COMPUTER SERVICE MANUAL

COVERING ALL SYSTEMS OF THE

RMI KEYBOARD COMPUTER
MODEL KC-II

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RMI

ROCKY MOUNT INSTRUMENTS, INC., MACUNGIE, PA. 18062

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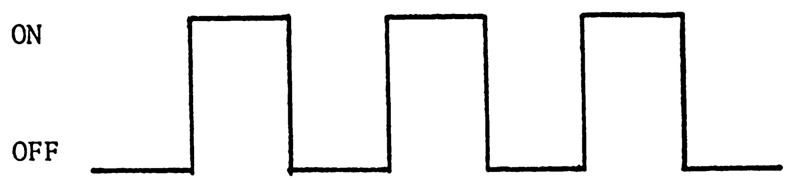
SCHEMATICS & BOARD LAYOUTS

HOW DOES THE RMI KEYBOARD COMPUTER WORK?

When the KC is turned on, a clock inside is also turned on. Instead of ticking once each second like ordinary clocks, this clock ticks four million times per second! Engineers call this device a four megahertz (4 MHz) clock. Instead of causing hands to move around a face with numbers on it, this clock sends out a continuous stream of electrical pulses. The pattern of this pulse stream looks like this when drawn on graph paper:



Notice that the pulse stream exists in one of two states, ON or OFF. The pulses are completely on or completely off. They do not assume any values between the ON and OFF limits. This feature is characteristic of digital devices and contributes to the accurate control of tone quality and tuning found in the RMI Keyboard Computer.

After leaving the clock, the 4 MHz pulses are divided into four streams, each ticking at a slower rate, only one million times per second (1 MHz)! These four streams are fed, singly or in groups, to all the various parts of the KC causing its many functions to occur at precisely the correct point in time. As you will see, the time at which events occur in the KC is of great importance.

One part of the total computer system to which the 1 MHz pulses are directed is a memory bank. This memory contains, in binary, computer language, an exact description of each voice on the KC,and the exact frequency of each note of each voice.

While it is operating, the memory is constantly scanning the voice tab switches on the panel. By this we mean that these switches receive pulses from the memory, one voice at a time, in a certain unchanging order. This is accomplished with the aid of another circuit board called a Stopboard Array.

These pulses are electrically asking the question, "Are you turned on?" Once all the voices have been pulsed, the computer returns to the first voice and pulses the entire series again, and again, continuously for as long as the KC is turned on.

If no voices are switched, the computer receives all "NO" answers to its scanning of the voices. When any voice tab is depressed, the computer receives a "YES" answer when that voice is scanned. The computer now knows three things. It knows that it received a "YES" answer. It also knows in which time slot (one time slot provided for each voice on the KC) the "YES" was received. Finally, it knows which voice was being scanned in the time slot when the "YES" occurred.

Let us assume that a "YES" was received when the 8' Jazz Flute voice in Division "A" was being scanned. In response to this, the memory will shift data which describes 8' Jazz Flute tone quality from its permanent storage area, and transfer it to a temporary data assembly area, where pitch information can be combined with it.

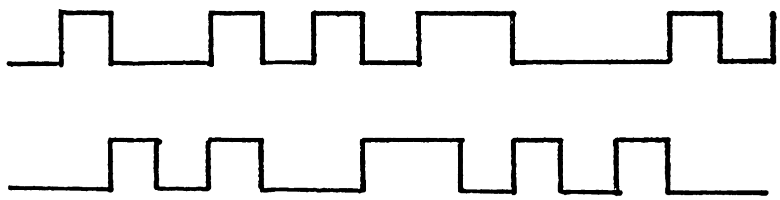
While it is scanning the voice and shifting tone quality data, the memory is also scanning the keyboard switches in a similar manner, constantly asking "Are you pushed down?" As with the voice scanning, the memory knows in which time slot a "YES" answer was returned, and as a result, which key is being depressed. Each key has a specific time slot assigned to it. Only one key is sampled in a given interval of time. Key sensing is aided by a special circuit board called a Keyboard Array. Sensing "YES" answers as keys are depressed, the memory responds by shifting into the data assembly area new data which describes the pitches at which the tone qualities previously shifted are to be produced.

The computer has now gathered together data indicating the tone quality of each voice selected by the musician as well as data indicating at which pitches these various qualities should sound. This data exists as a long string of pulses, quite like a freight train, with each data pulse comparable to a specific car in the train. Each pulse bears information due in part to the nature of that pulse (is it an ON pulse or an OFF pulse) and, in part, to its position in the entire train of pulses. In other words, the time slot in which a pulse exists is as important as the electrical make-up of that pulse.

Do not confuse this system with any system utilizing a master super-audio frequency standard, from which all required audio frequencies are obtained by frequency-division networks. The function of the clock pulses in the KC which do nothing more than define increments of time, is to extract pre-determined tone quality and frequency data from a memory, and ultimately transfer it to circuitry designed to recreate the voices and pitches in aural form desired by the musician.

As long as one or more voices are selected, the memory repeatedly sends out data describing the tone quality of those voices. As long as one or more keys are depressed, the memory continually generates data indicating at what pitches these qualities are to sound. This repeating train of data, tone qualities plus pitches, is fed to another portion of the computer called a Digital to Analog Converter (DAC).

It should be pointed out here that the repeating stream of data just described is not capable of driving audio amplifiers because it consists of a DC voltage jumping back and forth between two levels (a lower level defined as OFF and a higher level defined as ON) at a rate far above the highest audible frequencies. The pattern in which this voltage jumps between ON and OFF is determined by the tone quality and pitch information contained in the pulse train. Every time a voice or note is changed by the musician, the pulse pattern will change accordingly. The following two samples show typical pulse trains representing different stop or pitch data:



When this data stream reaches the DAC, it is transformed into an analog (continuously varying) audio signal of the type customarily fed into amplifiers. This signal varies at rates within the audible frequency range. As a result, it can be heard when increased in volume by the amplifiers and then directed to loudspeakers.

It is easy to see now that all electronic organs or synthesizers producing only continually varying audio waveforms in their tone generation circuits (the familiar audio oscillators found in most organs fall into this category) are analog devices. By contrast, the RMI Keyboard Computer is a digital device since its tone generation circuits produce pulse trains which can assume only one of two distinct states, ON or OFF. An ON state is sometimes called a "1" (one) state; and OFF state is sometimes called a "0" (zero) state. Any number value in our normal decimal system of counting can be expressed in another system of counting, known as the binary system, in which only ones and zeros are used. All magnitudes can be expressed in the binary system as a series of ones and zeros, or as a series of ON and OFF electrical pulses.

The information describing the various tone qualities found in the RMI KC is stored in the computer's permanent memory in the form of binary numbers expressed as patterns of ON and OFF pulses.

The binary number system just described is an excellent practical application of the new mathematics being taught in our public schools today. This is the essence of a digital system.

DESCRIPTION OF RMI MUSICAL DIGITAL COMPUTER

The RMI Digital Computer can be described in computer engineering terminology as a time-division-multiplexed parallel processor. It is similar to conventional digital computers in that it contains memory, performs arithmetic functions, and is designed using typical digital computer components. For example, more than 150 shift registers of ten bit average length are used in the RMI computer. It contains five random access, read-write memories of 1,600 bits total capacity as well as several read only memories holding a total of over 5,500 bits.

The data channels within the computer vary in width between 7 and 14 bits. Addition and multiplication functions are executed simultaneously at various points along these data channels.

To illustrate the computational capability of the RMI computer, it can be pointed out that for every microsecond of time the computer simultaneously performs ten separate additions and four separate multiplications. In other words, in the time it takes to complete one cycle of a 16' voice (Transpose 8) played at Middle "C" (3.8 milliseconds), the computer will have performed 38,200 additions and 15,280 multiplications.

BOARD FUNCTIONS

The RMI Digital Computer System can be divided into five basic component parts, excluding the analog portions of the KC. The five parts are shown in figure 1 as the Clockboard, the Stopboard Array, the Keyboard Array, the Digital to Analog Converter (DAC Board) and the brain of the entire system, the MOS Board.

The primary function of the Clockboard is to provide a set of timing pulses, or clock phases, to the rest of the system. These clock phases, of which there are four, are pulse trains which maintain constant frequency (1 MHz) and exhibit a constant phase relationship one to another. The type of logic circuitry utilized in the construction of the MOS chips requires these four clock phases as a basic operational requirement. It is this board which contains the variable 4 megahertz clock by which the entire computer is tuned. The Clockboard also provides the logic required to properly transfer the Alterable Voice information from the card reader assembly to the MOS Board. The Clock and Card Reader functions have no direct relationship. They are merely combined on the same board for design convenience.

The Stopboard Array and Keyboard Array are both for the purpose of interfacing the MOS Board to the outside world, so to speak. The Stopboard Array provides the link between the voice switches and the voice selection circuitry on the MOS Board while the Keyboard Array provides the link between the key switches and the frequency generation circuitry on the MOS Board. The Keyboard Array also provides the control for the Vibrato/Chorus, Percussion, Sustain, Transposer, and Coupler (Add Channel) functions.

The Digital to Analog Converter (DAC) has a very unique job to perform. The job is that of producing a recognizable audio tone out of a seemingly unrelated string of "ones" and "zeros" coming from the MOS Board. The DAC Board is really two DAC's in one, as both the Channel One and Channel Two voice information is converted separately on the same board. As a matter of interest, the rate at which information is converted in the DAC is once every 12 microseconds or 83 thousand cycles a second (83 kHz).

The last and probably most important part of the computer system is the board referred to as the MOS Board. The term MOS is short for metal-oxide-semiconductor, which describes the fabrication process used to manufacture the type of logic circuitry found on this board. Every chip represents a combination of many hundreds or even thousands of MOS transistors on a piece of silicon approximately .01 inch square.

The MOS Board is the master control for the entire system. It contains memory areas for voice information storage, voice selection circuitry, frequency generation circuitry, and data processing sections for such things as attack and decay control.

In figure 1, located within the MOS Board box, are some of the functions just mentioned plus one called clock level shifter. As mentioned the MOS Board circuitry requires a four phase clock system in order to function. The required voltage swing for these clock phases is 0 volts to -27 volts. The clock voltages produced by the Clockboard, however, only swing from 0 volts to -5 volts. It is then the function of the clock level shifter, which is the discrete circuitry found in the center of the MOS Board, to convert the clock voltages to those levels required by the MOS chips.

One of the Computer's chief claims to fame is its ability to faithfully reproduce any desired voice over the entire range of keyboard frequencies. In essence, this is accomplished by storing voice information in computer memory and then reading out this information at any key related frequency.

The voice information which is stored in the computer memory consists of 16 seven bit words per voice. A word is a string of "ones" and "zeros" such as 0001001 which represents an amplitude at some point on the voice waveform. In order to obtain this information, the desired voice must be recorded and analyzed for its harmonic content so that a waveform can be constructed as shown in figure 2. It must be noted that the harmonics which make up this voice have been arranged phasewise so as to produce a waveform whose first half cycle and second half cycle are mirror images of each other except for sign. Arranging the waveform this way means that only one-half of the cycle information has to be stored in the computer memory. The first half cycle is then reconstructed as 16 amplitude samples corresponding to 16 equally spaced sample points on the half waveform, figure 3. Converting each of these sample points to binary "ones" and "zeros" yields the required information.

The voice information is stored in a memory called the specification memory. The type of memory used for this purpose is a Read Only Memory, usually referred to as a ROM. A ROM is such that the information to be stored is built right into the memory when it is manufactured, so that the only electrical function that can be performed on it is the act of reading. Although our ROM is capable of holding thousands of bits of informaton on one tiny chip, it is analogous to a diode matrix type of storage.

The specification memory, figure 4, is divided up into blocks, the number of blocks corresponding to the number of voices in the KC. Each block is further divided into 16 sublocations, one for each of the 16 sample points making up a voice. For purposes of locating the various voices within the memory, each block is assigned a numerical address, also each sample point located is assigned a numerical address.

Assuming that we now have a fully loaded specification memory, the voice reconstruction, or read out mechanism is as follows: The procedure begins with the transfer of voice information from the specification memory to another memory called the registraton memory. The registration memory is a read-write or random access memory (RAM) which means that information can be written in as well as read out. The function of this memory is to allow two or more voices to be combined. The registration memory is divided in two, one side stores the combined voices for Division "C" and the other side stores the combined voices for Division "B." Each side is further divided into 16 sublocations to accommodate the 16 sample points of the combined voices. Referring to figure 5, you will see the two memory areas just described and their general relationship to the rest of the system. In the actual computer there are several registration memories, one for the CH 1 voices, one for the CH 2 voices, and one for the Division "A" voices. For simplicity, however, only one is shown on the diagram.

The object of the read out procedure is to successively read out the 16 sample points stores in the registraton memory at such a rate as to eventually produce an audio tone related in frequency to the key depressed.

Located on the MOS Board are several basic circuits to perform the required read out function. One of these is called the Keyboard Decoder and Multiplexer. This, in conjunction with the Keyboard Array and the Key Switches produces an output pulse for every key depressed. One key produces one pulse, two keys produce two pulses and so on. These pulses go to the Frequency Generator circuit on the MOS Board, and because they are time related to the frequency generator, only the desired frequencies are allowed to be passed to the Address Generator portion of the MOS Board. The signal going to the address generator is a string of pulses whose repetition rate is directly related to the desired audio frequency.

Every time the address generator receives a pulse, it advances to the next higher address. This procedure continues until address 16 is reached. At this point the address generator reverses its action and begins to count backwards on each succeeding frequency generator pulse. In this way, the registration memory puts out 32 sample point words per cycle, 16 in one directon and the same 16 in the reverse direction. Referring to figure 2, it was stated that only the first half of the waveform would be dealt with (16 sample points) because the second half would be reconstructed from the first half. This is accomplished by the reverse counting of the address generator during the second 16 frequency generator pulses. During this time the data coming out of the registration memory is multiplied by minus one which completes the waveform reconstruction process. Figure 6 shows an example of a reconstructed waveform as it is read out of the registration memory.

From the registraton memory the data goes to a multiplication circuit where the attack and decay functions are performed. This is accomplished by multiplying attack and decay factors by the voice data and thus varying the over-all audio level. The attack and decay factors are, once again, in the form of a set of binary words ("ones" and "zeros") which describe the shape of the attack and decay envelope. These factors are stored in another ROM and read out as required. It is interesting to note that during the time between key depressions and the tone reaching full audio level, more than 120,000 multiplications take place for a mid-frequency 8' voice.

The data is then ready to be converted to a conventional audio signal. This process consists of looking at every sample point word, determining its numerical value, and putting out a voltage proportional to that numerical value. This, of course, is done in the DAC in a matter of a few microseconds.

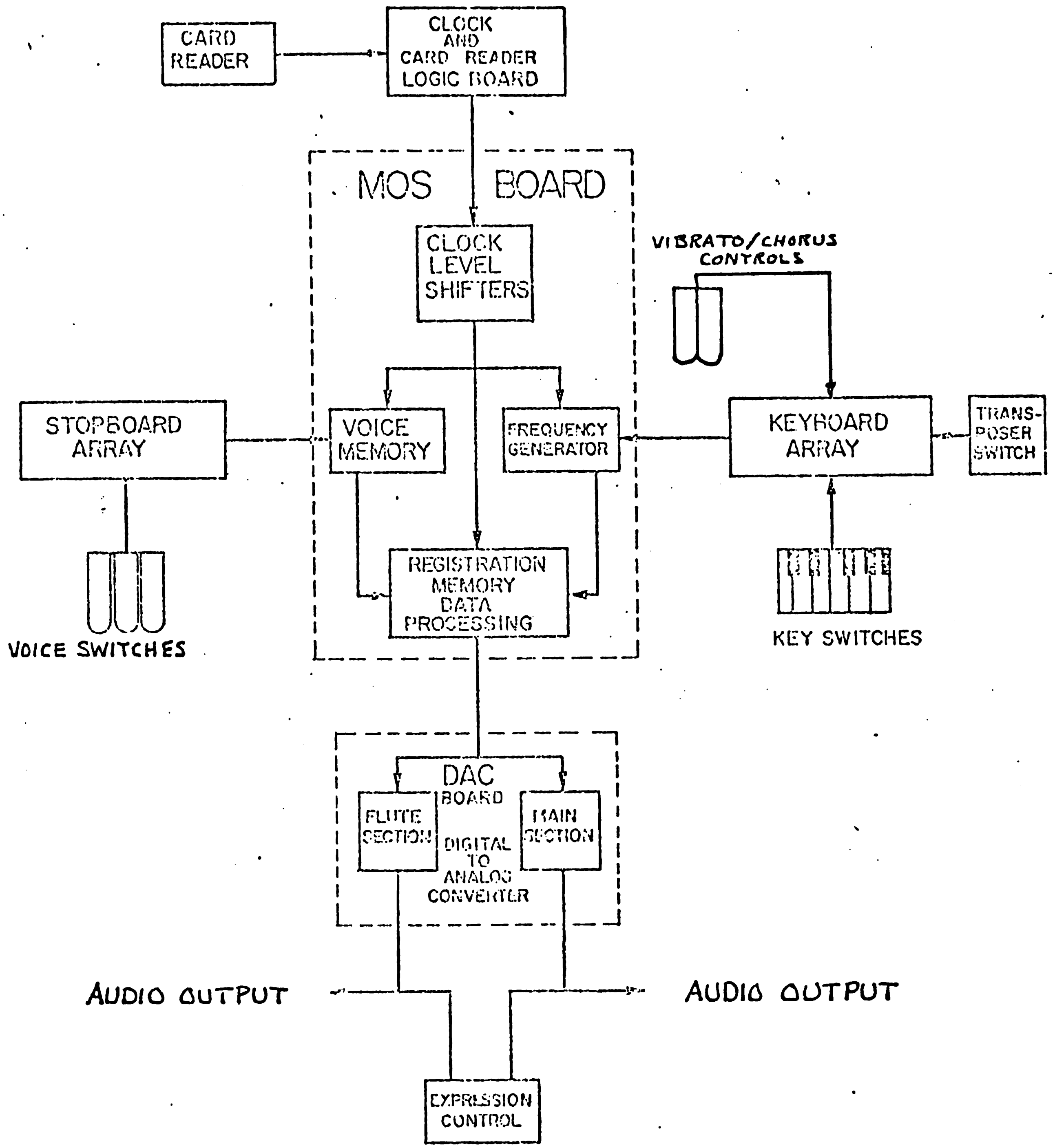


Figure 1

SYSTEM BLOCK DIAGRAM
FOR COMPUTER ORGANS
ALLEN ORGAN CO.
MACUNGIE, PENNA.
012-0062

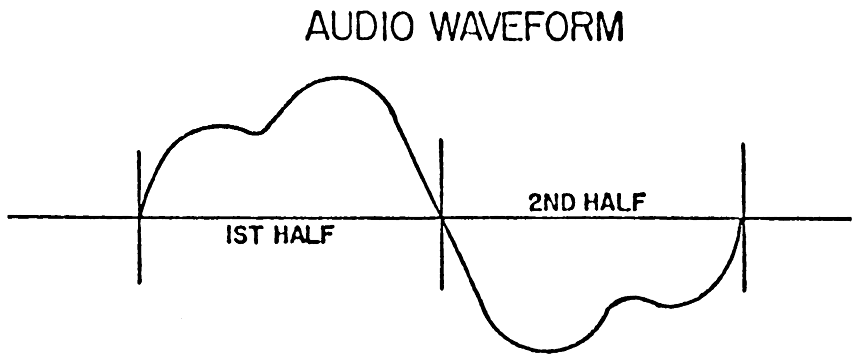


FIG. 2

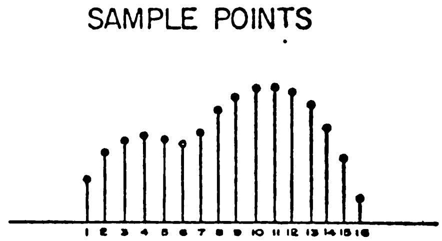


FIG. 3

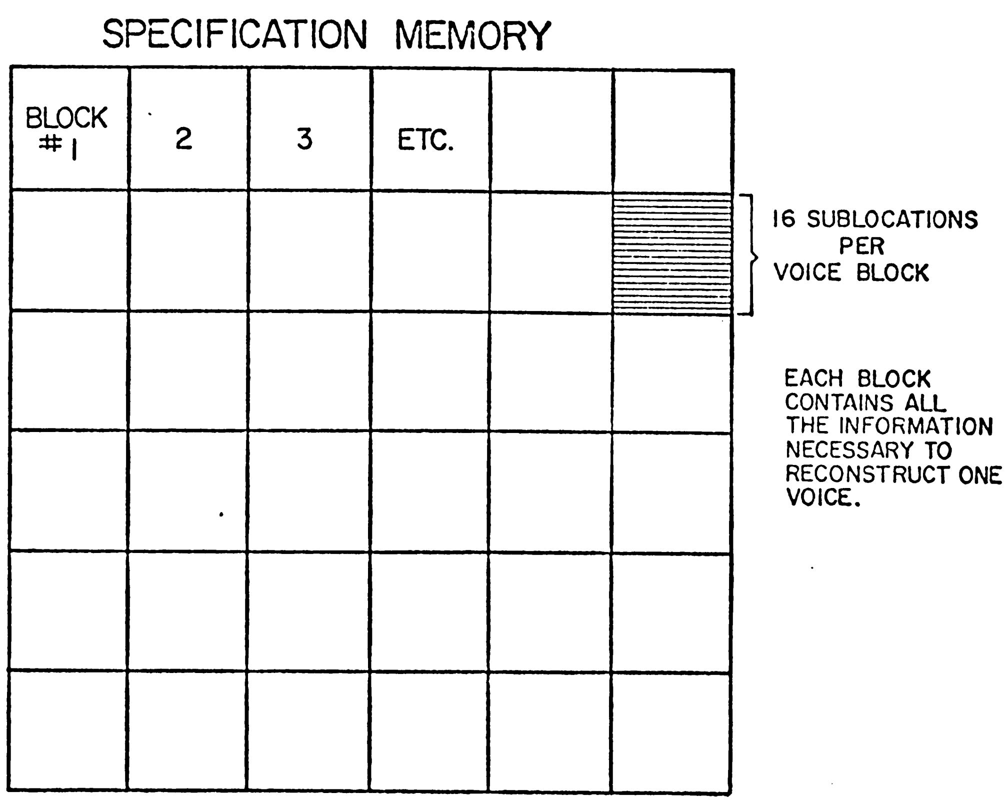


FIG. 4

COMPUTER ORGAN SYSTEM

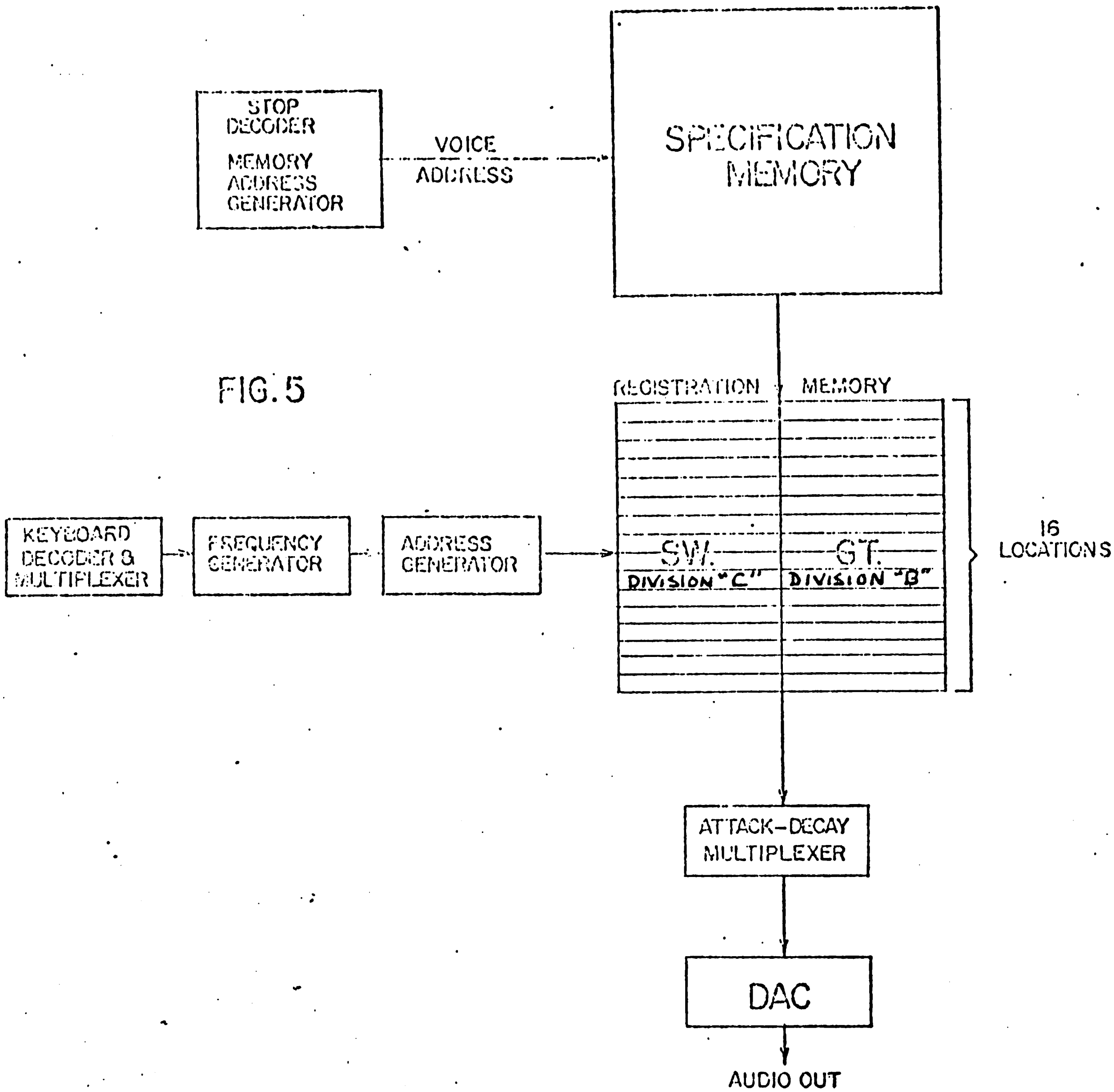


FIG. 5

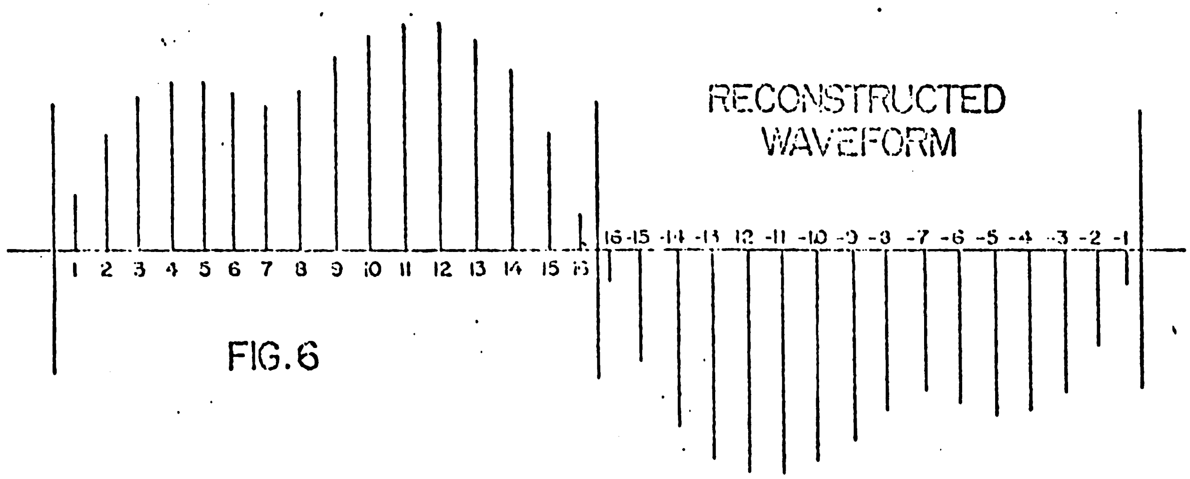
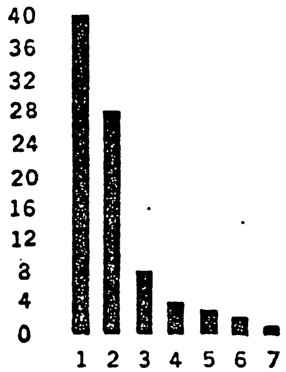
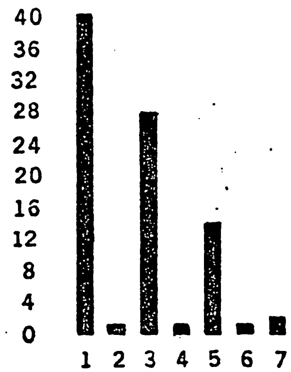


FIG. 6

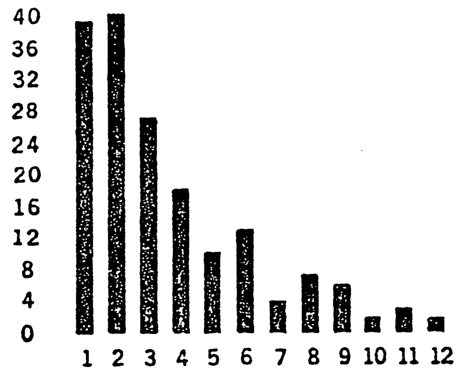
ALLEN ORGAN CO.
MACUNGIE, PENNA.
012-0050



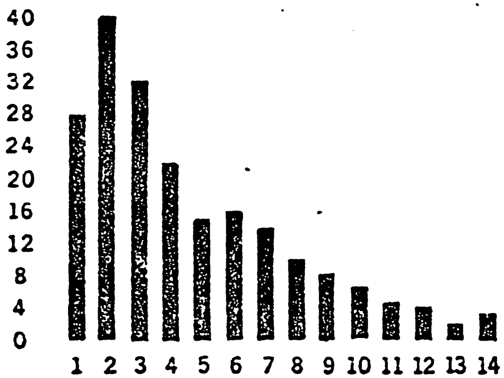
HOHLFLOTE
(OPEN FLUTE)



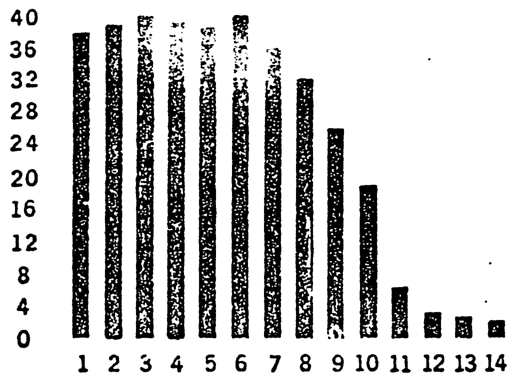
STOPPED FLUTE



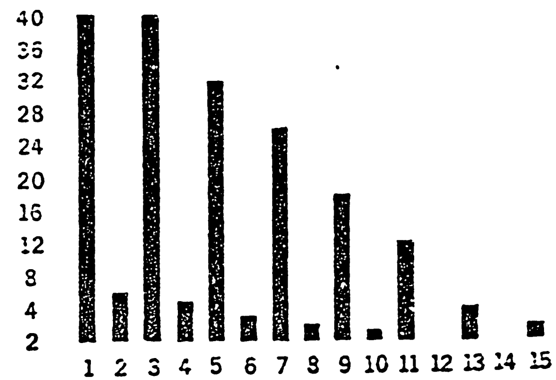
PRINCIPAL



STRING



ENSEMBLE REED



CLARINET

RMI KEYBOARD COMPUTER MODEL KC-II SERVICE INFORMATION

KC-II is a highly complex instrument. Before assumptions of malfunction are made, proper musical function should be thoroughly understood. If there is any doubt at all as to proper functions, consult the function descriptions in the Owner's Manual.

Other than a totally dead instrument, careful observations should be made and written down as to which functions are operating correctly and which are not, and specifically, how not. If a situation is intermittent, make your observations quickly during the malfunction. Check for response to physical shock or extreme variation in line voltage -- KC-II is well regulated to tolerate substantial line variation (as low as 90 vac).

GENERAL SERVICE PROCEDURES:

Bring the Pedal Assembly and Audio Cables to your Service Center. Model KC-II will not operate properly without the Pedal Assembly connected. It is also possible that your problem may be related to the Pedal Assembly.

Opening the lid: To raise the lid on the KC, two large slotted (flat-blade) screws must be removed from the ends of the preset panel. Some units may have two additional small Phillips screws on the sides of the lid. Do not remove Phillips screws holding upper front panel to lid.

All servicing can be divided into three categories:

1. Power Supply
2. Hardware (switches, pots, connectors, wiring, etc.)
3. Circuit Boards

Procedures involved with the hardware are rather standard among technicians. Before suspecting any circuit boards, a voltage check should be made on the power supply to verify its accuracy - use a reliable meter of known accuracy (digital is preferable). The power supply is well labeled. Correct any voltages that are inaccurate by readjusting. It is also conceivable that a defective board can be brought into operation by a slight intentional misadjustment of the power supply voltages. This should not be considered a permanent fix, however.

In general, all boards should be returned to the factory for repair. Schematics and board layouts are provided for all boards except the MOS board (the big one). Some qualified technicians may prefer to perform service on the smaller boards; however, NO ONE is to perform any service on the MOS board.

Lightning strikes twice. Benjamin Franklin discovered lightning or static electricity in the sky. It also appears in other places such as carpets, sweaters, clothing, etc., particularly in dry climates or locations and in winter. Expensive MOS devices such as used twenty-two times on the MOS board of the KC-II can be damaged by these static charges during handling outside of the instrument. If you have ever had the occasion to receive a MOS board shipped from our factory, you will notice that we take two precautions against static charges: (]) We place a carbon-impregnated plastic keeper over the plug which shorts all pins together; and, (2) We wrap the entire board in aluminum foil.

Should you be required to exchange a suspected defective MOS board with a known working MOS board, the following precautions are suggested, especially if the instrument is on a rug or the humidity is low:

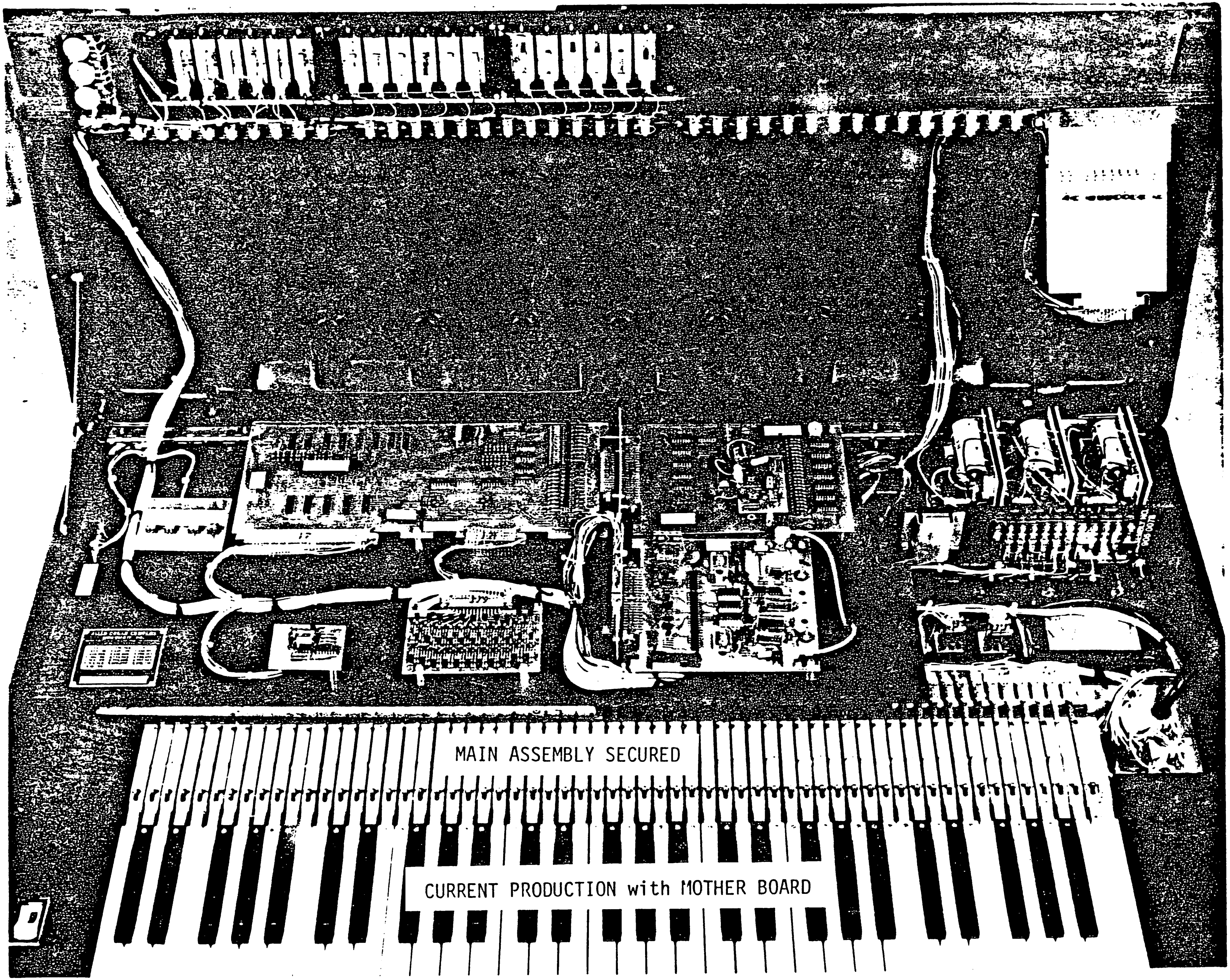
1. Turn off AC power. Open the lid.
2. Touch power supply ground to discharge any static build-up you may have developed. You may even want to take the added precaution of attaching a clip lead between ground and your wristwatch while you are working.
3. Have the new MOS board within reach with a minimum of foot movement.

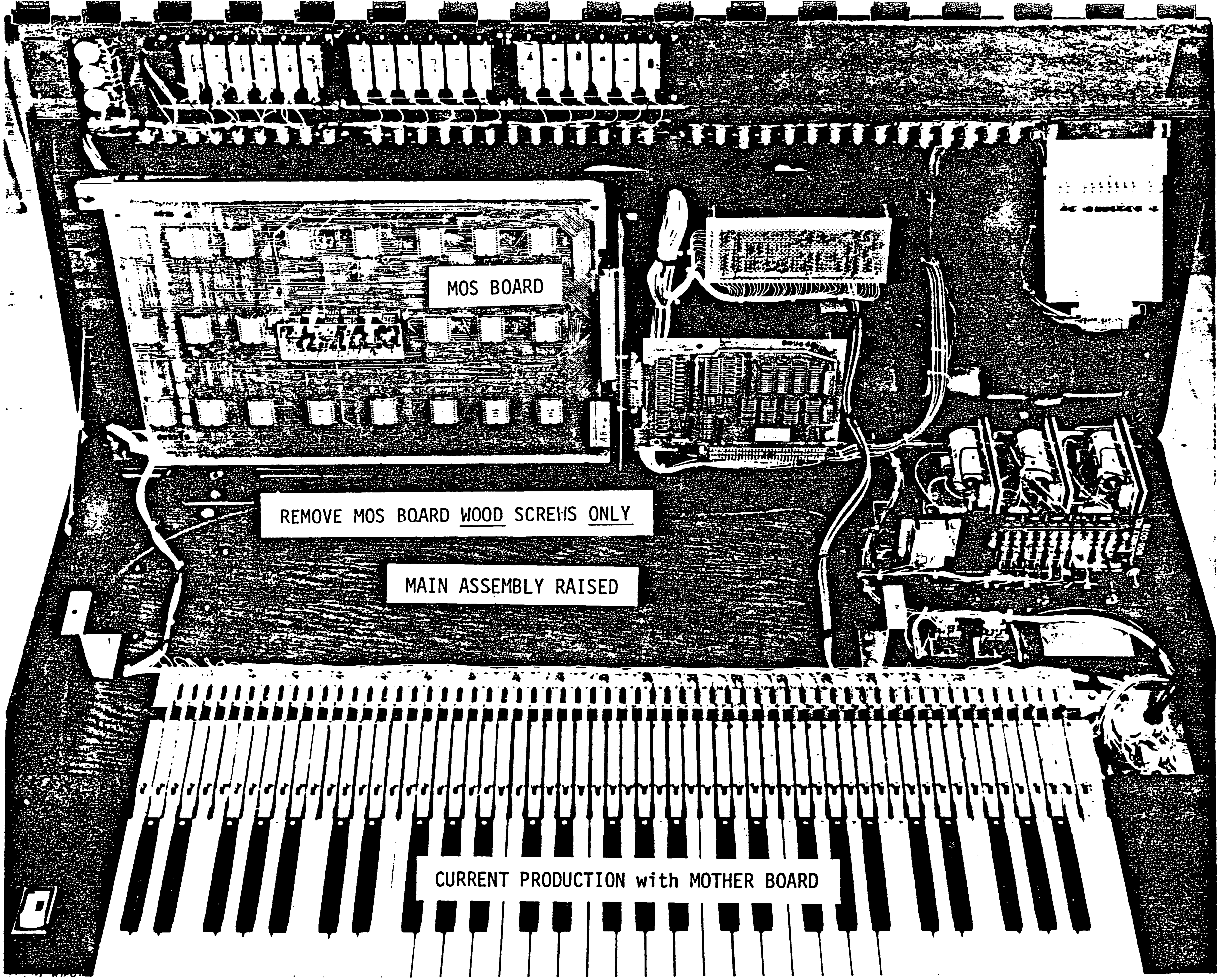
4. Slide out the defective MOS board. Do not lay it on a carpet. Do not touch the chips or plug.
5. Unwrap the foil from the new board. Slide the new board in, but do not remove the plastic keeper until just prior to insertion into the connector. Hold the board by the aluminum rail edges. Do not touch any other part of the board.
6. Place plastic keeper on the defective board and wrap in foil immediately.

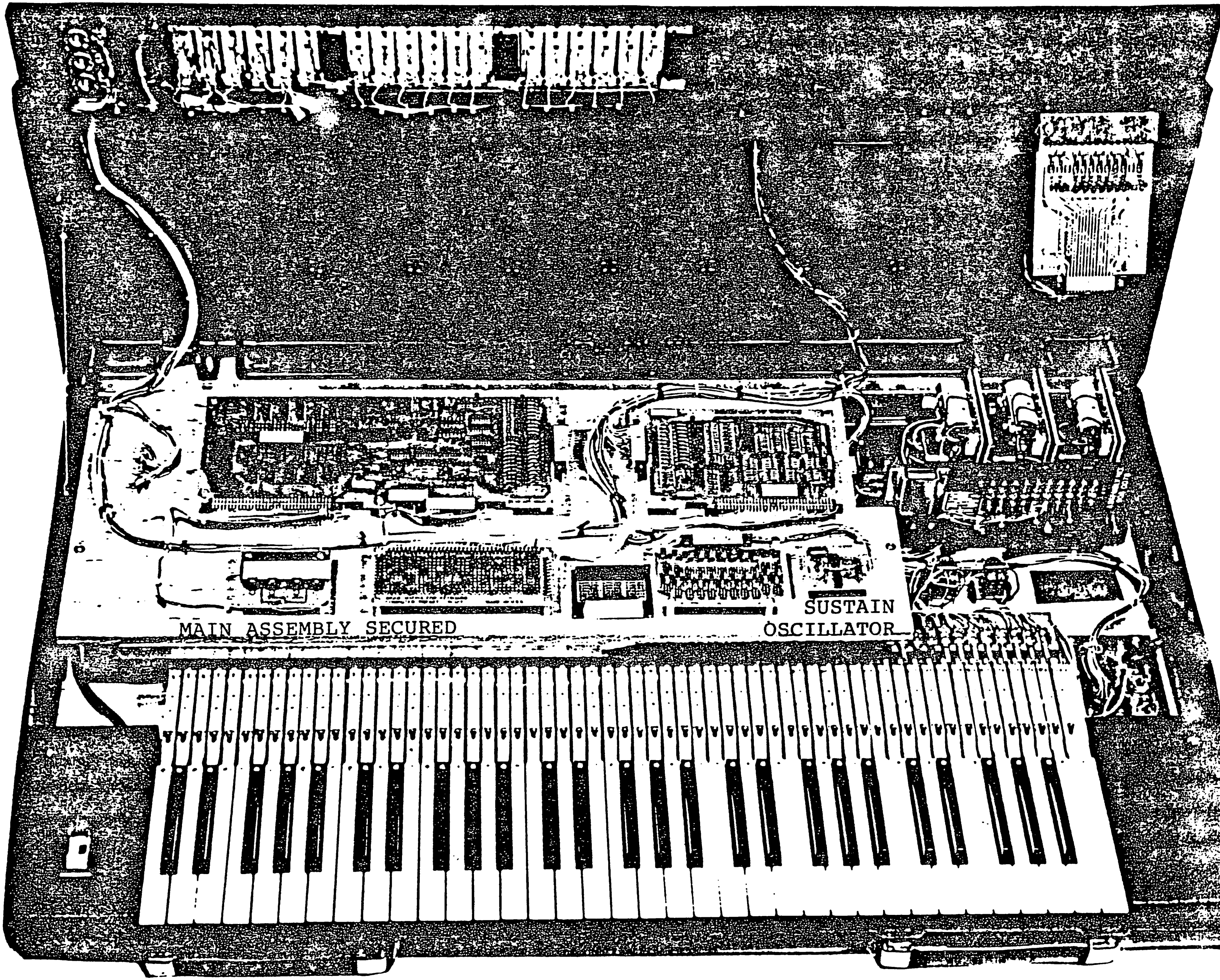
The service procedure is accomplished by exchanging boards. Of course, it is absolutely necessary to have a complete set of working spare boards on hand. RMI Keyboard Computer dealers accomplish this by maintaining at least one KC in stock on the floor. Some dealers may obtain a spare boards kit if sales volume so warrants.

In general, the plug-in boards and power supplies used in the RMI KEYBOARD COMPUTER are the same as those used in ALLEN COMPUTER ORGANS. The differences are as follows:

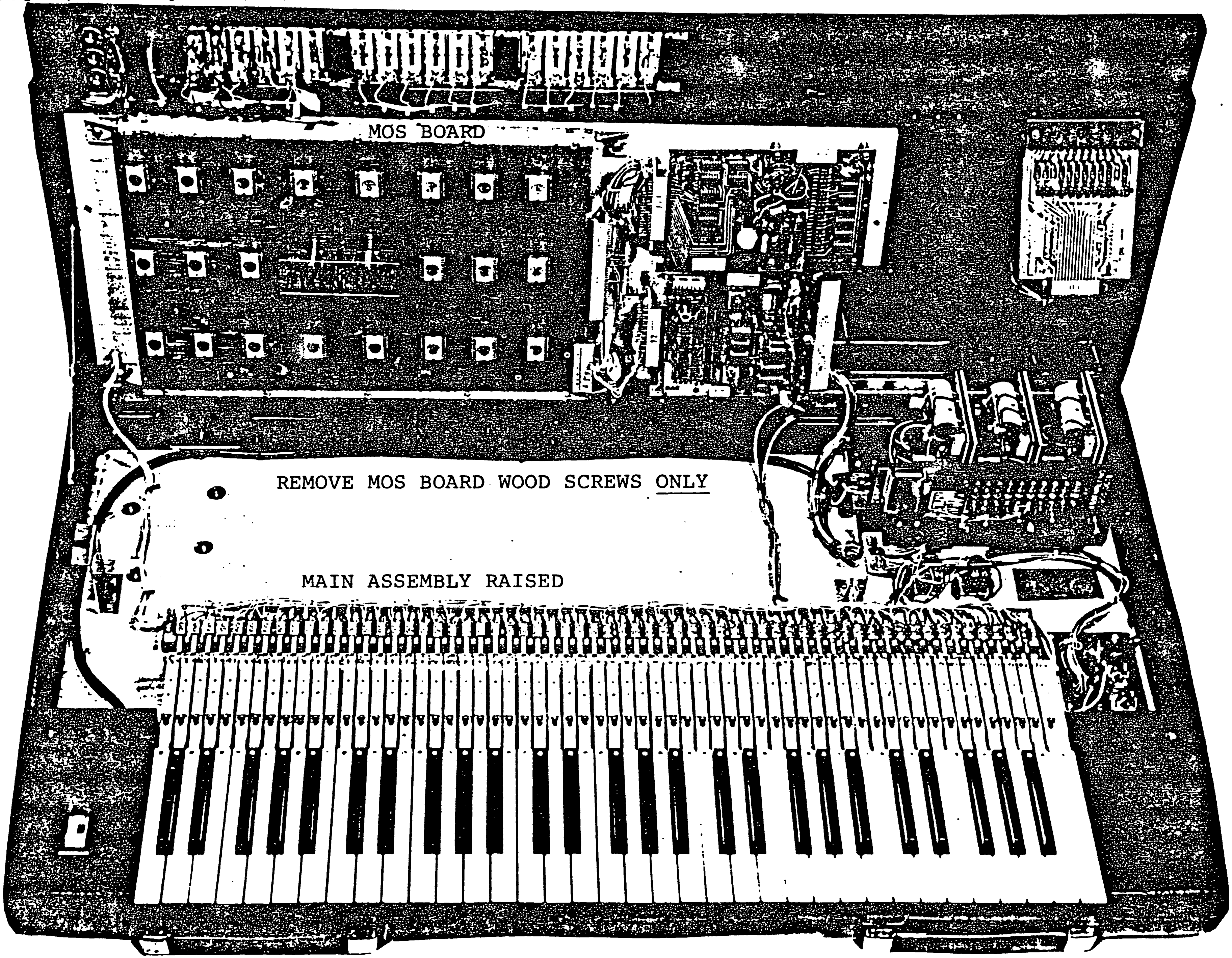
1. Clock Board - Allen is fixed tuning with a slug and coil. RMI has a Voltage-Controlled Oscillator to gain the pitch-bender effect and heavier vibrato.
2. MOS Board - Has RMI Spec Chip and different metal frame.
3. Keyboard Array - Tremulant or vibrato oscillator speed, and sustain or percussion length controls have been removed for remote control from front panel. Speech articulation function has been eliminated.
4. D.A.C. Board - Flute and Main channels are Ch. 1 and Ch. 2, respectively. Bass boost controls for both channels should be set at minimum (fully counterclockwise). Note: There are two flat mica trim capacitors and one flat wafer trim pot on the board -- DO NOT TOUCH these controls. These are alignment controls set at the factory. Movement of these controls can cause considerable distortion of audio.


MAIN ASSEMBLY SECURED
CURRENT PRODUCTION with MOTHER BOARD


MOS BOARD
REMOVE MOS BOARD WOOD SCREWS ONLY
MAIN ASSEMBLY RAISED
CURRENT PRODUCTION with MOTHER BOARD



EARLY PRODUCTION - WITHOUT MOTHER BOARD



EARLY PRODUCTION - WITHOUT MOTHER BOARD

BASIC GUIDE TO KEYBOARD COMPUTER SERVICING

1. NEVER change more than one board at a time. If changing a board does not correct a problem, always put the original board back before changing the next one.
2. ALWAYS turn KC off before changing boards. Plugs or boards should never be inserted or disconnected while the KC is "on."
3. If changing a board seems to correct your problem, always re-insert the original board again just to help verify that the board is really defective. Sometimes the act of changing a board can correct a plug problem, and the board isn't actually at fault. IMPORTANT - before sending a board back to the factory, ALWAYS try it in another KC to see if it produces the same defective condition.
4. Each computer has two divisions -- Ch. 1 and Ch. 2. ALL Div "A" voices, DIV "C", 32' Bass Reed and Chiff come through the Ch. 1 audio output, in addition to all the red engraved voices. The Alterable voices can sound through both audio systems in addition to all the non-red engraved Div "B" and "C" voices.
5. Keeping (4) above in mind, always ISOLATE your problem by using the following criteria:
   A. Problems affecting the ENTIRE KC (both Ch. 1 and Ch. 2 voices) are usually related to Power Supply, MOS board or possibly DAC board defects. Check Power Supply voltages first. See section 7. Clock board problems will affect the entire KC, but problems in this board are rare. Static problems are usually related to MOS board malfunctions.
   B. Problems affecting ONE division such as all Ch. 1 or all Ch. 2 can be anywhere from the MOS board on, but NOT Stopboard Array, Keyboard Array or Clock Board. The division of Ch. 1 and Ch. 2 starts in the MOS board and continues through the DAC, Bass Boost, and volume pedals. See Section 6.
   C. Problems affecting voices, especially groups of voices in patterns such as 5 or 6 voices being either dead or on all the time, are related to the Stopboard Array.

D. Problems affecting keys, especially groups of keys in patterns of six adjacent keys, or perhaps all C#'s and G's on the entire KC (example) are usually Keyboard Array problems. Percussion, sustain, CV and Transposer problems are also Keyboard Array related. Transposer problems can also be related to master clock tuning and pitch bender (See schem Model KC-II Pitch Bender controls, Page 46).

E. Problems affecting the Card Reader can be somewhat broken down as follows:

(1) ALL alterables are malfunctioning. This is usually incorrect voltage on the reader lamps or a defective card reader unit. The lamp voltage adjustment is on the main power supply. Usually adjust for between 7 and 7-1/2 volts. A new reader can be temporarily tried by holding it in your hand and transferring the plug. This should be done, however, in subdued room light. CAUTION -- It is easy to put the plug on backwards. This does no harm, but your clue is that the lights are not lit.

(2) Alterables of odd or even number malfunctioning usually indicates a MOS board problem.

(3) Alterable problems which do not fit either of the above patterns - suspect the Clock and Logic Board.

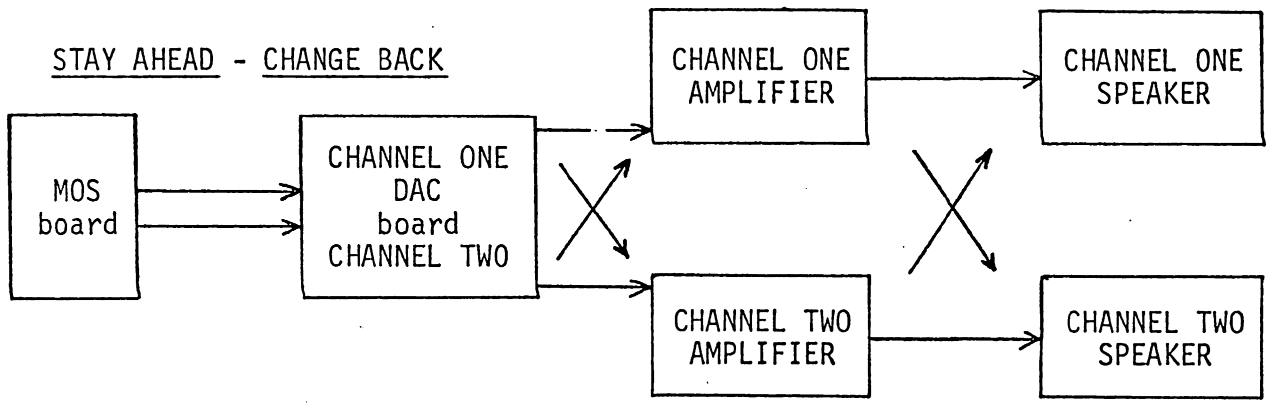
6. Suggestions for isolating problems relating to channel of audio -- example, distortion in channel 1:

A. Reverse the audio output cables on the DAC board.

(1) If the problem stays in the same speaker cabinet -- remember that Ch. 2 voices are now coming through the Ch. 1 amplifier -- then the problem will be in that amplifier or speaker. To go a step further, exchange the speaker output cables between the two amplifiers. If the original speaker cabinet still produces distortion, you have a bad speaker. Replace the speaker output cables to their original location.

(2) If by reversing the DAC board audio output cables the distortion moves to the other cabinet, you know that the amplifiers and speakers are O.K. Your problem will be either a defective DAC board or MOS board. Since in your backing up process the DAC is next in line, change it first. If that does not correct your problem, change the MOS board.

(3) Memorize the simple rule "STAY, AHEAD -- CHANGE, BACK". Explanation: When you reverse channels, if the problem STAYS in the same Speaker, the problem is AHEAD of where you made the change. If after reversing channels the problem CHANGES to the other speaker, the problem is BACK from the point where you reversed the channels.



POWER SUPPLY: This is a well-regulated supply (tolerating line variations as low as 90 vac) which should present no problem unless a control is inadvertently changed. All measurements can be taken between ground and the appropriate terminal connections. Place your positive (red) lead on ground. The -27, +5, -5 voltage levels should be precise and be set with a known accurate meter. When setting up a new instrument for the first time, the voltages should be checked and set, if necessary, as a matter of routine. "ADJ. C.R." is the control for the card reader lamps. Operating range for the card reader lamps is 6-8 vdc. The control is set in the middle at the factory - about 7 volts. Should a card reader fail to program a card correctly, the voltage should be adjusted until correct programming is achieved. Notice that the voltage outputs for the lamps are independent of the common ground: C.R. POS. and C.R. NEG. This is due to deriving the available 10 volt potential from the -5 vdc and the +5 vdc.

MOS BOARD DEFECT SYMPTOMS

Dead KC - sometimes caused by defective or broken power transistor on clock section of MOS board.

Crackling or breaking up with or without keys depressed. This symptom will almost always be a MOS board.

Bee hive cipher when KC is turned on. No voices activated or keys depressed. Always a MOS board.

Buzzy tones in either channel.

Plays when keying but without any voices activated.

Will play only 6 notes at a time instead of 12. (Be sure you understand processor assignment).

Overtones or extraneous harmonics in Ch. 1 or Ch. 2 voices. To verify use Sine Wave 2' and add Ch. 2. Vary the -27 control slightly to each side of 27 to check for voltage sensitivity.

High frequency signal in audio after KC is on for a while -- gradually gets worse. Do not confuse with normal high pitched low-level sing which is frequently evident in Ch. 1 audio system.

Unstable percussion or sustain or distortion when using percussion or sustain. If there is any Sustain time evident at all, this means the Sustain oscillator is working and the problem will be on the MOS board. To check the Sustain oscillator, use a VOM set on the 50V. A. C. scale. Take a reading between Ground and output (black and white twisted pair).

Plays fine with only one note keyed, but distorts if more than one key is depressed.

Problems relating only to both the bass reed 32' Div. "C" voice and the Chiff.

Mixture distortion. Heard only on the pipe organ preset.

Alterable voice problems -- tone is slightly incorrect.

Alterables affect each other. Odd or even numbers. Example: putting a card on Alterable #1 will affect Alterable #3. If #1 Alterable affects #2 Alterable, or #3 affects #4, the problem will more likely be on the Clock & Logic board.

No vibrato at all. Could also be broken wire or defective Tremulant oscillator on the Keyboard Array. To check Tremulant oscillator, use a VOM set on the 50V. A. C. scale. Take a reading between Ground and the Collector of Q88 on the discrete Keyboard Array or Q22 on the IC type Array (also pin 2 of Keyboard Array connector J5). If the oscillator is working, you will see a consistent fluctuation of the meter needle.

Out of tune -- relative tuning unstable.

Frequency Distortion. To check, use Bagpipe 16' in Div. "C" and play octaves in the upper end of the keyboard. If defective, the tone will get "mushy". This usually occurs only after the KC has been on for some time.

Some Transposer problems -- generally noticed as frequency distortion in upper pitches when Transposer is in the 16' position. If the transposer does not operate properly in a certain position, it could be caused by a problem with the Transposer section of the Keyboard Array or dirty or misadjusted transposer relay contacts.

TROUBLE-SHOOTING CHECK LIST

A. Dead Condition - entire instrument:

1. Is A.C. input live?
2. Does pilot light come on?
3. Are ALL voltages normal?
4. Can you get hum from audio (finger on D.A.C.)?
5. Are all boards tight and connectors clean?
6. Did you change: MOS? DAC? Clock & Logic? KBD Array? Stopbd Array?
7. Were the above substitutions known to be good?
8. Did you try a second set of boards?
9. Did you check for shorts between connector pins?
10. Is transposer possibly between positions?

B. Dead Condition - only one channel:

1. Did you check for hum at DAC output to test amplifiers (finger on D.A.C.)?
2. Did you reverse DAC outputs?
3. Did you change DAC? MOS?
4. Did you check all audio connectors for shorts or opens?

C. Distortion:

1. Did you check all voltages?
2. How do you know meter is reliable?
3. Is the distortion in each channel?
4. Did you reverse DAC outputs?
5. Are amplifier settings correct?
6. Are amplifiers operating correctly?
7. Do you understand Digital overload?
8. Did you change MOS? DAC?
9. Did you check for A.C. on D.C. outputs?
10. Did you check individual speakers for distortion?

D. Stop Problems:

1. Did you inspect the stop switch?
2. Did you change the Stopboard Array?

3. Did you change MOS board?
4. Are affected stops those which are connected directly to the MOS Board rather than to the Stopboard Array?
5. Did you check for broken wires?
6. Did you check preset diode matrix for multiple keying of voices through a shorted diode?

E. Keying Problems:

1. What is pattern of problem?
2. Did you check the contacts (dirty, shorts, adjustment)?
3. Did you check the key switch diodes?
4. Did you check for broken wires or cold solder joints?
5. Did you change: Keyboard Array? MOS Board?

F. Card Reader Problems:

1. Which Alterables are affected?
2. Did you check CR lamp voltage? (7-1/2 volts, average)
3. Are ALL the lamps lit?
4. Did you change: Card Reader? MOS Board? Clock & Logic Board? Stopboard Array?
5. Did you check Alterable Voice Programmer switch (rotary)?
6. Did you check stop switch?
7. Does MOS Board have Alterable Chips (should total 22)?

G. Preset Problems:

1. Set same combination manually and compare to Preset.
2. If manual combination works, problem is in Preset Circuit or Diode Matrix.
3. Shorted diode on Control Tab switch:
   Entire MANUAL Set-Up will be added to any PRESET involving the Control Tab function with the shorted diode. No trouble will occur if all Control Tabs are turned off.

4. Shorted diode on Matrix:
   a. Corresponding Control Tab will activate entire PRESET through shorted diode.
   b. Other PRESETS using the same function will activate entire PRESET through shorted diode (two PRESETS will operate at the same time).

NOTE TO TECHNICIANS ON TERMINOLOGY - ALLEN ORGAN VS. RMI

Technicians already familiar with ALLEN ORGAN terminology will find some differences in RMI terminology. Those not familiar with the ALLEN terminology will find some references in the schematics that require some explanation:

1. References to the SWELL (SW) division of the organ in ALLEN terms means DIVISION "C" on the KC.
2. References to the GREAT (GT) division of the organ in ALLEN terms means DIVISION "B" on the KC.
3. References to the PEDAL (PED) division of the organ in ALLEN terms means DIVISION "A" on the KC.
4. References to PIANO MODE in ALLEN terms means RMI PERC (percussion). ALLEN term PERCUSSION normally means PIANO MODE plus SUSTAIN MODE.

EARLY PRODUCTION (NON-MOTHER BOARD) WIRING HARNESS

RMI KC-II PLUG WIRING CHART

MOS/DAC

J1	J2
12	28
14	16
16	12
70	40
74	36

MOS/CLOCK

J1	J71
40	44
42	40
46	42
48	32
61	17
65	19
69	21
71	23
73	1
75	3
77	13
79	11
81	9
83	7
85	5

DAC/CLOCK

J2	J71
24	34
32	36

MOS/STOP ARR.

J1	J4
1	27
20	15
22	21
24	22
26	20
28	19
30	23
32	17
34	25
36	26
38	24
45	28
47	11
57	5
80	7
82	13
87	9

MOS/-27v

J1	27k ohm
35	"
49	"
51	"
53	"
55	"
59	"
8	"
10	"
80	"
88	"

CLOCK/CARD READER

J71	J8	RIBBON
2	6	BROWN
28	3/4	RED
SPARE		ORANGE
16	8	YELLOW
14	10	GREEN
12	12	BLUE
10	14	PURPLE
8	16	GRAY
6	18	WHITE
4	20	BLACK
NC	25	BROWN (gnd)
20	22	RED
NC	25	ORANGE (gnd)
18	24	YELLOW
NC	25	GREEN (gnd)

SWITCH: (see schem)

J71/24	BLUE
J71/27	PURPLE
J1/67	GRAY
J1/63	WHITE
J1/72	BLACK

MOS/KBD ARR.

J1	J5
2	3
4	6
5	13
6	5
7	14
9	12
11	26
15	18
17	20
18	24
19	27
21	25
23	19
25	23
27	17
29	21
33	2
37	4
39	10
41	11
43	9
50	22
86	28

SPARES - ORANGE

for further wiring information see:

1. PEDAL ASSEMBLY WIRING CHART
2. STOPBOARD WIRING CHART
3. KEYING SYSTEM
4. SPECIFIC SCHEMATICS
5. POWER SUPPLY WIRING CHART

PRESETS

SWITCH	J/79 IN	J/79 OUT	MATRIX
STRINGS	16	25	1
ELECTRIC ORGAN	24	23	2
ORGAN & BELLS	22	21	3
ORGAN & GUITAR	20	19	4
HORN	18	17	5
ELECTRIC PIANO	16	15	6
CLAV	14	13	7
JAZZ FLUTE/CLAV	12	11	8
ALTO REC/HARPSI	10	9	9
BELLS	8	7	10
PIPE ORGAN	6	5	11
ECHO	4	3	12

RMI KC-II POWER SUPPLY WIRING CHART

GROUND BLACK

J2/2	DAC
J71/31	CLOCK
J1/76	MOS
J4/18	STOP
J5/16	KBD
J6/68	STOP
J6/7	STOP
J7/67	KBD
J7/2	KBD
J21/15	KBD
J8/25	READER
J8/26	READER
J8/28	READER
J6/60	STOP

-27vdc YELLOW

J71/27	CLOCK
J6/4	STOP
J1/44	MOS
J2/44	DAC
J7/1	KBD
J79/1	PRESET

-5vdc BLUE

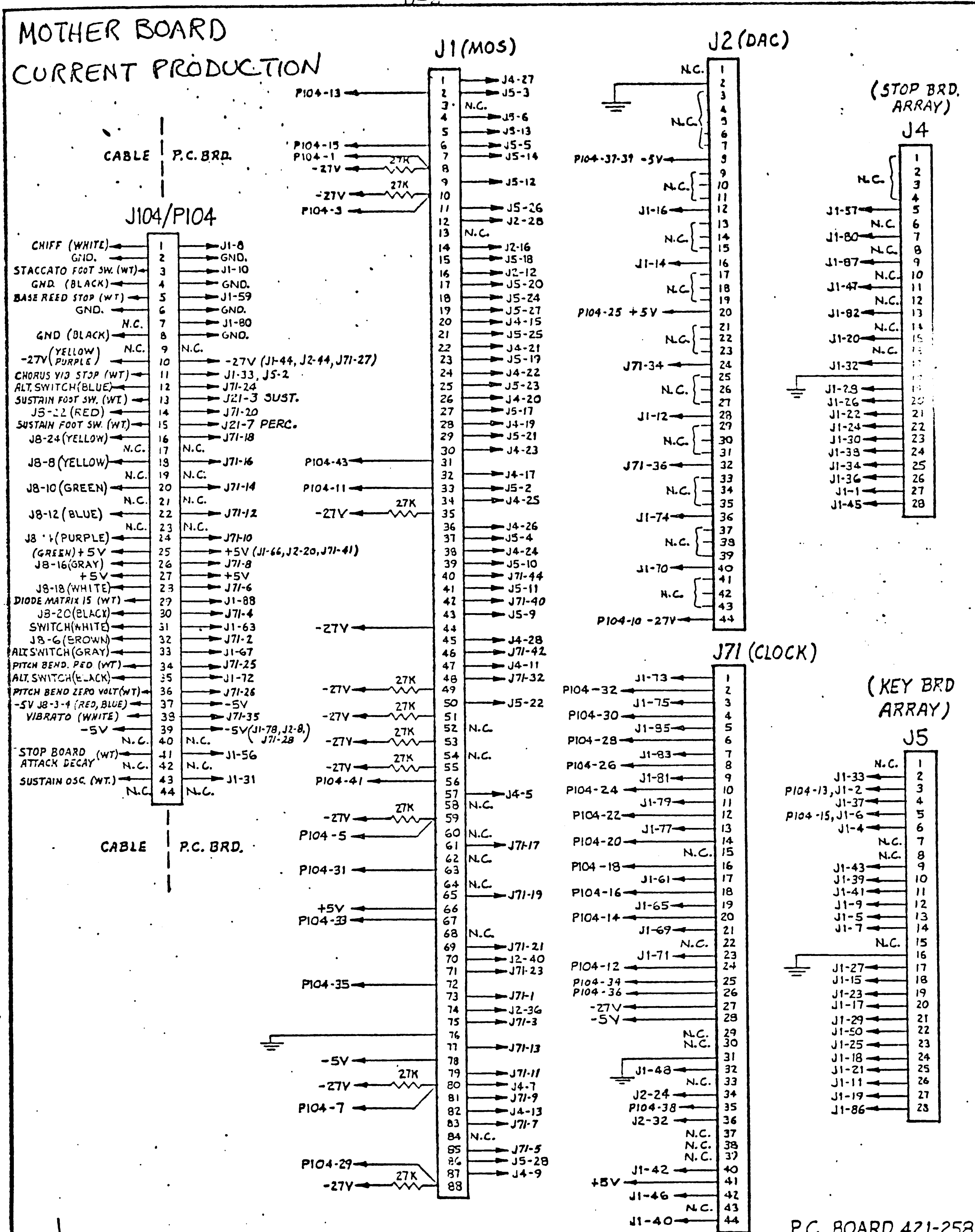
J1/78	MOS
J2/8	DAC
J71/28	CLOCK
J6/12	STOP
J7/3	KBD

+5vdc GREEN

J1/66	MOS
J2/20	DAC
J71/41	CLOCK
J6/63	STOP
J7/65	KBD

ALL SPARES - ORANGE

TE (2)



REVISIONS

GEN. REVISION 12 MAY 1978

ALLEN ORGAN CO.
MACUNGIE, PENNA.

MOTHER BOARD - K.C. II

BY G.S.	SCALE		MATERIAL
CHK'D K.B. 11-10-77	DATE 11-3-77	APP'D	NO. 081-6800

← FROM PRESET CIRCUIT DRIVER

PRESETS:
1. STRINGS
2. ELECTRIC ORGAN
3. ORGAN + BELLS
4. ORGAN + GUITAR
5. HORN
6. ELECTRIC PIANO
7. CLAV
8. JAZZ FLUTE/CLAV
9. ALTO REC./HARPSI
10. BELLS
11. PIPE ORGAN
12. ECHO

FUNCTIONS KEYED:

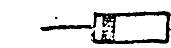
VOICE	PITCH	PLUG-PIN	12	11	10	9	8	7	6	5	4	3	2	1
DIVISION "A"														
1. ALTO RECORDER	8	J6-27				X								
2. JAZZ FLUTE	8	J6-43					X							
3. VIBRATO		J7-61				X	X							
4. SHORT ATTACK		J7-55									X	X	X	
5. PERCUSSION (PIANO MODE)		J7-62	X		X			⊠	X					
6. SUSTAIN		J7-63			X									
7. GREAT to PED. NAT. (ADD CH2)		J7-4	X	X	X				X	X	X	X	X	X
8. SWELL to PED. SYN. (DIV C CH1)		J6-58						X						
9. SWELL to PED. NAT. (DIV C CH2)		J7-6	X			X	X	X			X	X	X	
DIVISION "B"														
10. LINEAR SAWTOOTH	16	J6-18	X											X
11. FRENCH HORN	16	J6-23								⊠	X	X	X	
12. CORNOPEAN REED	16	J6-21							X	X				
13. CHRYSOGLOTT (BELLS)	–	J6-17			X									
14. CHRYSOGLOTT (BELLS)		J6-15			X									
15. MIXTUR	IV	J1-88		X										
16. ELECTRIC PIANO	16	J6-33							X	⊠				
17. PIPE ORGAN ENS. 16'8'4'		J6-31		X										
18. VIBRATO		J7-57	X	X	X				X	X	X	X	X	X
19. SHORT ATTACK		J7-51								⊗	X	X	X	⊗
20. PERCUSSION (PIANO MODE)		J7-47	X		X				X					
21. SUSTAIN		J7-64			X									
DIVISION "C"														
22. 32ND PULSE	16	J6-30				X		⊗						
23. 32ND PULSE	16	J6-34				X		⊗						
24. SINE WAVE	5 1/3	J6-54									X		X	
25. SINE WAVE (CH 2)	2	J6-52										X		
26. SINE WAVE (CH 1)	2	J6-28										X		
27. SINE WAVE (NAZ 2 2/3)	5 1/3	J6-50									X		X	
28. SINE WAVE	5 1/3	J6-44									X		X	
29. BASS REED	32	J1-59	X											
30. JAW HARP	16	J6-26					X	⊠			X			
31. SPANISH TRUMPET	16	J6-24									X			
32. BAGPIPE	16	J6-20					X	⊠						
33. VIBRATO		J7-59						⊗						
34. SHORT ATTACK		J7-53												
35. PERCUSSION (PIANO MODE)		J7-49				X	X	⊠			X	X	X	
36. SUSTAIN		J7-66										X		
37. CHIFF		J1-8	X											
GENERALS														
38. CHORUS		J5-2	X	X	X			⊗	X	X	X	X	X	X
39. ATTACK-DECAY VARIABLE		J1-56	X							⊗				X
40. STACCATO		J1-10						⊗						

STOPBOARD CUT-OUT RELAY ACTIVATED BY PRESETS

GREAT to PED. SYN. WIRED "ON"

NOTE: CHORUS IS ACHIEVED BY KEYING "CHORUS" (J5-2) AND AN APPROPRIATE DIVISIONAL VIBRATO

IN4151

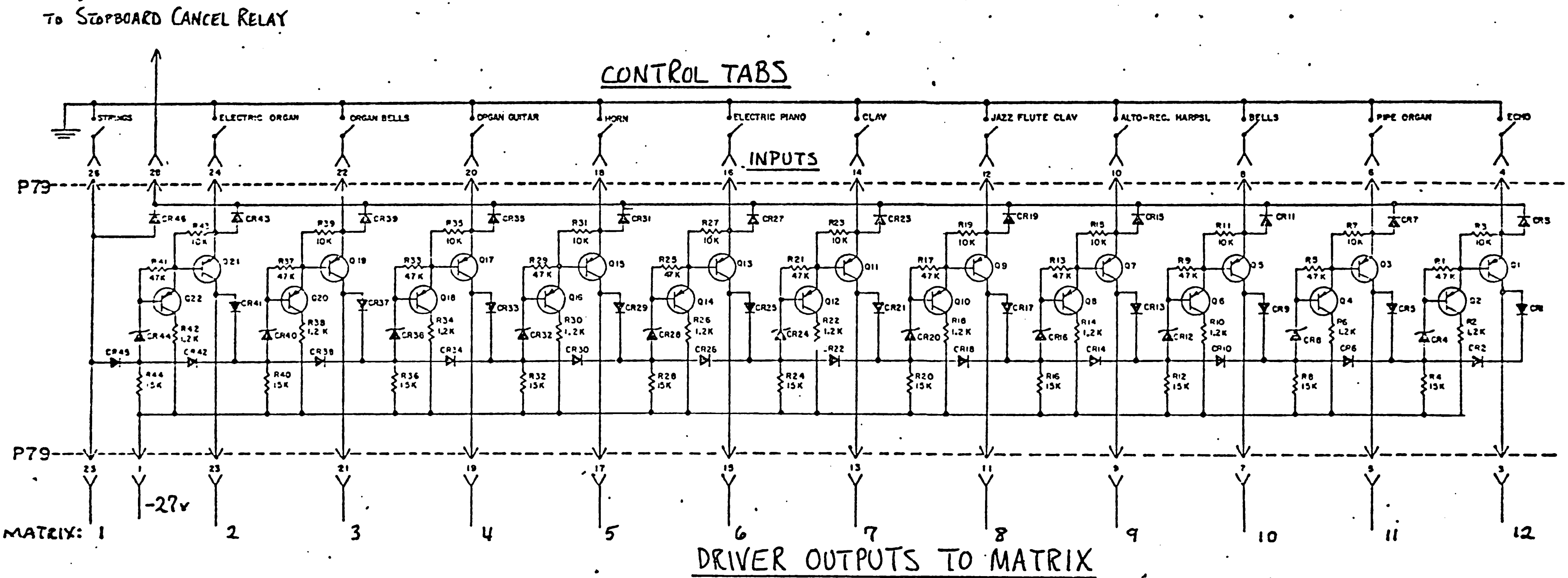


DIODE BAND TOWARD FUNCTION KEYED ←

SOON AFTER INTRODUCTION KC-II CHANGES WERE MADE IN STRING, HORN, AND CLAV PRESETS. NOTE ADDITIONS AND OMISSIONS ON MATRIX:

(LATER PRODUCTION) ⊠ ADDED ⊗ OMITTED

PRESET MATRIX



NOTES: 1) CR4,8,12,16,20,24,28,32,36,40,44 = IN4742
ALL OTHER DIODES ARE 232-0006

2) ALL TRANSISTORS ARE 2N3906

REVISIONS

P.C. BOARD NO. 421-2545
ASS'Y NO. 904-5551

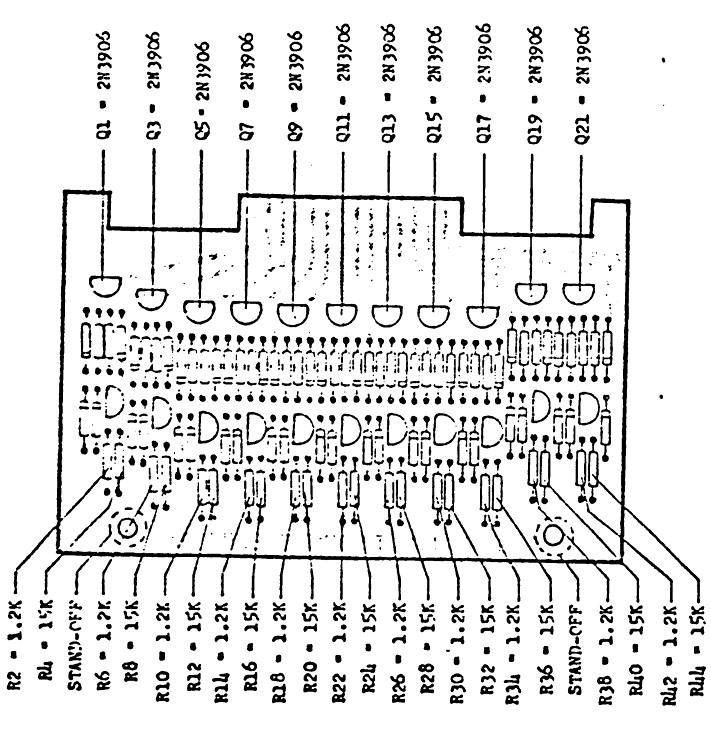
ALLEN ORGAN CO.

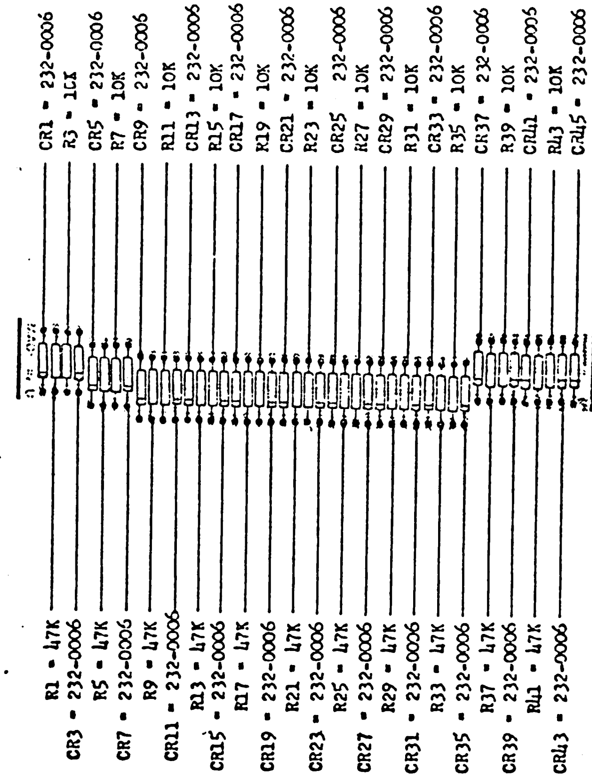
K.C. PRESET CIRCUIT

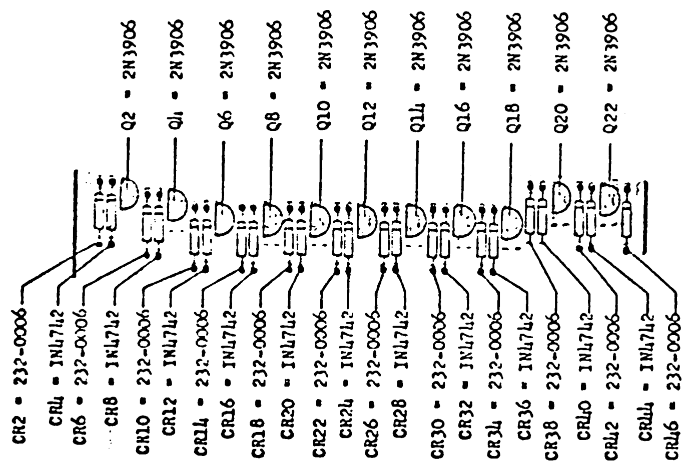
G.S.

3-31-77

081-5066







P.C. BOARD NO. 421-2545
SCHEMATIC NO. 031-5066

ALLEN ORGAN CO.

K.C. PRESET CIRCUIT P.C. BOARD ASSEMBLY

G.S.	FULL	
	3/30/77	904-5551

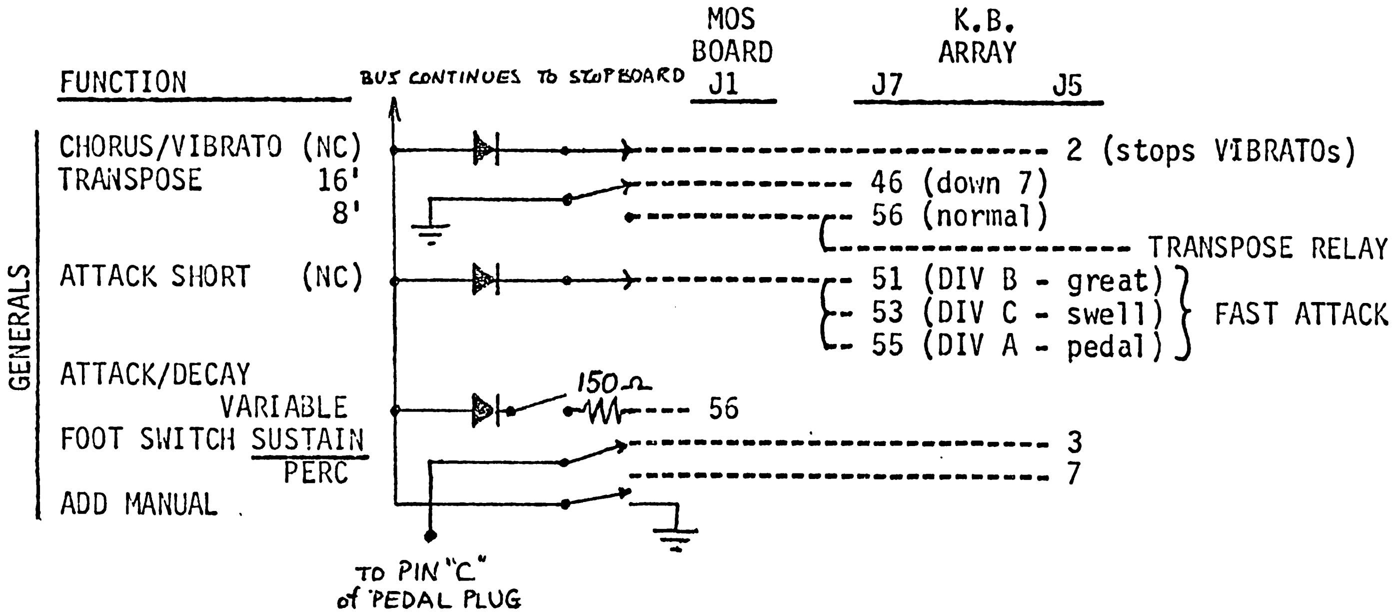
BUS CONTINUES TO "GENERALS"

Division	Function		MOS Board J1	S.B. Array J6	K.B. Array J7 (A.O.C. terms)
DIVISION A - CH. ONE	SINE BASS	32		47, 51	
	SUB GAMBA	32		53	
	BASS REED	32	59		
	SINE CHORUS	16		37	
	WALDHORN	16		41	
	WOOD CLARINET	16		35	
	ALTO RECORDER	8		27	
	SOLO FLUTE	8		25	
	JAZZ FLUTE	8		43	
DIVISION B - CHANNEL ONE & TWO	CH 1	CV			61 (PED TREM)
	CH 2	CV			57 (GT TREM)
	CH 2 ADD CHANNEL				4 (GT-PED NAT)
	CH 1-2 PERCUSSION				47 (GT PIANO MODE), 62 (PED PIANO MODE)
	CH 1-2 SUSTAIN				63 (PED SUSTAIN), 64 (GT SUSTAIN)
	LINEAR SAWTOOTH	16		18	
	FRENCH HORN	16		23	
	CORNOPEAN REED	16		21	
	ELECTRIC PIANO	16		33	
	8th PULSE	16		36 (CH 1 ONLY)	
	16th PULSE	16		38 (CH 1 ONLY), 40 (CH 1 ONLY)	
	ALTERABLE VOICE #1			19	
	ALTERABLE VOICE #2			29	
DIVISION C - CHANNEL ONE & TWO	CH 2 CHIFF	CF	8		
	CH 2	CV			59 (SW TREM)
	CH 1 CANCEL	(NC)		58	(SW-PED SYN)
	CH 2 ADD CHANNEL				6 (SW-PED NAT)
	CH 2 PERCUSSION				49 (SW PIANO MODE)
	CH 2 SUSTAIN				66 (SW SUSTAIN MODE)
	SPANISH TRUMPET	16		24	
	BAGPIPE	16		20	
	JAW HARP	16		26	
	32nd PULSE	16		30, 34	
	SINE WAVE	5 1/3		44; 50 (NAZARD), 54	
	SINE WAVE	2		28 (CH 1); 52 (CH 2)	
	SINE WAVE	1 3/5		46; 48	
	ALTERABLE VOICE #3			32	
	ALTERABLE VOICE #4			22	

STOPBOARD CANCEL RELAY -27 (from PRESET CIRCUIT)

STOPBOARD WIRING CHART

(continued on E-5)



STOPBOARD WIRING CHART (contd)

STOPBOARD ARRAY TROUBLESHOOTING CHART

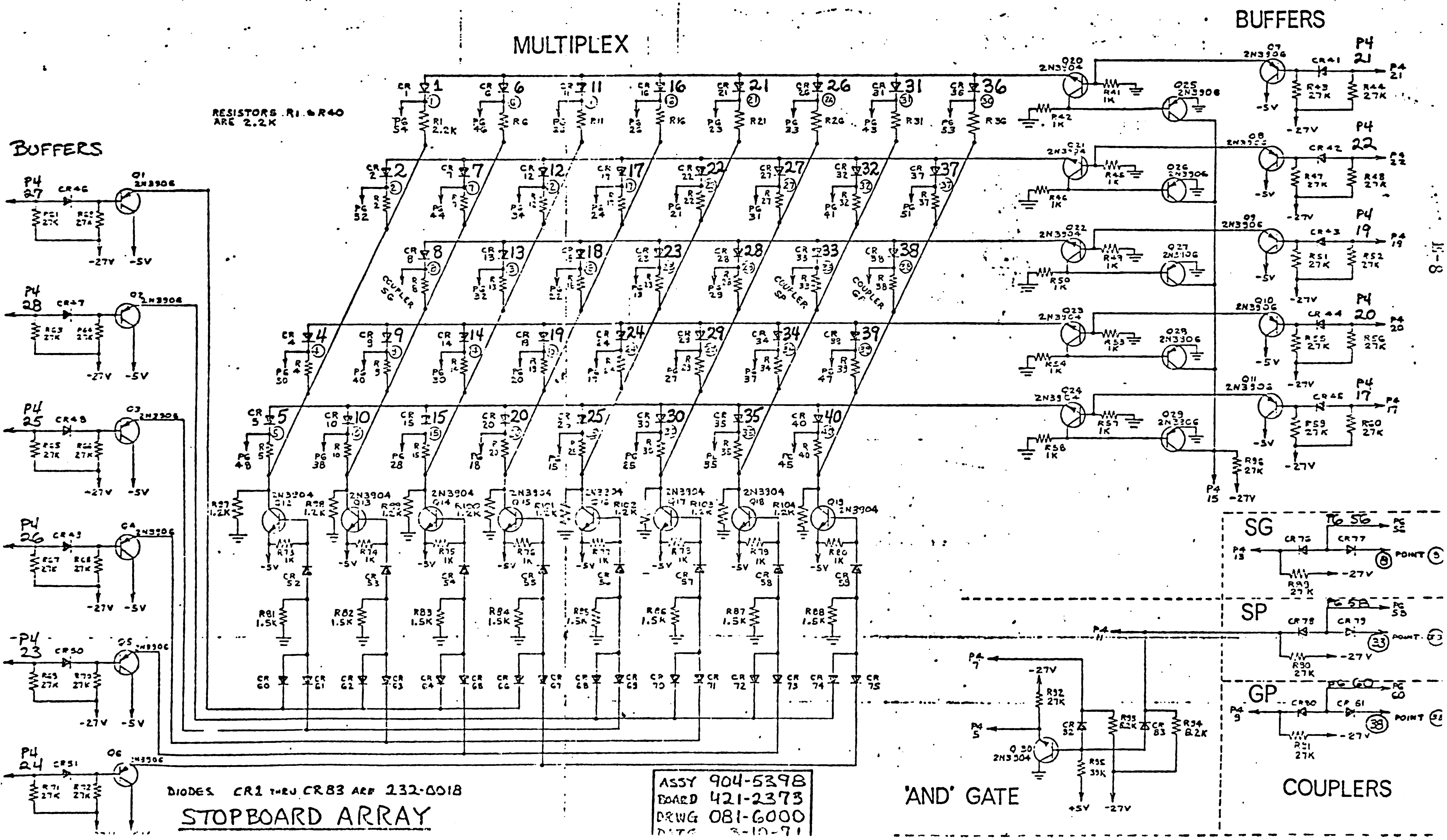
Totally dead board.	Shorted Q25 to Q29.
Voices cipher, one Horizontal row.	Shorted Q7 to Q11. Open Q20 to Q24. Open Q25 to Q29.
Voices cipher, one Vertical row.	Open Q12 to Q19.
Voices cipher, four Vertical rows.	Shorted Q1 or Q2.
Voices cipher, two Vertical rows.	Shorted Q3 to Q6.
One voice ciphers.	Open diode for that voice.
One Horizontal row works, but any voice in that row, when on will allow its Vertical row to also work.	Open Q7 to Q11. Shorted Q20 to Q24.
One Vertical row works, but any voice in that row, when on, will allow its Horizontal row to also work.	Shorted Q12 to Q19.
One voice, when on, turns on all the other voices in its Horizontal row.	Shorted diode for that voice.
Four Vertical rows are dead.	Open Q1 or Q2 for the four rows that do work.
Six Vertical rows are dead.	Open Q3 to Q6 for the two rows that do work.

NOTE: Cipher = Voice unintentionally "on"

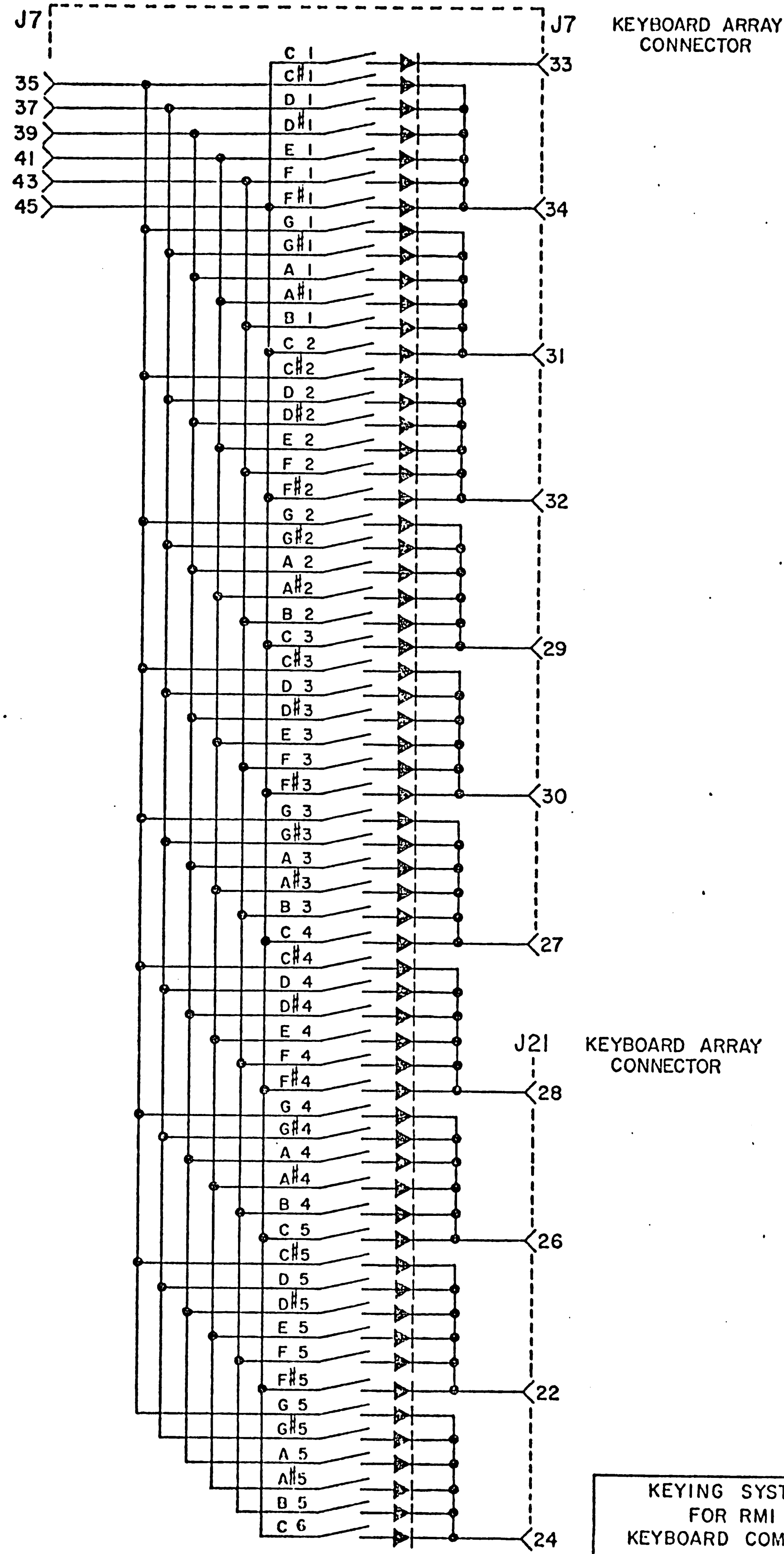
(1) Div C SINE WAVE 5-1/3 (Doubled) Ch 1 only	(6) Div C SINE WAVE 1-3/5 (Doubled)	(11) Div B 8th PULSE 16	(16) Div C JAW HARP 16	(21) Div B FRENCH HORN 16	(26) Div B ELECTRIC PIANO 16	(31) Div A JAZZ FLUTE 8	(36) Div A SUB GAMBA 32 Ch 1 only
(2) Div C SINE WAVE 2 (Doubled) Ch 1 only	(7) Div C SINE WAVE 5-1/3 (Doubled) Ch 1 only	(12) Div C 32nd PULSE 16 (Doubled)	(17) Div C SPANISH TRUMPET 16	(22) Div B CORNOPEAN REED 16	(27) Div B PIPE ORGAN (Preset only)	(32) Div A WALD HORN 16	(37) Div A SINE WAVE 32 (Doubled) Ch 1 only
	(8) (DIV C) (TO) (DIV B) (Syn Coupler) NOT USED	(13) Div C ALTERABLE VOICE #3	(18) Div C ALTERABLE VOICE #4	(23) Div B ALTERABLE VOICE #1	(28) Div B ALTERABLE VOICE #2	(33) Div C CANCEL CHANNEL Ch 1 (Normally On)	(38) DIV B TO DIV A Syn Coupler (Wired On)
(4) Div C NAZARD (Presets only) Ch 1 only	(9) Div B 16th PULSE (Doubled) Ch 1 only	(14) Div C 32nd PULSE (Doubled)	(19) Div C BAG PIPE 16	(24) Div B BELLS (Doubled) Preset only	(29) Div A ALTO RECORDER Ch 1 only	(34) Div A SINE CHORUS 16 Ch 1 only	(39) Div A SINE BASS (Doubled) Ch 1 only
(5) Div C SINE WAVE 1-3/5 (Doubled) Ch 1 only	(10) Div B 16th PULSE (Doubled) Ch 1 only	(15) Div C SINE WAVE 2 (Doubled)	(20) Div B LINEAR SAWTOOTH 16	(25) Div B BELLS (Doubled) Preset only	(30) Div A SOLO FLUTE 8 Ch 1 only	(35) Div A WOOD CLARINET 16 Ch 1 only	(40) Div A (BASS) (REED) (32) NOT USED

A = Division A
B = Division B
C = Division C

RMI STOPBOARD ARRAY LAYOUT



MULTIPLEX
BUFFERS
BUFFERS
RESISTORS R1 & R40 ARE 2.2K
COUPLER SG
COUPLER SP
COUPLER GP
SG
SP
GP
'AND' GATE
COUPLERS
DIODES CR1 THRU CR83 ARE 232-0018
STOPBOARD ARRAY
ASSY 904-5398
BOARD 421-2373
DRWG 081-6000



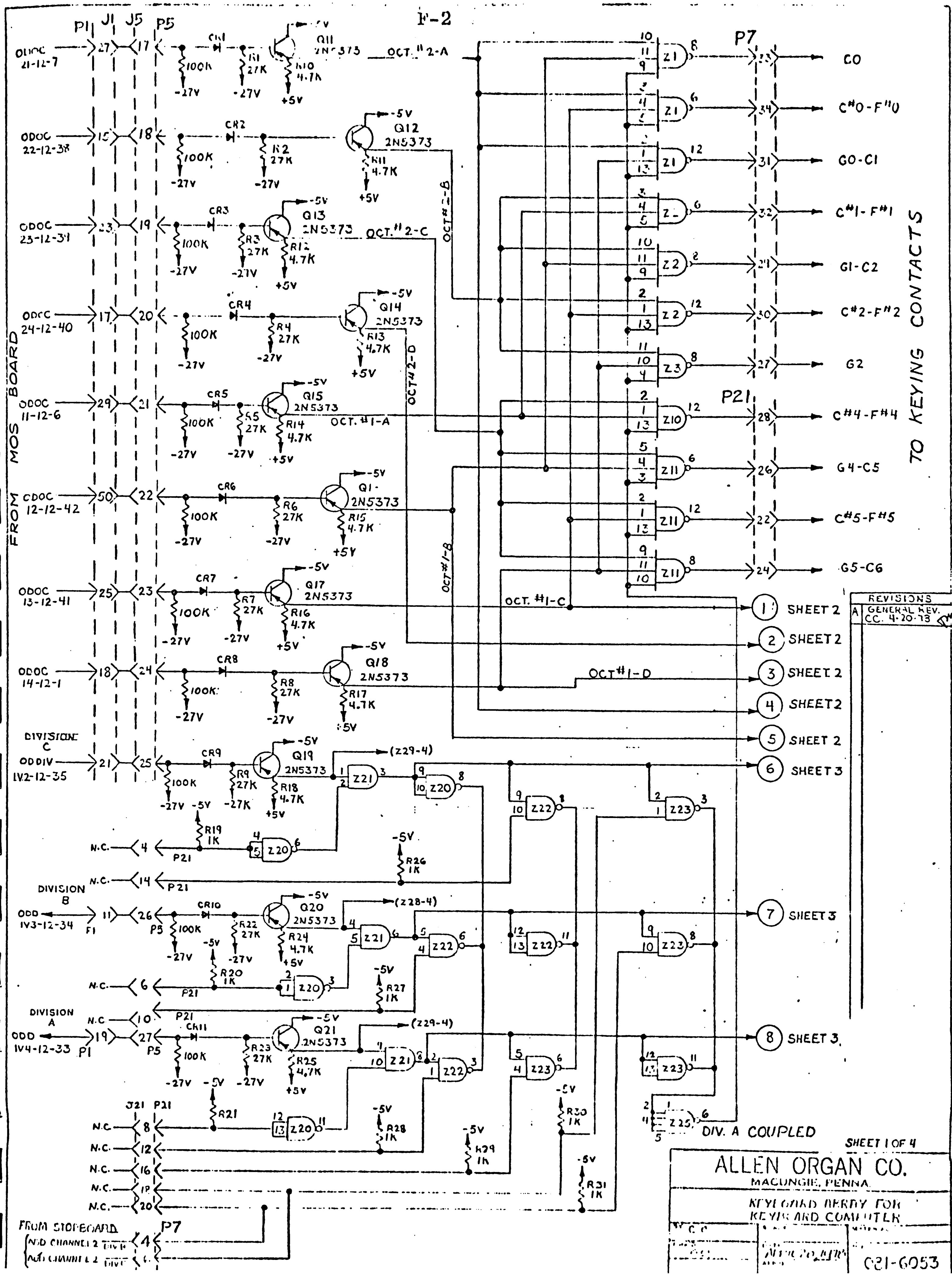
ALL SWITCHES ARE:
SPST #903-2065

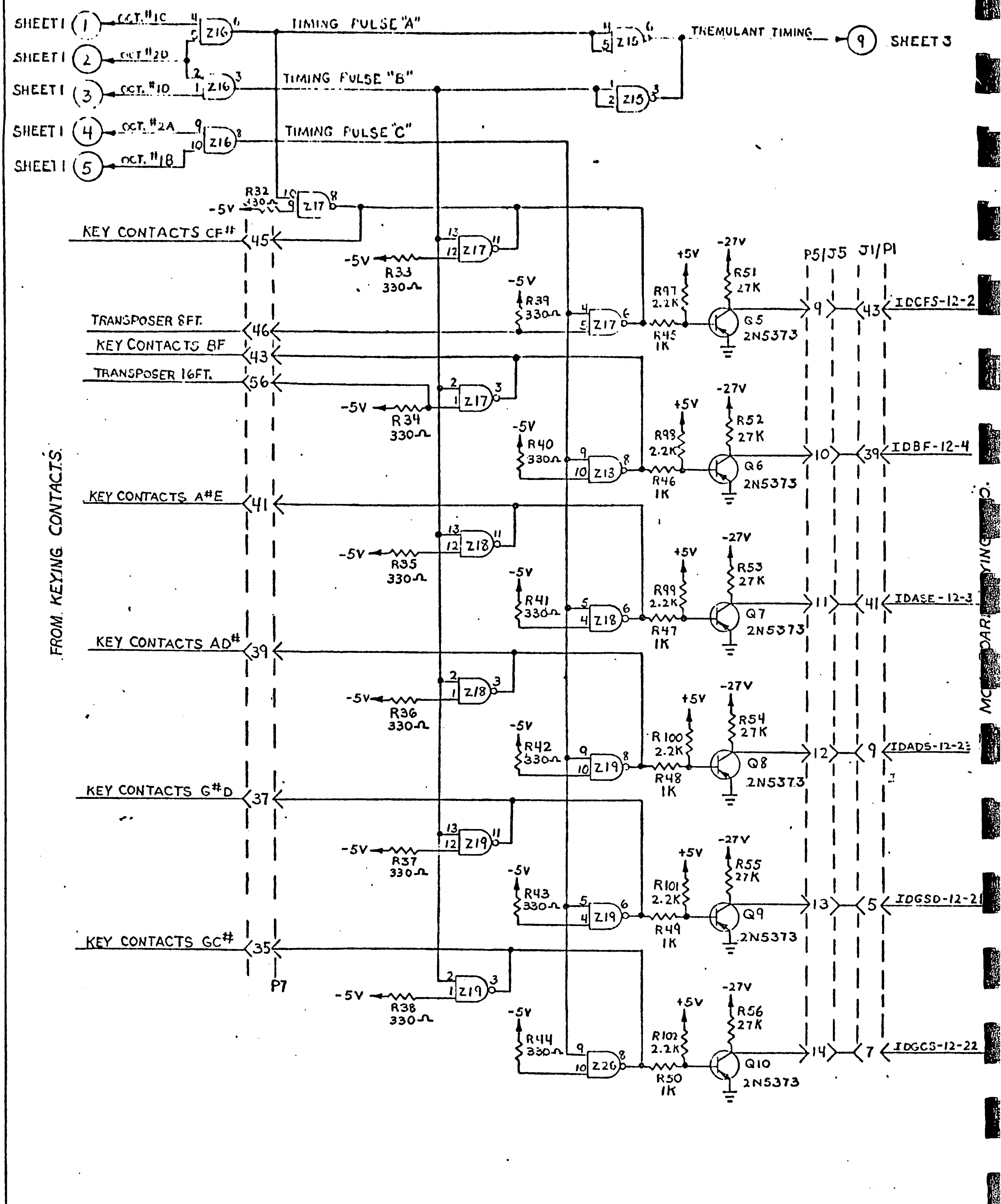
ALL DIODES ARE:
300 mA, 50V.
#232-0006

KEYING SYSTEM
FOR RMI
KEYBOARD COMPUTER

012-0077

ROCKY MOUNT INSTRUMENTS


F-2
P1 J1 J5 P5
FROM MOS BOARD
ODOC 21-12-7
ODOC 22-12-38
ODOC 23-12-39
ODOC 24-12-40
ODOC 11-12-6
ODOC 12-12-42
ODOC 13-12-41
ODOC 14-12-1
DIVISION C
ODDIV 1V2-12-35
DIVISION B
ODD 1V3-12-34
DIVISION A
ODD 1V4-12-33
OCT. #2-A
OCT. #2-C
OCT. #1-A
OCT. #1-C
OCT #1-D
2N5373
P7
P21
CO
C#0-F#0
G0-C1
C#1-F#1
G1-C2
C#2-F#2
G2
C#4-F#4
G4-C5
C#5-F#5
G5-C6
TO KEYING CONTACTS
SHEET 2
SHEET 3
DIV. A COUPLED
FROM STOPBOARD
REVISIONS
GENERAL REV. CC. 4-20-73
SHEET 1 OF 4
ALLEN ORGAN CO.
MACUNGIE, PENNA.
C21-6053



REVISIONS

GENERAL REVISIONS C.C. 4-20-79

SHEET 2 OF 4

ALLEN ORGAN CO.

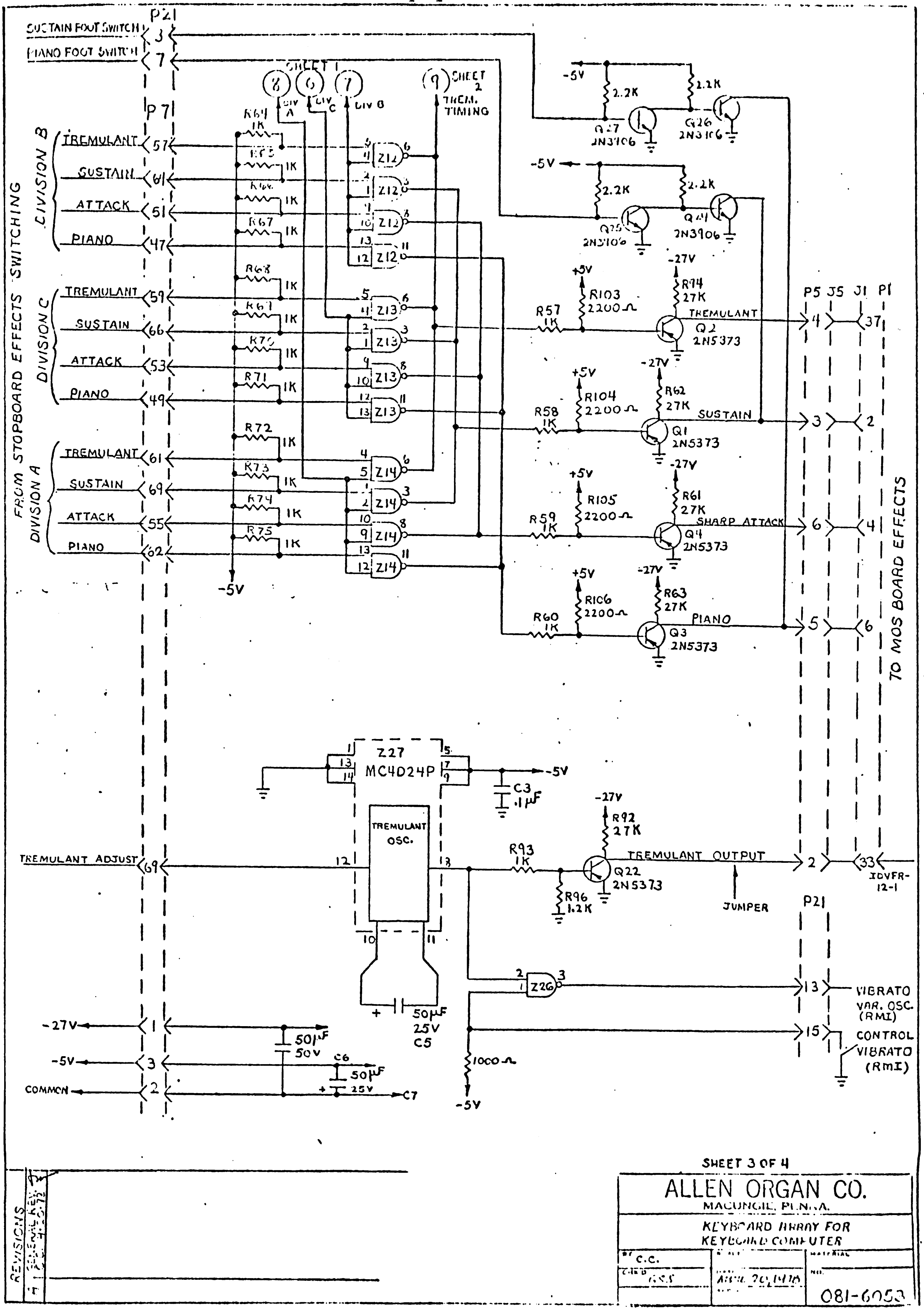
MACUNGIE, PENNA.

KEYBOARD ARRAY FOR KEYBOARD COMPUTER

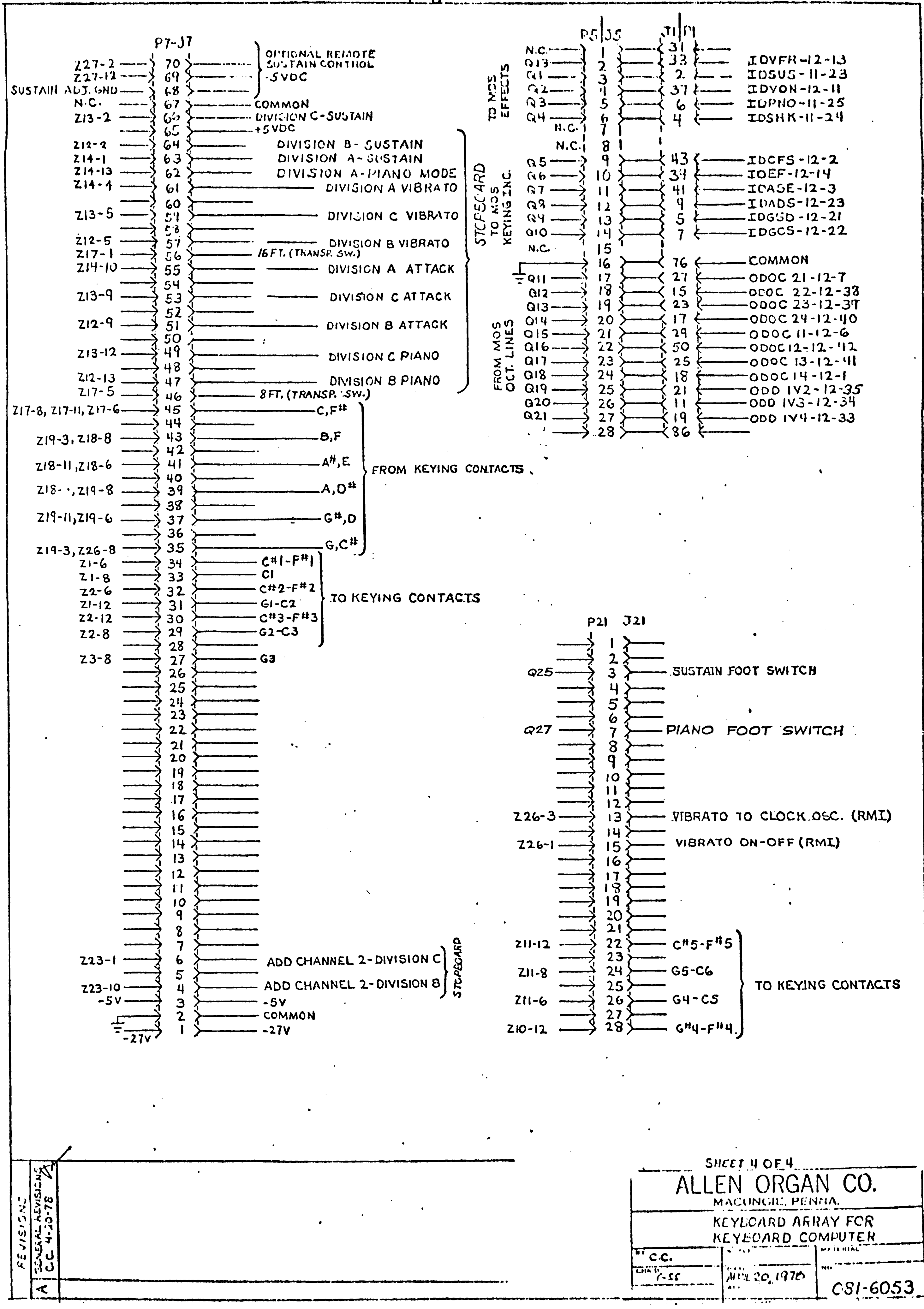
C.C.

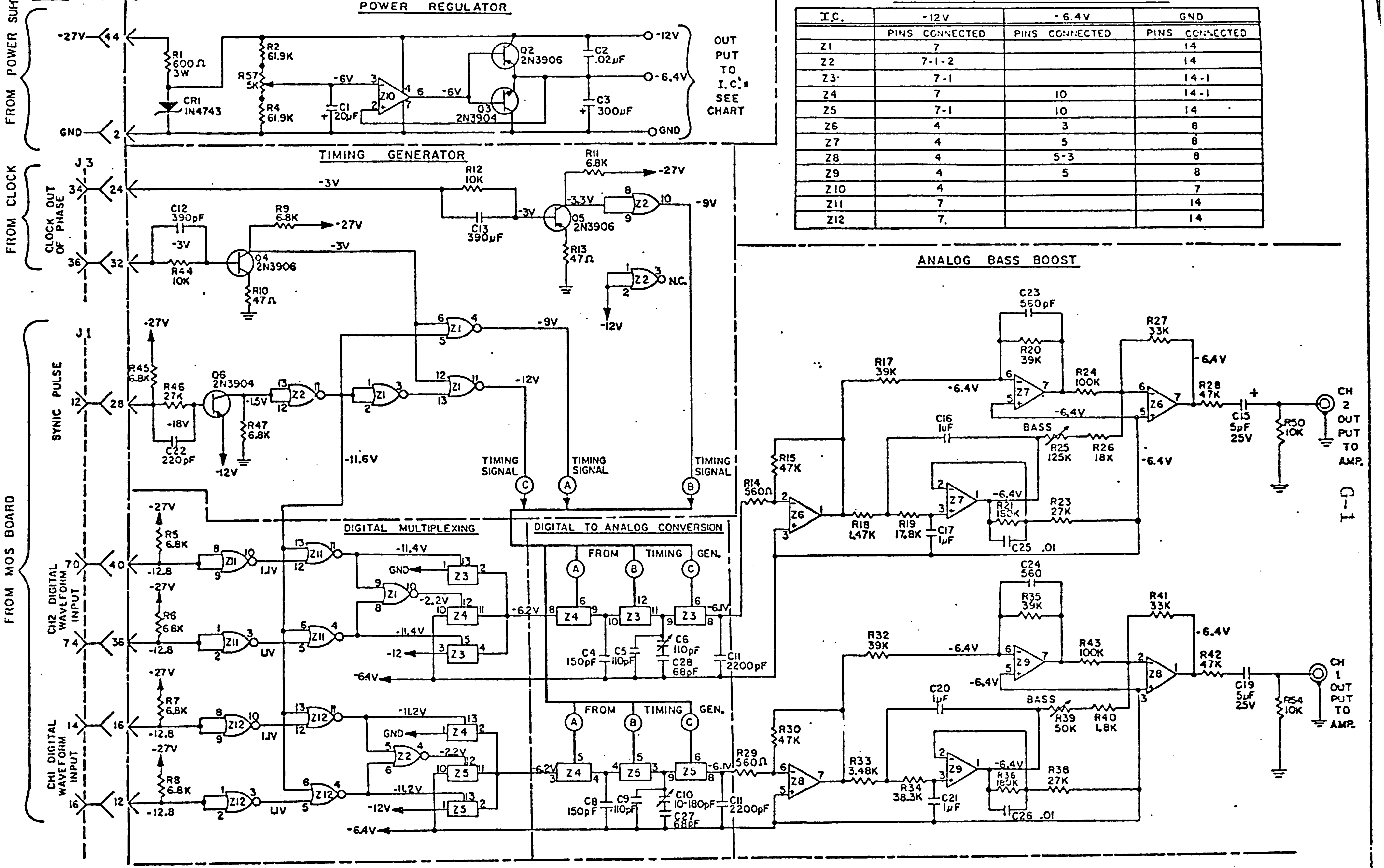
NOV 20, 1978

081-6053



SUSTAIN FOOT SWITCH
PIANO FOOT SWITCH
P21
P7
SHEET 1
DIV A
DIV C
DIV B
SHEET 2
TREM. TIMING
FROM STOPBOARD EFFECTS SWITCHING
DIVISION B
TREMULANT
SUSTAIN
ATTACK
PIANO
DIVISION C
TREMULANT
SUSTAIN
ATTACK
PIANO
DIVISION A
TREMULANT
SUSTAIN
ATTACK
PIANO
-5V
2.2K
Q27 2N3906
Q26 2N3906
Q25 2N3906
Q24 2N3906
+5V
-27V
R103 2200 Ω
R104 2200 Ω
R105 2200 Ω
R106 2200 Ω
R57 1K
R58 1K
R59 1K
R60 1K
R74 27K
R62 27K
R61 27K
R63 27K
TREMULANT
SUSTAIN
SHARP ATTACK
PIANO
Q2 2N5373
Q1 2N5373
Q4 2N5373
Q3 2N5373
P5
J5
J1
P1
TO MOS BOARD EFFECTS
Z27 MC4024P
TREMULANT OSC.
C3 .1µF
TREMULANT ADJUST
R93 1K
R92 27K
R96 1.2K
Q22 2N5373
TREMULANT OUTPUT
JUMPER
IDVFR-12-1
50µF 25V C5
Z26
VIBRATO VAR. OSC. (RMI)
CONTROL VIBRATO (RMI)
1000 Ω
-27V
-5V
COMMON
50µF 50V
C6 50µF 25V
C7
REVISIONS
SHEET 3 OF 4
ALLEN ORGAN CO.
MACUNGIE, PENNA.
KEYBOARD ARRAY FOR KEYBOARD COMPUTER
C.C.
081-6053


P7-J7
OPTIONAL REMOTE SUSTAIN CONTROL
-5 VDC
SUSTAIN ADJ. GND
COMMON
DIVISION C-SUSTAIN
+5 VDC
DIVISION B-SUSTAIN
DIVISION A-SUSTAIN
DIVISION A-PIANO MODE
DIVISION A VIBRATO
DIVISION C VIBRATO
DIVISION B VIBRATO
16 FT. (TRANSP. SW.)
DIVISION A ATTACK
DIVISION C ATTACK
DIVISION B ATTACK
DIVISION C PIANO
DIVISION B PIANO
8 FT. (TRANSP. SW.)
STOPBOARD TO MOS KEYING INC.
C,F#
B,F
A#,E
A,D#
G#,D
G,C#
FROM KEYING CONTACTS
C#1-F#1
C1
C#2-F#2
G1-C2
C#3-F#3
G2-C3
G3
TO KEYING CONTACTS
ADD CHANNEL 2-DIVISION C
ADD CHANNEL 2-DIVISION B
STOPBOARD
-5V
COMMON
-27V
P5 J5
J1 P1
TO MOS EFFECTS
IDVFR-12-13
IDSUS-11-23
IDVON-12-11
IDPNO-11-25
IDSHK-11-24
IDCFS-12-2
IDEF-12-14
IDASE-12-3
IDADS-12-23
IDGSD-12-21
IDGCS-12-22
COMMON
FROM MOS OCT. LINES
ODOC 21-12-7
ODOC 22-12-38
ODOC 23-12-37
ODOC 24-12-40
ODOC 11-12-6
ODOC 12-12-42
ODOC 13-12-41
ODOC 14-12-1
ODD IV2-12-35
ODD IV3-12-34
ODD IV4-12-33
P21 J21
SUSTAIN FOOT SWITCH
PIANO FOOT SWITCH
VIBRATO TO CLOCK OSC. (RMI)
VIBRATO ON-OFF (RMI)
C#5-F#5
G5-C6
G4-C5
G#4-F#4
TO KEYING CONTACTS
REVISIONS
A GENERAL REVISIONS CC 4-20-78
SHEET 4 OF 4
ALLEN ORGAN CO.
MACUNGIE, PENNA.
KEYBOARD ARRAY FOR KEYBOARD COMPUTER
C.C.
APR. 20, 1978
CSI-6053



POWER REGULATOR OUTPUT CHART

I.C.	-12V	-6.4V	GND
	PINS CONNECTED	PINS CONNECTED	PINS CONNECTED
Z1	7		14
Z2	7-1-2		14
Z3	7-1		14-1
Z4	7	10	14-1
Z5	7-1	10	14
Z6	4	3	8
Z7	4	5	8
Z8	4	5-3	8
Z9	4	5	8
Z10	4		7
Z11	7		14
Z12	7.		14

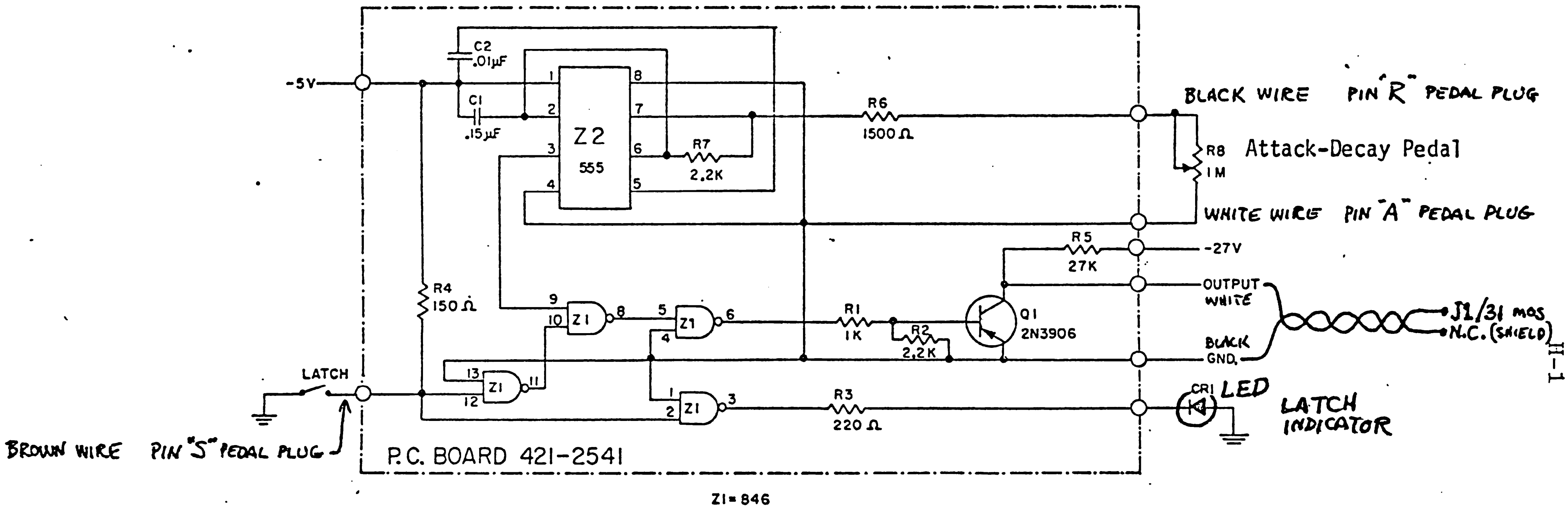
G-1

REVISIONS

ALLEN ORGAN CO.
MACUNGIE, PENNA

D.A.C. FOR KC II

G.S. | FULL | 7-31-78 | 081-6024

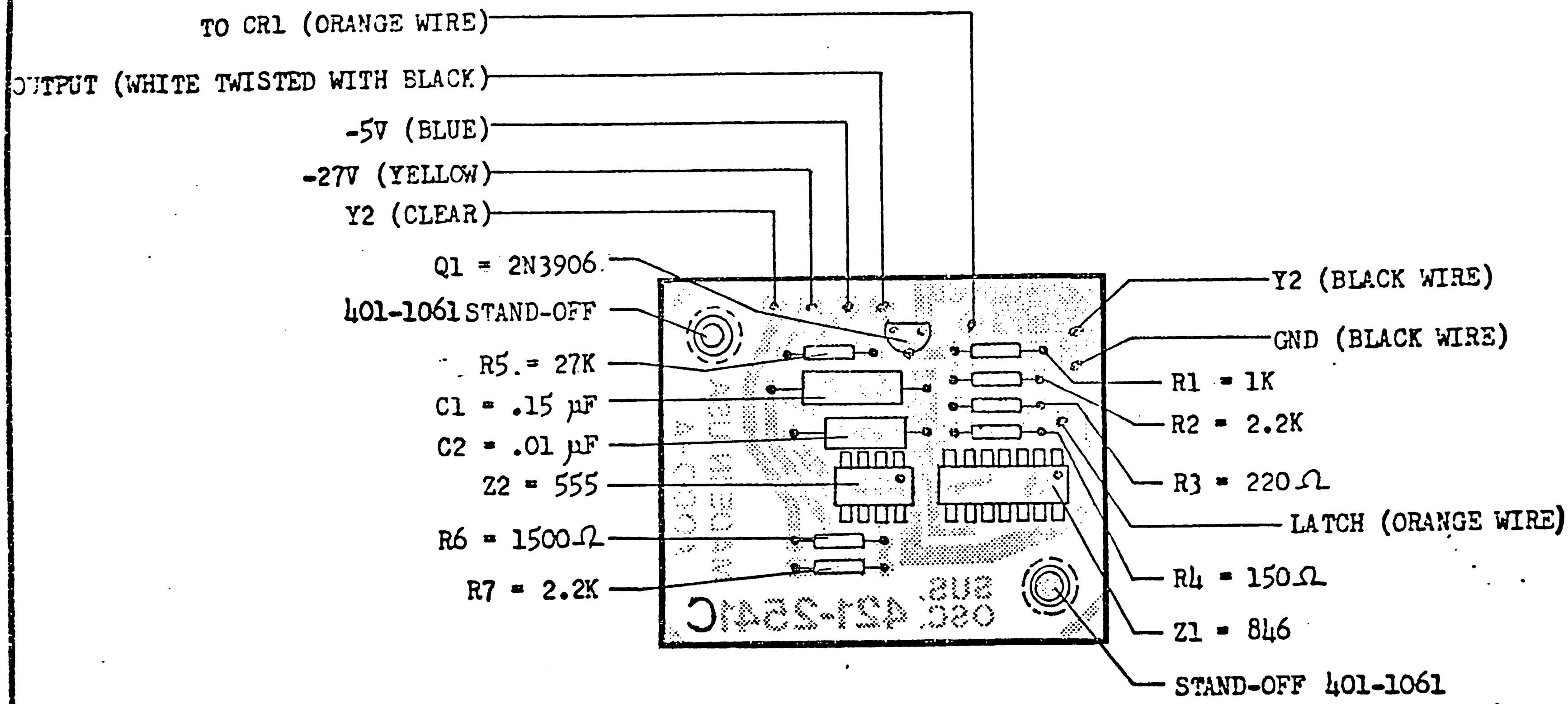


II-1

REVISIONS

ASSEMBLY NO. 904-5552

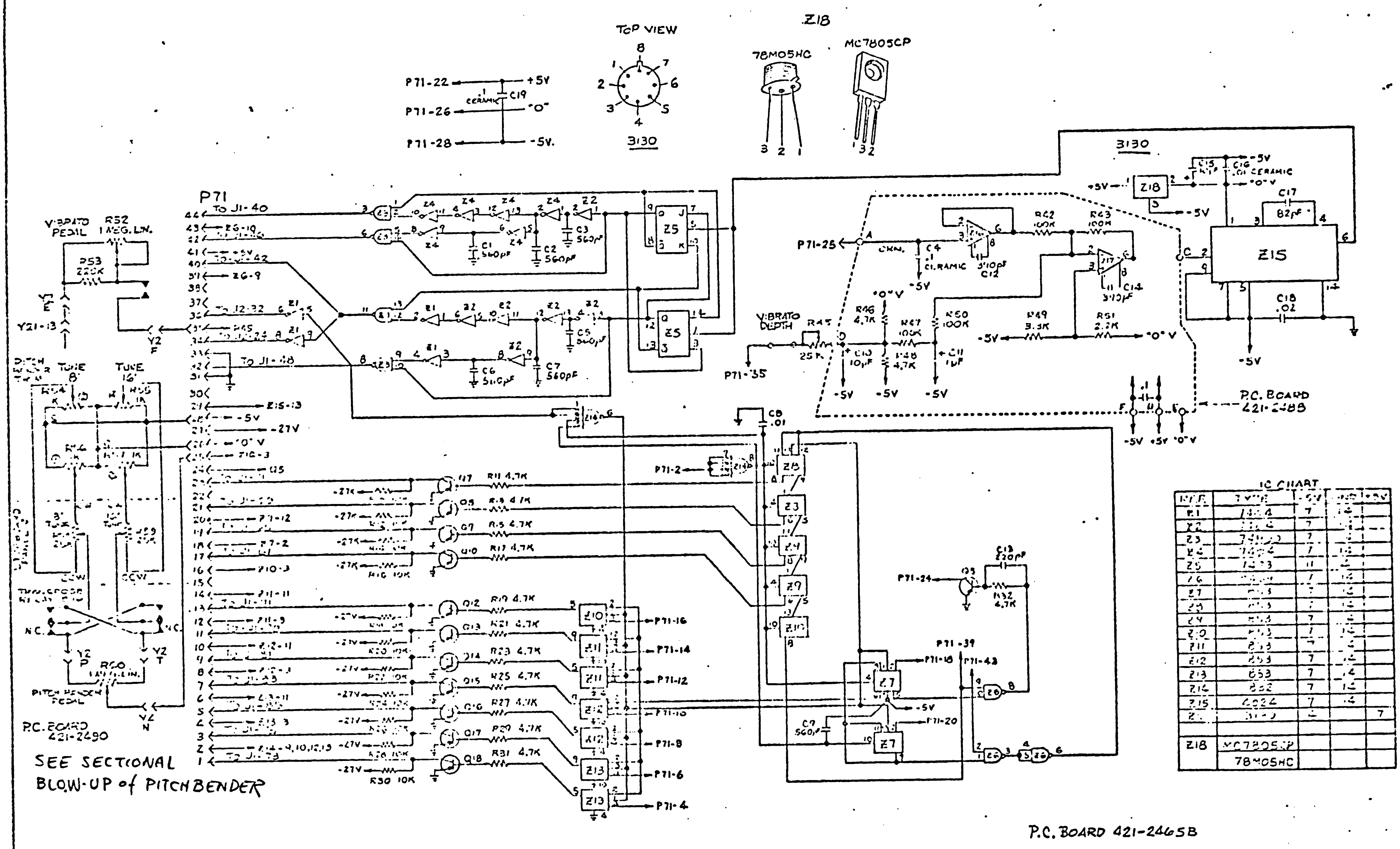
ALLEN ORGAN CO.	
WIDE RANGE SUSTAIN OSCILLATOR	
G.S.	
4/6/77	081-6047



P.C. BOARD NO. 421-2541
SCHEMATIC NO. 031-6047

REVISIONS

ALLEN ORGAN CO. MACUNGIE, PENNA.		
WIDE RANGE SUSTAIN OSCILLATOR P.C. BOARD ASS'Y		
G.S.	FULL	
	4/6/77	904-5552



IC CHART

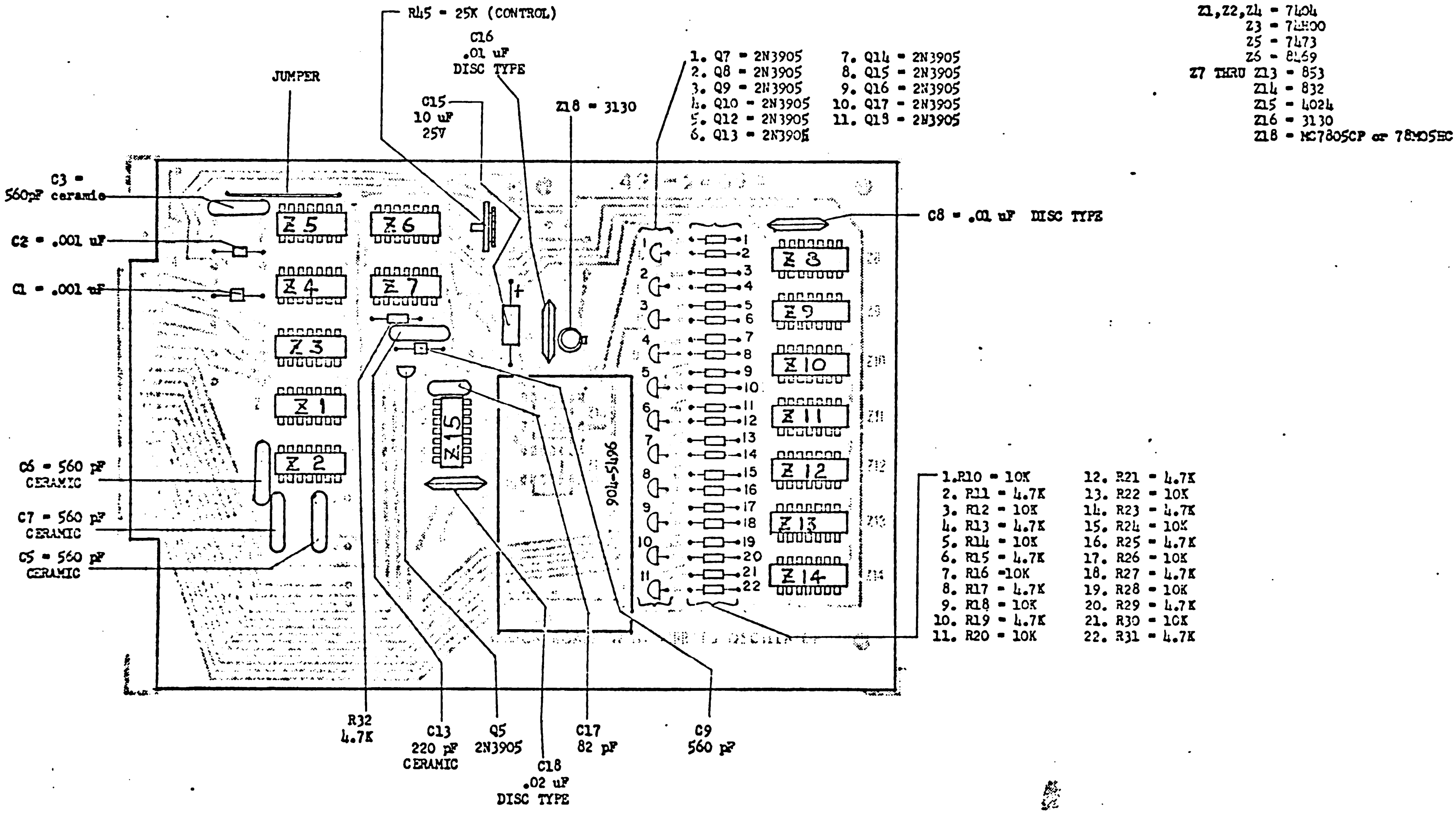
REF.	TYPE	-5V	"0"V	+5V
Z1	[illegible]	7	[illegible]	
Z2	[illegible]	7	[illegible]	
Z3	[illegible]	7	[illegible]	
Z4	[illegible]	7	[illegible]	
Z5	[illegible]	11	[illegible]	
Z6	[illegible]	7	[illegible]	
Z7	[illegible]	7	[illegible]	
Z8	[illegible]	7	[illegible]	
Z9	[illegible]	7	[illegible]	
Z10	[illegible]	7	[illegible]	
Z11	853	7	[illegible]	
Z12	853	7	[illegible]	
Z13	853	7	[illegible]	
Z14	852	7	[illegible]	
Z15	4024	7	[illegible]	
Z[illegible]	3130	[illegible]		7
Z18	MC7805CP			
	78M05HC			

VCO CLOCK BOARD

ALLEN ORGAN CO.

MACUNGIE PENNA

VARIABLE FREQUENCY CLOCK FOR RMI COMPUTER



BOARD NO. 421-2465 B

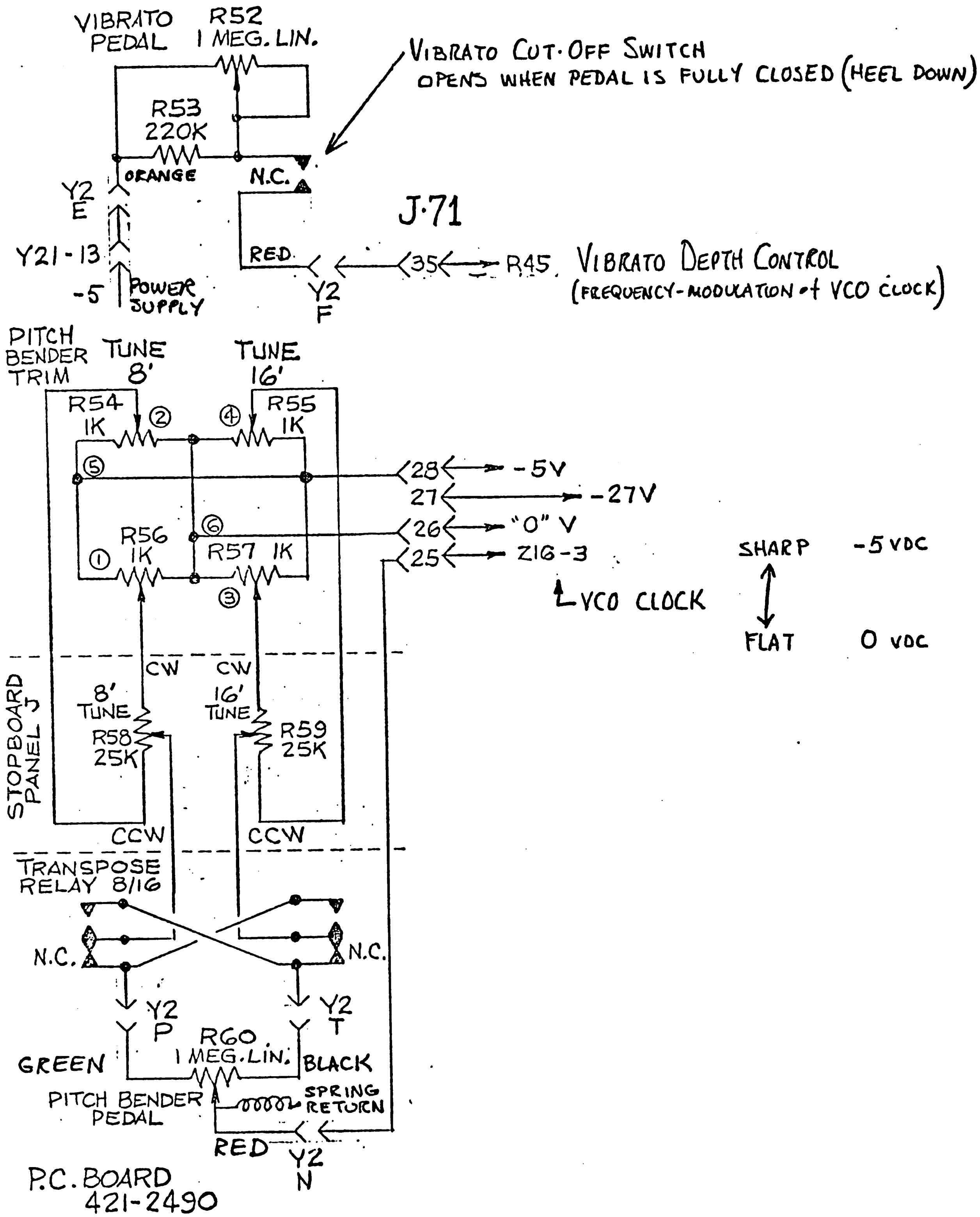
SCHEMATIC NO. 081-6041

VCO CLOCK BOARD

TOLERANCES UNLESS OTHERWISE SPECIFIED	ALLEN ORGAN CO. MACUNGIE, PENNSYLVANIA
FRACTIONAL DIMENSIONS ± 1/64	TITLE: CLOCK BOARD W/ VIBRATO OSCILLATOR COMP. LAY.
DECIMAL DIMENSIONS ± .005	DRAWN: G.S. DATE: 6/3/75 SCALE: FULL MATERIAL:
ANGLES ± 1/4	CHKD: DATE: DO NOT SCALE DRAWING - REFER TO DIMENSIONS INDICATED. FINISH:
HOLE DIA FRACTIONAL ± .006	APPD: DATE: SUPERSEDES: NO. 904-5465
HOLE DIA DECIMAL ± .003	FIRST MADE FOR: SUPERSEDED BY:

REVISIONS

A — A 22K fixed resistor was in place of the Jumper and R45 was not shown. G.S. 3/24/77



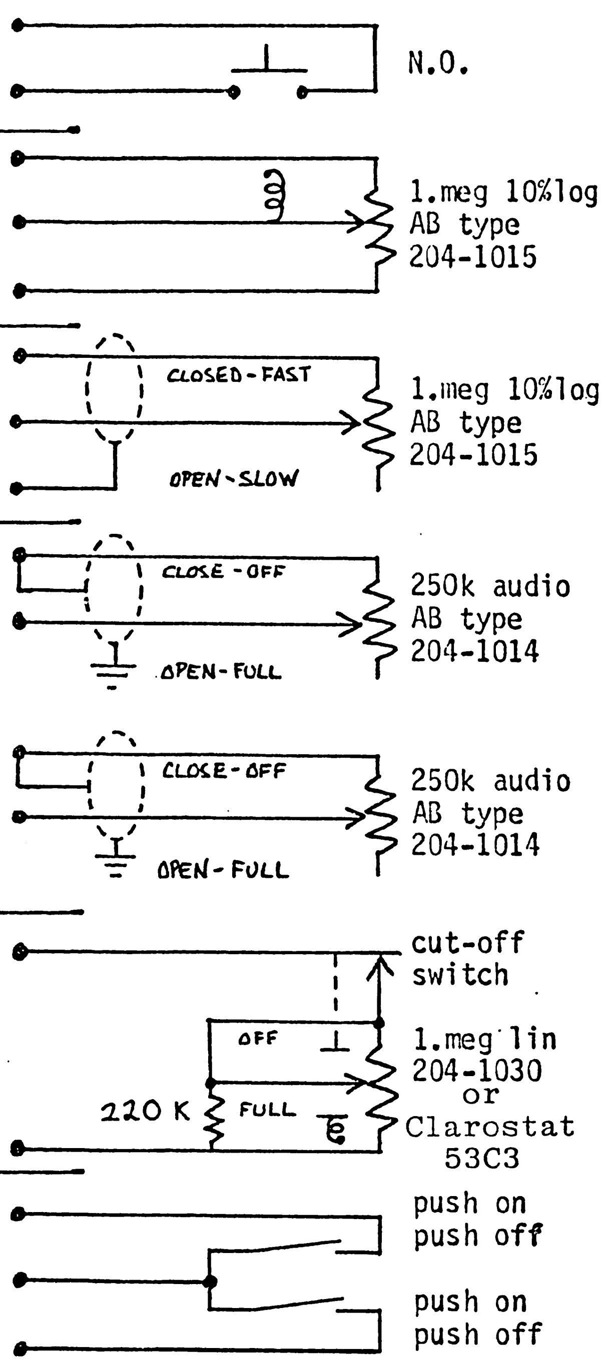
Pitch Bender Schematic

SECTIONAL BLOW-UP of DRAWING # C31-6041

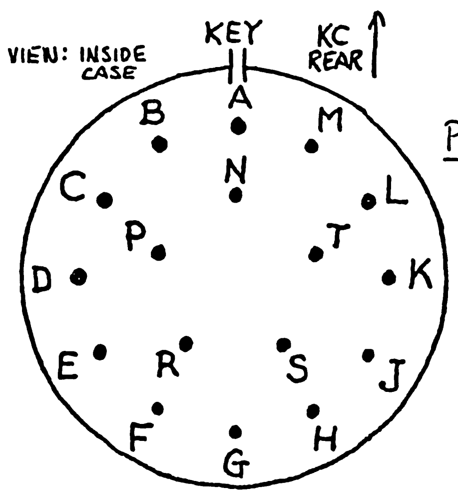
RMI KC-II PEDAL ASSEMBLY WIRING

FUNCTION	BOARD PLUG/PIN	PEDAL PLUG/PIN		PEDAL CABLE WIRE
SUSTAIN-PERC	switch com.	C-	-C	yellow
	gnd	S-	-S	black
normal	xpose relay	P-	-P	black
PITCH BENDER	J71/25	N-	-N	red
depressed	xpose relay	T-	-T	green
ATTACK-DECAY	sustain oscillator board (see schematic)	R-	-R	black
		A-	-A	white
		G-	-G	shield
CHANNEL 2 VOLUME	DAC BOARD → AUDIO OUTPUT	L-	-L	shield
		K-	-K	center
CHANNEL 1-2 VOLUME	DAC BOARD → AUDIO OUTPUT	H-	-H	shield
		J-	-J	center
VIBRATO	J71/35	F-	-F	red
	J21/13	E-	-E	orange
STACCATO	J1/10	D-	-D	white
	gnd (independent)	S-	-S	brown
LATCH	sustain oscillator board	M-	-M	green

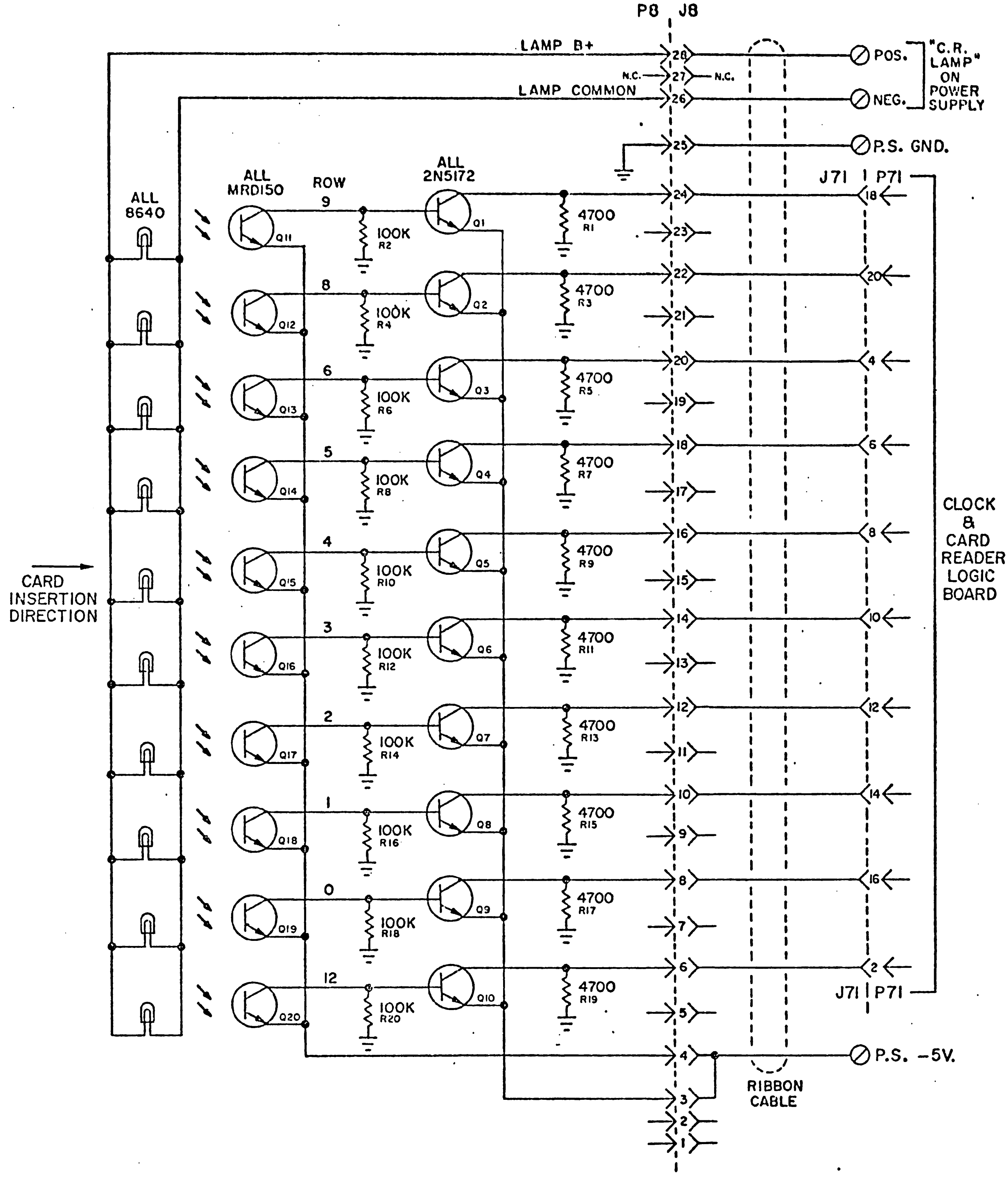
SCHEMATIC



PIN "B" IS NOT USED



PEDAL PLUG



CARD READER ASSEMBLY #903-6055

CARD READER CIRCUIT FOR KEYBOARD COMPUTER
012-0079
ROCKY MOUNT INSTRUMENTS

CARD READER CHECK

First check the lamp voltage to make sure your problem is not simply a voltage adjustment. This reading must be taken on the power supply between "CR LAMP POS. AND NEG." Each card reader has a tag attached which indicates the proper lamp voltage range for that particular reader. As a general rule it is best to set the voltage toward the high end of the range.

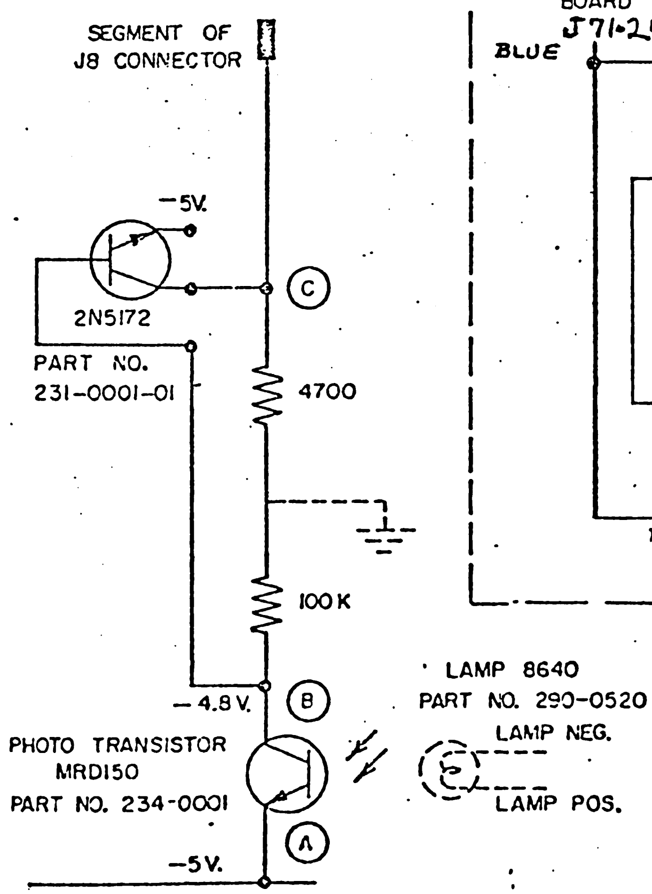
Use a VOM set on 10 V.D.C. scale. If meter is not equipped with polarity reversing switch, put red lead on ground.

1. Apply black lead to Point (B) of Section 12. Move card in and out. Voltage should drop approximately 4/10 V. (from 5 V.) when inserting the card. Repeat the same procedure on each section. All sections should have the same amount of drop. If one section has less drop, visually check the #8640 lamp for that section. If the brilliance appears less than adjacent lamps, replace the lamp and check (E) again. If the lamp brilliance appears normal, replace the Photo Sensitive Transistor MRD150. See the drawing below for polarity of MRD150.

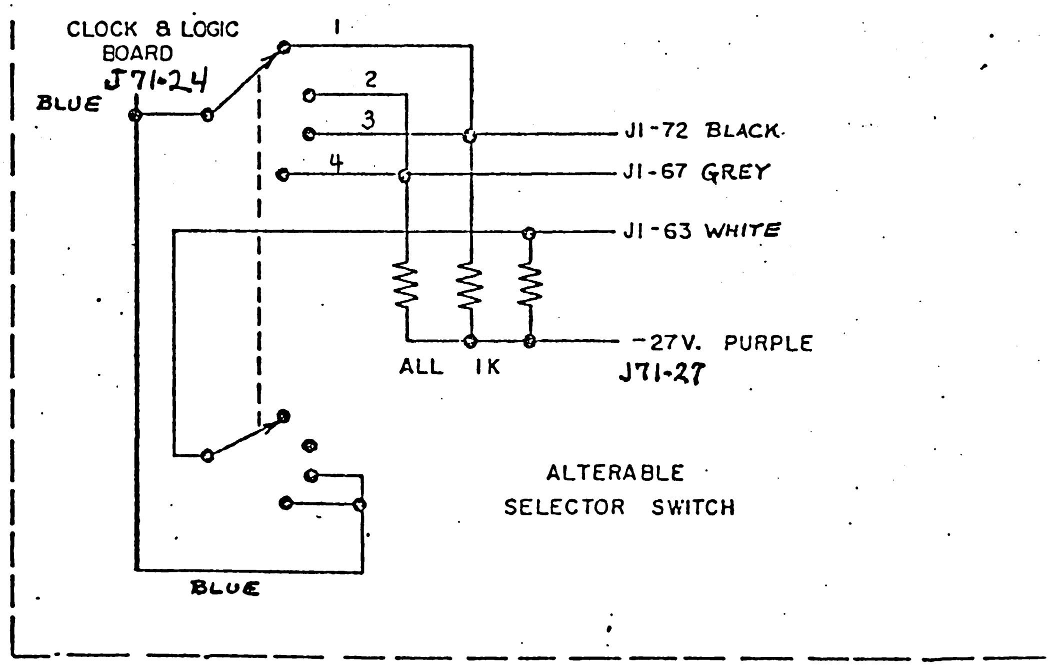
2. Apply black lead to Point (C) of Section 12. Without card inserted, Point (C) should read 0 volts. When card is inserted, the voltage should go to -5. As card is moved in, this shift will occur as every card hole passes over the MRD150. The voltage must go to zero one way and -5 V. the other. If either voltage is off, change the 2N5172 for that section.

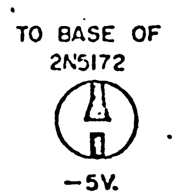
Note: If Sections 8, 9 or 12 are defective, the card reader will be inoperative. If any section from 0 through 6 is defective, the card reader will wo·k; but the tones will not be correct.

A card reader problem can also be in the Clock & Logic board or the MOS board.

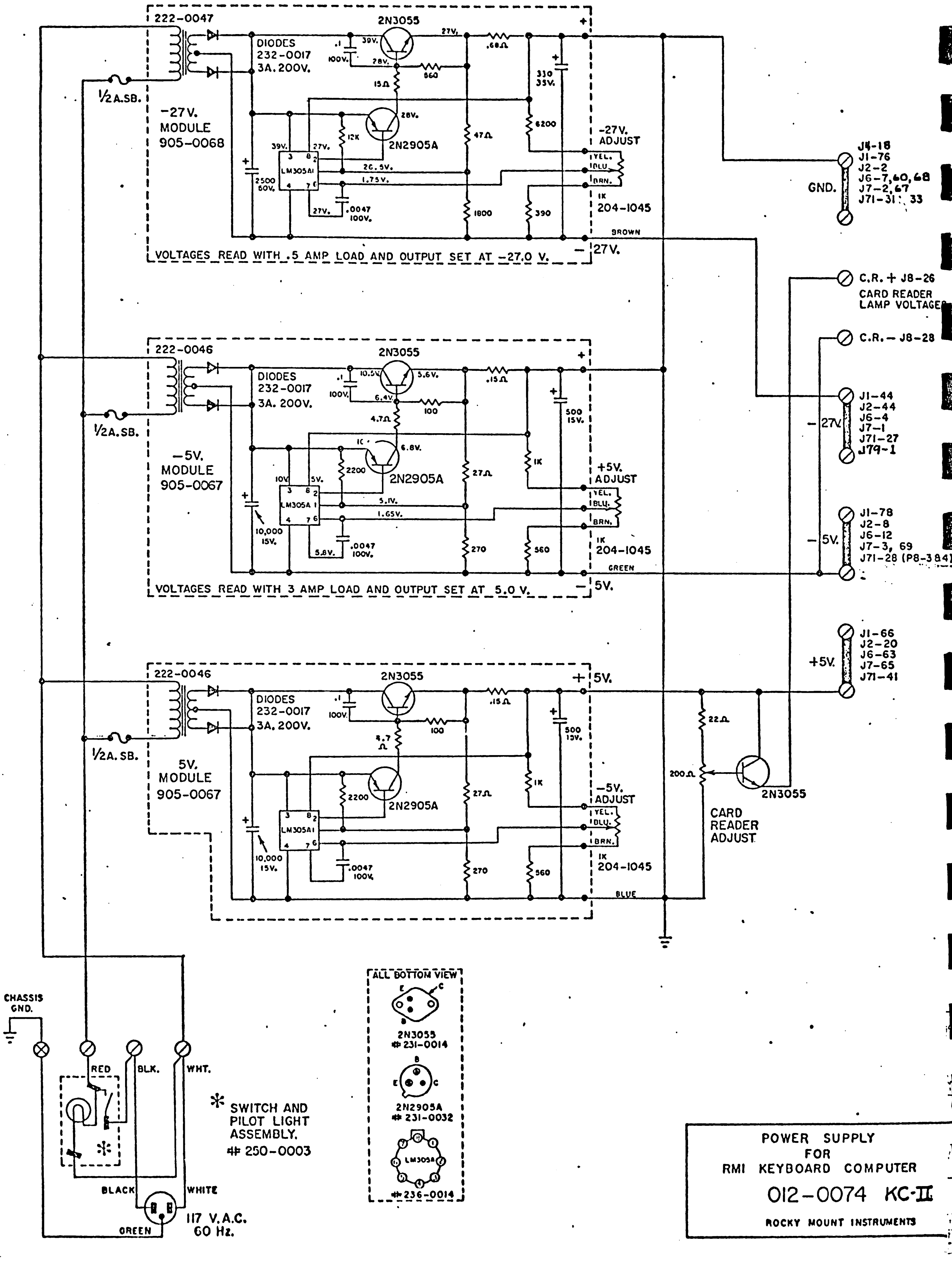


PHYSICAL LAYOUT OF ONE SECTION OF CARD READER P.C. BOARD





ENLARGED VIEW OF TOP OF PHOTO TRANSISTOR MRD150



POWER SUPPLY
FOR
RMI KEYBOARD COMPUTER
012-0074 KC-II
ROCKY MOUNT INSTRUMENTS

OPT. RAM.

← PLUG

03	12	01F	02F	10	11	13F	02G
10133 VOICER • STOP-RAIL MULTIPLEXER	10142 FREQUENCY SYNTHESIZER • KEYBOARD MULTIPLEXER • FREQUENCY NUMBER MEMORY • VIBRATO CONTROL • OCTAVE DECOUPLING AUTOMATIC TRANSPOSITION • RANDOM MOTION GENERATOR NOT USED • MIXTURE CUT-BACK	10131 CH. 1 ADDER (FLUTE CHANNEL) • COMBINES FLUTES AND PEDAL WITH 32 FOOT AND 16 FOOT MANUALS • ADDS INTERPOLATION FACTOR FURNISHED FROM SCALERS • COMPLEMENTS WAVE FORMS	10132 CH. 1 GAIN SCALER (FLUTE CHANNEL) • ATTACK/DECAY GENERATOR • COMBINES ALL N.G. CHANNELS INTO A SINGLE NUMBER • PARALLEL-TO-SERIAL CONVERTER	10140 NOTE GENERATOR #3 • SAMPLE POINT ADDRESS • ATTACK/DECAY ADDRESS • SUSTAIN • STACATTO	10141 KEY ASSIGNOR • ASSIGNS NOTE GENERATORS • ASSIGNS FREQ. NO. TO N.G. FROM FREQUENCY SYNTHESIZER • ASSIGNS N.G. TO MIXTURE AS DICTATED BY CUT-BACK REGIONS • ASSIGNS N.G. TO KEYBOARDS • CONTROLS: PIANO, SUSTAIN, CHIFF, EXTRA ATTACK	10143 INCREMENTOR CH. 1 (FLUTE CHANNEL) • COMPUTES AND STORES AMPLITUDE INCREMENTS • GENERATES TIMING PULSE FOR DAC	10132 INTERPOLATION SCALER CH. 1 (FLUTE CHANNEL) • MULTIPLIES INTERPOLATION FACTOR FROM NOTE GENERATOR #2 BY INCREMENT FROM INCREMENTOR (FLUTE CHANNEL) • ACCUMULATES SUM FOR ALL NOTE GENERATORS

07	040	04E			05	08	09
10137 SPECIFICATION MEMORY • MEMORY FOR ALL VOICES (EXCLUDING THOSE ON IC135 AND IC136) • ACCUMULATES TOTAL VOICE INFORMATION FOR REGISTRATION MEMORIES AND COMBINES INPUT FOR ALTERABLE MEMORIES KC-II = L137C	10134 REGISTRATION MEMORY CH. 1 (FLUTE CHANNEL) • STORES TOTAL SELECTED WAVE FORMS FOR DIV A ~~PEDAL~~ VOICES (EXCLUDES 32 FOOT VOICES)	10134 REGISTRATION MEMORY CH. 1 (FLUTE CHANNEL) • STORES TOTAL SELECTED FLUTE WAVE FORMS FOR SWELL AND GREAT (EXCLUDES 16 FOOT GREAT VOICES)			10135 16 FOOT MANUAL • 32 FOOT VOICE MEMORIES • 16 FOOT MANUAL VOICE MEMORIES • CHIFF MEMORY L135	10138 NOTE GENERATOR #1 • STORES FREQUENCY NUMBERS ASSIGNED TO NOTE GENERATORS • INTRODUCES RANDOM MOTION NOT USED	10139 NOTE GENERATOR #2 • ACCUMULATES FREQUENCY NUMBERS • GENERATES INTERPOLATION FACTORS

K-1

←CONNECTOR THIS END

04A	04B	04C	01M	02M	06	13M	02N
10134 ALTERABLE MEMORY • STORES ~~SWELL I AND GREAT I~~ ALTERABLE VOICES 1 AND 3	10134 ALTERABLE MEMORY • STORES ~~SWELL II AND GREAT II~~ ALTERABLE VOICES 2 AND 4	10134 REGISTRATION MEMORY CH. 2 (MAIN CHANNEL) • STORES TOTAL SELECTED NON-FLUTE WAVE FORMS FOR SWELL AND GREAT (EXCLUDES 16 FOOT SWELL VOICE)	10131 CH. 2 ADDER (MAIN CHANNEL) • COMBINES MIXTURES WITH MAIN CHANNEL VOICES	10132 GAIN SCALER CH. 2 (MAIN CHANNEL) • ATTACK/DECAY GENERATOR • COMBINES ALL N.G. CHANNELS INTO A SINGLE NUMBER • PARALLEL-TO-SERIAL CONVERTER	10136 MIXTURE MEMORY (USED w/. PIPE ORGAN PRESET) • MIXTURE VOICE MEMORIES • ATTACK/DECAY MEMORIES S10136	10143 INCREMENTOR CH. 2 (MAIN CHANNEL) • COMPUTES AND STORES AMPLITUDE INCREMENTS (TIMING PULSE FOR DAC NOT USED)	10132 INTERPOLATION SCALER CH. 2 (MAIN CHANNEL) • MULTIPLIES INTERPOLATION FACTOR FROM NOTE GENERATOR #2 BY INCREMENT FROM INCREMENTOR (MAIN CHANNEL) • ACCUMULATES SUM FOR ALL NOTE GENERATORS

NOTE: ALLEN ORGAN TERMINOLOGY VS. RMI – ALLEN / RMI

FLUTE = CHANNEL 1
MAIN = CHANNEL 2
PIANO = PERCUSSION
PEDAL = DIVISION "A"
GREAT = DIVISION "B"
SWELL = DIVISION "C"
32' = 64' (NOT USED)
16' = 32'
MANUAL = DIVISIONS "B" AND "C"

← PLUG

MOS BOARD CHIP LAYOUT for KC-II

ALLEN ORGAN CO.
MACUNGIE, PENNA.

DIGITAL TONE GENERATOR

BY AR	SCALE	MATERIAL
CHK. 2.10.71	DATE 2-9-71	NO. 081-2619
	APPD.	

	control tab name:		usage:	channel:	value:	card name:		card nu
DIV A:	SINE BASS	32'	adds soft depth	1	33.8	Tibia	16'	32F0308 A-
			(keys two voices)	1	10.9	Tibia	16'	32F0308 A-
	SUB GAMBA	32'	adds rich depth	1	29.9	Diaphone	16'	32F0342
	BASS REED(div c)	32'	adds colorful depth to Pipe Organ	1	18.0	Contra Fagotto (swell)	16'	S02R1117
	SINE CHORUS	16'	electronic organ ensemble 16' 8' 4' 2'	1	39.8	Sine Chorus "C"		16F1327
	WALD HORN	16'	mellow reed with heavy twelfth - smooth	1	29.8	Waldhorn	8'	MOOR1324
	WOOD CLARINET	16'	solos or marimba percussion transients	1	32.0	Clarinet	8'	16R1450
	ALTO RECORDER	8'	solo flute, highly imitative	1	43.4	Alto Recorder	4'	MOOF2065
	SOLO FLUTE	8'	solo flute, loud and pure	1	57.7	Flute "B"	4'	16F2253
	JAZZ FLUTE	8'	solo flute, highly imitative	1	39.2	Jazz Flute	4'	16F2335
DIV B:	LINEAR SAWTOOTH	16'	string ensemble	1 & 2	30.3	Linear Sawtooth "H"	8'	16S1111
	FRENCH HORN	16'	fat & mellow ensemble - B-3	1 & 2	29.5	French Horn "D"	8'	16R1184
	CORNOPEAN REED	16'	rich & warm ensemble - Horn Preset	1 & 2	24.5	Cornopean "B"	8'	MOOR1012
	ELECTRIC PIANO	16'	fat & mellow ensemble - pure & bassy	1 & 2	38.2	Piano	8'	16D1118
	8th PULSE	16'	rich & fat - Clavinet, Sax, Banjo	1&2 RED	XX.X	Pulse Width 1/8	8'	SPG2004
	16th PULSE	16'	rich & nasal - Clavinet, Sax, Banjo	1&2 RED	XX.X	Pulse Width 1/16	8'	SPG2002
			(keys two voices)	1&2 RED	XX.X	Pulse Width 1/16	8'	SPG2002
DIV C:	SPANISH TRUMPET	16'	rich & brilliant - Guitar & Pipe Organ	1 & 2	38.7	Spanish Trumpet	8'	MOOR1254
	BAG PIPE	16'	nasal, increases toward 4th harmonic	1 & 2	31.0	Bagpipe	8'	16R1502
	JAW HARP	16'	twangy - use w. Bagpipe for funky Clav.	1 & 2	27.0	Jaw Harp "B"	8'	16R1427
	32nd PULSE	16'	nasal narrow pulse - Clavinet Preset	1 & 2	XX.X	Pulse Wave 1 Time Slot	8'	SPG1001
			(keys two voices)	1 & 2	XX.X	Pulse Wave 1 Time Slot	8'	SPG1001
	SINE WAVE	5 1/3'	loud quint - intended for percussion	1&2 RED	44.8	Flute "B"	2 2/3'	MOOF3186
			(keys three voices)	1&2 RED	44.8	Flute "B"	2 2/3'	MOOF3186
			(keys three voices)	1&2 RED	14.1	Nazard	2 2/3'	S02F3186
	SINE WAVE	2'	loud octave - intended for percussion	1 & 2	63.0	Sine	1'	16F1289
			(keys two voices)	1&2 RED	63.0	Sine	1'	16F1289
	SINE WAVE	1 3/5'	loud tierce - intended for percussion	1&2 RED	45.4	Flute 24th	4/5'	MOOF9183
			(keys two voices)	1&2 RED	45.4	Flute 24th	4/5'	MOOF9183

FIXED VOICES CHART

[redacted]RM[redacted]		C[redacted]Spe[redacted]tior[redacted]	I[redacted]ica[redacted]	[redacted]Spe[redacted]tio[redacted]		[redacted]F	[redacted]	V[redacted]RMS [redacted]			
F	M	PEDAL						FLUTE	MAIN	PEDAL (CH.1 DIVISION)	
25.0		Contre Bass 32	M0D1066	Diaphone 32	64F0001	31.6					
30.6		Principal 16	M00D1051	Diaphone 16	32F0342	29.9		* 29.9		DIAPHONE 16	32F0342
20.9		Bourdun 16	S01F1079	Tibia 16	32F0308 A-B	33.8		* 33.8		TIBIA 16	32F0303 A-B
7.6		Lieblich Gedeckt 16	S01F1103	Tibia 16	32F0308 A-B	10.9		* 10.9		TIBIA 16	32F0303 A-B
20.2		Octav 8	S03D1033	DIAP 8	16D1032	15.0		43.4		ALTO RECORDER 4	M00F2065
17.0		Gedackflote 8	S03F1091	Tibia 8	F1153	13.1		57.7		FLUTE "B" 4	16F2253
18.5		Choralbass 4	S02D2042	DIAP 4	16D2042	11.9		39.2		JAZZ FLUTE 4	16F2335
14.6		Flute Ouverte 4	S01F2068	Tibia 4	S02F2176	9.8		29.8		WALDHORN 8	M0021324
28.5		Mixtur II	M00FPD21	String 8'	16S1064	8.0		39.8		SINE CHORUS "C"	16F1327
27.7		Posaune 16	M00R1135	Ophicleide 16	32R0484 A-B	29.3		* 29.3		OPHICLEIDE 16	32R0484 A-B
32.2		Trompete 8	M00R1133	Tuba Horn 8	R1056	26.2		32.0		CLARINET (SAME AS THEATRE) 8	16R1450
		Swell to Pedal 8									
		Great to Pedal 8									
242.8					T	219.50		345.8		total	
		SOLO - SWELL		Viole						SWELL (PERC. DIVISION)	
	9.9	Salizional 8	S03S1020	D'Orchestra 8	S03S1034		8.0		XX.X?	PULSE WAVE 1 TIME SLOT	SPG1001
	17.7	Gemshorn 8	S05D1030	Vox 8'	16R1451		8.0		XX.X?	PULSE WAVE 1 TIME SLOT	SPG1001
18.9		Gedackt 8	S01F1030	Tibia 8	16F1286	30.0		44.8		FLUTE "B" 2 2/3	M00F3186
	17.2	Spitzprincipal 4	S02D2059	Viole D'Orchestra 4	S03S2036		8.0		63.0	SINE 1	16F1289
14.5		Kopple Flute 4	S03F2065	Tibia 4	16F2290	25.0		63.0		SINE 1	16F1289
13.6		Nasat 2-2/3	S01F3023	Nazard 2 2/3	S02F3186	14.1		* 14.1		NAZARD 2 2/3	S02F3186
11.2		Blockflote 2	S01F4071	Tibia 2	F4187	20.0		45.4		FLUTE 24th 4/5	M00F9193
9.4		Terz 1-3/5	S01F5016	Larigot 1-1/3	16F6189	10.2		45.4		FLUTE 24th 4/5	M00F9193
9.2		Sifflote 1	S01F8020	Fife 1	16F1289	10.0		44.8		FLUTE "B" 2 2/3	M00F3136
	29.0	Mixtur III A-M00FSA25	B-M00FSB23	C-M00FSC23	D-M00FSD23						
18.0		Contra Fagotto 16	S02R1117	Tibia 16	32F0349	30.0					
	17.4	Hautbois 8	S02R1037	Orch Oboe	16R1478		15.1		27.0	JAW HARP "B" 8	16R1427
	24.5	Trompette 8	S02R1011	Trumpet	R1056		29.2		38.7	SPANISH TRUMPET 8	M00R1254
	18.4	Clairon 4	S02R2119	Clarion	SAME		18.4		31.0	BAGPIPE 8	16R1502
		Alterable Voice									
		Sustain									
		Tremulant	6.5								
		Chiff		11th(5-1/2)harmonic	32F9351	3.5					
T 94.8	134.1				T	142.80	86.7	257.5	159.7	total	
		ACCOMP - GREAT									
11.8		Quintaden 16	S03F1073	Tibia 16	32F0349	20.0				GREAT (ENSEMBLE DIVISION)	
	31.8	Principal 8	M00D1032	String	16S1064		8.0		30.3	LINEAR SAWTOOTH "H" 8	16S1111
	7.1	Dulciana 8	S01D1033	Cello			7.0		29.5	FRENCH HORN "D"	16R1184
23.9		Hohlflote 8	S02F1074	Concert Flute 8	F1300	20.1		XX.X?		PULSE WIDTH 1/16 8	SPG2002
	18.6	Octav 4	S02D2050	String	16S2062		5.7		24.5	CORNOPEAN "B" 8	M00R1012
12.8		Spitzflote 4	S02F2087	Concert Flute 4	16F2298	14.8		XX.X?		PULSE WIDTH 1/16 8	SPG2002
	14.3	Quinte 2-2/3	S03D3056	Chrysoglott	M00F1163		31.9	*	31.9	CHRYSOGLOTT 8	M00F1163
	14.7	Doublette 2	S01D4060	Chrysoglott	M00F1163		31.9	*	31.9	CHRYSOGLOTT 8	M00F1163
9.8		Waldflote 2	S01F4069	Piccolo 2	16F4304	10.2		XX.X?		PULSE WIDTH 1/8 8	SPG2004
	24.0	Mixtur IV A-M00FGA22	B-S03FGB22	C-S02FGC22	D-S03FGD22						
	22.2	Shalmei 8	S02R1170	Horn	16R1423		27.7		38.2	PIANO 8	F0111?
	19.8	Krummhorn 8	S02R1002	Clarinet	16R1450		32.0		35.5	PIPE ORGAN ENSEMBLE 8-4-2	F01116
		Alterable Voice			T	65.1	144.2				
		Swell to Great 8									
T 58.3	152.5							XXX.X?	221.8	total	
T395.9	286.6				T	427.4	230.9	603.3	331.5	GRAND TOTAL not inc. SPG	
						Modified Jan	75	*******	*******	*indicates orig. spec. carried over	

VOICE CHIP COMPARISON

ALLEN CHURCH | ALLEN THEATRE AND KC-I | KC-II

K-3

RMI KEYBOARD COMPUTER

KEYBOARD TECHNIQUE: ______________________________

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WAVEFORM CARDS:

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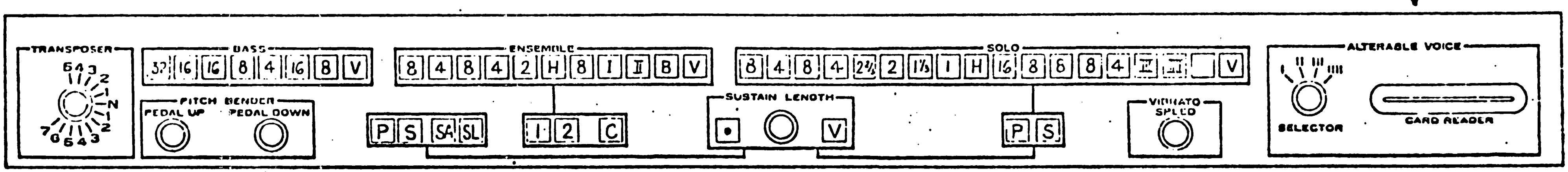

TUNE A 440

TUNE: ______________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET # ______________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

TITLE: ______________

RMI KEYBOARD COMPUTER

KEYBOARD TECHNIQUE: ______________________

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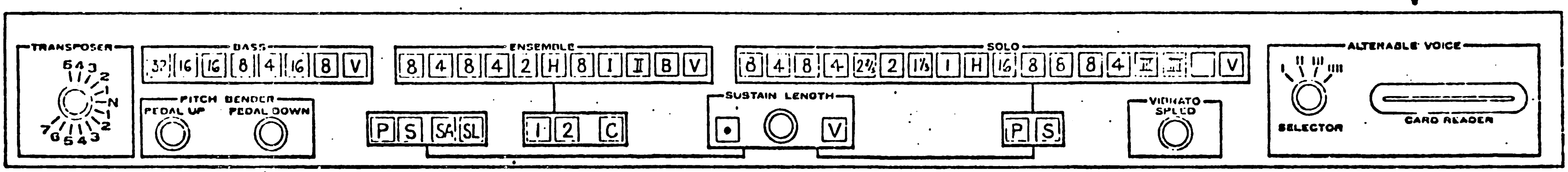

TUNE A 440

TUNE: __________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET # ______________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/966-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

TITLE: ______________

RMI KEYBOARD COMPUTER

KEYBOARD TECHNIQUE:______________________________

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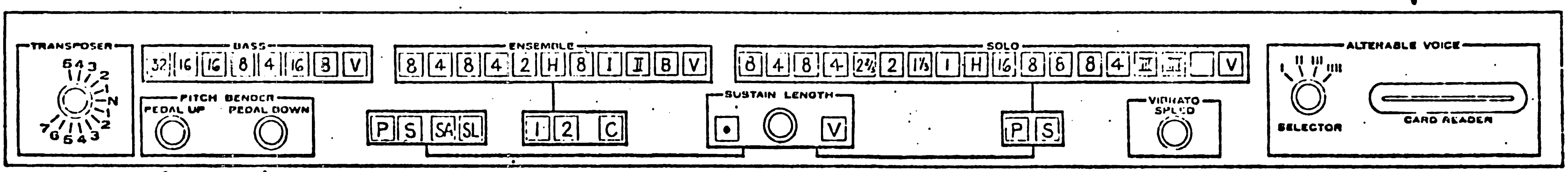

TUNE A 440

TUNE:________________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET #________________________

TITLE:___________________________________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

RMI KEYBOARD COMPUTER

KEYBOARD TECHNIQUE: ______________________________

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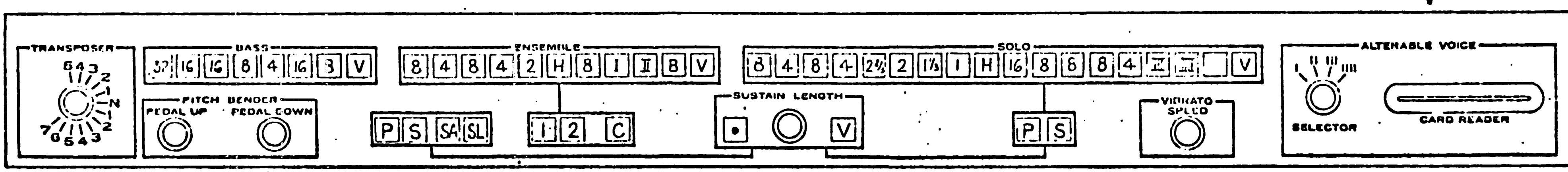

TUNE A 440

TUNE: ______________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET #______________

TITLE: ______________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

RMI KEYBOARD COMPUTER

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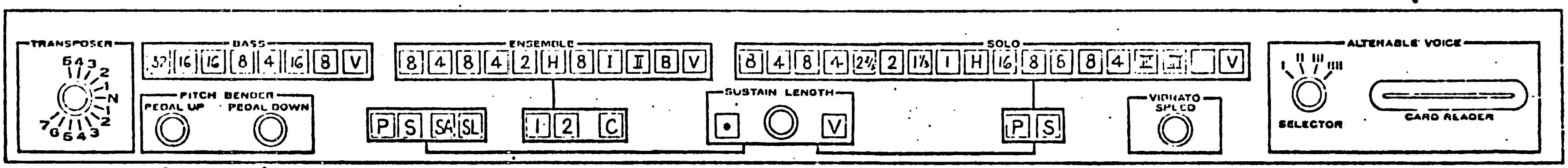

TUNE A 440

TUNE:____________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET #________________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

TITLE:________________

RMI KEYBOARD COMPUTER

KEYBOARD TECHNIQUE: ______________________________

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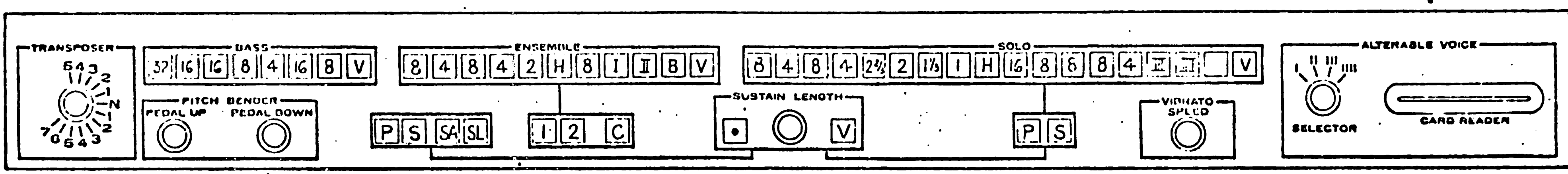

TUNE A 440

TUNE: __________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET # ______________________

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

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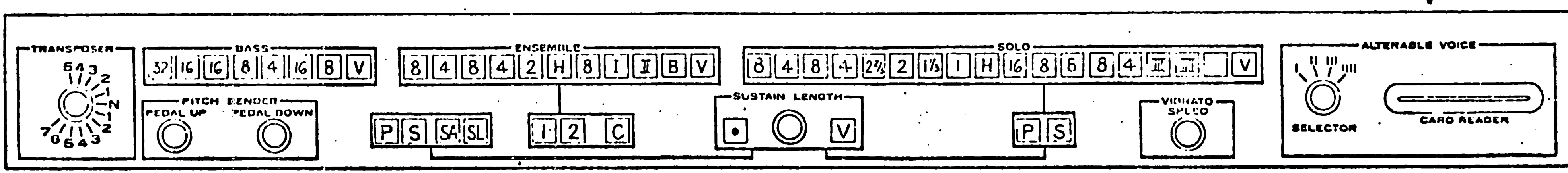

TUNE A 440

TUNE: ______________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

PROGRAMMING SHEET # ______________

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
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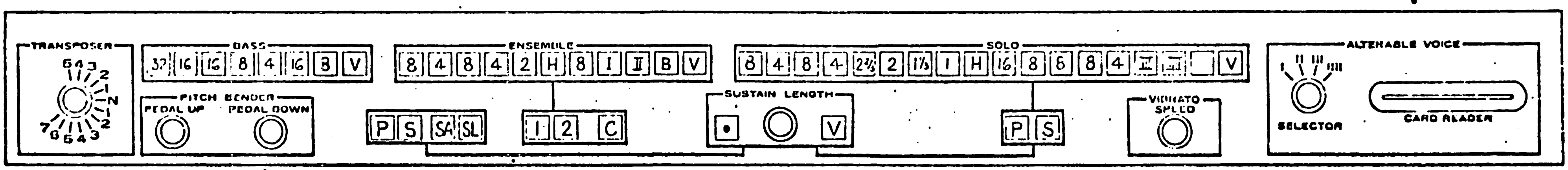

TUNE A 440

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CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

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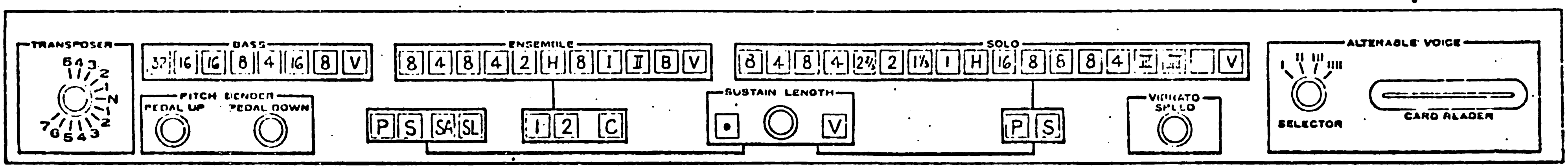

TUNE A 440

TUNE:______________

CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
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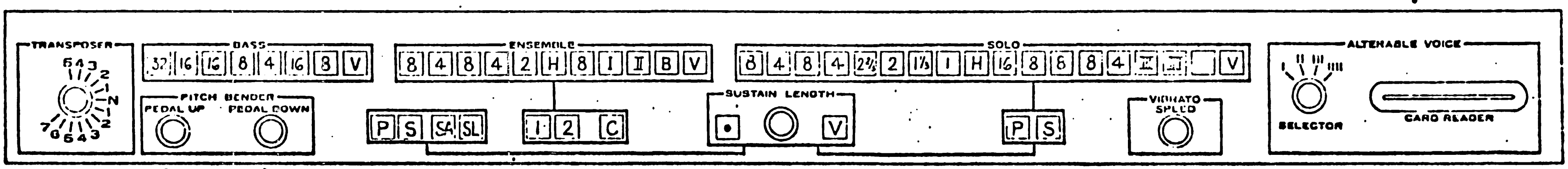

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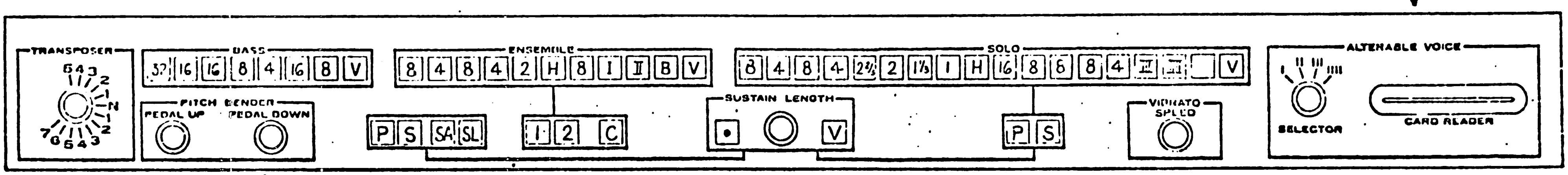

TUNE A 440

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PROGRAMMING SHEET #______________________

TITLE: ______________________

ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

RMI KEYBOARD COMPUTER

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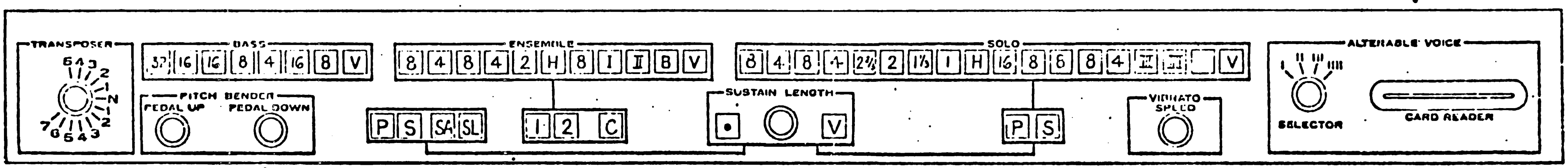

TUNE A 440

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CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

TITLE:________________

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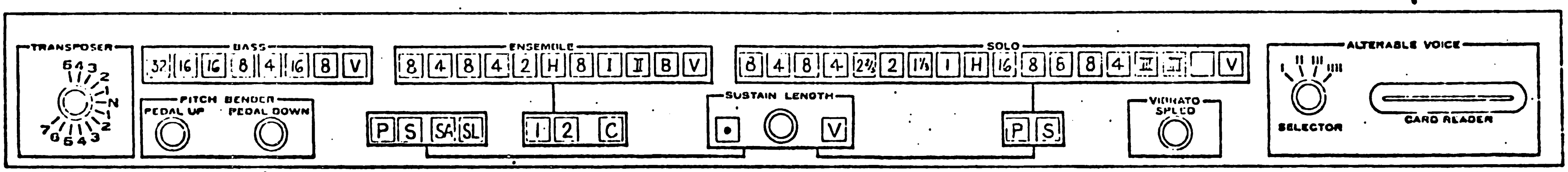

TUNE A 440

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

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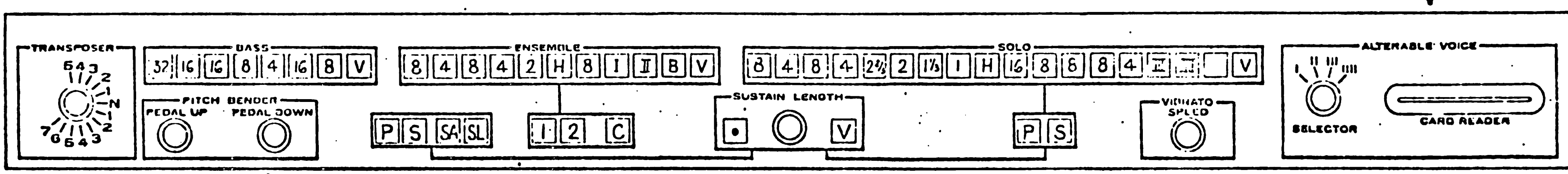

TUNE A 440

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

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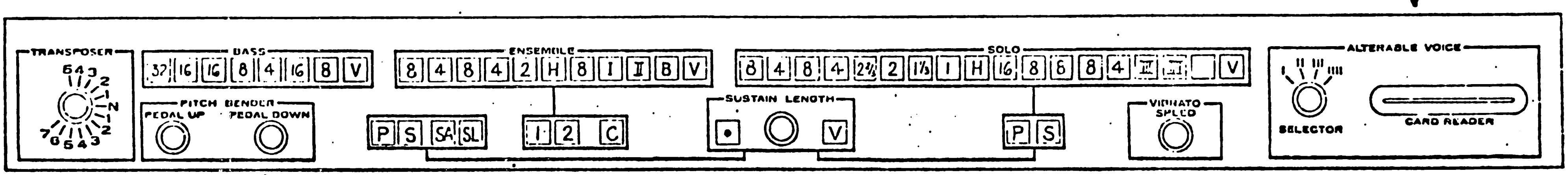

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

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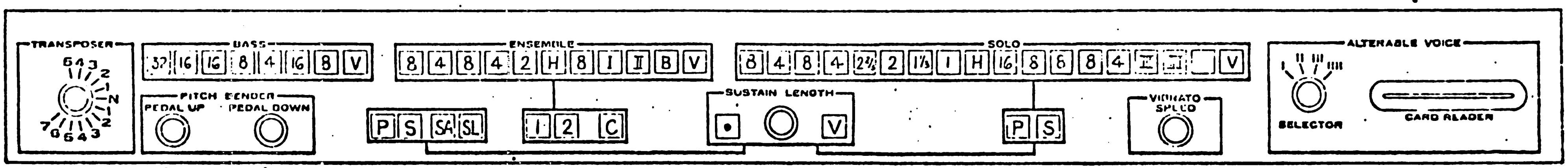

TUNE A 440

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CHANNEL ONE	CHANNEL TWO	CHANNEL THREE	PITCH BENDER

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ROCKY MOUNT INSTRUMENTS, INC. MACUNGIE, PENNSYLVANIA 18062 215/965-9801
A SUBSIDIARY OF ALLEN ORGAN COMPANY PLANT: ROCKY MOUNT, N.C. 27801

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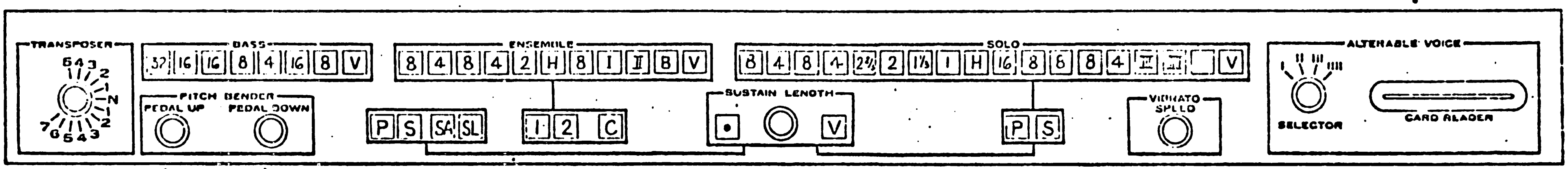

TUNE A 440

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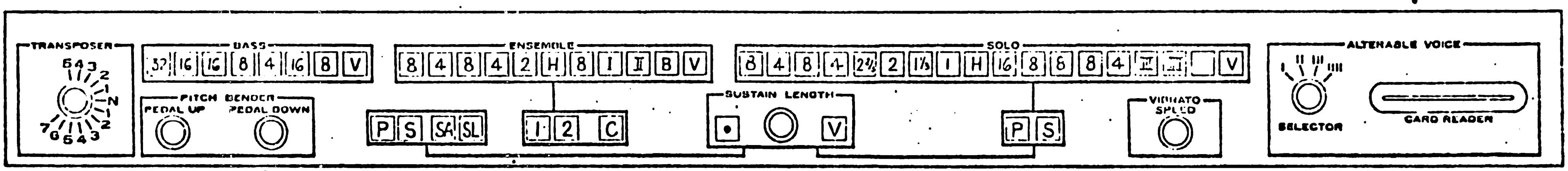

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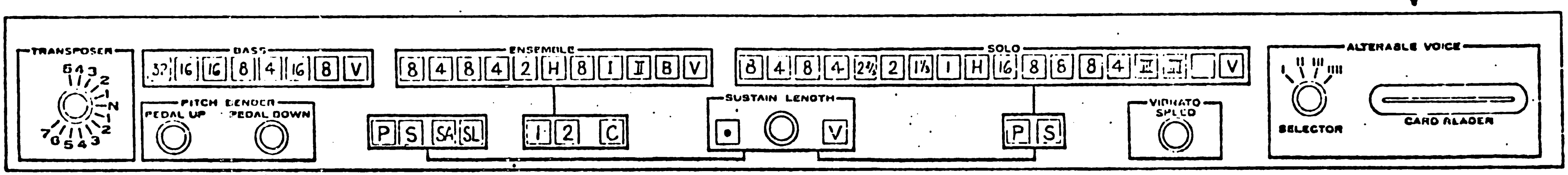

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