organ chiffing sound. Next, check all notes.
2. Turn on the 4' Nachthorn (all other stops Off). Check all notes.

NOTE: No Chiff past key 54 (F).

J. SFORZANDO

To turn on the Sforzando, depress either the thumb piston under the Great Manual (marked "SFORZ"), or the Sforzando toe stud on the knee panel to the right of the Expression and Crescendo pedals.

When the Sforzando is ON, a white indicator light (FF) to the right of the Crescendo lights will also come on. To turn the Sforzando OFF, depress either the thumb piston or the toe stud. Check the thumb piston, the toe stud, and the indicator light.

The Sforzando turns on most of the stops and couplers. See page 53 for a list.

K. GREAT TO PEDAL REVERSIBLE

To operate the Great to Pedal Reversible, depress either the thumb piston under the Great Manual (marked "Great-Pedal"), or the Great to Pedal toe stud on the knee panel to the right of the Expression and Crescendo pedals. The tab should move to the other position.

L. ACTIVITY

Requires no check.

M. AIR SOUND

Turn on the Air Sound switch (located either under the Choir keyboard or on the setterboard) by turning on an appropriate stop and check the Air Sound, depressing one key. Listen for Air Sound. Depress additional keys, adding them one at a time. The Air Sound will continue to build up until approximately five keys are depressed. Also check to see that the Air Sound switch will turn off the air.

Check these stops one at a time as described above:

Swell	8'	Hohlflöte	Choir	8'	Gedeckt
Swell	8'	Geigen Diapason	Choir	8'	Gemshorn
Great	8'	Bourdon	Pedal	8'	Flute
Great	8'	Principal	Pedal	8'	Octave

Check all other stops by simply holding one key and turning them on one at a time.

IF THIS CHECK-OUT PROCEDURE IS BEING USED TO INVESTIGATE A NEW ORGAN, BE SURE TO USE THE PINK CARD TO INDICATE COMPLETION OF EACH PHASE OF THE CHECK. WHEN FINISHED, PLEASE RETURN THE PINK CARD IMMEDIATELY TO

RODGERS ORGAN COMPANY.

IF ANY TROUBLES ARE FOUND, PLEASE LIST FULLY AND DESCRIBE WHAT CORRECTIVE ACTION WAS TAKEN, IF ANY.

VOICING THE SPECIFICATION 330

A Note of Caution!

Each new Rodgers organ is voiced first at the factory, again at the Dealer's Showroom, and finally at the point of installation. The voicing of any organ requires a great deal of musical and practical experience; and, whereas many aspects of voicing might well fall into the category of personal taste, there are certain conventions and limits to be observed.

The technician, especially, is cautioned to NOT disturb any of the voicing controls unless specifically requested to do so by the owner of the instrument, or unless necessary for a trouble-shooting procedure.

The following Voicing information combines Convention and Philosophy, and is primarily directed to the organist who feels a voicing alteration is necessary to satisfy his personal likes.

All leveling controls (potentiometers, in most cases) are designated in parentheses.

ADJUSTMENTS ENTIRE VOICE

All of these adjustments are located on the preamps and voicing circuit board.
Location 1-I

VOICE	TEXT	REF. NO.	COMMENTS
Swell Unit Diapason	19	R 360	
Swell Unit Flute	19	R 966	
Swell Unit Trompette	19	R 548	
Swell Voix Celeste	20	R 510	Affects only the "out of tune" portion
Swell Flute Celeste	20	R 490	Affects only the "out of tune" portion
Great Unit Diapason	17	R 666	
Great Unit Flute	18	R 225	
Choir Krummhorn	21	R 312	
Choir Gemshorn Celeste	20	R 530	Affects only the "out of tune" portion
Carillon	None	R 259	Affects only the "outdoor" Carillon
32' Contra Violone	22	R 798	
16' Principal	22	R 728	
16' Subbass	22	R 768	
16' Lieblich Gedeckt	22	R 788	
16' Violone	22	R 708	
16' Bombarde	22	R 748	
All Pedal Voices as a group	21	R 794	

VOICING ADJUSTMENTS

ADJUSTMENT		LOCATION	REF. NO.	SCHEMATIC PAGE	
Swell Unit Trompette		2I	L58	12	There are several of these formants.. each affects a group of notes at least three and up to twelve
Krummhorn		1I	L306 L307	13	These two formants affect 61 notes as a group
Pedal Bombarde		1I	L751 L752 L753	16	These three formants affect all 32 notes as a group

Voice Level Adjustments Can Be Made in Two Stages:

1. By Voice (adjusting each separate voice on the output circuit)
2. By Individual Stop (applies to variable transistor switches on the Unit Diapasons and Unit Flutes diode keyers).

I. VOICE LEVELING CONTROLS

These controls are all located on the output circuit board, and may be classified in two categories, vis. :

Unit Voice Leveling (affects more than one stop):

GREAT UNIT DIAPASON	R666	SWELL UNIT FLUTE	R966
GREAT UNIT FLUTE	R225	SWELL UNIT REED	R548
SWELL UNIT DIAPASON	R360	CARILLON (Outdoor)	R259

Straight Individual Leveling (affects only one stop):

SWELL VOIX CELESTE	R510	16' PRINCIPAL	R728
(Celeste Part)		16' SUBBASS BOURDON	R768
SWELL FLUTE CELESTE	R490	16' LIEBLICH GEDECKT	R788
(Celeste Part)		16' VIOLONE	R708
CHOIR GEMSHORN CEL.	R530	16' BOMBARDE	R748
(Celeste Part)			
CHOIR KRUMMHORN	R312		
32' CONTRA VIOLONE	R798		

Some Tips on Setting Voice Levels on the 330:

These apply to all voicing and balancing procedures.

- A. When making adjustments, make sure that the Crescendo pedal is fully closed (indicator lights OFF), the Sforzando OFF, both expression pedals fully open (fully depressed), and the Air Sound switch OFF (to the left).
- B. Always use at least two people; One to play the organ, and the other to adjust the level controls. If a third person is available to sit out in the center of the room to double-check settings by listening, so much the better.
- C. Change settings only while playing a continuous note or chord; never change settings with the instrument silent.

D. A good chord to use in making comparisons: The Middle C Major Triad of C-E-G (Keys 25, 29, 32).

E. The speaker cabinets should all be placed in approximately the location that they will permanently occupy. The M13-100 units should have the tweeter adjustment pot set at from 1/2 to 2/3 of its full setting. The W6-100 units should have the tweeter set like the M13-100 units. The mid-range pot for the W6-100 should be at about its mid-point. The Bass Switch should be in the high position. The tweeter/mid-range phasing switch should be set to taste, as there is no rule of thumb. All amplifier Bass Boost switches should initially be in the OFF (down) position.

II. INDIVIDUAL UNIT STOP LEVELING CONTROLS

These controls are all located on the diode keying rack, and are placed at the end of the diode slide for the stop that they affect. The following is a list of the unit stops that are so equipped:

<u>PEDAL</u>	<u>GREAT</u>	<u>SWELL</u>	<u>CHOIR</u>
8' Octave	16' Gemshorn	8' Voix Celeste	8' Gemshorn
8' Flute	8' Principal	(Unison)	8' Gedeckt
8' Violone (SW)	8' Bourdon	8' Flute Celeste	4' Principal
4' Choralbass	2-2/3' Twelfth	(Unison)	4' Nachthorn
Mixture II	2' Fifteenth	2' Flautino	2-2/3' Nazard
(2 adjustments)	2' Piccolo	Plein Jeu III	2' Blockflöte
	Furniture III	(3 adjustments)	1' Sifflöte
	(3 Adjustments)		1-3/5' Tierce

III. GENERAL VOICE LEVELING

A. Setting the Unit Diapason Level for Great ~~and~~ Choir:

1. Go through the steps in the section entitled, "Some Tips on Setting Voice Levels on the 330".
2. Turn on the 8' Principal, 4' Octave 2' Fifteenth (GREAT).
3. Play a chord on the Great Manual
4. Set the Great Unit Diapason level (R666) at a comfortably full volume (F).

5. This step (the most important step in the voicing process) will set the level of the Great/Choir Diapasons for making subsequent comparisons. You may find that your first impulse is to set the Unit Diapason loud. Adopt a conservative attitude initially. Then, if the organ seems too soft during the Sunday worship service, the leveling can always be reviewed. An organ can sound full and exciting without being overpoweringly loud. Besides, the first impression that the congregation gets of the organ is likely to stick in their minds, and it is better to start too soft than too loud.

B. Setting the Unit Flute Level for Great and Choir:

1. Turn on the 8' Gedeckt, 4' Nachthorn, 2' Blockflöte, 1' Sifflöte (CHOIR).
2. Play a chord on the Choir.
3. While alternating between the Choir Manual and the Great Manual (with the registration set-up in Step A), adjust the Flute leveling control (R225) so that the apparent loudness of the Choir is slightly less than that of the Great.
4. This will bring the Great and Choir (and some of the Pedal) Flutes into balance with the Diapasons.

C. A Further Check:

(The two above steps are the two most important in determining the basic overall ensemble sound of the Great and Choir divisions).

1. Press the General Cancel Piston (turn OFF all stops).
2. Hold a chord on the Great and add in succession the following stops on the Great:

8' Bourdon	2' Piccolo
8' Principal	2' Fifteenth
4' Spillflöte	2-2/3' Twelfth
4' Octave	Furniture III

The sound should build up smoothly, with no large or sudden bursts of loudness as each stop is added.

3. Remove the Furniture III from the above combination. The sound should be full, but still brilliant, with the Diapason tone predominating. The balance of the Diapasons and Flutes may vary somewhat, depending on the

tastes of a given denomination. The more Liturgical churches tend toward bolder Diapason tone in general, and fairly modest Flutes. With the more Evangelical churches, the opposite is often true.

D. Setting the Swell Unit Diapason Level:

1. Cancel all stops.
2. Turn on the 4' Octave (GREAT) and 4' Prestant (SWELL).
3. Play a chord on the Great and Swell, alternately.
4. Adjust the Swell Unit Diapason level (R360) so that the apparent loudness of the Swell is just slightly softer than that of the Great.

E. Setting the Swell Unit Flute Level:

1. Cancel all stops.
2. Turn on the 4' Spillflöte (GREAT) and 4' Flute Harmonique (SWELL).
3. Play a chord on the Great and Swell, alternately.
4. Adjust the Swell Unit Flute level (R966) so that the apparent loudness of the Swell is the same or just perceptibly louder than the Great.

F. Setting the Swell Unit Reed Level:

1. Cancel all stops.
2. Turn on the 8' Principal and 4' Octave (GREAT), and the 8' Trompette (SWELL).
3. Play a chord on the Great and Swell, alternately.
4. Adjust the Swell Unit Reed level (R548) so that the apparent loudness of the Swell is the same or slightly louder than the Great.
5. Further check this by adding the 2' Fifteenth, 8' Bourdon, 4' Spillflöte, and 2' Piccolo to the Great. Now, while holding a chord on the Great, turn the Swell Unit Reed level knob at Coupler. The 8' Trompette should add "fire" to the Great sound, but should never completely dominate it.

G. Setting the Swell Voix Celeste Level:

1. Cancel all stops.
2. Turn on the 8' Voix Celeste II (SWELL)
3. While holding a chord on the Swell, turn the Voix Celeste level (R510) all the way down.
4. While continuing to hold the chord, add the 8' Geigen Diapason momentarily, then turn it off. The Geigen Diapason should be considerably louder than the Voix Celeste unison. If it is not, adjust the pot on the 8' Geigen Diapason diode slide to soften the Celeste unison voice.
5. While continuing to hold the chord, slowly turn up the Voix Celeste level (Celeste part) until a pleasant undulation in the sound is achieved.
6. This sets the proper relationship of the Voix Celeste to its unison partial.

H. Setting the Swell Flute Celeste Level:

1. Cancel all stops.
2. Turn on the 8' Flute Celeste II (SWELL).
3. While holding a chord on the Swell, turn the Flute Celeste level (R490) all the way down.
4. While continuing to hold the chord, add the 8' Hohlflöte momentarily, then turn it off. The Hohlflöte should be considerably louder than the Flute Celeste unison. If it is not, adjust the pot on the 8' Hohlflöte diode slide to soften the Celeste unison voice.
5. While continuing to hold the chord, slowly turn up the Flute Celeste level (R490) until a pleasant undulation in the sound is achieved.
6. This sets the proper relationship of the Flute Celeste to its unison partial.

I. Setting the Choir Gemshorn Celeste Level:

1. Turn on both the 8' Gemshorn and the 8' Gemshorn Celeste on the Choir.
2. While holding a chord on the Choir, turn the Gemshorn Celeste level (R530) all the way down.

3. Compare the relative levels of the Choir 8' Gemshorn with the Great 8' Principal. The Gemshorn should be considerably softer than the 8' Principal. If it is not, adjust the pot on the Choir 8' Gemshorn diode slide to soften the Gemshorn.
4. Now, while holding a chord on the Choir, slowly bring up the Gemshorn Celeste level (R530) until a pleasant undulation in the tone is achieved.
5. This sets the proper relationship of the Gemshorn Celeste to its unison partial.

NOTE: If subsequent leveling changes are made in the Swell Unit Diapason, Swell Unit Flute, or Great/Choir Unit Diapason, the Celestes that use these unit voices as their unison partials must be re-balanced by the above procedures.

J. Setting the Choir Krummhorn Level:

1. Cancel all stops.
2. Turn on the 8' Swell Trompette and the 8' Choir Krummhorn.
3. While alternating chords between the Swell and Choir, adjust the Krummhorn level (R312) so that the apparent loudness of the Choir is somewhat less than the Swell.
4. This sets the level of the Choir 8' Krummhorn.

K. Setting Pedal 16' and 32' Levels:

1. Cancel all stops.
2. Turn on the Sforzando (Piston or Toe Stud).
3. Play a chord on the Great and low CCC on the Pedal.
4. The Pedal sound should complement the manual chord, adding a good amount of bass and weight, but should not produce a "boomy" effect. If the Pedal seems to be overpowering, adjust R794 to produce a proper balance.

L. Setting Individual Pedal Stop Levels:

1. Cancel the Sforzando.
2. The relative level of these stops has been set at the factory, and they should not require adjustment. However, this should be checked to insure that the factory setting is appropriate for the given installation.
3. Turn on the 16' Lieblich Gedeckt in the Pedal, play low CCC, and close the expression pedal (GT/CH/PED). The sound should be barely audible.
4. Now try the following stops in sequence, turning off the stop tried as the next one is added: 16' Lieblich Gedeckt, 16' Violone, 16' Subbass, 16' Principal, 16' Bombarde. The dynamic level of each succeeding stop should be greater than its predecessor.
5. Turn on all Pedal stops except the 32' Contra Violone.
6. While playing a note in the Pedal, turn the 32' Contra Violone ON and OFF several times, and adjust ~~3238~~ until the 32' stop adds the proper amount of weight to the Pedal. Be careful not to get this stop too loud, as it is also valuable when used under Celestes and other soft combinations.

M. Final Check:

1. An organist should be allowed at this point to try the organ in every possible context, exploring the total resources and listening critically for any discrepancies in the balance and voicing. Some of the following should be tried:
 - a. Several hymns, from loud to soft.
 - b. Several anthem accompaniments.
 - c. Pieces of organ literature (some Bach, some Romantic, some Contemporary).
 - d. The extreme dynamic ranges of the organ should be explored thoroughly, to assure that the organ is soft enough, when needed, and full enough to carry the congregational singing, without distortion.

N. Air Sound Levels:

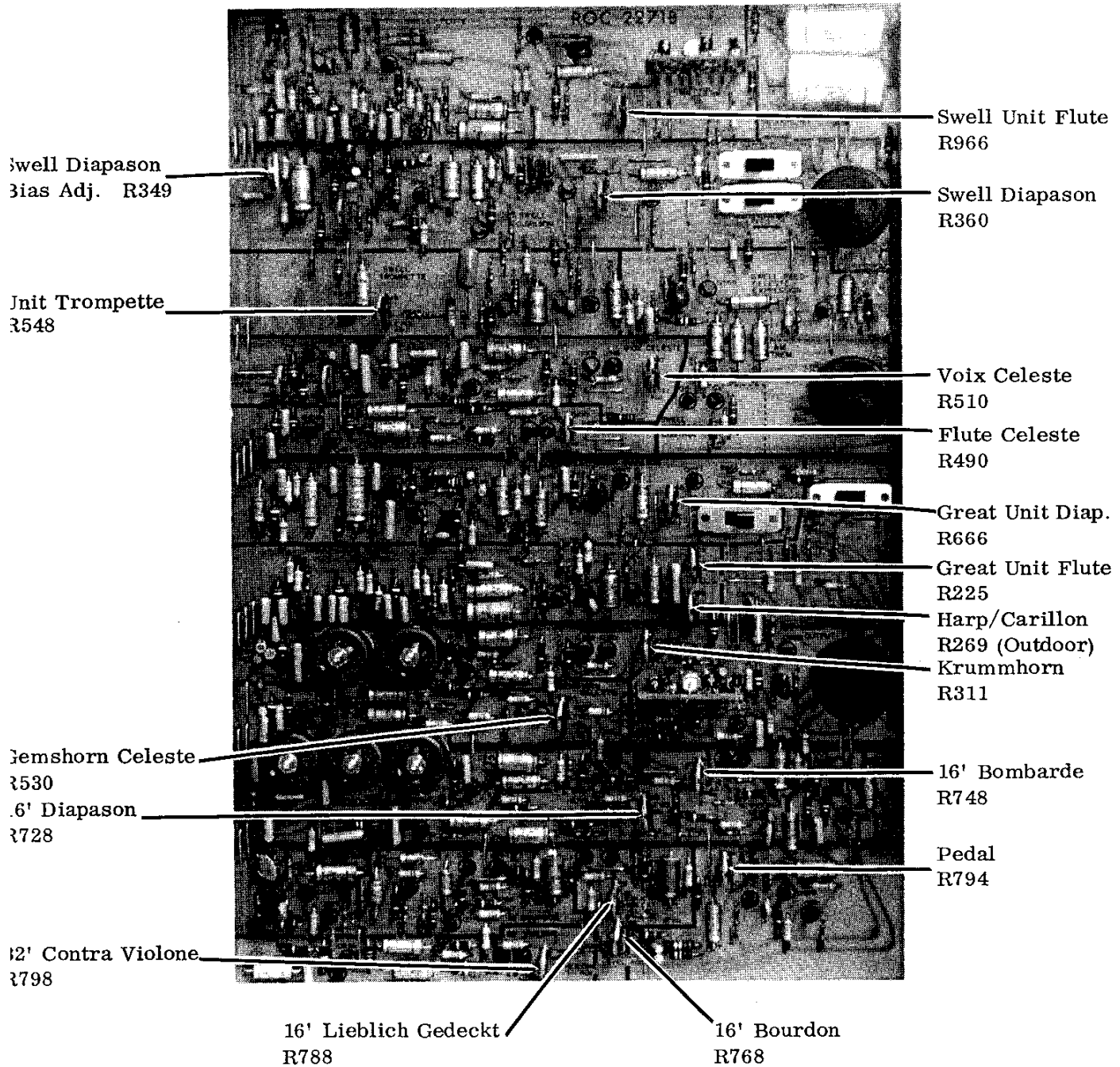
The Air Sound levels have been adjusted at the factory, and may not need further adjustment. However, tweeter settings can radically affect the apparent amount of air sound component in a given voice, so these settings should be set. The adjustments are all found on the Air Sound Board located on the outside rack. The pots are all labeled ~~R97~~, and there are two for each division of the organ (one for Diapason, one for Flute). To adjust the air sound, it is necessary to turn on an 8' stop on a given division (for instance, the Great 8' Principal), hold a chord, and adjust the corresponding R97 pot (Great Diapason ~~R97~~) for an appropriate amount of air sound. Be conservative in the adjustment of the air sound; it should be more conspicuous by its absence.

MISCELLANEOUS ADJUSTMENTS

ADJUSTMENT	VOICES AFFECTED	TEXT	LOCATION	REF. NO.	SCHEMATIC PAGE	COMMENTS
Gemshorn Celeste Feedthrough	Gemshorn Celeste		1I	R539	14	Adjusts the amount of signal that leaks through the Signal Keyer
Voix Celeste Feedthrough	Voix Celeste		1I	R519	14	
Swell Unit Diapason Feedthrough	Swell Unit Diapason		1I	R344	10	
Swell Unit Diapason Bias	Swell Unit Diapason		1I		10	Adjusts keying voltage required to key the signal. . affects feed-through and keying speed
Tremulant Speed	All Voices		1D	R138	6	Only speed adjustment
Tremulant FM Depth	All Voices		1D	R142	6	
Tremulant AM Depth	Swell Voices		1D	R212	6	Swell Unit Diapason, Unit Flute Voix Celeste, Unit Trompette, Flute Celeste
Activity Main I	All Main I Voices		1D	R380	6	Adjusts the Activity on all Main I Oscillators and Celeste Oscillators
Activity Main II	All Main II Voices		1D	R380	6	Adjusts Activity on all Main II Oscillators
Air Sound Level	One for Flute and one for Diapasons on each manual (8 in all)	23	1E	R997	29	Determines Air Sound Level for its family of voices on one keyboard (there are a total of 8 of these adjustments)
Harp Sustain Length	Harp		3B	R107	8	
Harp Chiff	Harp		3B	R202	8	Adjusts amount of chiff with Harp
Chiff	Great Unit Flute		3B	R212	8	Adjusts amount of chiff on all Great and Choir Flutes. . also affects Pedal Flutes 8' and up

LOCATIONS OF LEVEL CONTROLS ON PREAMPS

(This page folds out for reference with Voicing text)



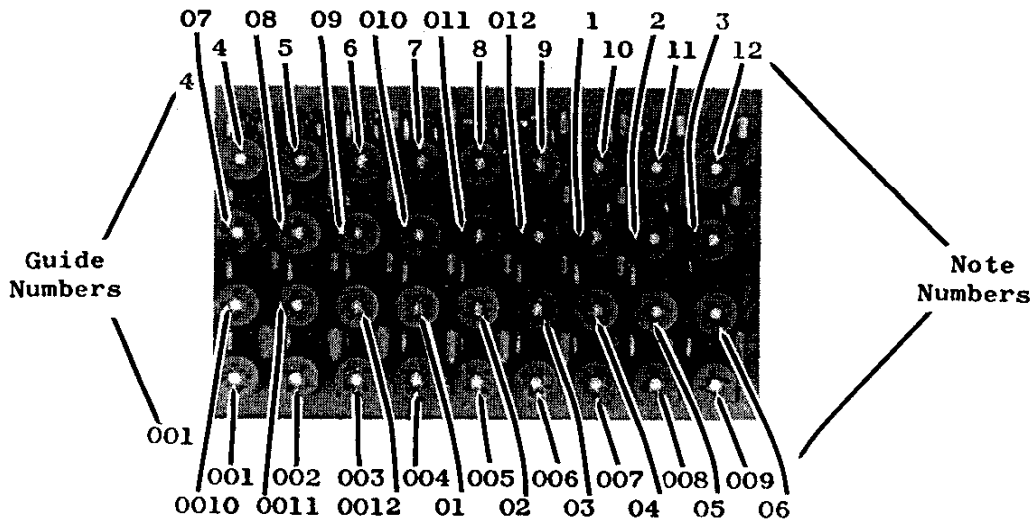
TUNING

GENERAL INFORMATION

This organ contains 157 Main and 49 Celeste oscillators, each of which may be individually tuned. The Main oscillators are located on the outer and middle racks, and the Celeste is on the middle rack.

The numbering system of all Rodgers Organs is such that middle C (261 Hz) is number 25. The 32' octave uses numbers 001 through 0012, and the 16' octave uses numbers 01 through 012. To determine the exact note number for any stop on any key you may refer to the Keying Chart (Schematic #1243) on page 3 of the schematics at the back of this manual. Guide numbers have been stamped on the wooden racks near the oscillators to assist you in locating any note.

For example: The bottom panel of the hinge end of the outer rack:



To make the tuning adjustment, turn the cap of the ferrite core counter-clockwise to raise the pitch and clockwise to lower it. DO NOT LOOSEN THE NUT ON THE HOLDING SPRING.

MAIN OSCILLATOR TUNING

First, tune the Main I oscillators 1 - 61 by turning On the Great 8' Principal and keying it one note at a time. Begin with Key #1 and continue through Key #61. Next, turn Off the 8' Principal, and turn On the 2' Fifteenth. Using keys 38 through 61, you may now tune Notes 62 - 85. The last tuning to be done on this set of oscillators is that of the 32' and 16' octaves. Turn on the Pedal 32' Contra Violone and key it one note at a time, starting with Key #1 and continuing through Key #24 (two octaves). This completes the tuning of the Main I oscillators.

In addition to the Main I set of oscillators, there is another short set to enhance the ensemble. This second set, Main II includes Notes 13 - 60 and may be tuned using the Swell 8' Geigen Diapason stop and keying it one note at a time beginning with Key #13.

CELESTE TUNING

After the Main oscillators have been tuned you may then tune the Celeste oscillators by beating them against the Main. To do this, turn On the Choir 8' Gemshorn Celeste II by itself, and key Notes 13 - 61 of the Celeste by depressing Keys 13 through 61, one key at a time. These oscillators should first be tuned to zero beat (dead-on), and then the cap of the core should be rotated counter-clockwise until the proper number of beats are heard.

<u>NOTES</u>	<u>BEATS PER SECOND</u>
13 - 24	1 at 13, graduated to 2 at 24
25 - 36	2 at 25, graduated to 3 at 36
37 - 61	3 at 37, graduated to 4 at 61

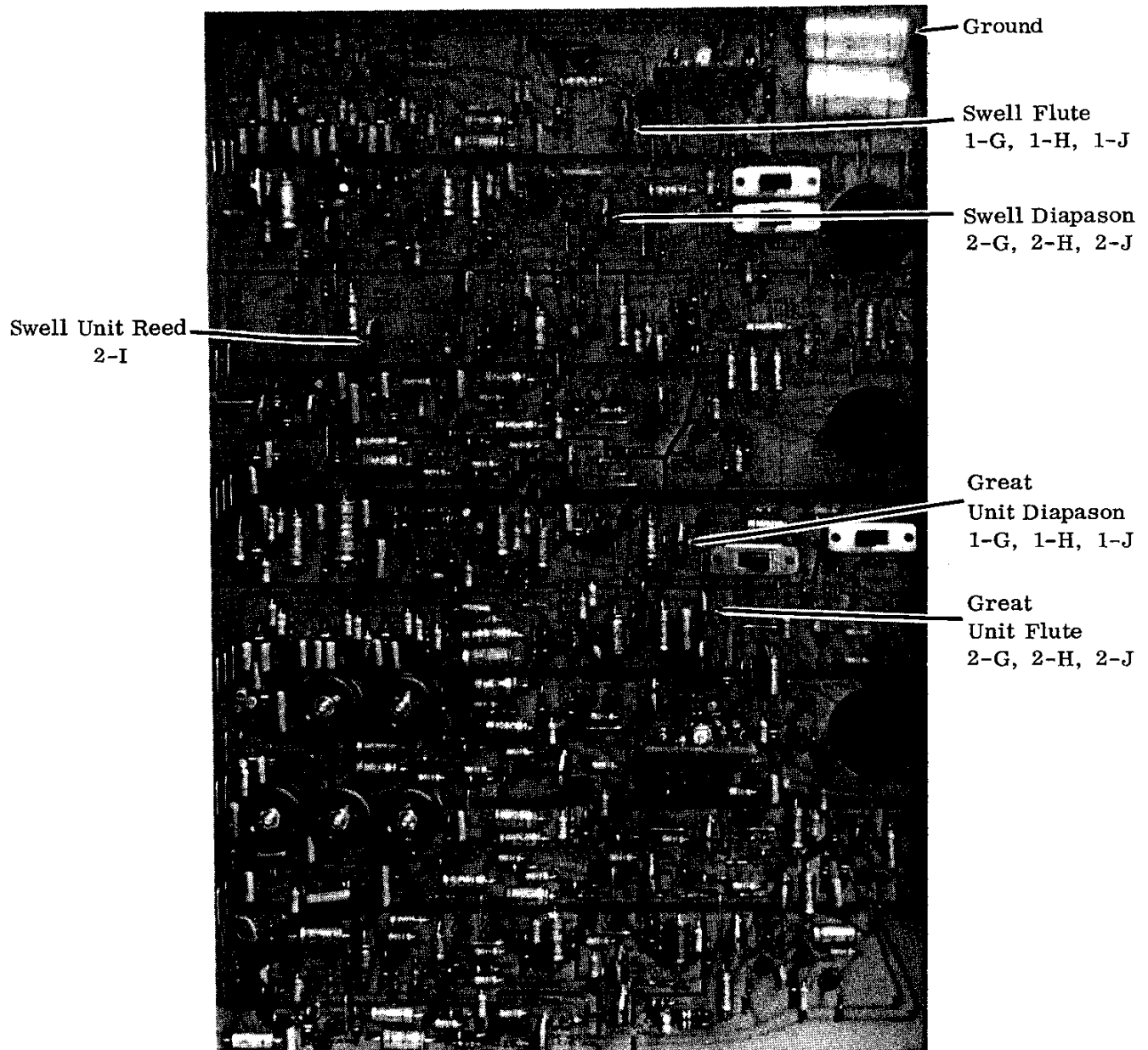
If desired, the Celeste oscillators may be tuned with a Stroboconn.

<u>NOTES</u>	<u>SET OSCILLATORS SHARP</u>
13 - 24	16 cents
25 - 29	15 cents
30 - 33	14 cents
34 - 36	13 cents
37 - 42	12 cents
43 - 45	10 cents
46 - 61	8 cents

This completes the tuning of all oscillators.

PREAMPS AND VOICING PRINTED CIRCUIT BOARD

Short arms of pots to ground to determine cyphering keyer.

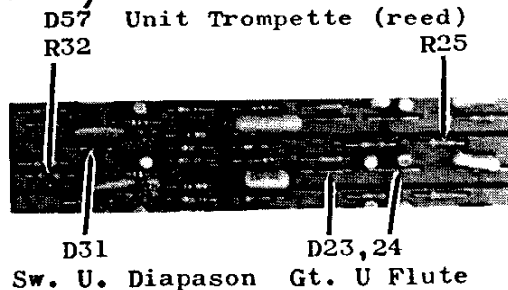
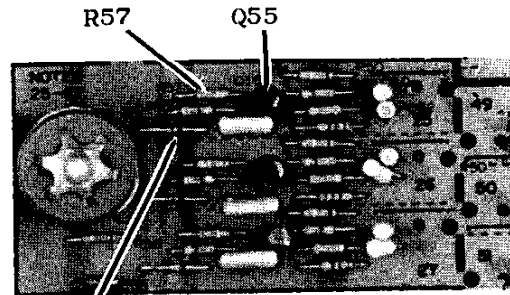
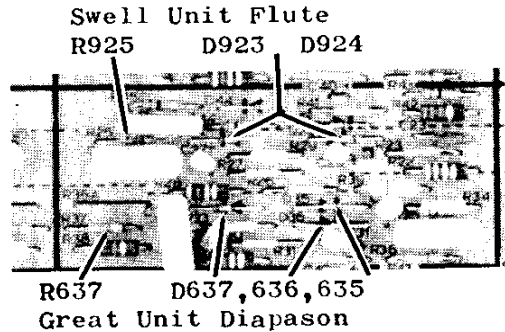


SERVICING THE 330

This section contains basic information on servicing the 330 organ. The locations indicated are in reference to the drawing on schematic page 4 in the back of the manual.

I. CIPHERS: ALL STOPS OFF

- Step 1. Refer to the photo on page 29, and one at a time short to ground the points indicated. The one which causes the cipher to stop will indicate the ciphering signal keyer and its location.
- Step 2. Determine what note it is by shorting across the keyer signal load resistor indicated in the appropriate photo on the right hand side of this page. The one that stops the cipher when shorted is the note ciphering.
- Step 3. If the Great Unit Flute has the cipher, try turning on the carillon.
- Step 4. If turning on the carillon stops the cipher, then replace Diode D101 for that note.
- Step 5. If Step 3 does not stop the cipher or if the cipher is not in the Great Unit Flute replace the diode(s) or the transistor (Unit Reed only), indicated in the photo.



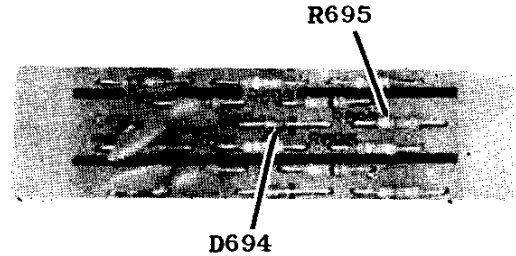
Sustain

II. CIPHERS: ONE STOP ON (Only the one stop except as noted)

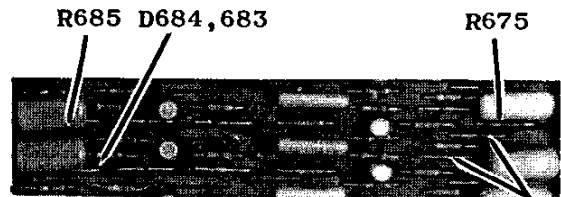
In all cases short across the indicated resistor on each note, one at a time, until one is found that stops the cipher.

Replace the diode(s) indicated.

- A. 32' Contra Violone: R695



- B. 16' Principal, 16' Violone,
16' Bombarde: R685

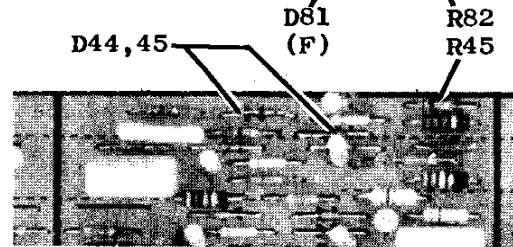


- C. 16' Subbass and
Lieblich Gedeckt: R675

- D. 8' Viox Celeste: R72
(but not 8' Geigen Diapason)



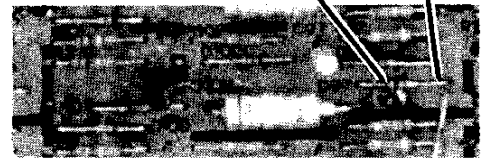
- F. 8' Gemshorn Celeste: R82
(but not 8' Gemshorn)



- G. 8' Krummhorn: R45

- H. Great and Choir Chiff:
Short to ground the point
indicated.

Replace D97 Ground



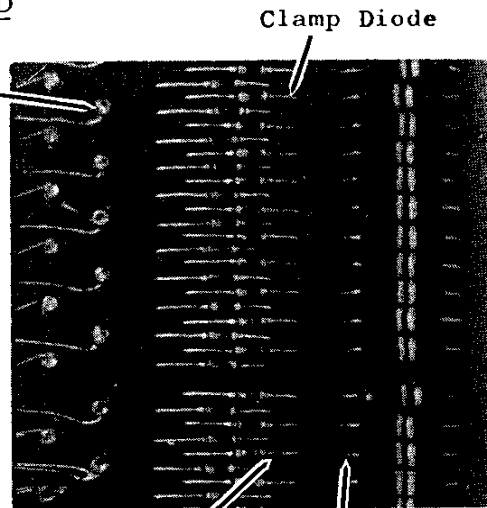
- I. All other Stops:
Ground the point indicated
on the appropriate diode
keyer assembly and replace
the diode indicated.

Ground Replace



III. CIPHER STOPS OFF KEY DEPRESSED

Short to ground the corresponding pins (pin #1 for Key #1) each of the diode gates for that manual, one at a time until the one is found that stops the cipher. (One pin per diode gate assembly). Replace the clamp diode (see photo).



IV. CIPHER STOP ON KEY DEPRESSED

This type of cipher is identical to the one described under II-I. With a key depressed, and the cipher sounding, ground the point indicated on the appropriate diode keyer assembly and replace the diode indicated.

V. DEAD KEY NOTHING WILL SOUND ON ONE KEY ON ONE KEYBOARD

A broken key contact or open keyboard diode where keys connect to coupler ganging board. Count to locate and replace the diode for that key. (Location 3-C).

VI. DEAD KEY IN A DIVISION. . . NOTHING WILL SOUND EVEN WHEN THE DIVISION IS COUPLED TO ANOTHER KEYBOARD

Defective transistor in the coupler current amplifier (on ganging board for its division), or open output diode in the coupler diode gate assembly.

Location 3-C.

VII. KEYBOARD DEAD: INCLUDING COUPLERS TO THAT MANUAL

Q176 for that manual (Q178 if organ includes transposer).

Location 3C

VIII. ENTIRE DIVISION DEAD: EVEN WHEN COUPLED TO OTHER MANUALS

Q196 for that manual. . . Location 3C (Swell has both 8' and 4' Q196's).

IX. ONE DIVISION PLAYS FROM ALL MANUALS

Q196 for that manual. . . Location 3C (Swell has both 8' and 4' Q196's).

X. ONE KEYBOARD PLAYS ALL STOPS IN ALL DIVISIONS

Q176 or Q178 for that keyboard.

XI. STOPS WON'T TURN ON OR WON'T TURN OFF

<u>STOP NAME</u>	<u>LOCATION</u>	<u>Won't Turn Off DEFECTIVE COMPONENT</u>	<u>Won't Turn On DEFECTIVE COMPONENT</u>
32' Contra Violone	1-I	Q796 or Q797, D793	Q796, Q797
16' Principal	1-I	Q726, Q727, D723	Q726, Q727
16' Violone	1-I	Q706, Q707, D703	Q706, Q707
16' Bombarde	1-I	Q746, Q747, D743	Q746, Q747
16' Subbass	1-I	Q766, Q767, D763	Q766, Q767
16' Lieblich Gedeckt	1-I	Q786, Q787, D783	Q786, Q787
8' Voix Celeste	1-I	Q508, Q509, D513	Q508, Q509
8' Flute Celeste	1-I	Q488, Q489, D493	Q488, Q489
8' Gemshorn Celeste	1-I	Q528, Q529, D533	Q528, Q529
8' Krummhorn	1-I	Q309, Q310, D313	Q309, Q310
Great and Choir Chiff	3-B	Q204, D200, D210	Q304, D202, D212
Main Tremulant	1-D	Q143	Q143, Q145
Tremulant (Swell)	1-D	Q213	Q213, Q214, Lamps
Couplers	3-C	Q192, Q196	Q192, Q196, D191, D192
Other Stops	3-D, E, F, G	Q63, Q64, D64	Q63, Q64

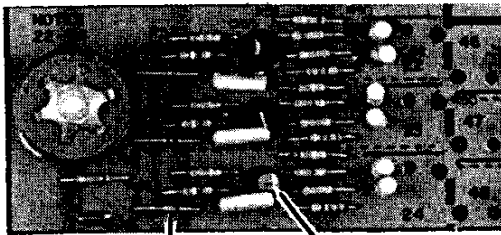
XII. DEAD NOTE SAME PITCH MORE THAN ONE VOICE

Oscillator is not operating: See Schematic Page 3 for oscillator number.

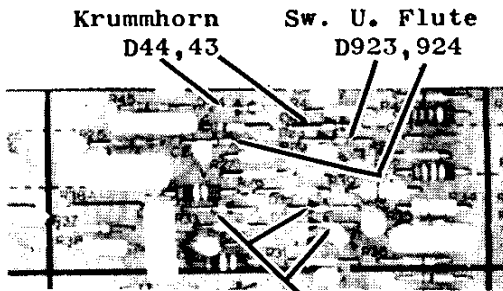
Check voices against Basic Information Charts for oscillator set(s) in use. Schematic Page 1 shows locations of oscillators.

XIII. DEAD NOTE SAME PITCH ONE VOICE (Keyer)

Determine the voice by referring to the "Basic Information About Stops" Charts. Refer to the photos below for the locations of the signal keyers and the suspect components.



D57 Q55
Unit Reed (Trompette)



Krummhorn D44, 43 Sw. U. Flute D923, 924
Gt U. Diapason D635, 636, 637

2 I

1 G,H,J

2 J



D31 D23, 24
Sw,U. Diapason Gt. U. Flute



D684, 683, 682 D673, 674
16' Pedal Pulse 16' Pedal Flutes

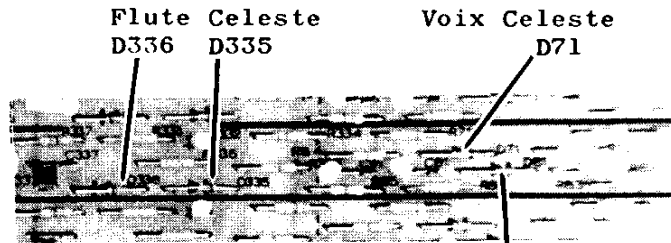
2 G, H

1 K

1 L



32' Contra Violone D694



Flute Celeste D336 D335 Voix Celeste D71
Gemshorn Celeste D81

ADDING ECHO SPEAKERS

Echo speakers may be easily added to the 330 through the use of plug-in adaptors. One adaptor will be needed for each echo speaker. The number of echo speakers is limited only by the number of main speakers, but can be as few as one.

ONE ECHO SPEAKER - MULTIPLE MAIN SPEAKERS

(Up to Four Main Speakers)

As there are always at least two main speakers, a single echo speaker may be added by using one EC III echo adaptor. To install this adaptor requires that it be mounted on the kneeboard to the left of the Crescendo pedal. The small six prong plug is plugged into the Echo Control Socket on the output panel. There are four, five prong plugs which are numbered 1 through 4. These plug into four, five prong sockets on the output panel. A suggested pattern of connection is: #1 Pedal, #2 Reeds, #3 Great Flute, and #4 Swell Flute. The three wires with individual terminals on them connect to the power supply. The White wire is ground, the Red/White wire is +12V DC regulated, and the Black/White wire is -12V DC regulated. These colors match the colors of wires already connected. Plug the main speakers into the sockets numbered from 1 through 4, so that the Pedal speaker is in #1, the Reeds speaker in #2, the Great Flute speaker in #3, and the Swell Flute speaker in #4. If there are less than four main speakers they are simply omitted. Plug the echo speaker into the socket marked ECHO.

There are four level adjust pots, one for each channel, on this echo adaptor to control the signal level of each of the channels in the echo speaker.

MULTIPLE ECHO SPEAKERS - MULTIPLE MAIN SPEAKERS

(One Echo Speaker per Main Speaker)

If one echo speaker is desired for each main speaker, then it will be necessary to have one EC II echo adaptor for each echo channel used. Connect the first EC II by mounting it near the output panel. Plug the small six prong plug into the Echo Control Socket on the output panel. Plug the five prong plug into an output socket, and then plug the main and echo speakers into the sockets on the EC II. Then plug the small six prong plug from the second adaptor into the small six prong socket on the first. Connect its main and echo speakers in the same manner as for the first EC II. If more than two echo channels are desired, add the third (etc.) in the same manner as the second one.

MULTIPLE ECHO SPEAKERS - MULTIPLE MAIN SPEAKERS

(Less than One Echo Speaker for each Main Speaker)

When you have more main speakers than echo speakers, but still require more than one echo speaker, you may use EC II's and an EC III in combination. To do so, connect the EC II single channel echo adaptor first, and then connect the EC III multiple channel adaptor second. Plug the small six prong plug of the EC III into the small six prong socket on the EC II. Connect the speakers as described above.

An alternate method is to use only an EC III, and add a UW-57 Y-Adaptor for the echo speakers.

CHANGING THE SFORZANDO COMBINATIONS

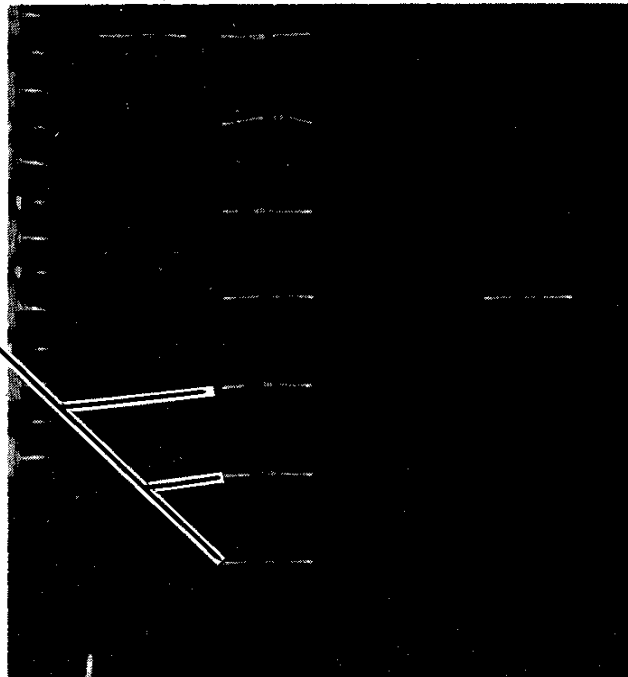
The stops are arranged in columns on the stop interconnect (location 3-A on the inner rack) with a "box" marked around each of them. Within this "box" are the Sforzando contact-multiplying diodes. These diodes are connected between the stop control wire and a bus.

To delete a stop from the Sforzando you simply clip out the appropriate diode.

To add a stop to the Sforzando, you only have to add a diode within the "box" for that stop between the stop and the Sforzando bus. Be sure to match the polarity of the other diodes. If the diode is reversed the stop will not only fail to operate, it will also turn on the Sforzando whenever the stop tab is depressed.

The Sforzando Schematic is 1271 (Drawing No. 20 in this book).

Sforzando Diodes



TECHNICAL DESCRIPTIONS

Basically the organ consists of five unified voices and seven "straight" voices. All of the voices are signal keyed. These voices are distributed in a manner that allows the organ to be divided by division, with respect to both expression and speaker systems. In addition, there are two sets of Unison tuned oscillators supplying signal to the voices in a manner that produces maximum ensemble at reasonable cost.

UNIT DIAPASON GREAT/CHOIR/PEDAL

The various pitches of this Diapason are keyed by diode gates, the outputs of which operate the signal keyer. Signal from this keyer is amplified by a common base preamp, mixed with the Great and Choir Diapason air sounds, amplified by a three stage preamp, and then expressed in a passive circuit utilizing an LDR (light dependent resistor). This expression affects the upper pitches more than the lower ones, and thus compensates for the Fletcher-Munsen effect. Output from the expression circuit is applied to the Great Diapason Output Channel. The signal for this voice is obtained only from the Main I oscillator set. (See also schematic page 7.)

UNIT DIAPASON SWELL

The keying for this voice is identical to that of the Great Unit Diapason. The signal keyer is a simpler circuit which provides a different voicing for this Diapason. The output from this signal keyer is mixed with the Swell Diapason Air Sound and the feed-thru canceling signal, amplified by a three stage preamp, which includes an AM Tremulant LDR, and then expressed in a circuit identical to that used for the Great Unit Diapason except that it is controlled by the Swell Expression pedal. Output from the expression circuit is applied to the Swell Diapason Output Channel. The signal for this voice is obtained from both Main I and Main II oscillator sets. Main I supplies Notes 1 - 13 and 61 - 85, while Main II supplies Notes 13 - 60. When coupled to the Great and played with the Great Diapason there will be ensemble in this important region. (See also schematic page 10.)

UNIT FLUTE GREAT/CHOIR/PEDAL

As with the Unit Diapason, the various pitches of the Unit Flute are keyed by diode gates which in turn operate the Great Unit Flute Signal Keyer. There is however, one difference. The Unit Flute diode gates in the Choir are isolated from those in the Great and Pedal by a diode. The Sustain is located

on the Choir side of the diode, and the signal keyer is on the Great and Pedal side of it. This prevents the sustain stops on the Choir from putting sustain on the Flutes on the Great and Pedal. Between the isolating diode and the signal keyer is the chiff circuit. The chiff momentarily keys a note a 12th above, through a capacitor. The sustain and chiff are located separately from the signal keyer.

Signal from the Flute Signal Keyer is amplified by three single stage summing preamps. Notes 01 - 36 are amplified by one preamp, Notes 37 - 57 by a second preamp, and Notes 58 - 85 by a third. The outputs of these three summing preamps are mixed together, and then amplified by a three stage preamp. The output of the three stage preamp is mixed with the Choir Gemshorn Celeste, the Choir Krummhorn, and the Great and Choir Flute Air Sound. These mixed signals are amplified by a three stage preamp and then expressed by the Flute expression circuitry, which is essentially identical to that of the Unit Diapason. From the expression circuitry the signals are applied to the Flute output channel. The signal for this voice is obtained from both the Main I, Notes 1 - 13, 61 - 85, and Main II, Notes 13 - 60 oscillator sets. When played with the Diapasons on the same manual there will be two pitch sources, and thus increased ensemble. (See also schematic page 8).

UNIT FLUTE SWELL

This voice is keyed in a manner identical to that of the Great Unit Flute. The signal keyer is similar, but with slightly different voicing. The signal from the signal keyer is amplified by three single stage summing preamps. Notes 01 - 36 are amplified by one preamp. These three preamps operate similarly to those in the Great Unit Flute. The outputs of these three preamps are mixed together with the Swell Flute Air Sound, and then amplified by a three stage preamp. In the feedback network of this preamp is an LDR to provide AM Tremulant. Signal from this preamp is then applied to a passive Expression circuit identical to that of the Great Flute, and then passed on to the Swell Flute output circuit. The signal for this voice is obtained only from the Main I oscillator set, and therefore provides ensemble when played with the Swell Diapason or when coupled to the Great and played with the Great Flutes. (See also schematic page 11.)

UNIT TROMPETTE

The Unit Trompette is also keyed through diode gates, the outputs of which key the Unit Trompette Signal Keyer. Within the Unit Trompette Signal Keyer are adjustable voicing formants. Each of these formants affects a group of notes; usually three, but in some cases six or twelve. The output of the signal keyer is amplified by a two stage preamp. The signal out of this preamp is then mixed with the signals from the Swell Celestes, and amplified by the "Reed Channel Preamp". Included in this preamp is an AM Tremulant LDR

like that in the Swell Flute. Following the Reed preamp is an expression circuit similar to those in the Unit Flutes and Unit Diapasons. From this expression circuit these combined signals are applied to the Swell Reeds output channel. The signal for this voice is obtained from both Main I and Main II oscillator sets. (See also, schematic page 12.)

CHOIR KRUMMHORN

This signal keyer is always keyed whenever the Choir division is keyed. The signal is amplified by a two stage preamp with a "lumped" formant circuit to produce the hollow sound of the Krummhorn. The signal is switched by a two transistor audio switching circuit, and then mixed into the Great Unit Flute mixing preamp. The signal for this voice is obtained only from the Main I oscillator set. (See also schematic page 13.)

CELESTES

All three celestes are keyed whenever their respective divisions are keyed. In each case the signal is amplified by a two stage preamp with a small amount of filtering, and then switched by a two transistor audio switching circuit. The two Swell Celestes, the 8' Flute Celeste and the 8' Voix Celeste, are mixed into the Reed Channel Preamp. The Choir Celeste, the 8' Gemshorn Celeste is mixed into the Great Flute mixing preamp. Signal for these voices is obtained from the one set of Celeste oscillators. (See also schematic page 14.)

PEDAL VOICES

These voices are the 16' Subbass/Lieblich Gedeckt, the 16' Principal/Violone, the 16' Bombarde, and the 32' Contra Violone. Three signal keyers are keyed whenever a Pedal key is depressed. One keyer is for the Subbass and Lieblich Gedeckt (Flute). A second produces a pulse waveform for the Principal, Violone, and the Bombarde, while the third keyer is used only for the 32' Contral Violone.

Signal from these keyers is amplified by three separate preamps, and then fed into the appropriate voicing circuits. (The Bombarde includes formants.) Outputs of the voicing circuits are switched by transistor audio switching circuits, mixed together with the Pedal Diapason and Flute Air Sound signals, and then amplified by three stage preamp. Following the preamp is a passive expression circuit similar to those already described. The signal is then either fed into the Pedal output socket or mixed into the Great Unit Flute output channel. (See also schematic pages 15, 16, and 17.)

OUTPUT CIRCUITS

There are seven (7) output channels on the 330.

1. Great Flute Channel:

This channel consists of a three stage preamp into which is always mixed the Great Unit Flute, Choir Gemshorn Celeste, and the Choir Krummhorn. In addition it is possible, by means of switches, to add the Great Diapason and/or the Pedal channels when there are less than the maximum number of speakers being used.

2. Great Unit Diapason:

This channel is a simple emitter follower with only the Great Unit Diapason signal.

3. Swell Flute Channel:

This channel consists of a three stage preamp which normally only has the Swell Unit Flute fed into it. If less than the maximum number of speakers are used, it is possible to mix into it, by means of a switch, the Swell Unit Diapason channel and the Swell Reeds channel.

4. Swell Unit Diapason Channel:

A simple emitter follower provides a low output impedance for the Swell Unit Diapason signal.

5. Swell Reed, etc.:

This channel includes not only the Unit Trompette signal, but also that of the Swell Celestes. The circuit consists only of an emitter follower.

6. Pedal:

Only the 16' and 32' Pedal voices are in this channel. The output emitter follower circuit is shown on page 17 of the schematics.

7. Carillon:

This channel is intended to be used with an outdoor tower speaker and provides unexpressed Great Unit Flute signal. (See also schematic page 18.)

OSCILLATORS

The oscillators in this organ are somewhat unique in that the coil does not have a feedback winding. The feedback winding has been replaced by a transistor that also acts as an emitter follower to drive the heavy load presented by the signal keyers. There are 157 Main oscillators that provide the pitch sources for the Unit Diapasons, Unit Flutes, Unit Trompette, Krummhorn, and the 16' and 32' Pedal. In addition there are 49 Celeste oscillators that provide the pitch sources for the Celestes. Each oscillator from Note 1 (65 Hz) to Note 85 (8372 Hz) has a circuit associated with it to provide an FM Tremulant. (See also schematic page 6.)

COUPLER SYSTEM

Time has been divided into 10 microsecond segments with a 2 microsecond space between them. These time segments (slots) are actually used in groups of four. The first slot of the four is used for the Swell keys, the second for the Great keys, the third for the Choir, and the fourth for the Pedal. The operation of each of the time slots is identical.

Using the Great time slot as an example: Keying voltage (ground) is applied to the key contacts for 10 microseconds out of every 48 (every 4th time slot). The other side of the contacts are connected to 61 keying busses through diodes. (The other three keyboards are also connected to these same 61 busses through diodes of their own.) These busses are connected to 4 diode gates (61 notes each). They are: 8' Swell, 8' Great, 8' Choir, and 4' Swell (49 notes). During this Great time slot the 8' Great diode gate (Coupler) is turned on to allow the Great keying voltage to reach the Great Coupler Current Amplifier. This circuit inverts the keying voltage (changes it to +12 VDC), and includes a capacitor to store the keying voltage during the other three time slots until the Great keys once again have keying voltage applied to them. The other 8' Couplers (diode gates) are turned on when their respective keyboards have keying voltage on them. The Pedal "Coupler" does not turn off as it is connected to the Pedal keys ahead of the diodes, and thus never "sees" any keying voltage except that of the Pedal.

Turning on the 8' Swell Coupler during the Great time slot allows the Great keys to play the Swell stops by keying the Swell Coupler Current Amplifier. Other inter-manual couplers operate in a similar manner and include: 8' Swell to Choir, 8' Choir to Great, 8' Great to Pedal, 8' Swell to Pedal, and 8' Choir to Pedal. The 4' Swell to Swell also operates the same way except that it is turned on only during the Swell time slot. These inter and intra-manual couplers require that a stop tab be depressed for them to operate.

Electronically the system consists of a circuit to delay the application of +12 VDC to parts of the system while providing a fast rise time to insure that the circuits start properly. This delayed voltage is applied to the clock circuit, which consists of a free running multivibrator, a differentiating circuit to provide a narrow pulse, and a power gating circuit that advances the ring counter part of the time slot generator. There are four time slots, each consisting of a single stage of the ring counter and the transistors that gate the power to the keyboards. The outputs of the keyboards are connected together on 61 busses via diodes. These 61 busses connect to diode gate assemblies, the outputs of which are wired to the Coupler Current Amplifiers for each division. Coupler switch circuits operate these diode gates and in turn are controlled by the various Coupler Gates that synchronize them with the appropriate time slots. The outputs of the Diode Gate Assemblies (Couplers) are applied to the Coupler Current Amplifiers. These Coupler Current Amplifiers include capacitors to store the input keying voltage between the time slots that they receive this voltage. The output of the Coupler Current Amplifiers is DC, and is used to key some signal keyers directly and others via Diode Gates (Unified voices). (See also schematic page 5.)

The coupler system as described is called "Time Division Multiplexing" or "Time Sharing". If you are interested in more information about multiplexing, we suggest that you refer to the Howard Sams publication No. 20051, ABC's of Telemetry, by Alan Andrews. In particular, refer to pages 15, 16, 49 to 60, and 89 to 90.

TRANSPOSER

The Transposer consist of nine diode gates wired between the keyboard keying busses and the couplers. These diode gates are operated by a "preset" circuit that cancels all other eight circuits whenever a piston is depressed. The diode gates are wired one semitone apart, four flat, one normal, and four sharp. The output of these diode gates is then inverted and the current amplified by a transistor per note before being applied to the coupler ganging board.

AIR SOUND

The Air Sound for this organ consists of one Air Sound Generator, eight Stop Sense Circuits, and eight Air Gates.

The Air Sound Generator is a white noise generator using the reversed biased junction of a transistor to produce the noise, followed by a two stage preamp. A switch located under the Choir Manual (on the setterboard, on setterboard models) enables the organist to turn off the Air Sound when desired.

The output of the Keyboard is applied to two Stop Sense Circuits, one for the Flutes of that manual, and one for the Diapasons of that manual, that allow the output of the Keyboard to be applied to the Air Gate whenever an appropriate stop is turned on.

The Air Gate receives the Air Sound signal from the Air Sound Generator, and allows it to pass proportional to the number of keys depressed, if appropriate stops have been turned on. Tremulant is also applied to this circuit for added realism. The output of this gate is applied to the appropriate preamp and output channel. (See also schematic page 29).

TREMULANT

The Tremulants for this organ consist of an FM Tremulant that affects the entire organ, and an AM Tremulant that affects only the Swell voices. Both of these Tremulants are obtained from one R-C low-frequency oscillator that runs all the time. The FM Tremulant is turned on or off by a transistor audio switch, amplified by a single transistor and applied to a "variable capacitance" circuit in each of the tone generator oscillators. The AM Tremulant is controlled by a stop in the Swell Division that controls an identical transistor audio switch, and then is amplified by a single transistor that drives a lamp. This lamp is located in an LDR assembly with three LDRs in it. These LDRs are connected in the feedback circuits of the Swell Unit Flute, Unit Diapason, and Reed channel preamps to modulate the audio passing through them. (See also schematic pages 6, 10, 11, and 12).

SFORZANDO

The Sforzando consists of momentary contact pistons, a Schmitt Trigger Circuit, and a flip-flop. The Schmitt Trigger prevents problems that may be caused by dirty contacts and provides a controlled trigger pulse for the flip-flop. In turn the flip-flop then holds its position until triggered again. The output of flip-flop switches a transistor to supply the current to activate stops. Contact-multiplying diodes are used between the transistor and the stops. (See also schematic page 20).

SETTERBOARD

Seventeen pistons and four toe studs operate the Setterboard on this organ. When depressed, the pistons switch power transistors to apply power through diodes to the position selecting switches, and thus to the actuating coils of the stop actions. The Master pistons have relays to simultaneously operate both the Swell, Great, and Choir pistons of the same number. (See also schematic page 21).

GREAT TO PEDAL REVERSIBLE MOVING TAB

The piston triggers one of two SCRs depending on the position of the Great to Pedal stop. When the stop is Off, and the piston is depressed, the SCR connected to the "ON" coil is triggered, moving the stop to the "ON" position, and vice versa. Also included are two diodes that lock out the opposite SCR. (See also schematic page 22).

GREAT TO PEDAL REVERSIBLE LIGHTED TAB

The piston either triggers the SCR for this stop or interrupts the power to it, depending upon whether the SCR was conducting or not before the piston was depressed. When the stop is Off, the closing of the piston causes transistor Q9 to conduct, triggering the SCR, and also preventing transistor Q4 from conducting by way of a diode D9. When the stop is On, Q4 is conducting, and when the piston is depressed Q3 will also conduct. This causes the bias on Q23 to change so that it will stop conducting, interrupting the current through the SCR and turning it Off. C7 and C2 hold the circuits during noise transients caused by dirty piston contacts. (See also schematic page 26).

CAPTURE SYSTEM MOVING TAB

This is a relatively complex system, and will be only briefly described here.

The pistons energize circuits that produce pulses to read and write magnetic memory cores. The reading of the cores produces an output pulse, triggering SCRs that remain conducting long enough for the stops to move to the desired positions. This reading of the cores also erases them. After the stops have moved to the desired position, these positions are re-written into the cores.

The set piston operates by inhibiting the SCRs while allowing the cores to be read/erased, and re-written. (See also schematic pages 23 and 24).

CAPTURE SYSTEM LIGHTED TAB

Lighted stops are available only with a Capture System.

Pulling out the drawknob, or depressing the tilt tablet triggers an SCR, which then remains conducting, turning on both the stop and the lamp in the stop mechanism. Pushing in on the drawknob, or pushing in on the top of the tilt tab closes a contact which changes the bias on Q23, the transistor in series with the SCR, causing it to stop conducting. This interrupts the current through the SCR, turning it Off.

The action of the combination action is similar to that of the moving tab combination action, in that memory cores are read and written by pulses generated when a piston is depressed. In this case, however, the SCRs remain conducting.

The set piston operates by preventing the amplification of the core output pulse, and by preventing the generation of off pulses. (See also schematic page 25).

CAPTURE SYSTEM LOCATION GUIDE

This Chart shows the relationship of Stops to Core numbers on Capture System:

SWELL DIVISION

1. SPARE CORES
2. 8' Geigen Diapason
3. 8' Hohlfloete
4. 8' Voix Celeste II
5. 8' Flute Celeste II
6. 4' Prestant
7. 4' Flute Harmonique
8. 2' Flautino
9. Plein Jeu III
10. 16' Contra Fagotto
11. 8' Trompette
12. 4' Clairon
13. Tremulant
14. 4' Swell to Swell
15. SPARE CORES & Circuitry
16. SPARE CORES & Circuitry

PÉDAL DIVISION

1. SPARE CORES
2. 32' Contra Violone
3. 16' Principal
4. 16' Subbass
5. 16' Lieblich Gedeckt
6. 16' Violone (Sw)
7. 8' Octave
8. 8' Flute
9. 8' Violone (Sw)
10. 4' Choralbass
11. Mixture II
12. 16' Bombarde
13. 8' Trompette (Sw)
14. 4' Clairon (Sw)
15. SPARE CORES & Circuitry
16. SPARE CORES & Circuitry

GREAT DIVISION

1. SPARE CORES
2. 16' Gemshorn
3. 8' Principal
4. 8' Bourdon
5. 4' Octave
6. 4' Spill Flöte
7. 2-2/3' Twelfth
8. 2' Fifteenth
9. 2' Piccolo
10. Fourniture III
11. SPARE CORES & Circuitry
12. SPARE CORES & Circuitry

CHOIR DIVISION

1. SPARE CORES
2. 8' Gemshorn
3. 8' Gemshorn Celeste II
4. 8' Gedeckt
5. 4' Principal
6. 4' Nachthorn
7. 2-2/3' Nazard
8. 2' Blockflöte
9. 1-3/5' Tierce
10. 1' Siffloete
11. 8' Krummhorn
12. Harp
13. Carillon
14. SPARE CORES & Circuitry
15. SPARE CORES & Circuitry

GENERAL DIVISION

1. SPARE CORES
2. Main Off
3. Echo On
4. 8' Great to Pedal
5. 8' Swell to Pedal
6. 8' Choir to Pedal
7. 8' Swell to Great
8. 8' Choir to Great
9. 8' Swell to Choir
10. Main Vibrato
11. Great & Choir Flute Chiff
12. SPARE CORES & Circuitry
13. SPARE CORES & Circuitry

LIST OF OUTPUT CHANNELS ON THE 330

AND

STOPS ASSOCIATED WITH EACH

There are six main output channels on the Specification 330. In addition, there is an outdoor speaker channel that allows the Unit Flute on the Choir to be played through a Rodgers T4-100 tower speaker system (used with the Harp and Carillon).

PEDAL CHANNEL

16' Pedal and
32' Contra Violone Keyers

PEDAL: 32' Contra Violone, 16' Principal,
16' Subbass, 16' Lieblich Gedeckt,
16' Violone, 16' Bombarde

GREAT/CHOIR DIAPASONS

Great/Choir Diapason Keyer
and Choir Krummhorn Keyer

PEDAL: 8' Octave, 4' Choralbass,
Mixture II

GREAT: 16' Gemshorn, 8' Principal,
4' Octave, 2-2/3' Twelfth,
2' Fifteenth, Fourniture III

CHOIR: 8' Gemshorn, 4' Principal,
8' Krummhorn

GREAT/CHOIR FLUTES

Great/Choir Flute Keyer and
Choir Gemshorn Celeste Keyer

PEDAL: 8' Flute

GREAT: 8' Bourdon, 4' Spillflöte,
2' Piccolo

CHOIR: 8' Gedeckt, 4' Nachthorn,
2-2/3' Nazard, 2' Blockflöte,
1-3/5' Tierce, 1' Sifflöte, Harp,
Carillon, 8' Gemshorn Celeste

SWELL FLUTES

Swell Flute Keyer

SWELL: 8' Hohlflöte, 4' Flute Harmonique,
2' Flautino, 8' Flute Celeste II
(Unison Part)

SWELL DIAPASONS

Swell Diapason Keyer

PEDAL: 8' Violone (SW)

SWELL: 8' Geigen Diapason,
8' Voix Celeste II (Unison Part),
4' Prestant, Plein Jeu III

SWELL REEDS, CELESTES

Swell Reed Keyer, Swell
String & Flute Celeste Keyer

PEDAL: 8' Trompette (SW),
4' Clairon (SW)

SWELL: 16' Contra Fagotto, 8' Trompette,
4' Clairon, 8' Voix Celeste II,
8' Flute Celeste II (Celeste Parts)

OUTDOOR CARILLON

This carries the Great/Choir Flute Keyer (same as GREAT/CHOIR FLUTE channel), except that it is not under expression.

STOPS OPERATED BY SFORZANDO

SFORZANDO

The Sforzando turns on all stops normally used together. This excludes the following stops:

SWELL

8' Voix Celeste
8' Flute Celeste
Tremulant

CHOIR

8' Gemshorn Celeste
1-3/5' Tierce
8' Krummhorn
Harp
Carillon

MISC.

Main Tremulant
Great and Choir Flute Chiff
Main Off
Echo On

CRESCENDO SEQUENCE

CONTACT	PEDAL	SWELL	GREAT	CHOIR
1	16' Lieblich Gedeckt MP Light	8' Geigen Diapason	8' Bourdon	8' Gemshorn
2	Swell to Pedal	4' Flute Harmonique	Swell to Great	4' Nachthorn
3	16' Violone	8' Hohlflöte	Choir to Great	Swell to Choir
4	16' Subbass	2' Flautino	4' Octave	8' Gedeckt
5	8' Octave MF Light	4' Prestant	8' Principal	2' Blockflöte
6	16' Principal	8' Trompette	2' Fifteenth	4' Principal
7	Mixture II	Plein Jeu III	2-2/3' Nazard (CHOIR)	1' Siffote
8	Choir to Pedal F Light	4' Clairon	Fourniture III	8' Krummhorn

BASIC INFORMATION FOR INDIVIDUAL SWELL STOPS

STOP	OSCILLATORS	KEYERS	KEYS	DEVICE OPERATED BY STOP TAB	LEVEL ADJUSTMENT		
					Ref. No.	Loc.	Text
8' Geigen Diapason	Main I & II	Swell Unit Diapason	1 - 61	Diode Gate via Transistor Switch	None	3D	17, 19
8' Hohlflöte	Main I	Swell Unit Flute	1 - 61	Diode Gate via Transistor Switch	None	3D	17, 19
8' Voix Celeste	Main I & II	Swell Unit Diapason	1 - 61	Geigen Diapason . . . Soft	R66	3D	17, 19
	Celeste	Swell Voix Celeste	13 - 61	Transistor Audio Switch	R510	1I	17, 19
8' Flute Celeste	Main I	Swell Unit Flute	1 - 61	Hohlflöte. . . Soft	R66	3D	17, 20
	Celeste	Swell Flute Celeste	13 - 61	Transistor Audio Switch	R490	1I	20
4' Prestant	Main I & II	Swell Unit Diapason	1 - 61	Diode Gate via Transistor Switch	None	3D	17, 19
4' Flute Harmonique	Main I	Swell Unit Flute	1 - 61	Diode Gate via Transistor Switch	None	3D	17, 19
2' Flautino	Main I	Swell Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3D	17, 19
Plein Jeu III	Main I & II	Swell Unit Diapason	1 - 61	3 Diode Gates via Transistor Switch	R66	3D	17, 19
16' Contra Fagotto	Main I & II	Swell Unit Trompette	1 - 61	Diode Gate via Transistor Switch	None	3D	19
8' Trompette	Main I & II	Swell Unit Trompette	1 - 61	Diode Gate via Transistor Switch	None	3D	19
4' Clairon	Main I & II	Swell Unit Trompette	1 - 49	Diode Gate via Transistor Switch	None	3D	19
Tremulant					R212	1D	
4' Swell to Swell		All Swell	1 - 61	Multiplexed Diode Gate (Coupler)	None	3C	

BASIC INFORMATION FOR INDIVIDUAL GREAT STOPS

STOP	OSCILLATORS	KEYERS	KEYS	DEVICE OPERATED BY STOP TAB	LEVEL ADJUSTMENT		
					Ref. No.	Loc.	Text
16' Gemshorn	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3F	17
8' Principal	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3F	17
8' Bourdon	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3F	17, 18
4' Octave	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	None	3F	17
4' Spillflöte	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	None	3F	18
2-2/3' Twelfth	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3F	17
2' Fifteenth	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3F	17
2' Piccolo	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3F	17, 18
Furniture III	Main I	Great Unit Diapason	1 - 61	3 Diode Gates via Transistor Switch	R66	3F	17
8' Swell to Great		All Swell Voices	1 - 61	Multiplexed Diode Gate (Coupler)	None	3C	
8' Choir to Great		All Choir Voices	1 - 61	Multiplexed Diode Gate (Coupler)	None	3C	

BASIC INFORMATION FOR INDIVIDUAL CHOIR STOPS

STOP	OSCILLATORS	KEYER	KEYS	DEVICE OPERATED BY STOP TAB	LEVEL ADJUSTMENT		
					Ref. No.	Loc.	Text
8' Gemshorn	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3G	17
8' Gemshorn Celeste	Celeste	Great Unit Diapason	1 - 61	8' Gemshorn turned On with Celeste	R66	3G	20, 21
		Choir Gem. Celeste	1 - 61	Transistor Audio Switch	R530	1I	20, 21
8' Gedeckt	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3G	17, 18
4' Principal	Main I	Great Unit Diapason	1 - 61	Diode Gate via Transistor Switch	R66	3G	17
4' Nachthorn	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3G	17, 18
2-2/3' Nazard	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3G	17, 18
2' Blockflöte	Main I & II	Great Unit Flute	1 - 61	Diode Gate via Transistor Switch	R66	3G	17, 18
1-3/5' Tierce	Main I & II	Great Unit Flute	1 - 57	Diode Gate via Transistor Switch	R66	3G	17, 18
1' Sifflöte	Main I & II	Great Unit Flute	1 - 49	Diode Gate via Transistor Switch	R66	3G	17, 18
8' Krummhorn	Main I	Choir Krummhorn	1 - 61	Transistor Audio Switch	R311	1I	21
Harp	Main I & II	Great Unit Flute	1 - 61	Turns on 8' Gedeckt and Sustain	R269	3G & 3B	
Carillon	Main I & II	Great Unit Flute	1 - 61	Turns on 4', 2-2/3', 2' and a 6-2/5' Flute Diode Gates and Sustain	R269	3G, 3B	
8' Swell to Choir		Swell Stops	1 - 61	Multiplexed Diode Gate (Coupler)	None	3C	

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BASIC INFORMATION FOR INDIVIDUAL PEDAL STOPS

STOP	OSCILLATORS	KEYERS	KEYS	DEVICE OPERATED BY STOP TAB	LEVEL ADJUSTMENT		
					Ref. No.	Loc.	Text
32' Contra Violone	Main I	32' Contra Violone	1 - 32	Transistor Audio Switch	R798	1I	22
16' Principal	Main I	16' Pulse	1 - 32	Transistor Audio Switch	R728	1I	22
16' Subbass	Main I	16' Flute	1 - 32	Transistor Audio Switch	R768	1I	22
16' Lieblich Gedeckt	Main I	16' Flute	1 - 32	Transistor Audio Switch	R788	1I	22
16' Violone	Main I	16' Pulse	1 - 32	Transistor Audio Switch	R708	1I	22
8' Octave	Main I	Great Unit Diapason	1 - 32	Diode Gate via Transistor Switch	R66	3E	17
8' Flute	Main I & II	Great Unit Flute	1 - 32	Diode Gate via Transistor Switch	R66	3E	17, 18
8' Violone (SW)	Main I & II	Swell Unit Diapason	1 - 32	Diode Gate via Transistor Switch	R66	3E	19
4' Choralbass	Main I	Great Unit Diapason	1 - 32	Diode Gate via Transistor Switch	R66	3E	17
Mixture II	Main I	Great Unit Diapason	1 - 32	2 Diode Gates via Transistor Switch	R66	3E	17, 18
16' Bombarde	Main I	16' Pulse	1 - 32	Transistor Audio Switch	R748	1I	22
8' Trompette	Main I & II	Swell Unit Trompette	1 - 32	Diode Gate via Transistor Switch	None	3E	19
4' Clairon	Main II	Swell Unit Trompette	1 - 32	Diode Gate via Transistor Switch	None	3E	19
8' Great to Pedal		All Great	1 - 32	Multiplexed Diode Gate (Coupler)	None	3C	
8' Swell to Pedal		All Swell	1 - 32	Multiplexed Diode Gate (Coupler)	None	3C	
8' Choir to Great		All Choir	1 - 32	Multiplexed Diode Gate (Coupler)	None	3C	

BASIC INFORMATION FOR MISCELLANEOUS STOPS

STOP	COMMENTS
Main Tremulant	Turns on the FM Tremulant to all oscillators, Notes 1 and up.
Great and Choir Chiff	Turns on chiff for all Great, Choir, and Pedal Unit Flutes (not the Pedal 16' Flutes).
Main Off	Operates a relay or LDR lamp in an Echo Adaptor via a Transistor Switch.
Echo On	Same as Main Off.

TYPICAL SPEAKER CONFIGURATIONS FOR THE 330

Minimum Complement - Two Cabinets

W6-100	Combined Great/Choir/Pedal Voices
M13-100	Combined Swell Voices

Three Cabinet Installation

W6-100	Combined Pedal/Great and Choir Flute
M13-100 or W6-100	Great and Choir Diapason
M13-100	Combined Swell

Four Cabinet Installation

P2-100	Pedal
W6-100 or M13-100	Great and Choir Flute
M13-100 or W6-100	Great and Choir Diapason
M13-100	Combined Swell

Five Cabinet Installation

P2-100	Pedal
W6-100 or M13-100	Great and Choir Flute
M13-100 or W6-100	Great and Choir Diapason
M13-100	Swell Diapasons/Flutes combined
M13-100	Swell Reeds

Antiphonal

The console is provided with tabs for switching an antiphonal speaker system. By using echo adaptors, any or all channels of the organ may be switched to an antiphonal system.

LIST OF SCHEMATICS AND DRAWINGS

SPECIFICATION 330

<u>PAGE</u>	<u>NAME OF DRAWING</u>	<u>DRAWING NUMBER</u>
GENERAL		
1	Photo-Block Fold Out	
2	Console Dimensions	1276
3	Keying Chart	1243
4	Parts Location	1378
5	Coupler System	1379
AUDIO		
6	Tremulants and Oscillators	1380
7	Great Unit Diapason	1384
8	Great Unit Flute	1382
9	Great Unit Flute Mixing and Expression	1383
10	Swell Unit Diapason	1386
11	Swell Unit Flute	1385
12	Unit Trompette	1387
13	Krummhorn	1388
14	Celestes	1381
15	Pedal Signal Keyers	1389
16	Pedal Voicing and Preamps	1390
17	Pedal Output and Expression	1391
18	Output Circuitry	1392
COMBONS		
19	Page Deleted	
20	Sforzando	1271
21	Setterboard	1216
22	Reversible (moving tab)	1280
23	Capture System (moving tab)	1297
24	Capture System (moving tab)	1298
25	Capture System (lighted tabs)	1396
26	Reversible (lighted tabs)	1401

LIST OF SCHEMATICS AND DRAWINGS

SPECIFICATION 330

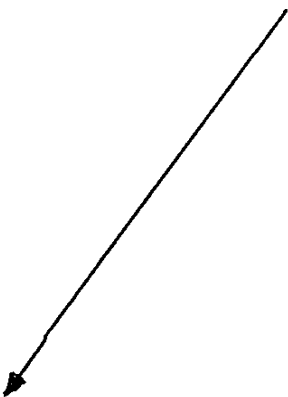
<u>PAGE</u>	<u>NAME OF DRAWING</u>	<u>DRAWING NUMBER</u>
	POWER SUPPLIES AND AIR SOUND	
28	Power Supply	1192
29	Air Sound	1393
	ACCESSORIES	
30	EN-II 330 Practice Panel	
31	EC-II Single Channel Echo Adaptor	1180
32	EC- VI Multichannel Echo Adaptor	1413
33	Transposer	1404
	AMPLIFIERS AND SPEAKERS	
34	S-100 Amplifier	1200
35	W-6 Speaker System	1314
36	M-13 Speaker System	1247

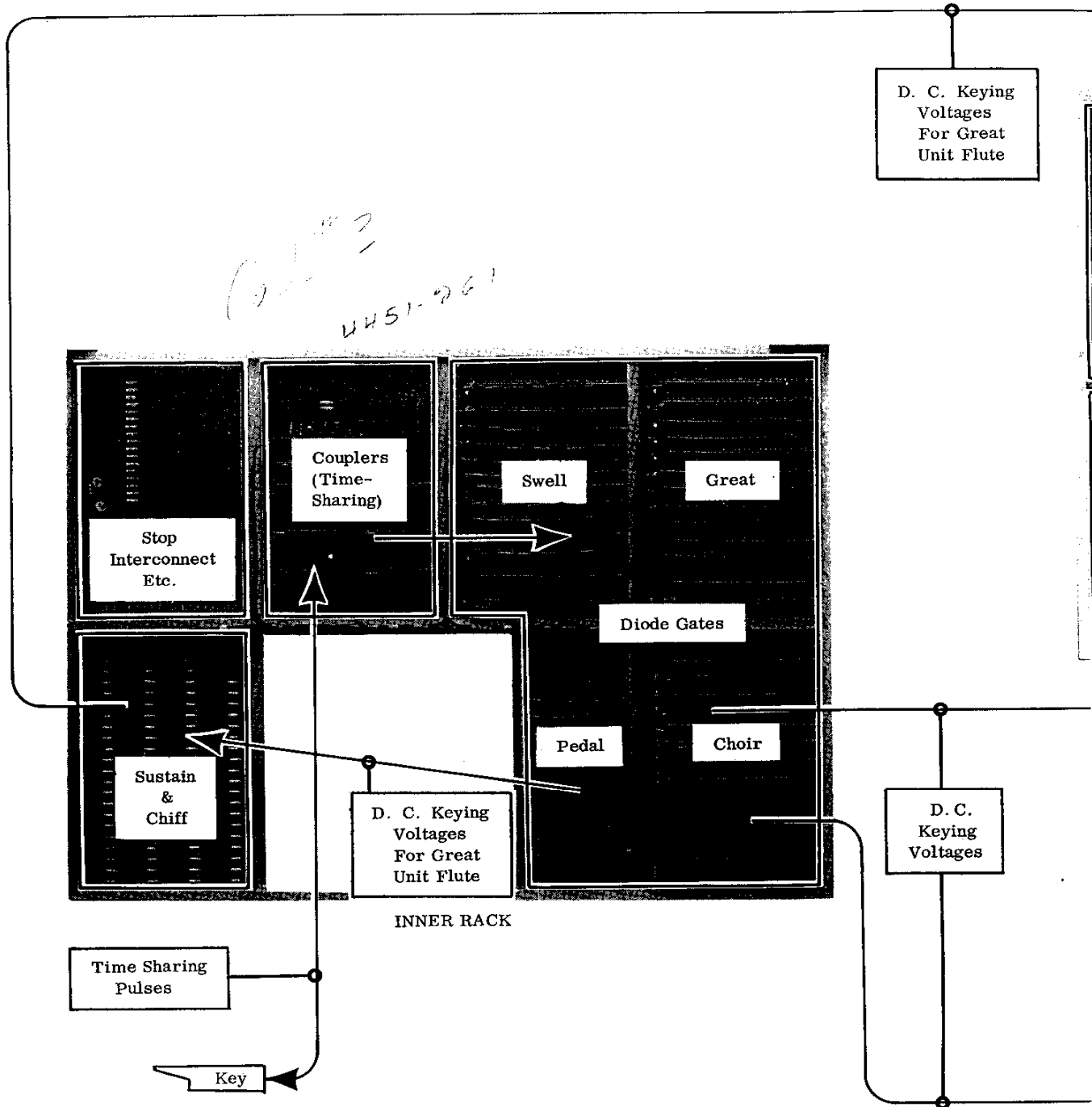
The Photo-Block Diagram on the inside of this Fold-Out shows:

1. The locations of major circuits.
2. Signal and Keying flow.

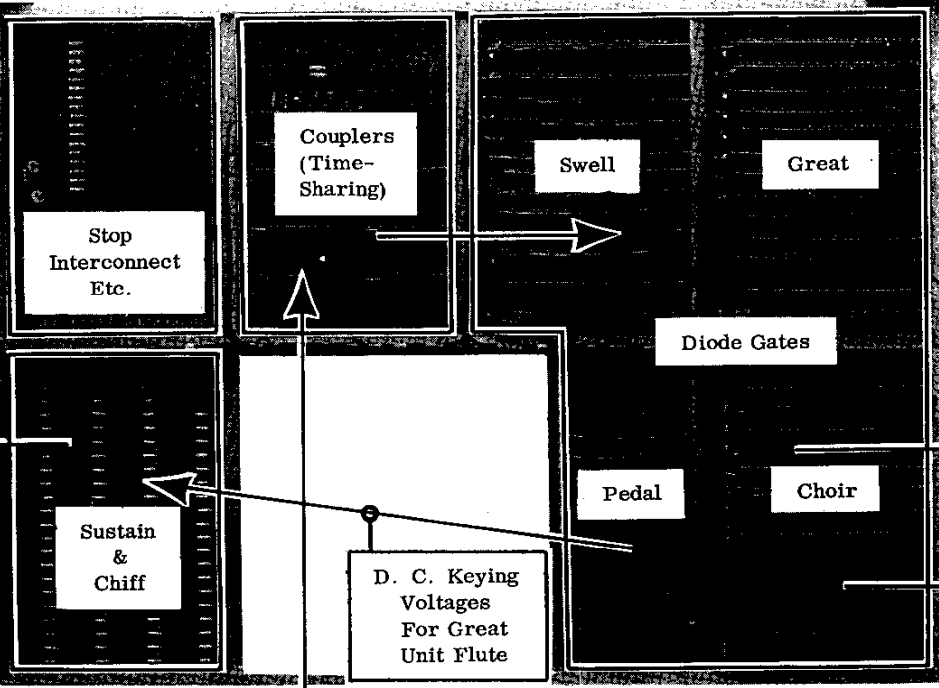
For locations of Adjustments, refer to the photos on page 25 of the text.

Fold-Out for Photo-Block Diagram.





D. C. Keying Voltages For Great Unit Flute

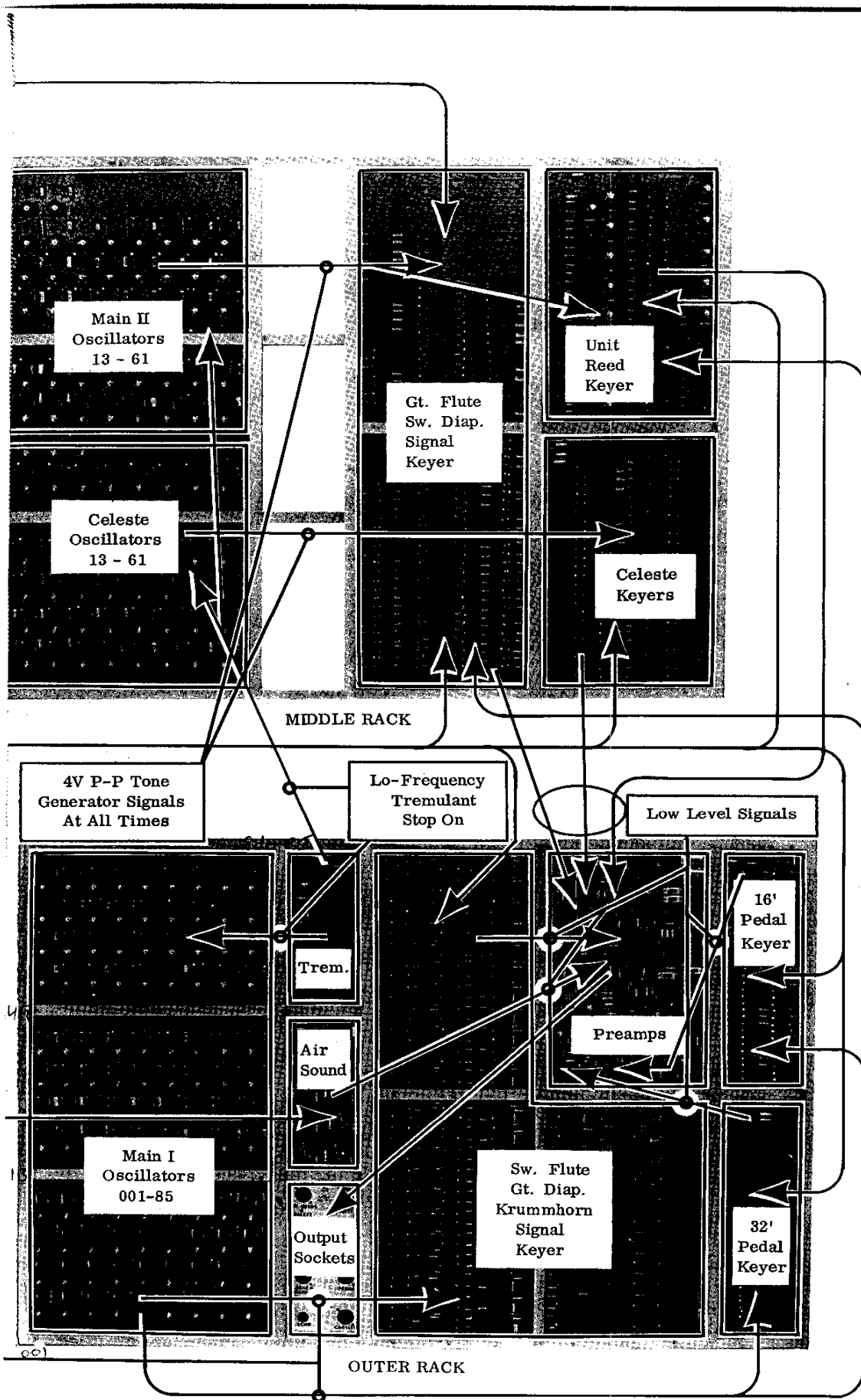


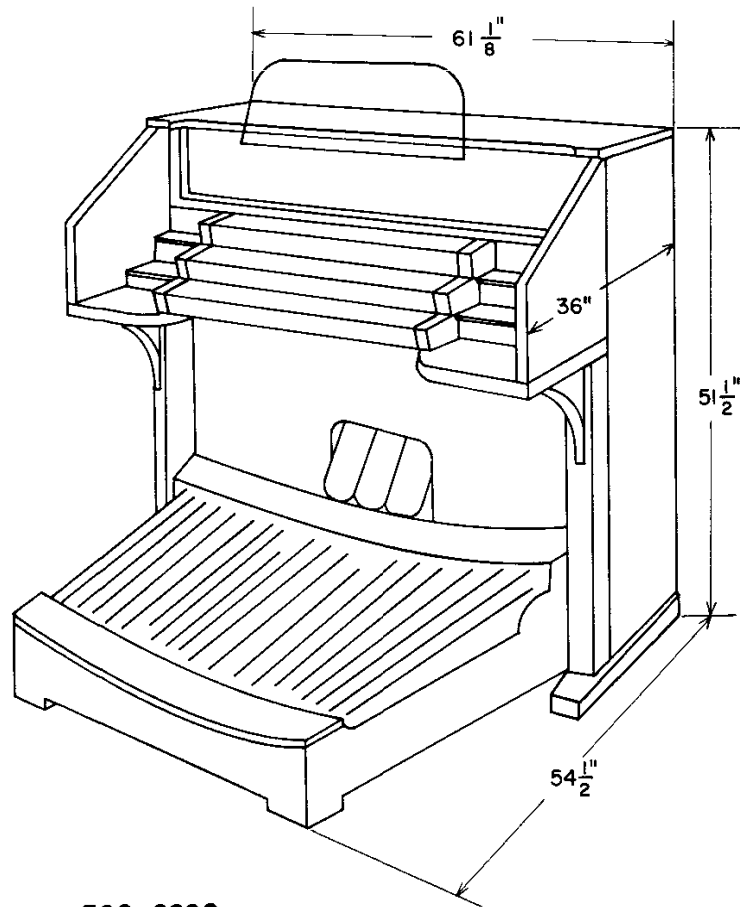
D. C. Keying Voltages

Time Sharing Pulses

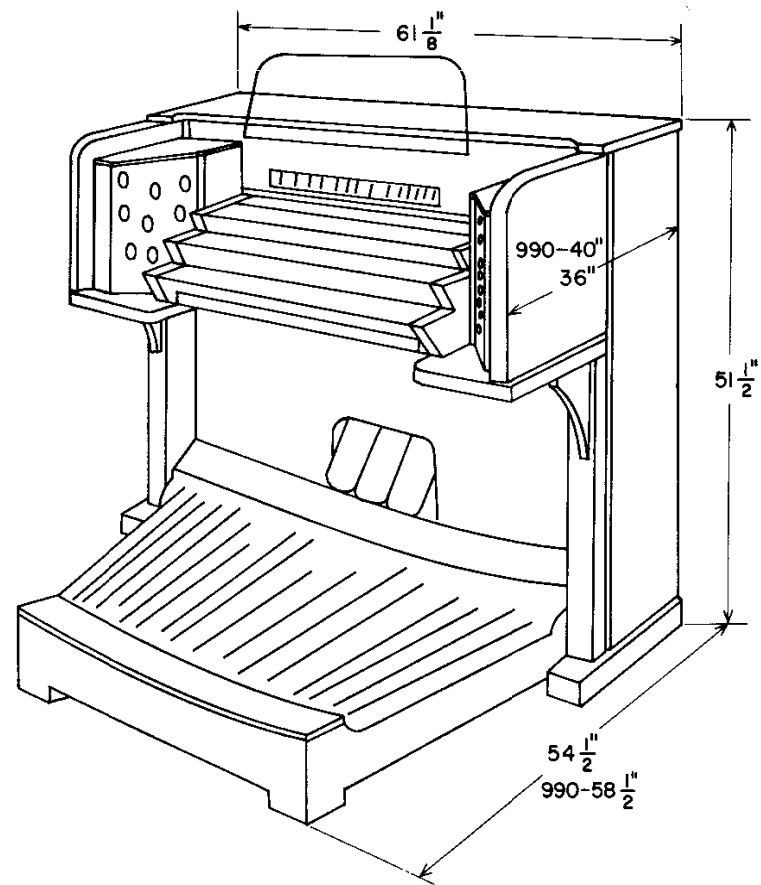
Key

4V P-P Tone Generator Signal At All Times





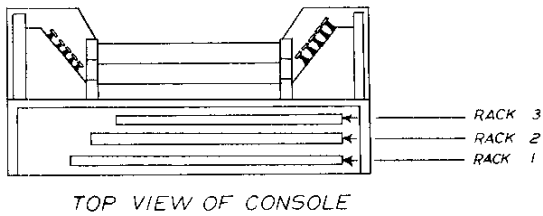
**32C, 660C
CONSOLE**



**32D, 660D, 990D, 990C
CONSOLE**

2

REVISIONS				
B 1028-68 WJ ERRORS				
A 9-30-68 WJ NAME CHANGES				
REPLACES DWG.'S 1238 & 1239				
LTR	DATE	BY	DESCRIPTION	
RODGERS ORGAN COMPANY				
DRAWN	DATE	SCALE	MODEL	DWG. NO.
DMV	4-2-68	60		1276B
TITLE				
32C/D 660C/D, 990C ORGAN CONSOLE				



2-A	2-D	2-G	2-I
2-B	2-E		
2-C	2-F	2-H	2-J

RACK 2

1-A	1-D	1-G	1-I	1-K
1-B	1-E			
1-C	1-F	1-H	1-J	1-L

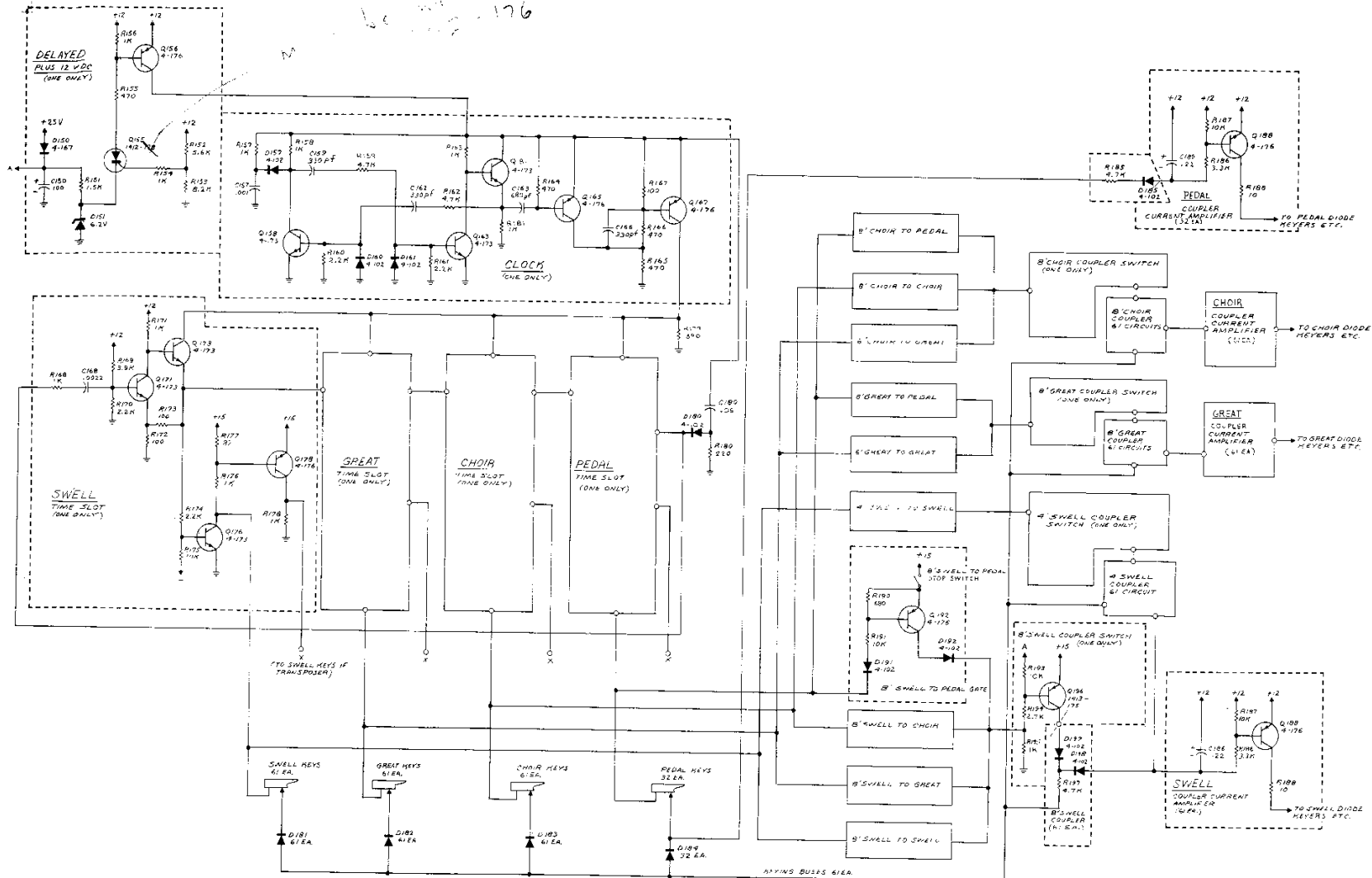
RACK 1

3-A	3-C	3-D	3-F
3-B		3-E	3-G

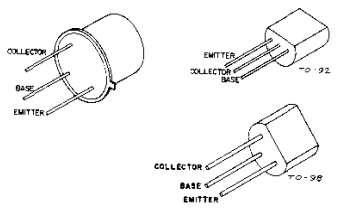
RACK 3

4

LTR	DATE	BY	DESCRIPTION	
REVISIONS				
RODGERS ORGAN COMPANY				
DRAWN	DATE	SCALE	MODEL	DWG. NO.
J.D.W.	4-28-71	40	330	1378
CHECKED	DATE	PRJ. ENG.	ENG. MRG.	REL. DATE
TITLE PARTS LOCATION				



5

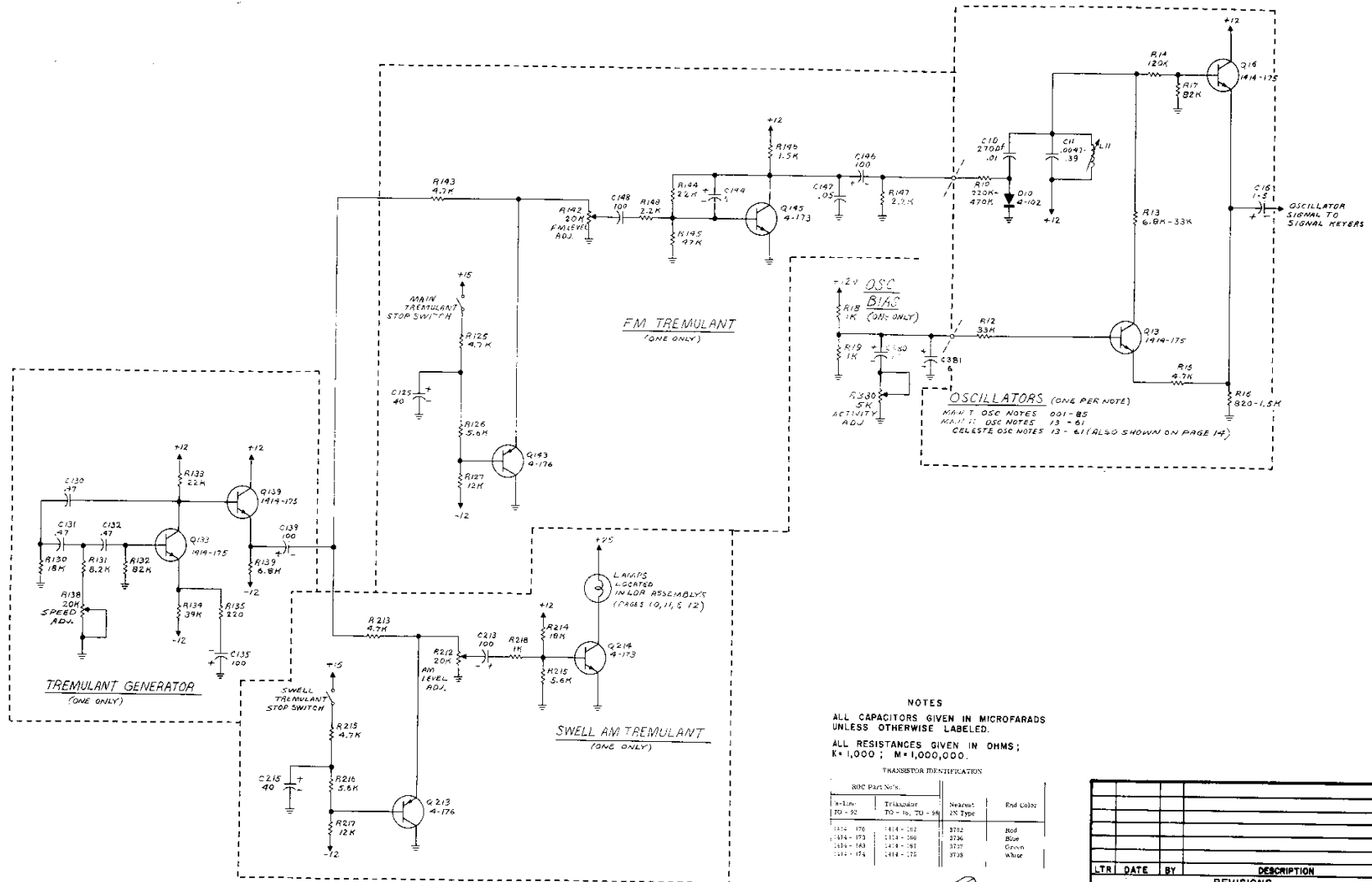


NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.

TRANSISTOR IDENTIFICATION

Part No.	Manufacturer	Meaning	Part No.
2N41	2N	2N41-100	2N41
2N42	2N	2N42-100	2N42
2N43	2N	2N43-100	2N43
2N44	2N	2N44-100	2N44
2N45	2N	2N45-100	2N45
2N46	2N	2N46-100	2N46
2N47	2N	2N47-100	2N47
2N48	2N	2N48-100	2N48
2N49	2N	2N49-100	2N49

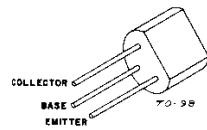
A 11-8-71 GM 1005-316-3170-3158-3 65				
LR DATE	BY DESCRIPTION			
REVISIONS				
RODGERS ORGAN COMPANY				
DRAWN J.D.W.	DATE 5-18-71	SCALE 25	MODEL 33C	DWG. NO. 1379A
CHECKED	DATE	PRJ. ENG.	ENG. MFG.	REL. DATE
TITLE COUPLER SYSTEM				



NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.

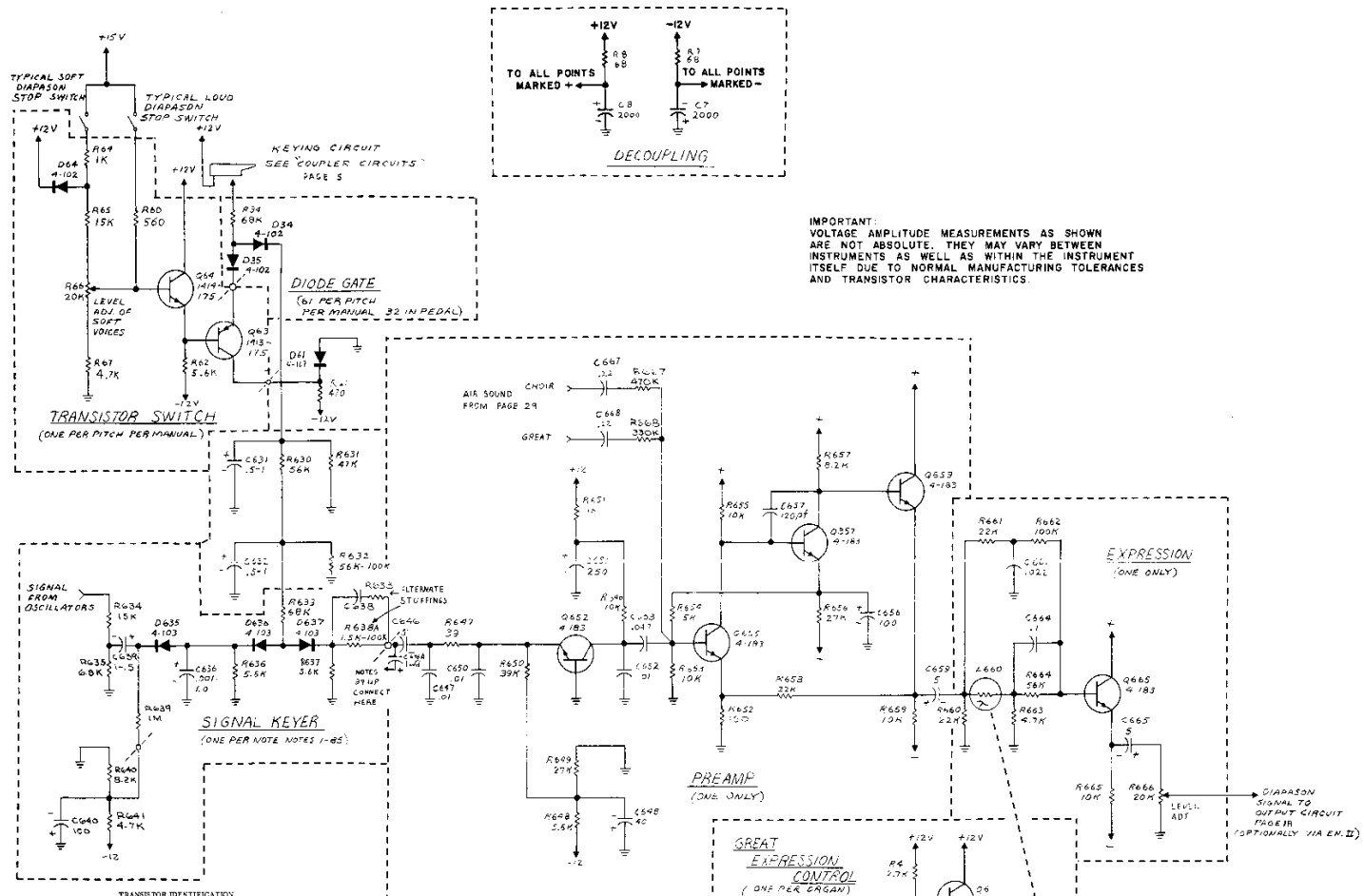
TRANSISTOR IDENTIFICATION

ROD Part No.	Transistor	Nearest AN Type	End Color
141-176	141-176	2N3055	Red
141-177	141-177	2N3055	Blue
141-178	141-178	2N3055	Green
141-179	141-179	2N3055	White



LTR		DATE	BY	DESCRIPTION
REVISIONS				
RODGERS ORGAN COMPANY				
DRAWN	DATE	SCALE	MODEL	DWG. NO.
J.D.V.	5/4-71	30	330	1380
CHECKED	DATE	PRJ. ENG.	ENG. MGR.	REL. DATE
TITLE <u>OSC./TREMULANTS</u>				

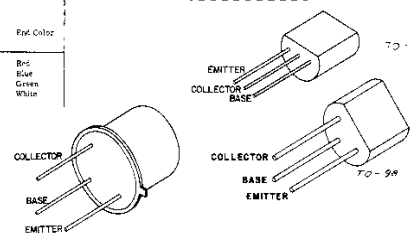
9



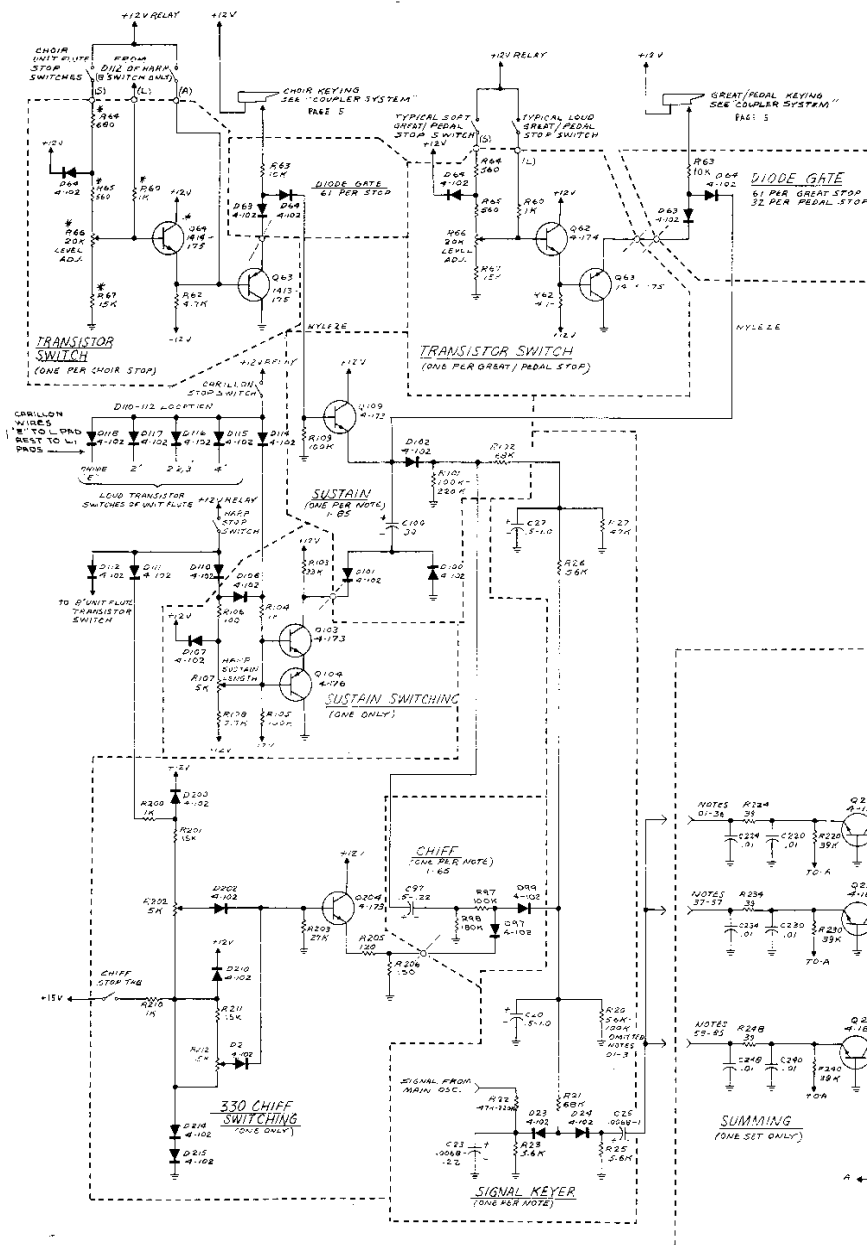
IMPORTANT VOLTAGE AMPLITUDE MEASUREMENTS AS SHOWN ARE NOT ABSOLUTE. THEY MAY VARY BETWEEN INSTRUMENTS AS WELL AS WITHIN THE INSTRUMENT ITSELF DUE TO NORMAL MANUFACTURING TOLERANCES AND TRANSISTOR CHARACTERISTICS.

TRANSISTOR IDENTIFICATION

RU-Part No.	Transistor TO-18, TO-18A	Neccessary 2N Type	Part Color
1414-126	1414-162	2N10	Brown
1414-173	1414-166	2N106	Blue
1414-193	1414-167	2N107	Green
1414-214	1414-173	2N108	White



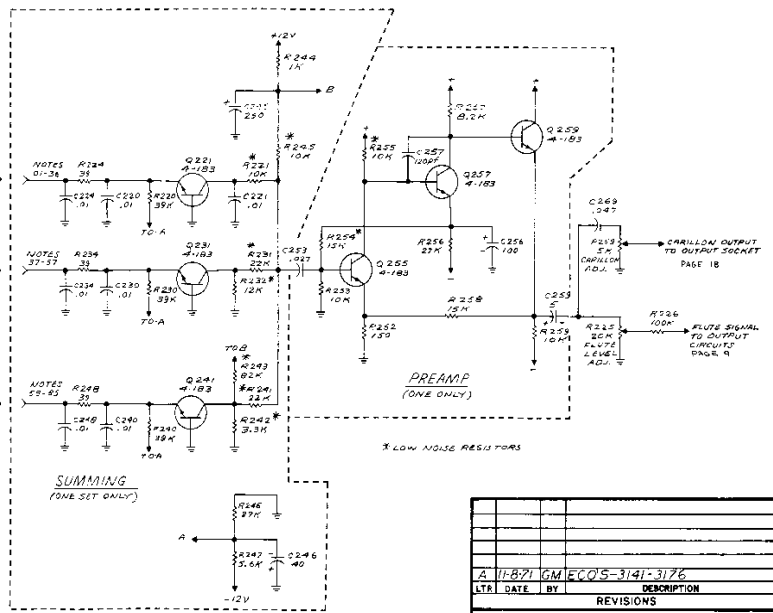
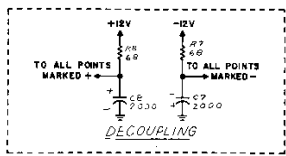
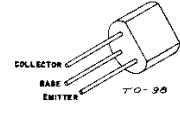
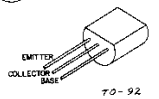
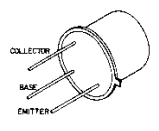
DRAWN		DATE		SCALE		MODEL		DWG. NO.	
J.D.W.		5-13-71		30		330		1384 B	
CHECKED		DATE		PRJ. ENG.		ENG. MGR.		REL. DATE	
TITLE GREAT UNIT DIAPASON									



NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.

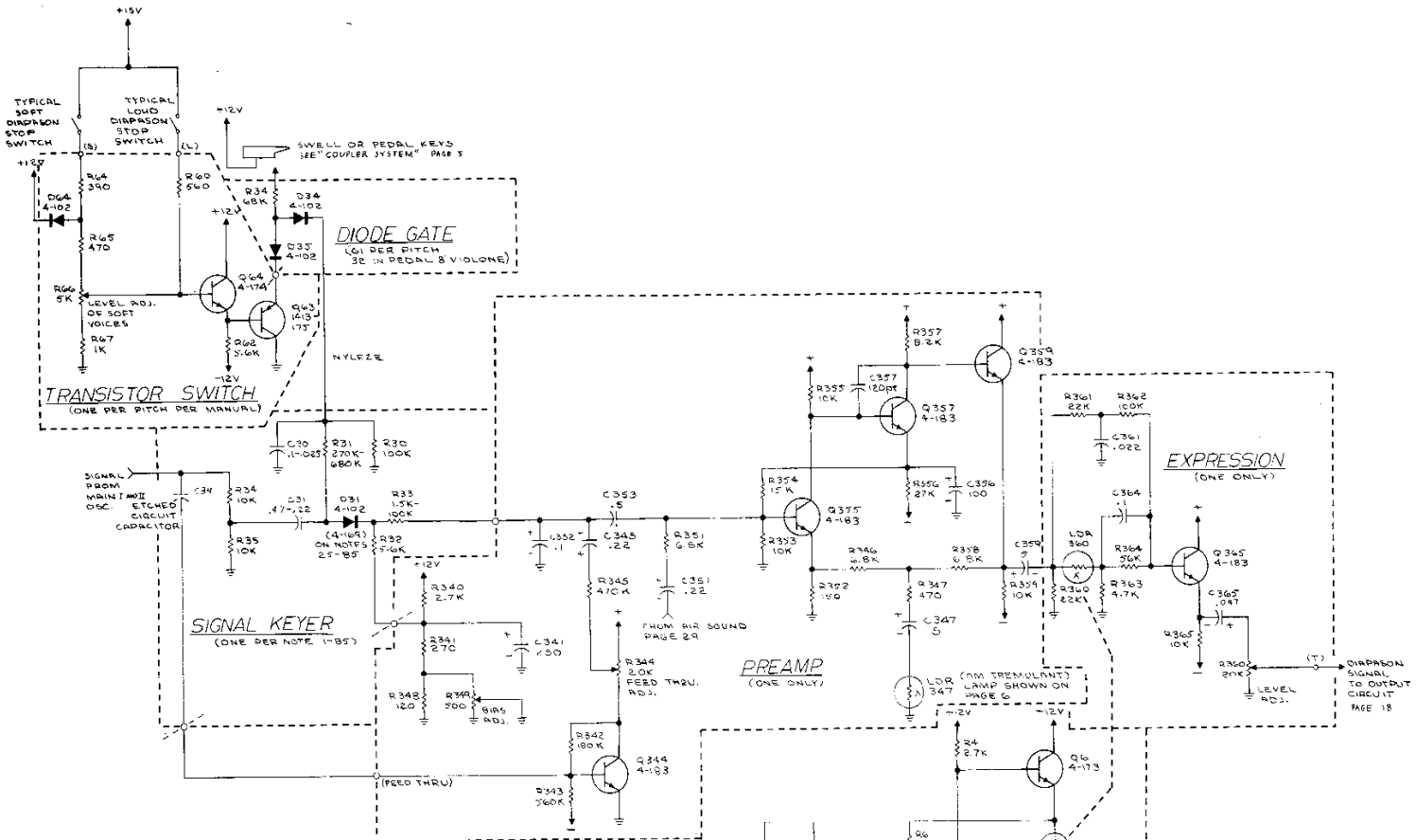
TRANSISTOR IDENTIFICATION

TOC Part No.	TOC Part No.	TOC Part No.	TOC Part No.
1141-116	1141-117	1141-118	1141-119
1141-120	1141-121	1141-122	1141-123
1141-124	1141-125	1141-126	1141-127
1141-128	1141-129	1141-130	1141-131

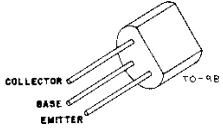
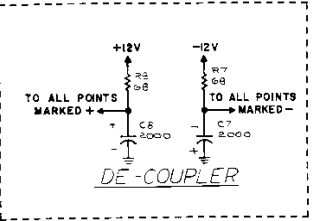
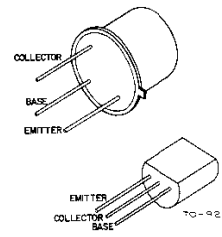


REVISIONS			
DATE	BY	DESCRIPTION	
RODGERS ORGAN COMPANY			
DRW. NO.	DATE	SCALE	MODEL
JCW	7-29-71	25	330
CHECKED	DATE	PRJ. ENGR.	REL. DATE
TITLE GREAT UNIT FLUTE 330			





NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.

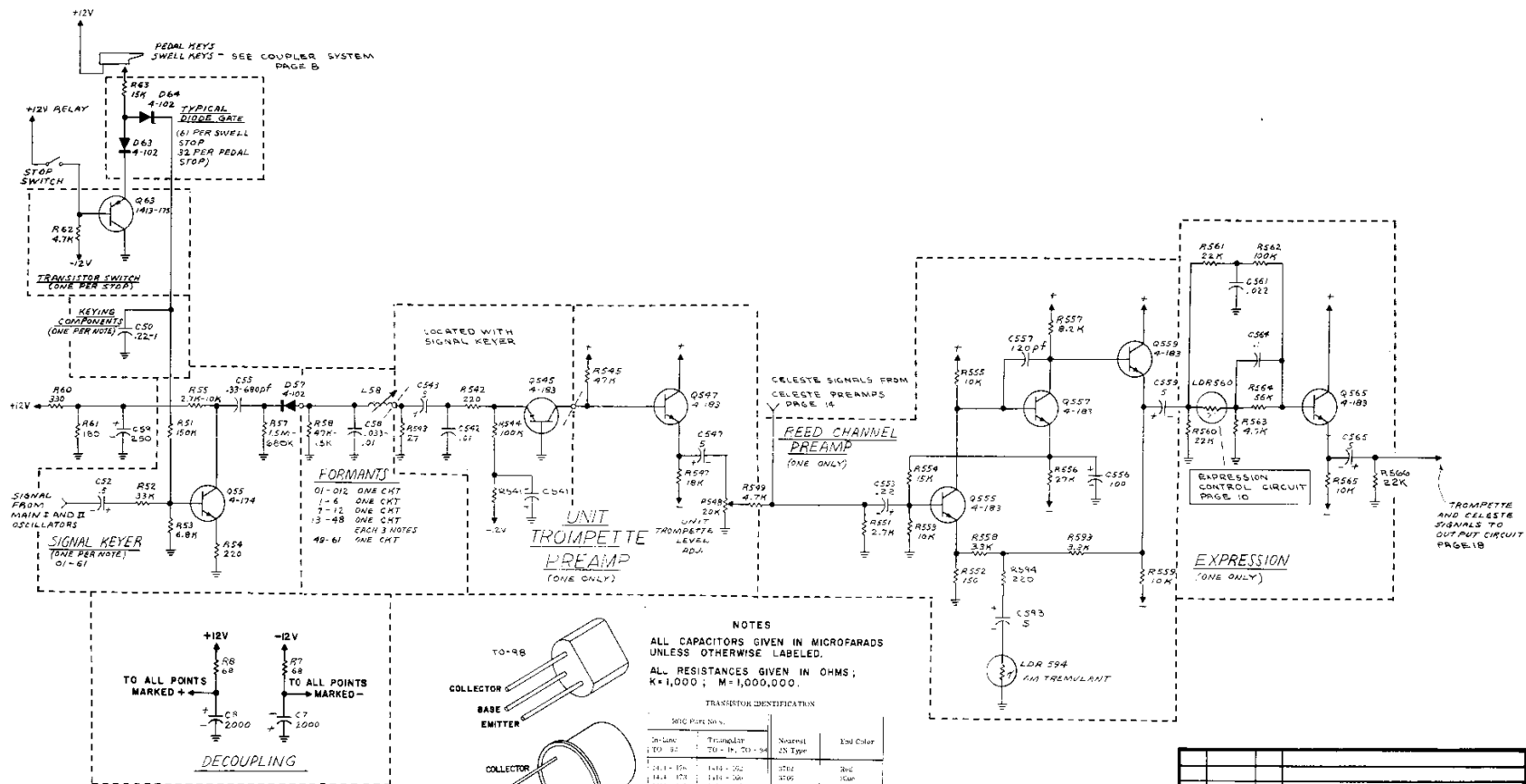


TRANSISTOR IDENTIFICATION

Dr-Line TU-92	Transistor 70-18, TO-18	Nearest 2S Type	Lead Color
111-125	414-162	3502	Red
141-173	5114-168	3504	Blue
142-169	3114-167	3505	Green
143-174	4114-173	3506	White

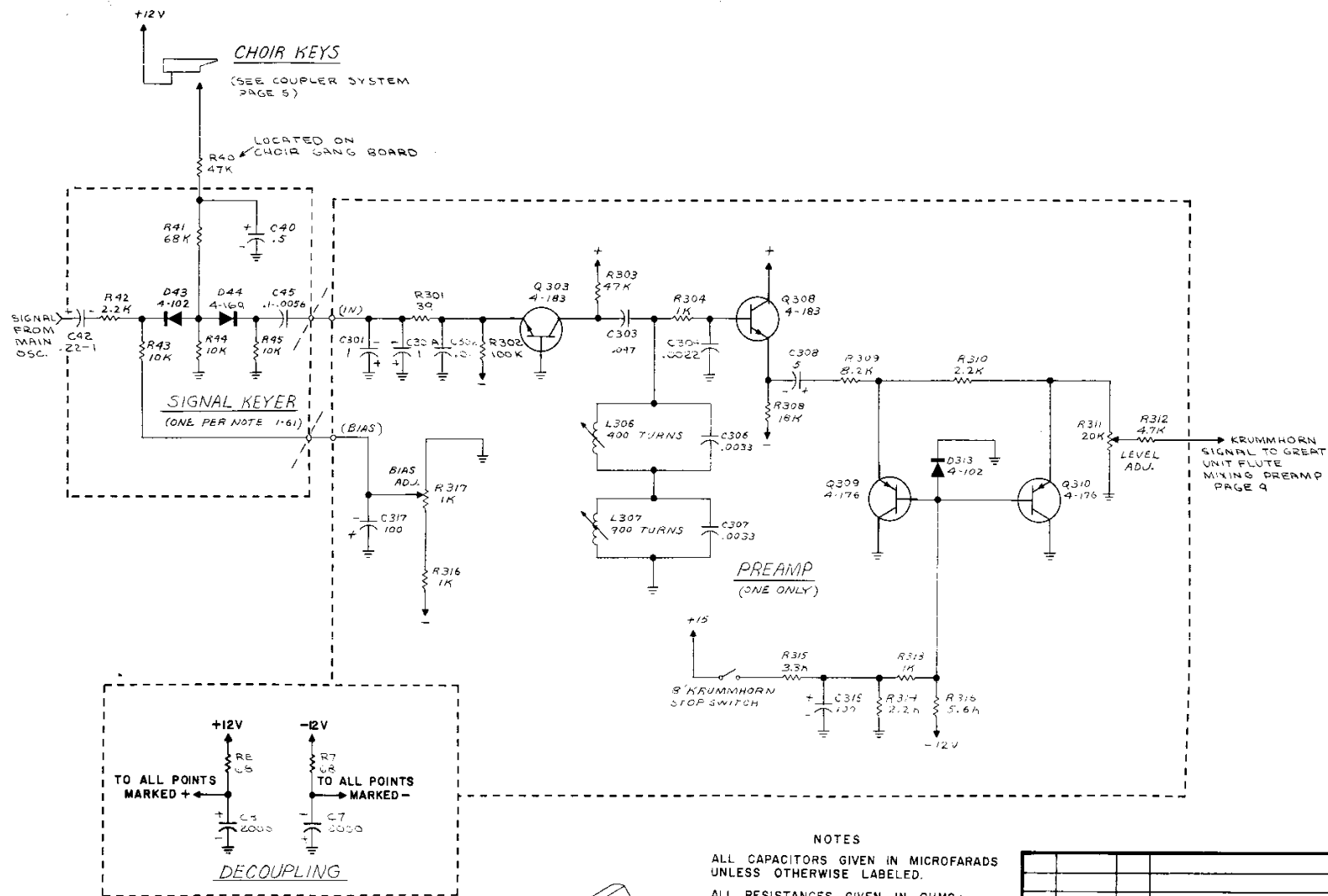
DRAWN		DATE		SCALE		MODEL		DWG. NO.	
GGM		6-1-71		30		330		1386B	
CHECKED		DATE		PRJ. ENG.		ENG. MRS.		REL. DATE	
TITLE SWELL UNIT DIAPASON 330									

10



12

A 11-8-71 GMECO5-3139-3152				
LTR. DATE		BY DESCRIPTION		
REVISIONS				
RODGERS ORGAN COMPANY				
DRAWN	DATE	SCALE	MODEL	DWG. NO.
J.O.W.	6-2-71	30	330	1387A
CHECKED	DATE	PRJ. ENG.	ENG. MRG.	REL. DATE
TITLE UNIT TROMPETTE/REEDPREAMP				



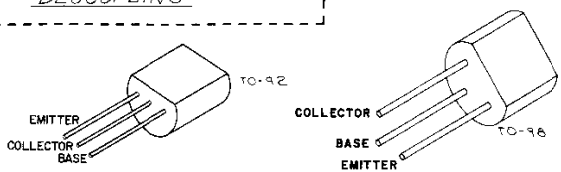
NOTES

ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED.

ALL RESISTANCES GIVEN IN OHMS; K=1,000; M=1,000,000.

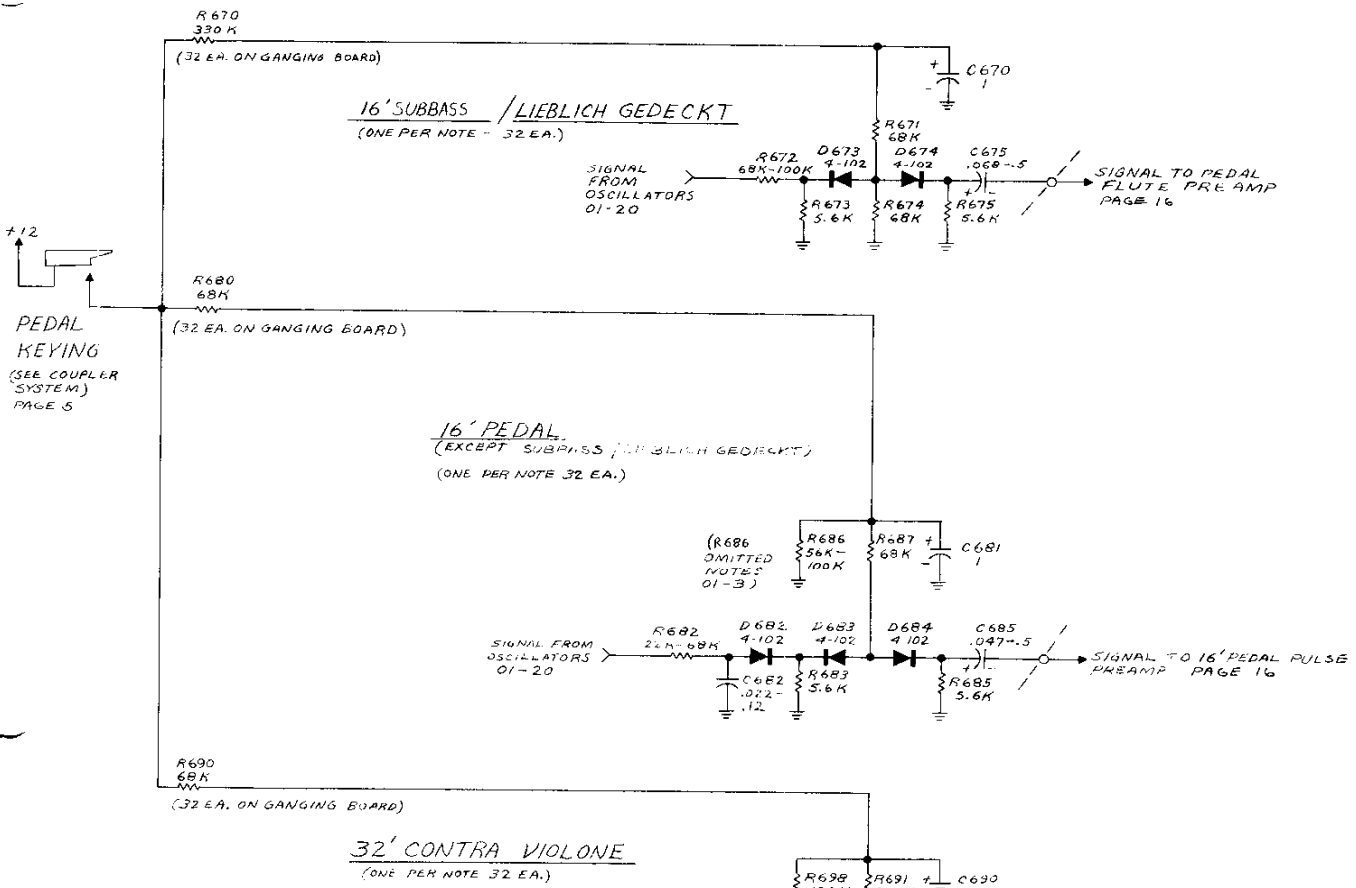
TRANSISTOR IDENTIFICATION

IWC Part No's.			
In-Line TO-92	Triangular TO-18, TO-98	Nearest 2N Type	End Color
1414-176	1414-162	3702	Red
1414-170	1414-166	3706	Blue
1414-182	1414-167	3709	Green
1414-174	1414-175	3708	White



13

A		11-9-71	GM	ECO'S-3143-3144-3173
LTR	DATE	BY	DESCRIPTION	
REVISIONS				
RODGERS ORGAN COMPANY				
DRAWN	DATE	SCALE	MODEL	DWG. NO.
J.D.W.	5/4/71	40	330	1388A
CHECKED	DATE	PR. ENG.	ENG. MRG.	REL. DATE
TITLE KRUMMHORN 330				

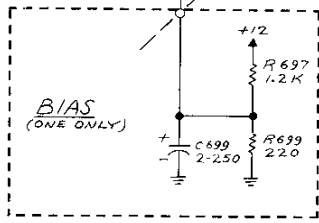
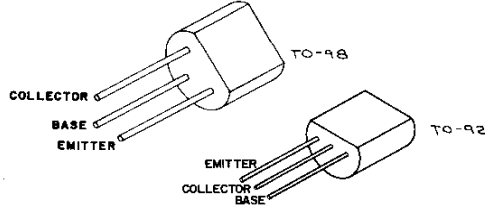


NOTES

ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED.
ALL RESISTANCES GIVEN IN OHMS;
K=1,000; M=1,000,000.

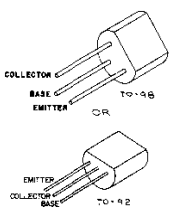
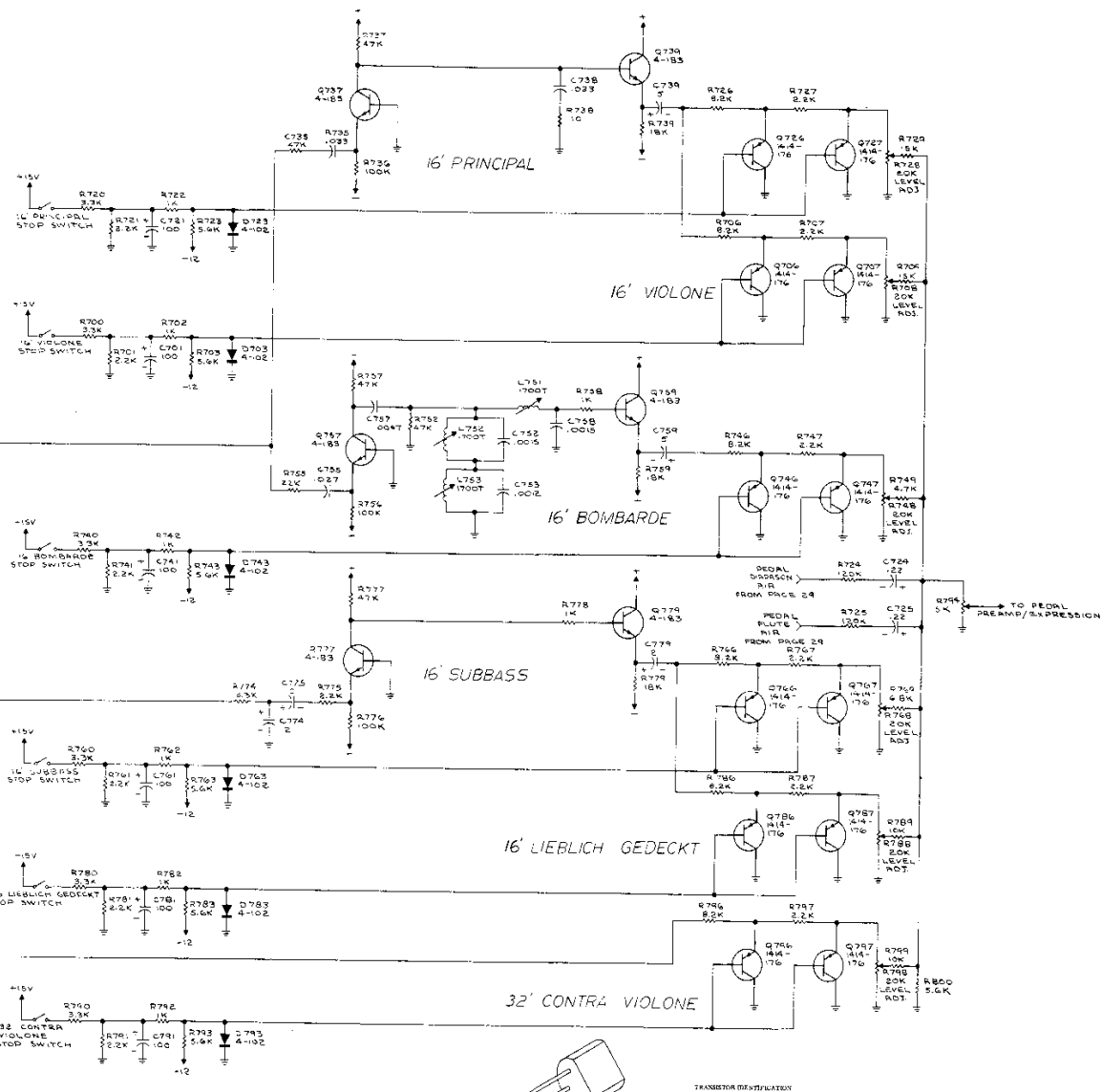
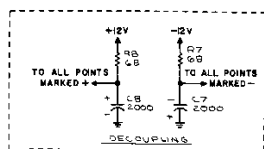
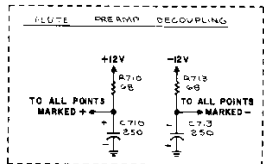
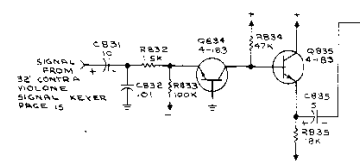
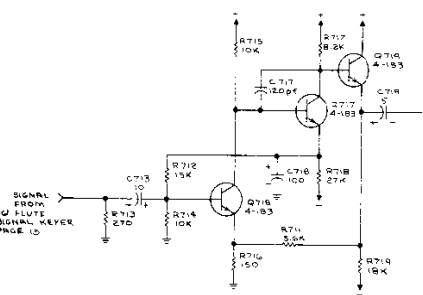
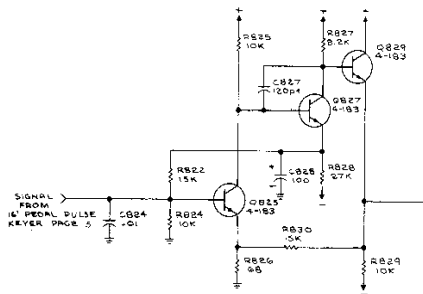
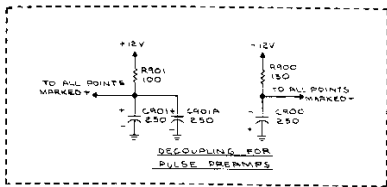
TRANSISTOR IDENTIFICATION

IOC Part No's.			
In-Line TO-92	Triangular TO-18, TO-98	Nearest 2N Type	End Color
1414 - 176	1414 - 162	3702	Red
1414 - 173	1414 - 166	3706	Blue
1414 - 183	1414 - 167	3707	Green
1414 - 174	1414 - 175	3708	White



15

DRAWN		DATE		SCALE		MODEL		REV. NO.	
J.D.W.		8-6-71		40		330		1389B	
CHECKED		DATE		PAC. ENG.		ENCL. MGR.		REL. DATE	
TITLE PEDAL SIGNAL KEYS									

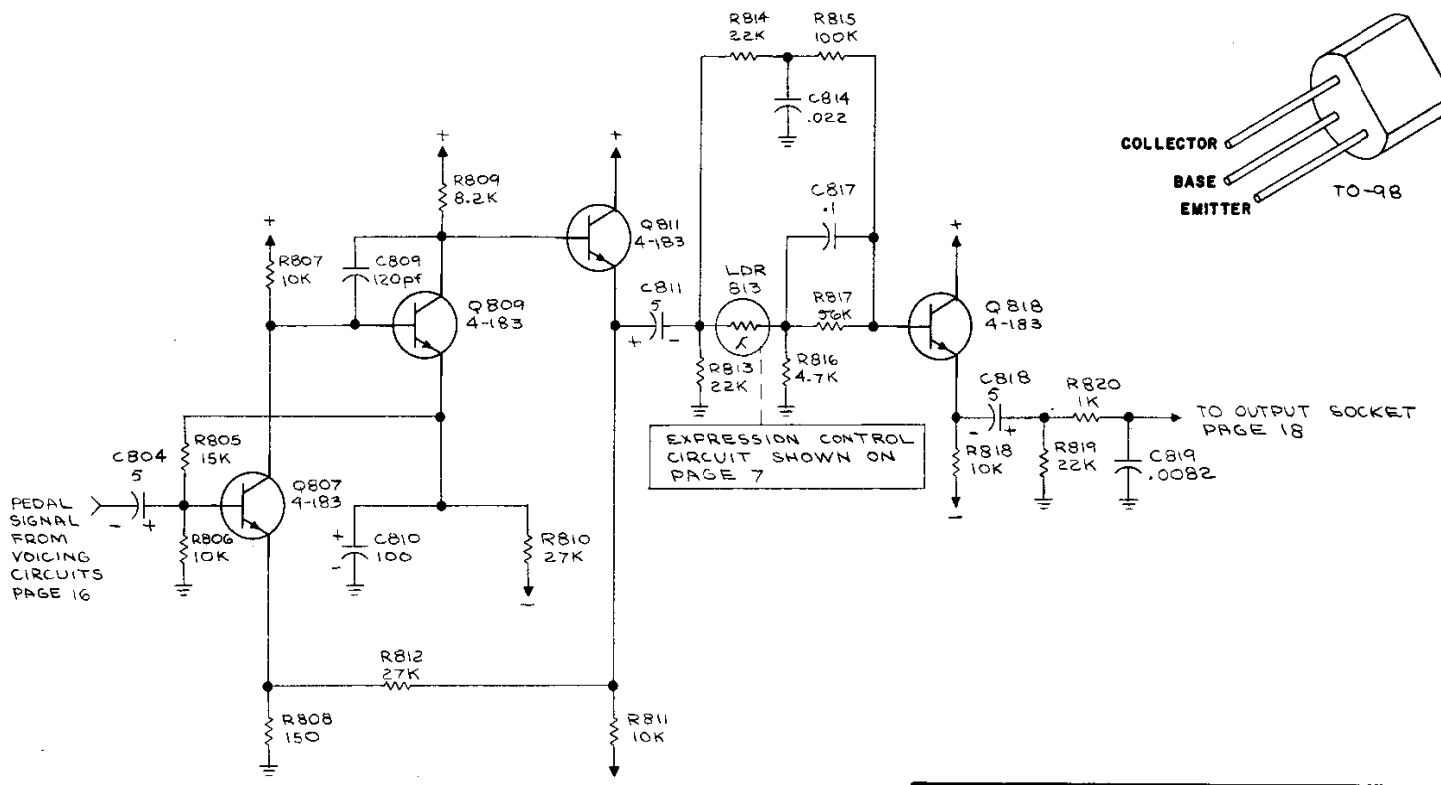


TRANSISTOR SUBSTITUTION				
PART NO.				
Part No.	Transistor	Power	Notes	End Date
20-12	TO-18	2N 704		
16A-175	16A-180	2N704	Res	
16A-175	16A-180	2N704	Res	
16A-175	16A-180	2N704	Res	
16A-175	16A-180	2N704	Res	

NOTES
ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED.
ALL RESISTANCES GIVEN IN OHMS; K=1,000; M=1,000,000.

RODGERS ORGAN COMPANY				
Design	DATE	SCALE	MODEL	DWG. NO.
6-28-71	6-28-71	25	330	1390A
CHECKED	DATE	PRG. ENR.	ENG. WKS.	REL. DATE
TITLE PEDAL VOICING 330				

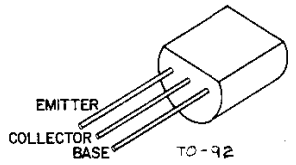
16



PEDAL SIGNAL FROM VOICING CIRCUITS PAGE 16

EXPRESSION CONTROL CIRCUIT SHOWN ON PAGE 7

TO OUTPUT SOCKET PAGE 18



TRANSISTOR IDENTIFICATION

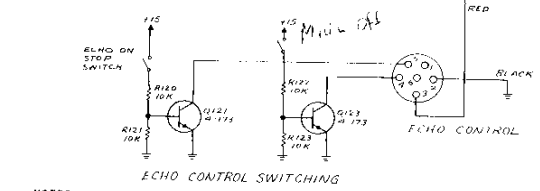
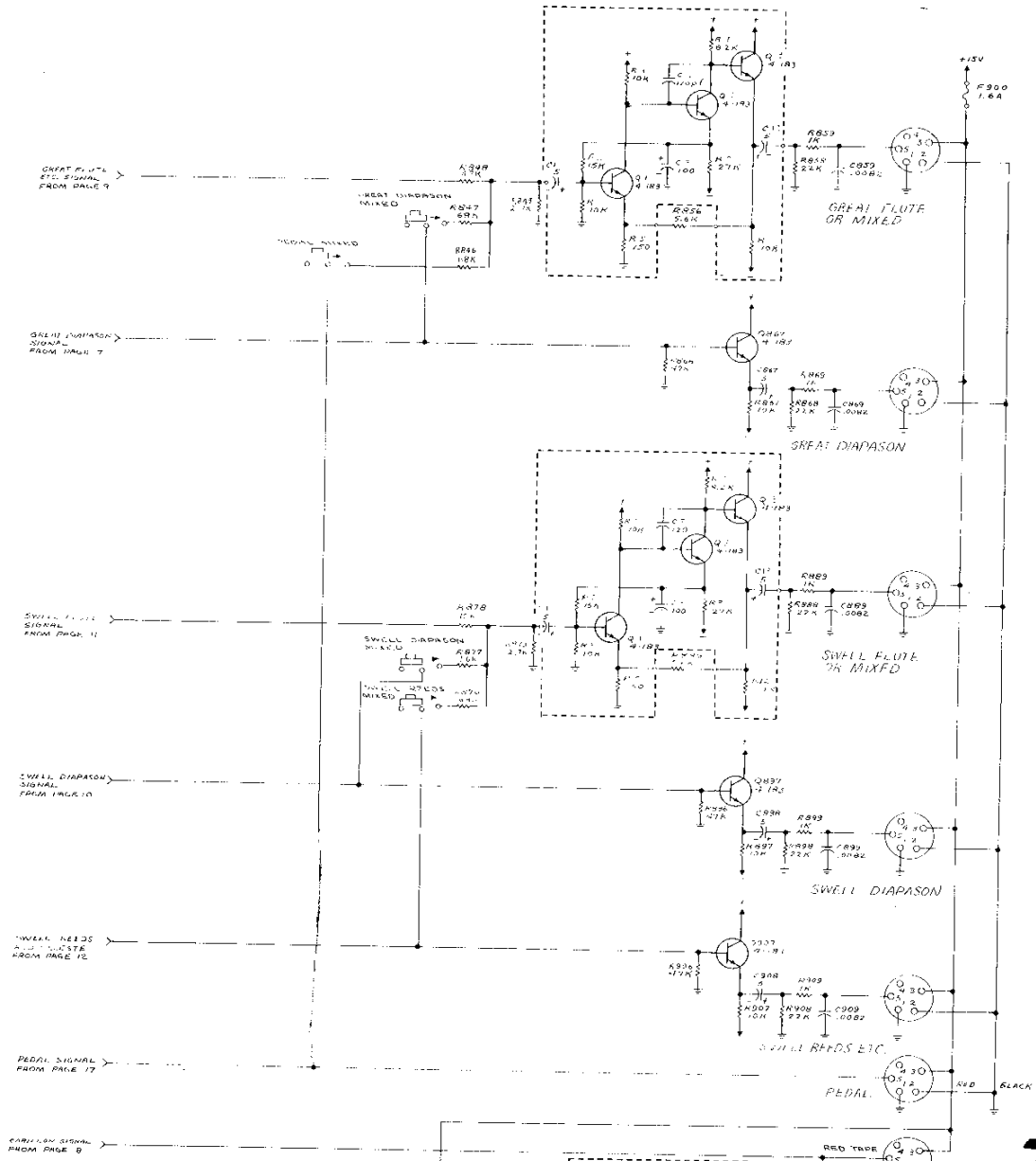
ROC Part No's.			
In-Line TO - 92	Triangular TO - 18, TO - 98	Nearest 2N Type	End Color
1414 - 176	1414 - 182	3702	Red
1414 - 173	1414 - 186	3706	Blue
1414 - 183	1414 - 187	3707	Green
1414 - 174	1414 - 175	3708	White

NOTES

ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K = 1,000 ; M = 1,000,000.

A 11-9-71 GM ECO-3146				
LTR	DATE	BY	DESCRIPTION	
REVISIONS.				
RODGERS ORGAN COMPANY				
DRAWN GGM	DATE 5-18-71	SCALE 50	MODEL 330	DWG. NO. 1391A
CHECKED	DATE	PRJ. ENG.	ENG. MRG.	REL. DATE
TITLE PED. OUTPUT/EXPRESSION 330				

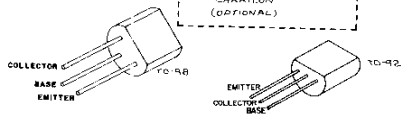
17



NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.

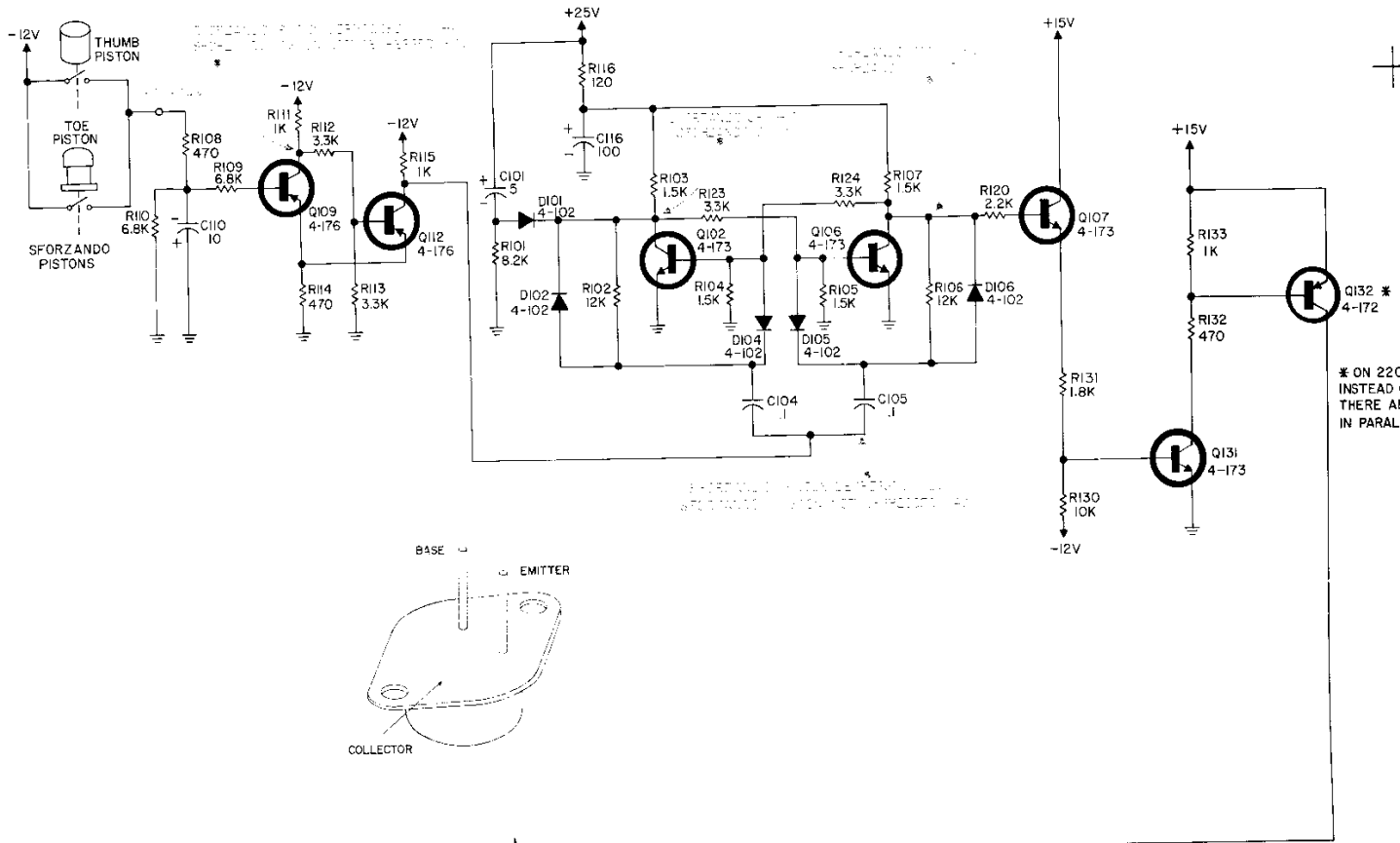
TRANSISTOR IDENTIFICATION

Part No.	Transistor	Number	End Color
1418-14	1414-122	3182	Red
1419-15	1414-123	3183	Blue
1420-16	1414-124	3184	Green
1421-17	1414-125	3185	White

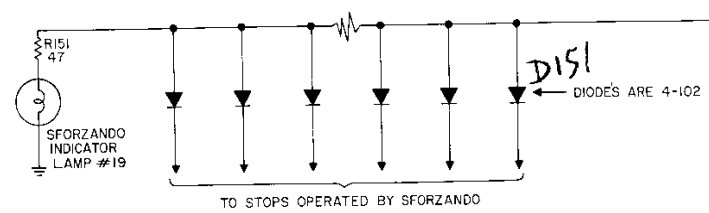
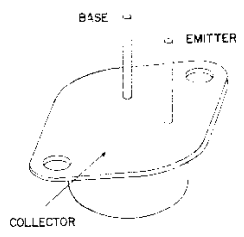


18

A 115-71 GM EGO-3153		DESCRIPTION	
DATE	BY	DATE	BY
REVISIONS			
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
JDW	6-15-71	25	330
CHECKED	DATE	PRJ. ENG.	ENG. MGR.
TITLE OUTPUT 330		DWG. NO. 1392A	
		REL. DATE	



* ON 220
INSTEAD OF ONE 4-172
THERE ARE TWO 4-172
IN PARALLEL.



IMPORTANT:
VOLTAGE AND CURRENT MEASUREMENTS AS SHOWN
ARE NOT ABSOLUTE. THEY MAY VARY BETWEEN
INSTRUMENTS AS WELL AS WITH THE INSTRUMENT
USED. USE OF NORMAL MANUFACTURING TOLERANCES
MAY TRANSFER CHARACTERISTICS.

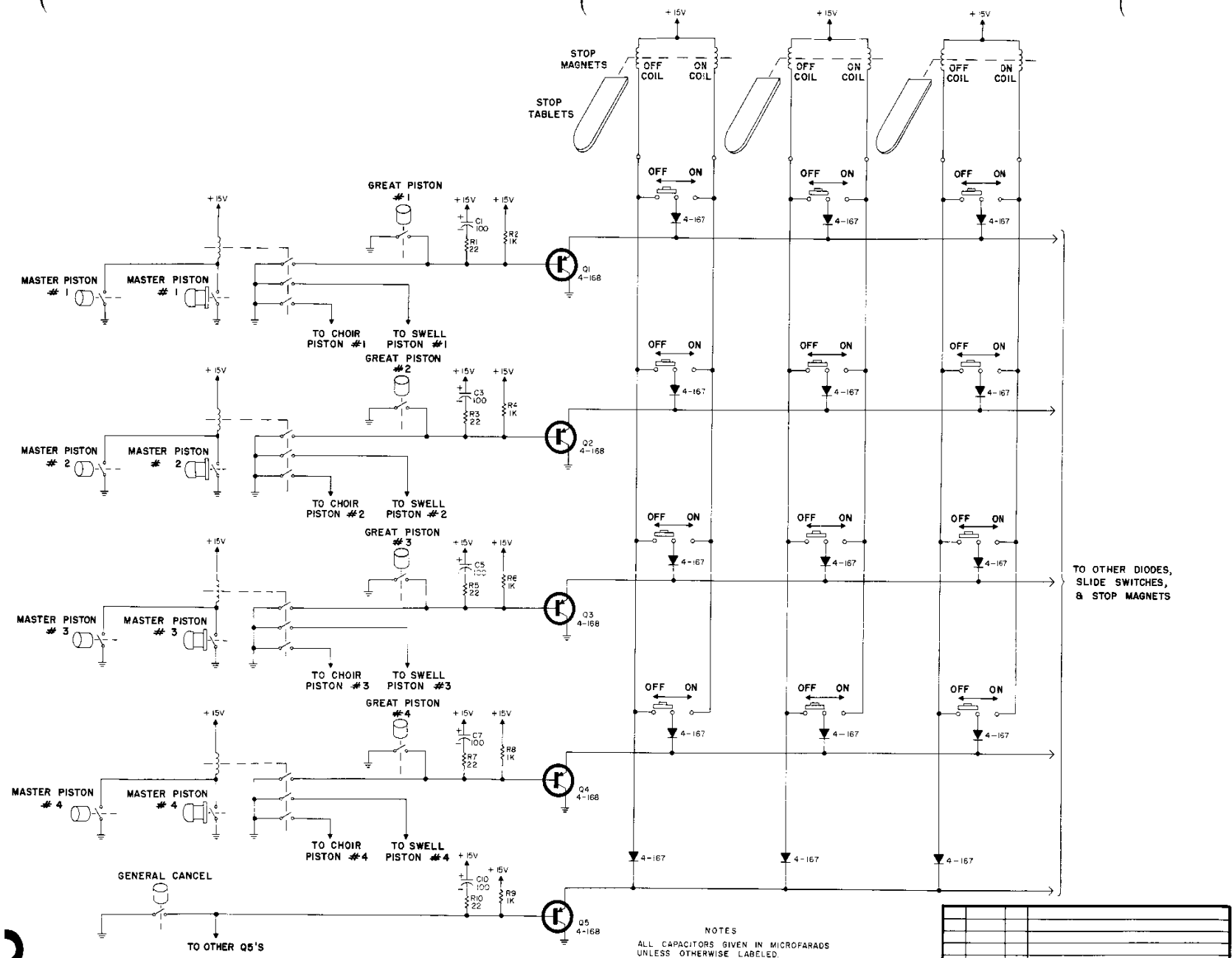
NOTES
ALL CAPACITORS GIVEN IN MICROFARADS
UNLESS OTHERWISE LABELED.
ALL RESISTANCES GIVEN IN OHMS;
K=1,000; M=1,000,000.

DWG. 1271E

REVISIONS			
REV	DATE	BY	DESCRIPTION
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
WRU	3-15-68	40	1271E
TITLE			
SILICON SFORZANDO OR TUTTI			

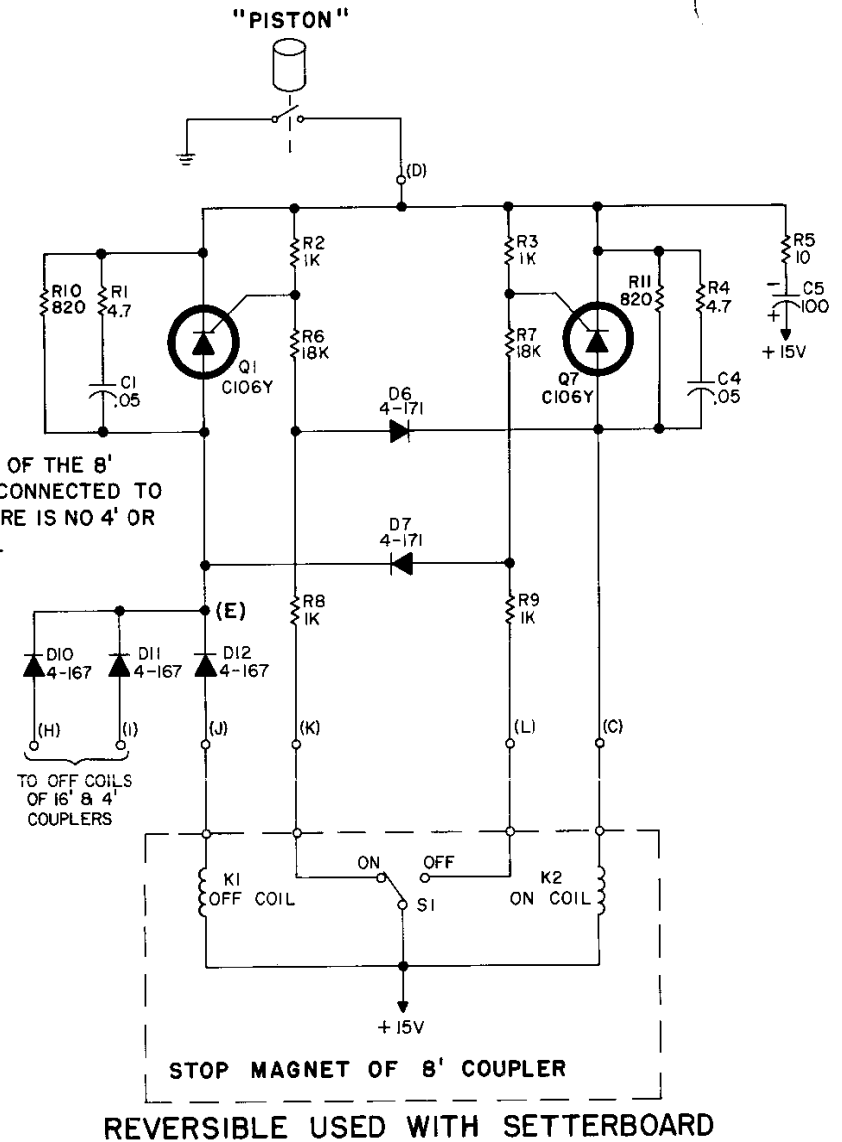
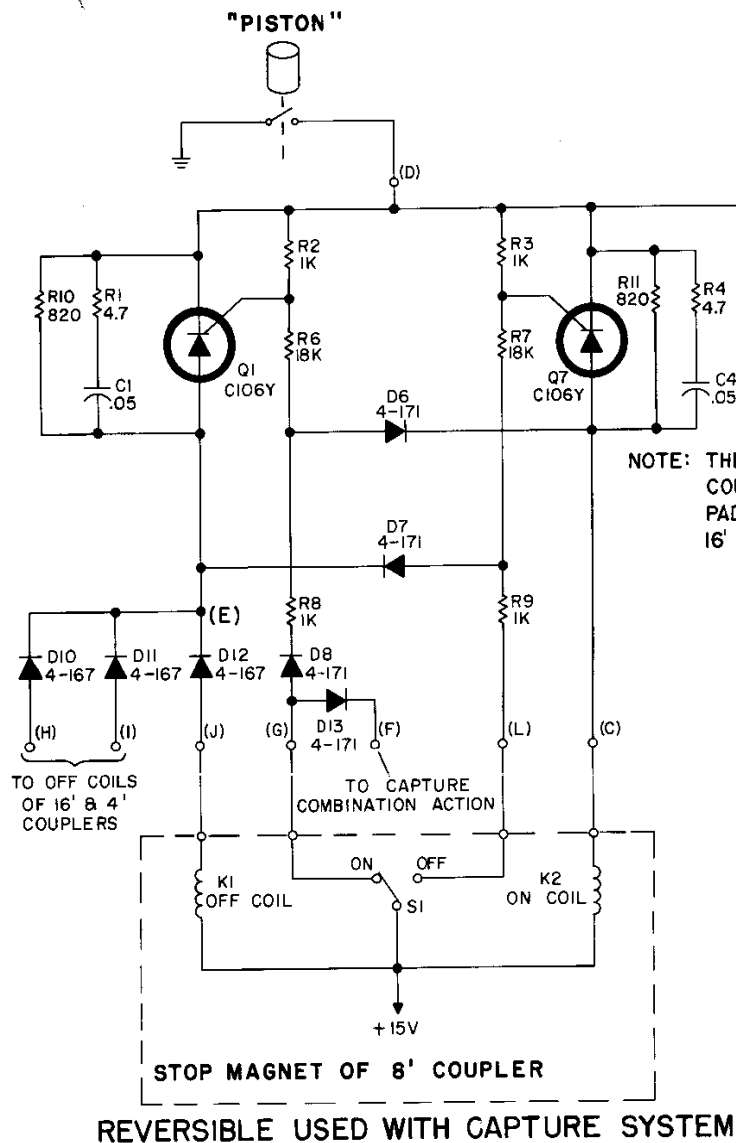
20

21

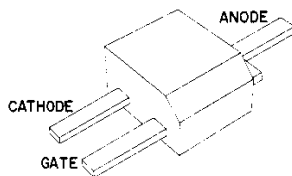


NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS; K=1,000; M=1,000,000.
 ALL RESISTORS & CAPACITORS ARE LOCATED ON STOP INTERCONNECT P.C. BOARD.

C	9 28 68	DV	ADDED R10 & C10
B	4 29 68	DV	REDRAWN
LTR	DATE	BY	DESCRIPTION
REVISIONS			
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
DMV	7 6 67	30	SILICON
TITLE		DWG. NO.	
SETTERBOARD COMBINATION ACTION		1216C	



22

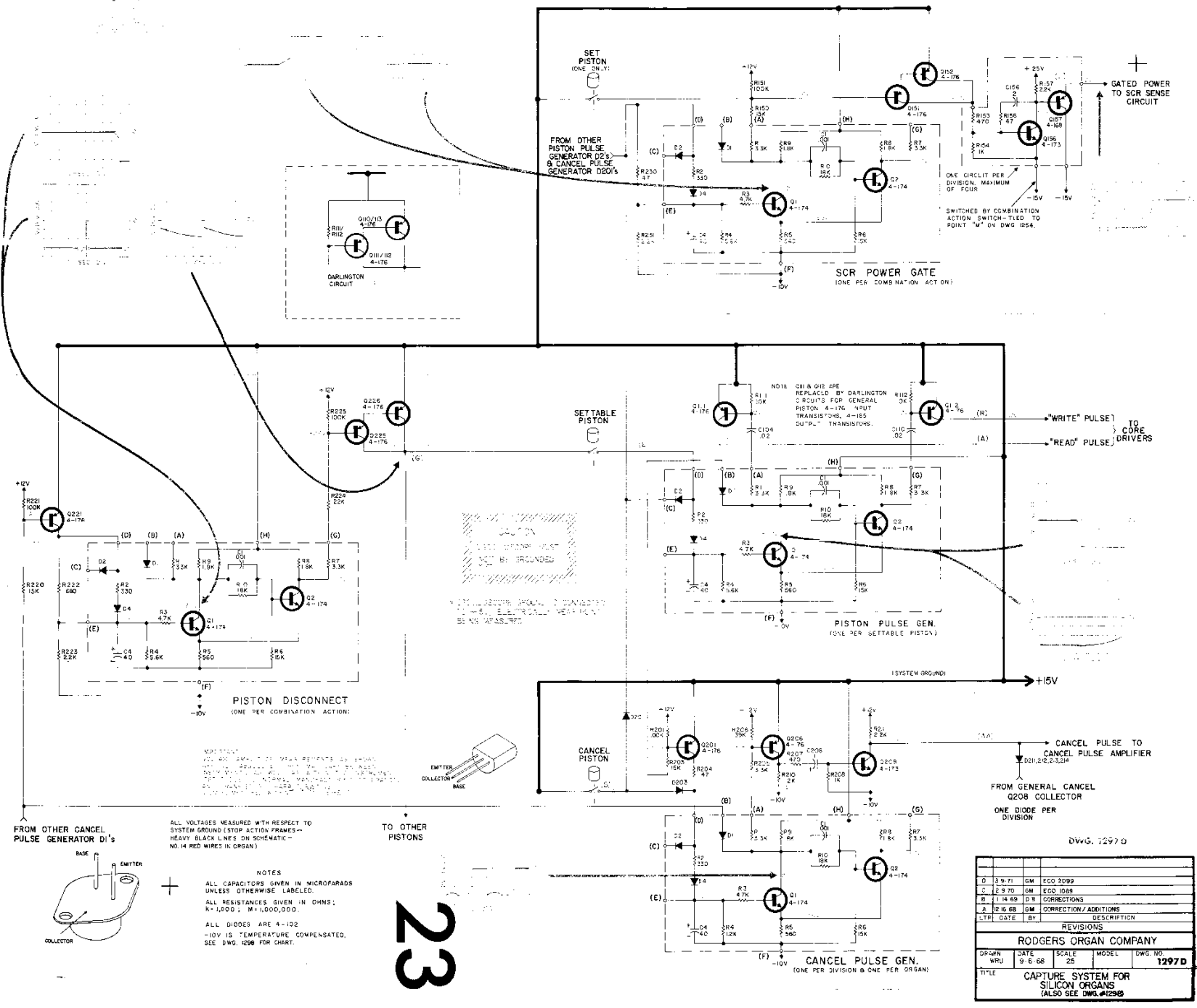


NOTES

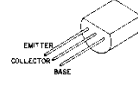
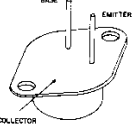
ALL CAPACITORS GIVEN IN MICROFARADS
UNLESS OTHERWISE LABELED.

ALL RESISTANCES GIVEN IN OHMS;
K = 1,000 ; M = 1,000,000.

C	4-16-71	J.W.	ECO-3025
B	9-27-68	WU	CORRECTIONS - ADDITIONS
A	8-13-68	WU	CORRECTIONS - ADDITIONS
LTR	DATE	BY	DESCRIPTION
REVISIONS			
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
DMV	4-10-68	50	
TITLE		DWG. NO.	
REVERSIBLE FOR NPN ORGANS		1280C	



23



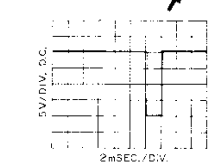
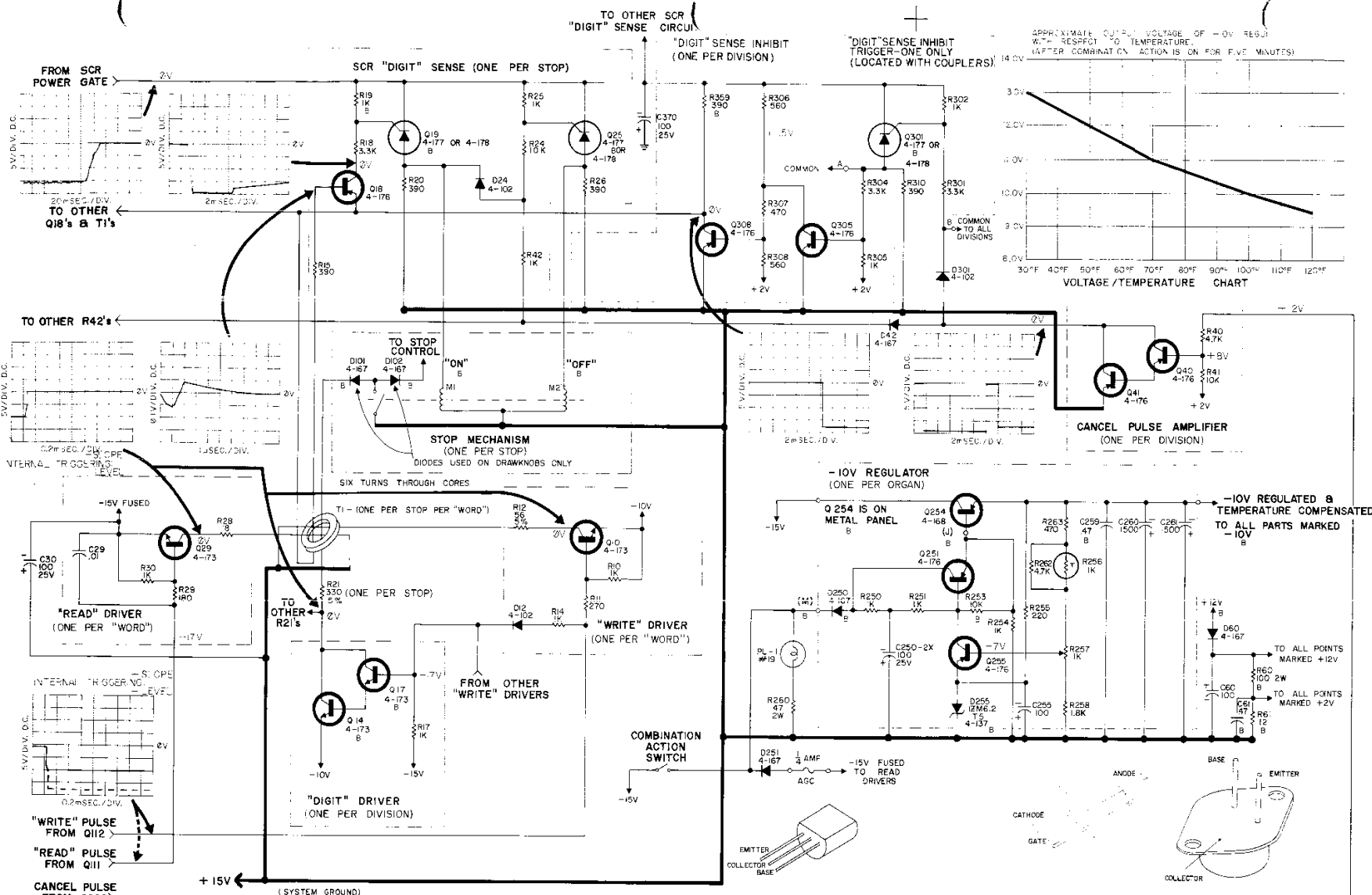
DWG. 1297 D

REVISIONS				
REV.	DATE	SCALE	MODEL	DWG. NO.
D	3 9 71	GM	ECO 2099	
C	2 9 70	GM	ECO 1088	
B	1 14 69	GM	CORRECTIONS	
A	12 16 68	GM	CORRECTION / ADDITIONS	

RODGERS ORGAN COMPANY

DRWN.	DATE	SCALE	MODEL	DWG. NO.
WHL	9 6 68	25		1297 D

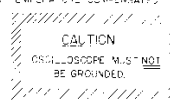
CAPTURE SYSTEM FOR SILICON ORGANS
(ALSO SEE DWG. #1298)



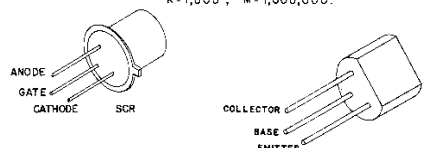
— WAVEFORMS —
 ORGAN STOP PISTON DEPRESSED
 AS LOGIC CHANGES EXTERNAL
 OTHERWISE NOTED
 PISTON SOURCE: COLLECTOR OF Q1
 OF PISTON DISCONNECT SCHEMATIC
 OTHERWISE NOTED.

ALL VOLTAGES ARE MEASURED WITH RESPECT
 TO SYSTEM GROUND—STOP ACTION FRAMES—
 HEAVY BLACK LINES ON SCHEMATIC—
 NO. 14 RED WIRES IN ORGAN.

IMPORTANT
 VOLTAGE AMPLITUDE MEASUREMENTS AS SHOWN
 ARE NOT ABSOLUTE. THEY MAY VARY BETWEEN
 INSTRUMENTS AS WELL AS WITHIN THE INSTRUMENT
 DUE TO NORMAL MANUFACTURING TOLERANCES
 AND TRANSISTOR CHARACTERISTICS.
 -10V IS TEMPERATURE COMPENSATED—SEE CHART



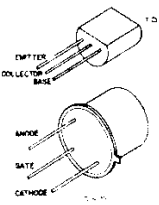
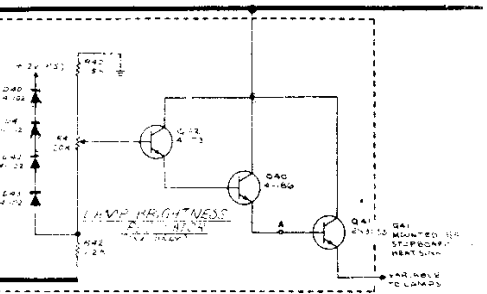
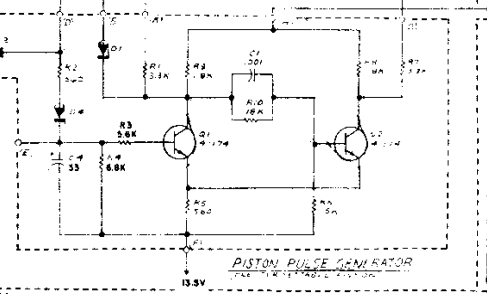
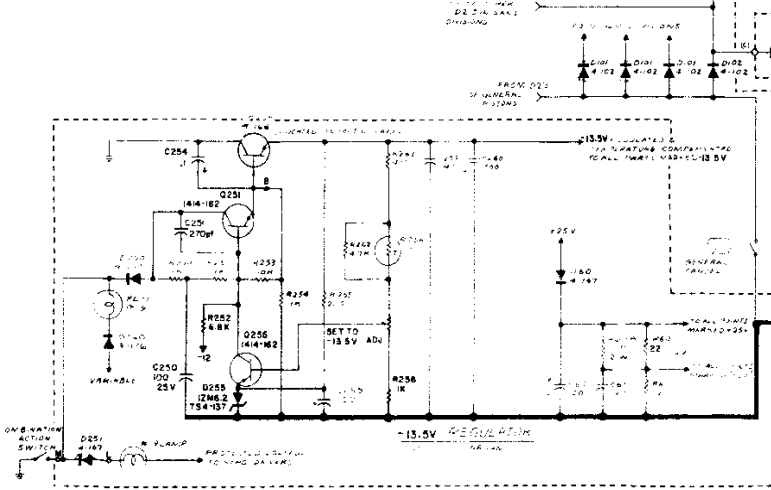
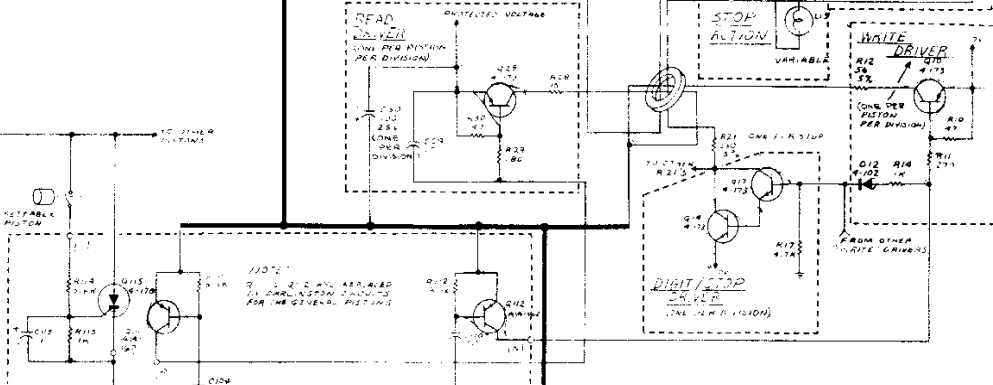
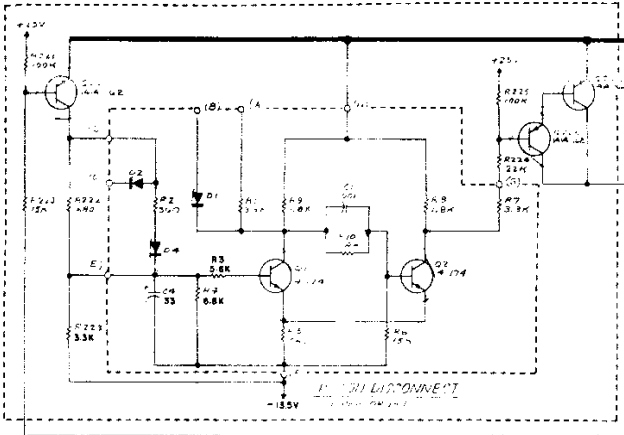
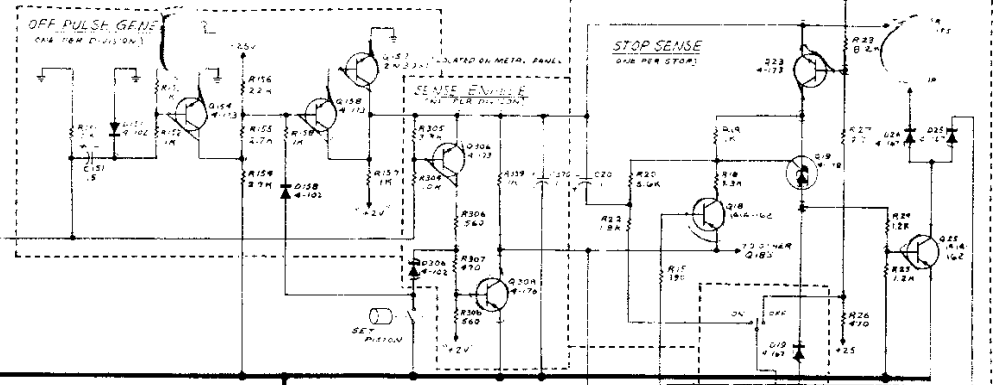
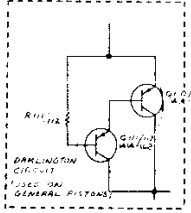
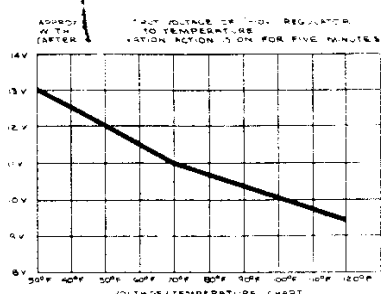
NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS
 UNLESS OTHERWISE LABELED.
 ALL RESISTANCES GIVEN IN OHMS;
 K=1,000; M=1,000,000.



DWG. 1298 H

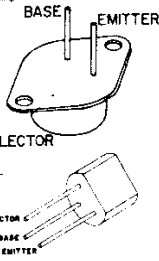
H	2-26-71	JW	ECO 2097-2098
G	2-9-70	GM	ECO 1093
LTR	DATE	BY	DESCRIPTION
REVISIONS			
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
DMV	9-8-68	30	
			DWG NO. 1298H
TITLE			
CAPTURE SYSTEM (ALSO SEE DWG. 1297)			

24



NOTES
 ALL CAPACITORS GIVEN IN MICROFARADS UNLESS OTHERWISE LABELED
 ALL RESISTANCES GIVEN IN OHMS. X=1,000; M=1,000,000

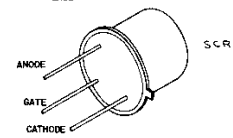
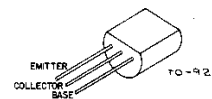
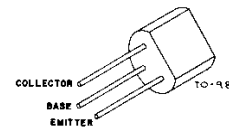
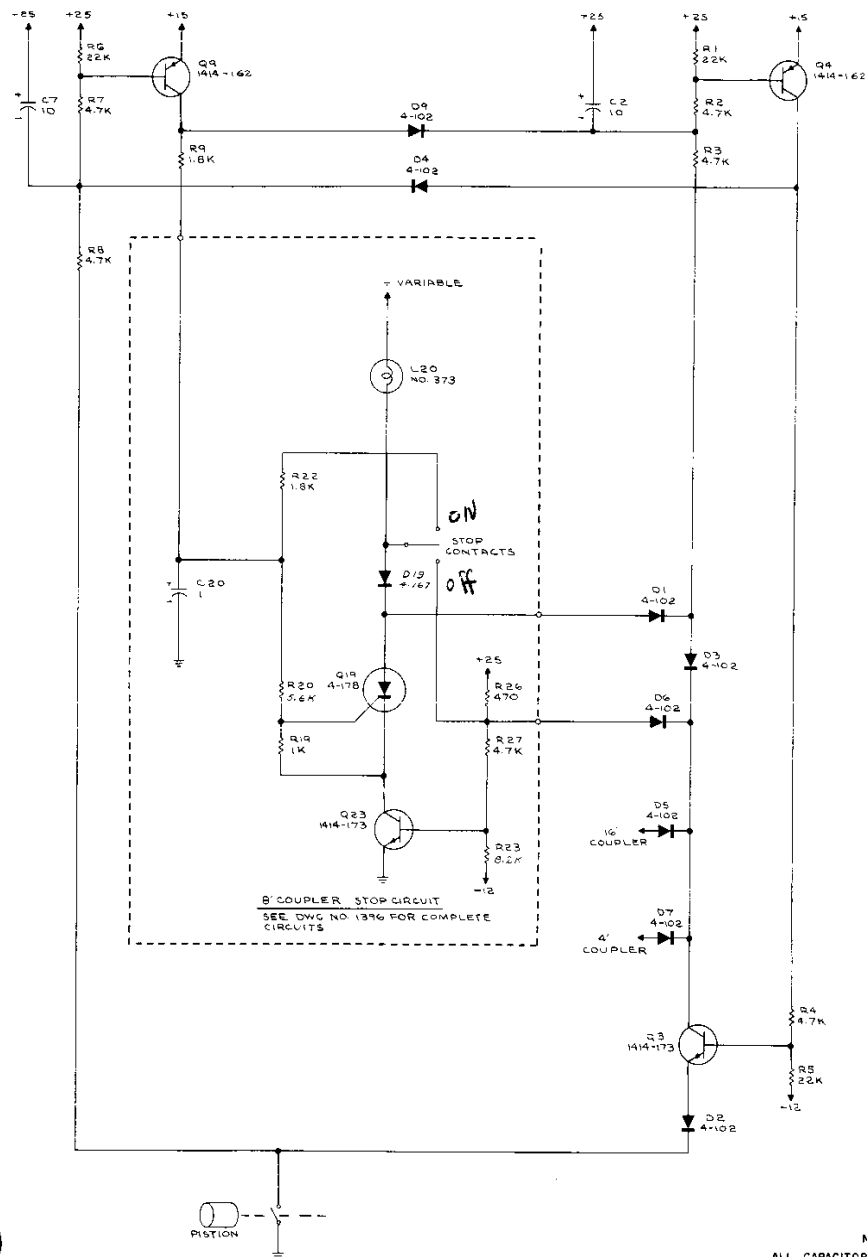
ROC PART NUMBER	MANUFACTURER	DESCRIPTION
1414 02	1414 02	3702 RED
1414 04	1414 04	3704 BLUE
1414 07	1414 07	3707 GREEN
1414 15	1414 15	3708 WHITE
1414 17	1414 17	3709 STRIP



LOC ON CIRCUIT BOARD ROC 294-1295

RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
JDW	8-7-71	25	ALL
CHECKED	DATE	PRJ. ENG.	ENG. MGR.
			REL. DATE
TITLE "LIGHTED CAPTURE SYSTEM"			

25

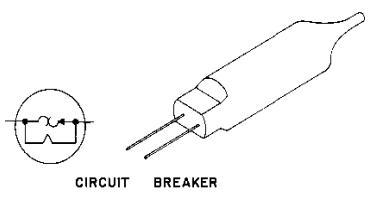
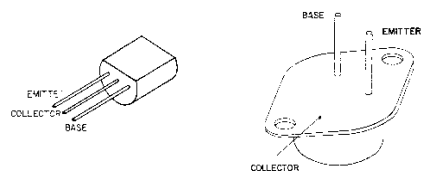
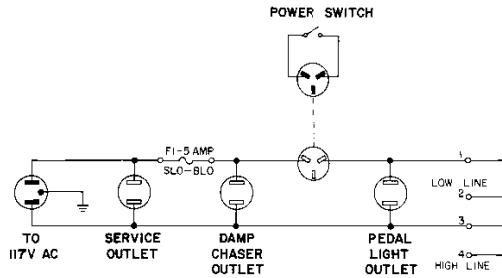


TRANSISTOR IDENTIFICATION

ROC Part No's			
On-Line TO - 92	Triangular TO - 18, TO - 94	Nearest 2N Type	End Color
144 - 176	1424 - 162	3762	Red
144 - 173	1424 - 166	3766	Blue
144 - 169	1418 - 151	3767	Green
144 - 174	1418 - 155	3768	White

NOTES
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 K=1,000; M=1,000,000.

DATE	BY	REVISION
REVISIONS		
RODGERS ORGAN COMPANY		
NAME	DATE	SCALE
G.M.	7/1/71	30
NO. 200	DATE	PLT. ENR.
		DRG. DIV.
TITLE LIGHTED REVERSIBLE		



POWER SWITCH

TO 117V AC

SERVICE OUTLET

DAMP CHASER OUTLET

PEDAL LIGHT OUTLET

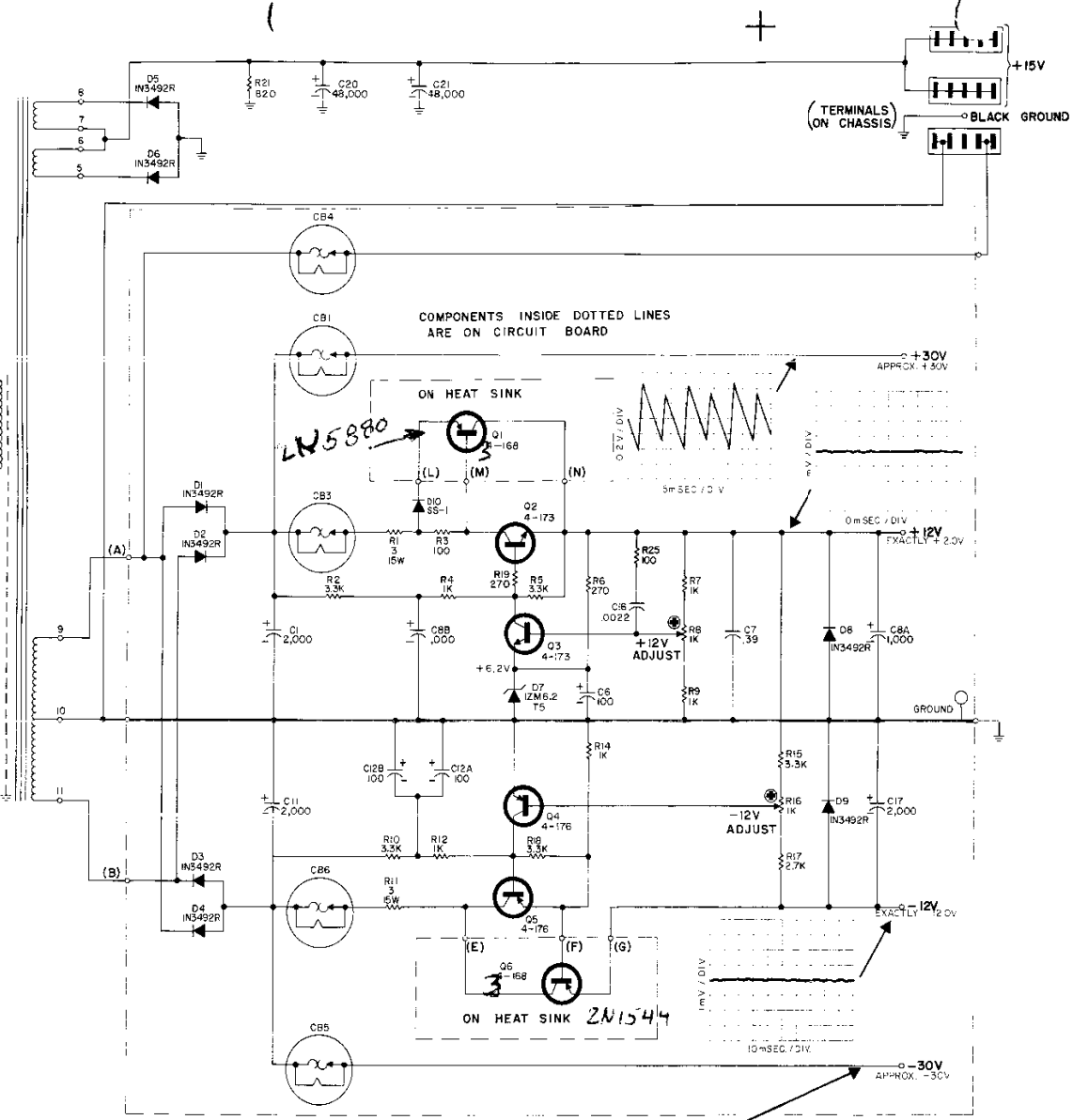
LOW LINE

HIGH LINE

EMITTER
COLLECTOR
BASE

BASE
EMITTER
COLLECTOR

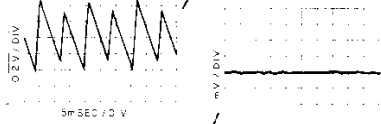
CIRCUIT BREAKER



COMPONENTS INSIDE DOTTED LINES ARE ON CIRCUIT BOARD

ON HEAT SINK

2N580

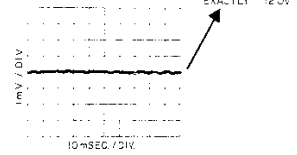


+6.2V

+12V ADJUST

+12V

ON HEAT SINK 2N1544



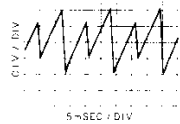
DWG 1192 K

+

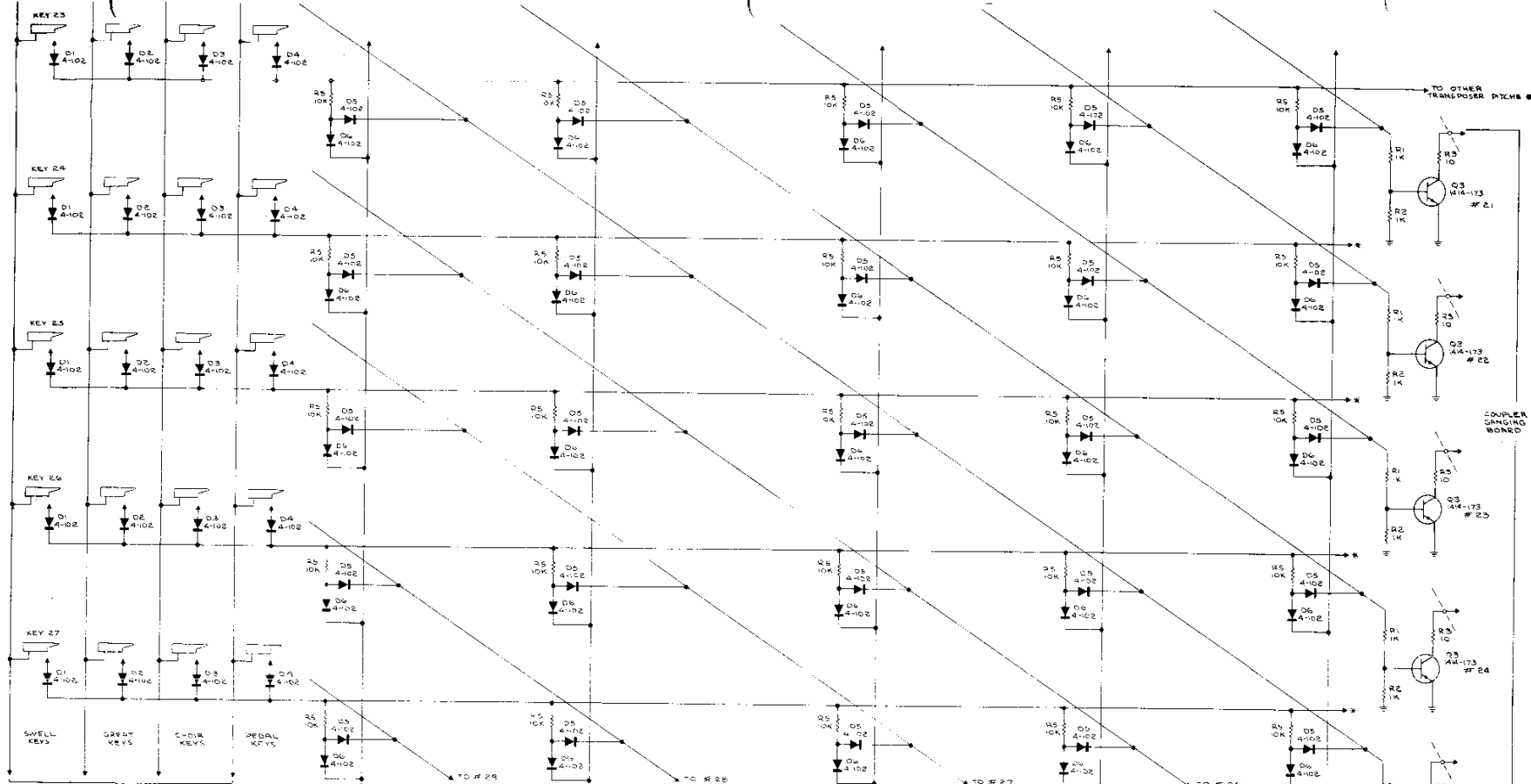
28

NOTES
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ALL RESISTANCES GIVEN IN OHMS; K=1,000; M=1,000,000.

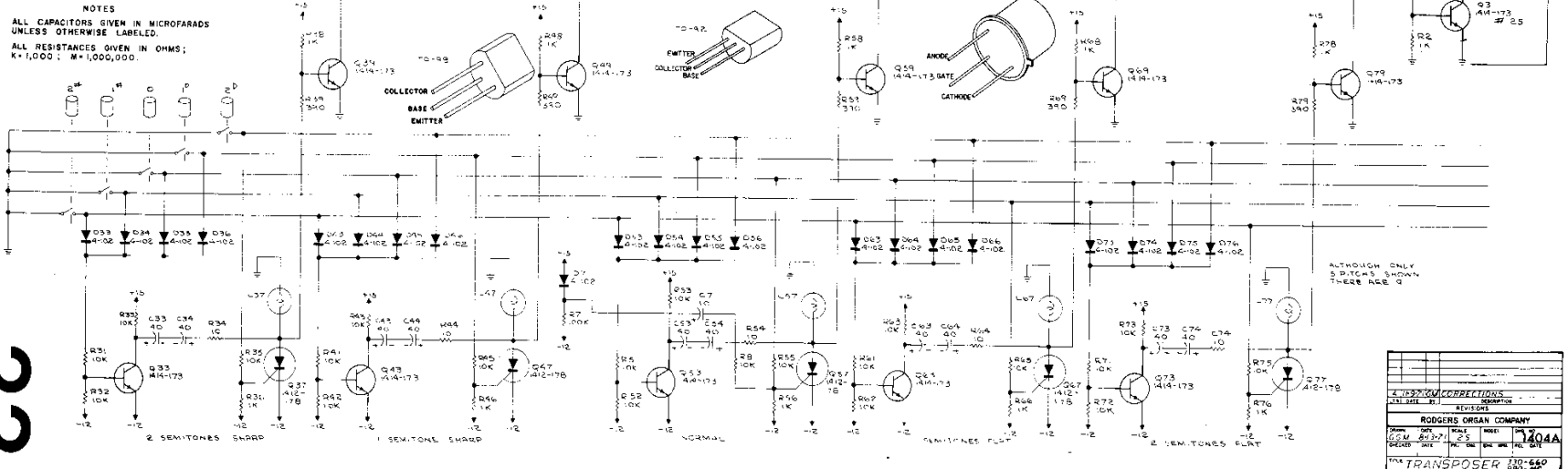
MEASURED VOLTAGE AMPLITUDE MEASUREMENTS AS SHOWN ARE NOT ABSOLUTE. THEY MAY VARY BETWEEN INSTRUMENTS AS WELL AS WITHIN THE INSTRUMENT DUE TO NORMAL MANUFACTURING TOLERANCES AND TRANSISTOR CHARACTERISTICS.



DATE		BY		ADDED	WAVEFORMS
K	7-7-69	CF			
REVISIONS					
DESCRIPTION	DATE	BY	SCALE	MODEL	DWG. NO.
	6-17-68		30		1192 K
RODGERS ORGAN COMPANY					
TYPE IV SERIES REGULATED POWER SUPPLY					



NOTES
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K=1,000; M=1,000,000.

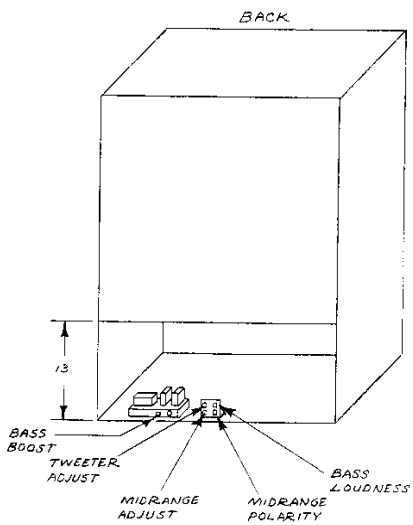
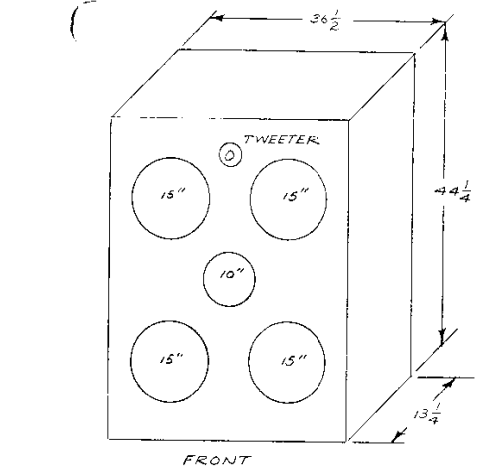


33

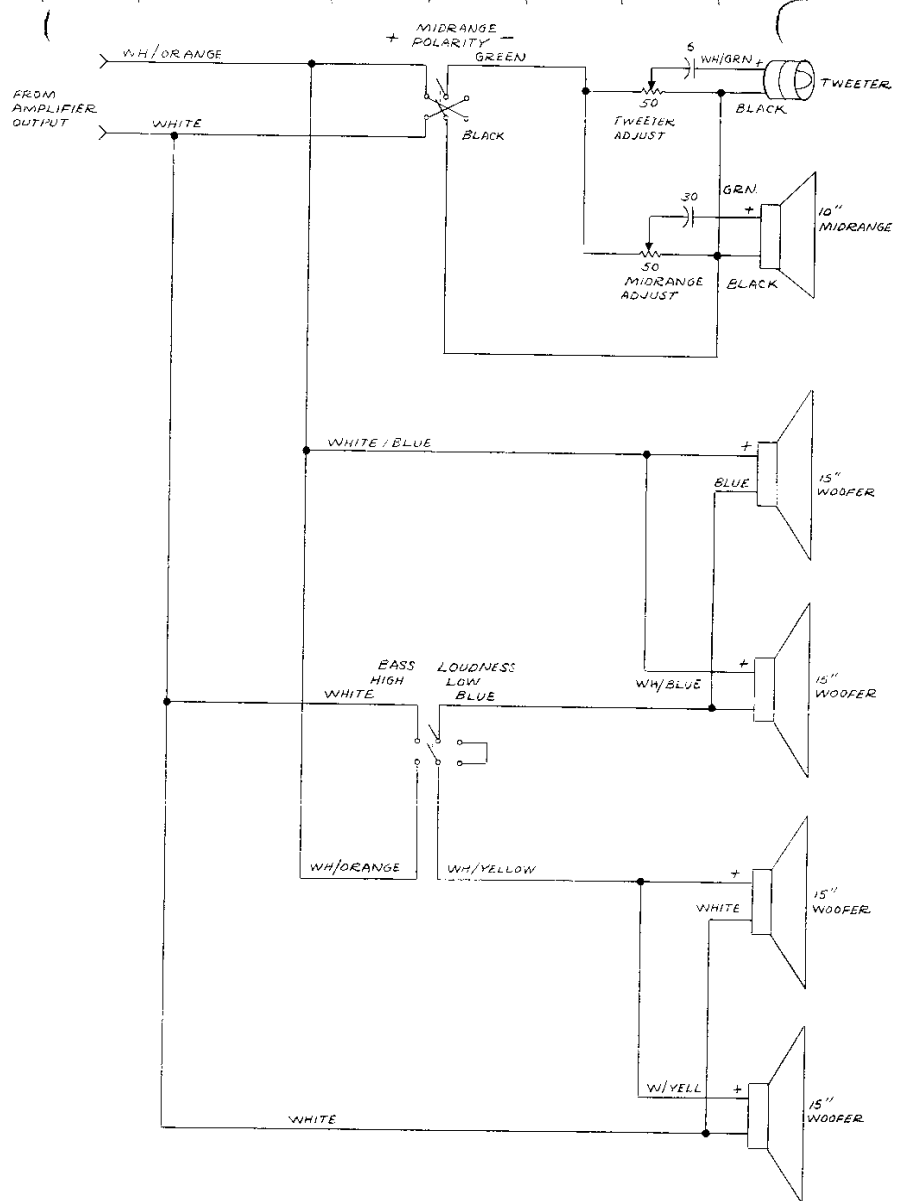
ALTHOUGH ONLY SWITCHES SHOWN THERE ARE 9

NO.	REV.	DATE	BY	CHKD.	TESTED
1	1	10/27/53	RS	RS	RS

RODGERS ORGAN COMPANY
1404A
TRANSPOSER 100-640



35



A 5220 JW REDRAWN		DESCRIPTION	
DATE	BY	REVISIONS	
RODGERS ORGAN COMPANY			
DRAWN	DATE	SCALE	MODEL
G.C.M.	12-19-70	40	1314A
CHECKED	DATE	PR.	ENG.
J.C.H.	5 FEB 70		
TITLE: W6-100 SPEAKER SYSTEM			

