

SOLID STATE COMBINATION ACTION

MODEL C

MODEL CA

FIELD SERVICE MANUAL

SCHANTZ ORGAN COMPANY

TABLE OF CONTENTS

	<u>Page No.</u>
Mainframe.....	1
Circuit Board Identification & Replacement.....	3
Memory Board.....	5
Index.....	6
Control Board.....	7
Protector Board.....	8
Reversible Board.....	11
Circuit Board Indicator Lights.....	13
Sforzando/Stop Action Board.....	14
Sforzando Relay Board.....	17
The Back Panel.....	18
Power Failure Alarm.....	20
Control Board Socket.....	24
Memory Board Socket.....	27
Reversible Board Socket.....	30
Model C Set-Pulse Circuit.....	35
Voltage Setting Instructions.....	36
18 Volt Power Supply.....	37
Distributor Bar.....	42
5 Volt Power Supply Replacement.....	44
Battery Maintenance.....	45
Summary.....	46
Additional Illustrations.....	47

**PREFACE**

Before attempting any repairs, you should read this manual entirely. Study the console and familiarize yourself with the entire system. You should know that the memory of combinations set, requires that power to the memory boards must be on at all times. That there is a battery pack that backs up the memory power supply to maintain power to the memory boards during short power outages. If you need to shut the system down for tests, you are going to interrupt the memory. You should therefore, copy down the piston settings, or obtain permission from the organist to change combinations before you disturb anything. If you need to remove the memory box from the console, you will find that the spare circuit boards and the index card (described later in the text) may fall out, and therefore, should be removed from the memory box before you pull the box out.

It should also be noted, that the 5 volt, 12 volt and 18 volt DC power supplies have their negative terminals tied together. This common (ground) point is the large stud on the back panel of the memory box (see figure 20 on p. 38).

If you are in doubt about anything, call the factory (216-682-6065) for assistance. This manual will help you find a great deal of problems on your own. It will also help us to communicate with you. The company maintains records on all solid state combination actions built, and is prepared to help you with any problem in the field you might encounter.

The purpose of this manual is to provide the service man in the field with enough information that he may effectively troubleshoot all of our solid-state memory systems. Almost all problems encountered will be resolved by exchanging circuit boards that plug in to the system. It is not the intention of this manual to go into circuit board repair, nor is it the policy of the company to authorize such repair. Faulty circuit boards should be returned to the factory for service.

Perhaps ten percent of the problems that may arise cannot be resolved by exchanging the circuit boards. This manual deals with these problems, and also how to determine which, if any, circuit board needs replacing. Thorough knowledge of electronics is not required, however, you should be able to properly use a multimeter. If you don't know how to use such a meter, get someone who does to help you.

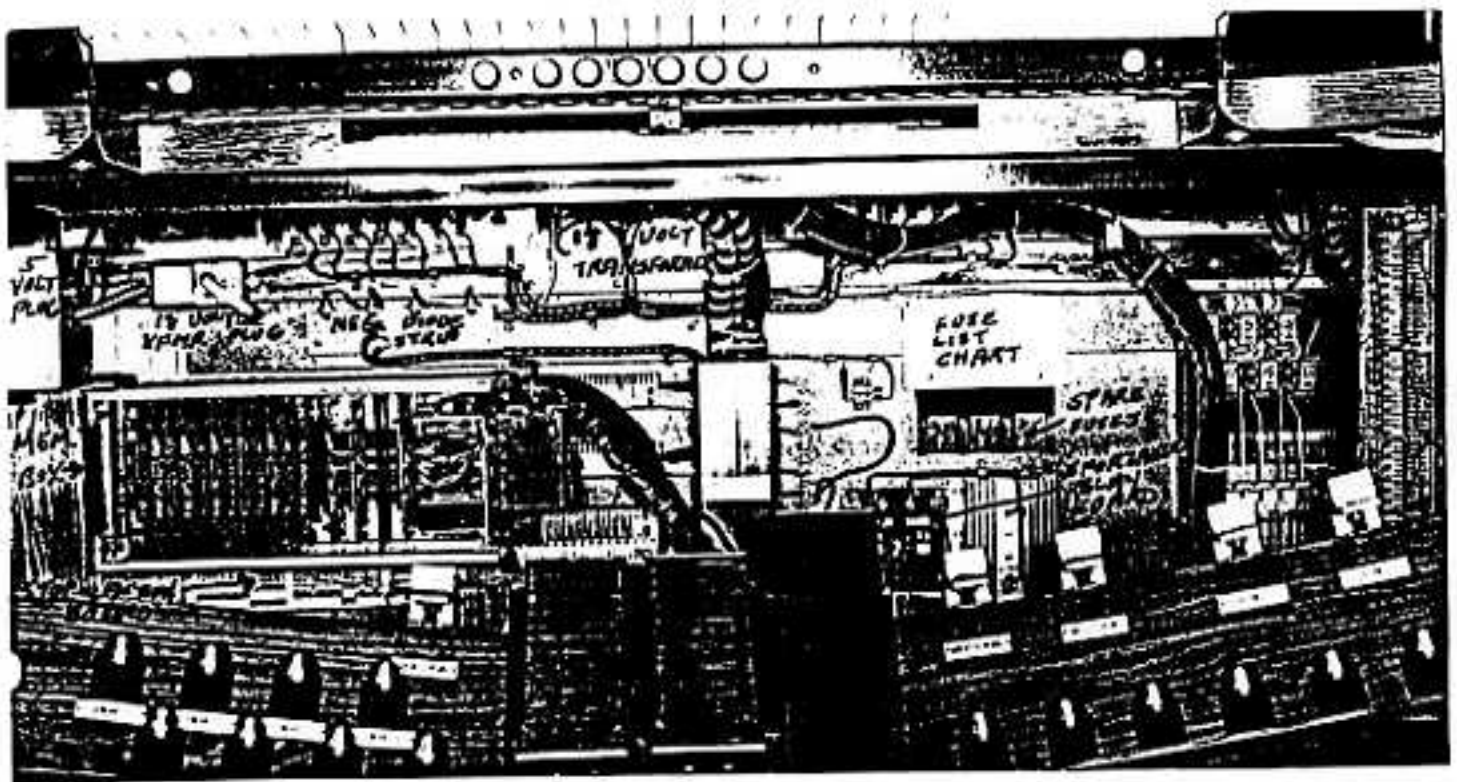


fig. 1

MODEL C & CA MEMORY SYSTEMS

The mainframe, or memory box (as we call it) consists of a back panel (or mother board) attached to a rack which contains slots to guide the removable circuit boards into their respective sockets on the back panel. The memory box also contains the 5 volt power supply and backup batteries which provide power for the memory portion of the circuitry. This power supply is located inside the box at the right end as you look into the front. The batteries are located in a box hanging outside the memory box at the right end. This entire assembly is located under the action frame (key desk) of the console, behind the knee panel. Circuit boards can usually be exchanged by removing just the knee panel for access, however, to check and adjust voltages, the entire box must be removed.

The box is attached to iron brackets with four screws through keyhole slots in the endplates of the box. To remove, simply loosen these screws, lift the box up, and pass over the screw heads using the large openings of the keyhole slots. You will find about eight feet of cable connected between the memory box and the console, which will give you enough cable to clearly remove the box from the console for service. Strapped to the outside of this cable, is a power cord for the 5 volt memory power supply. It plugs into a receptacle under the action frame.

It may be necessary to temporarily unplug this cord while removing the memory box, however, anytime this cord is unplugged, the memory circuits are being powered by the batteries. If you plan to leave this line unplugged for more than a few minutes, the batteries should also be unplugged. If you look at the batteries (fig. 2) you will find a disconnect plug on the battery cable. This pulls apart to unhook the batteries. The plug is polarized so that it will not go together backwards when plugging it back in.

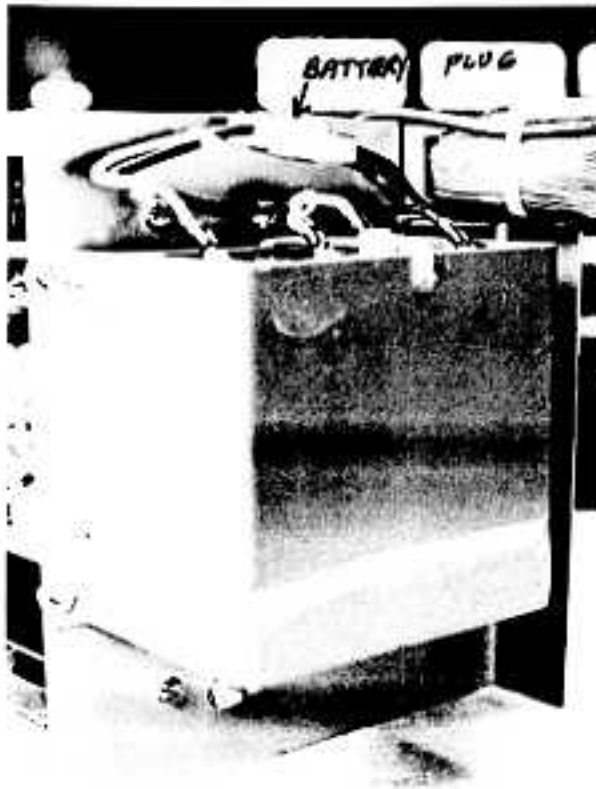


fig. 2

You should further note that anytime both the 5 volt power cord and the batteries are both unplugged, that the memory will be lost and all of the pistons will have to be reset. If you must completely disable the system, you may wish to write the organist's combinations down on paper beforehand so that you might be able to reset them afterwards.

CIRCUIT BOARD IDENTIFICATION, INDEX AND BOARD REPLACEMENT

fig. 3

Look again at the memory box (fig. 3). The first slot on your left is for the control board. This board may or may not have nylon pull tabs. The next group of boards are memory boards, and are numbered on the white numbering strip across the top of the box. The exact number of memory boards is determined by the size of the console. The next slot on some all-electric consoles is called the "protector board". This board, when fitted, is located to the right of the last memory board and is so marked on the white numbering strip. The last board is located at the far right end of the box just before the power supply. This is the reversible board. (On some jobs there are two reversible boards located side-by-side).



There is generally a wide space in the box between the last memory board and the reversible board. There, slots are located for a spare memory board, the index card, and on later consoles, a spare reversible board. These slots do not have sockets on the back panel, and therefore, serve only as a storage space for the above mentioned items. The slots are marked accordingly on the marker strip at the top of the box. You should always remove these items from the memory box before removing the memory box from the console. They, otherwise, may fall out during the box removal.

## CULPEPER BAPTIST CHURCH - CULPEPER, VA.

BD. #	CKT #1	CKT #2	CKT #3	CKT #4	CKT #5	CKT #6	CKT #7	CKT #8	
1	Gt	8 Prin	8 Ged	4 Oct	4 Koppel	2 Wald	IV For	8 Trom	Chime
2	Gt	XXXXXXXX	XXXXXX	XXXXXX	XXXXXX	Great 16	Great 4	Unison	-----
2	Sw	16 Rohr	8 Rohr	8 Viol	8 V.Cel	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX
3	Sw	4 Spitz	4 Hohl	2 2/3 Naz	2 Bloc	1 3/5 Tenz	III Scha	8 Trom	8 Oboe
4	Sw	4 Clar	Trem	Swell 16	Swell 4	Unison	-----	-----	-----
5	Pos	8 Nason	8 Erz	8 Cel	4 Nacht	2 Prin	1 1/3 La	III Zim	8 Krum
6	Pos	Trem	Pos 16	Pos 4	Unison	-----	-----	-----	-----
7	Ped	32 Res	16 Prin	16 Bour	16 Rohr	8 Oct	8 Bour	8 Rohr	4 C.B.
8	Ped	4 Bqr	2 C.B.	III Mix	16 Trom	8 Trom	4 Trom	-----	-----
9	CP	Gt-Pd 8	Gt-Pd 4	Sw-Pd 8	Sw-Pd 4	Pos-Pd 8	Pos-Pd 4	Sw-Gt 16	Sw-Gt 8
10	Cp	Sw-Gt 4	Pos-Gt 16	Pos-Gt 8	Pos-Gt 4	Sw-Pos 16	Sw-pos 8	Sw-Pos 4	-----
REV:	GT	SW	CH	POS					



THE MEMORY BOARD

The memory board contains the circuitry to remember combinations for eight stops. There are two types of memory boards: 16 piston and 32 piston. The only difference between the two boards is that the 16 piston boards have two integrated circuits removed from them. The photo on page 6 shows a 32 piston board.

The terminology 16 piston and 32 piston models may be a bit misleading. For example, 16 piston models have far more than 16 pistons total. If you count the largest number of any one group of divisional pistons, and add that to the number of general pistons, you will get 16 or less for 16 piston models and 17-32 will be counted on 32 piston models. Let's say that the Great has the largest group of divisional pistons (7) and you have 8 general pistons. If you add the 7 Great plus the 8 general pistons you get 15. That makes for a 16 piston model combination action.

The exact number of memory boards is determined by the size of the console. Remember that each memory board can handle up to eight stops. Boards are also grouped by division. So, the total number of boards is figured by dividing the number of stops in each division by eight separately. Obviously, unless each division has stops in multiples of eight, some boards will have unused sections. One board can be shared by two divisions providing that both divisions require four or less sections on that board.

INDEX

The chart on page 4 is a typical example of an index card supplied with each organ. It tells you which stop is controlled by which memory board. The first vertical column contains the slot number for the memory boards. The next vertical column shows the division for which that board operates. Note in the example that board #2 is listed twice. Once for the Great, and once for the Swell. Typically, the index is used as follows: Assume that the 8' Octave in the Pedal won't set off. The two left hand columns show that cards 7 and 8 are for the Pedal. Reading across line 7 we find the 8' Octave. We also find that the 8' Octave is located in the vertical column marked "CKT #5". Remove the

circuit board located in the slot numbered "7" and insert the spare. If the problem is then solved, return the board to the factory along with a note describing the problem, listing the stop name, and/or the circuit number from the index. This is the number of the vertical column in which the stop name was found. Be sure to also include the name and address of the church.

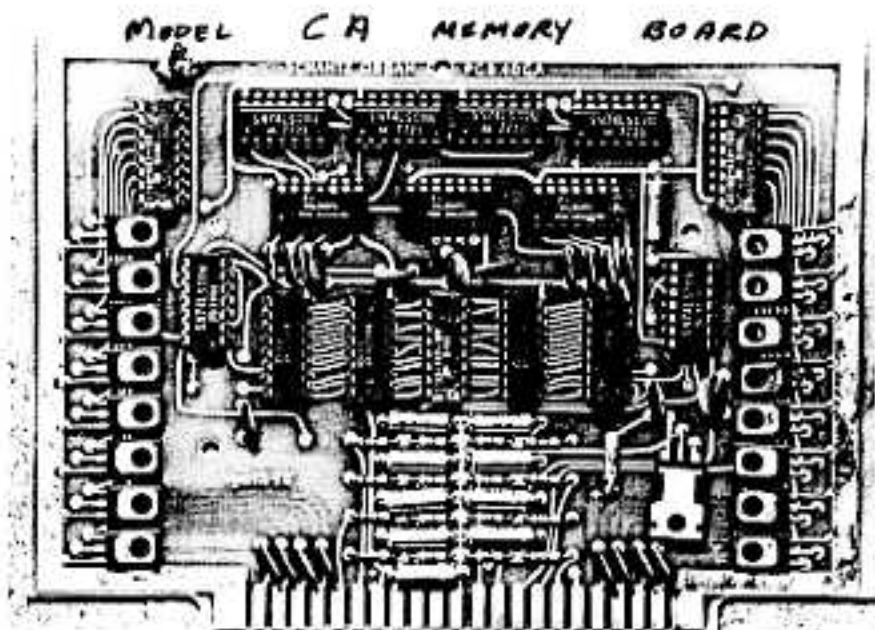


fig. 4a

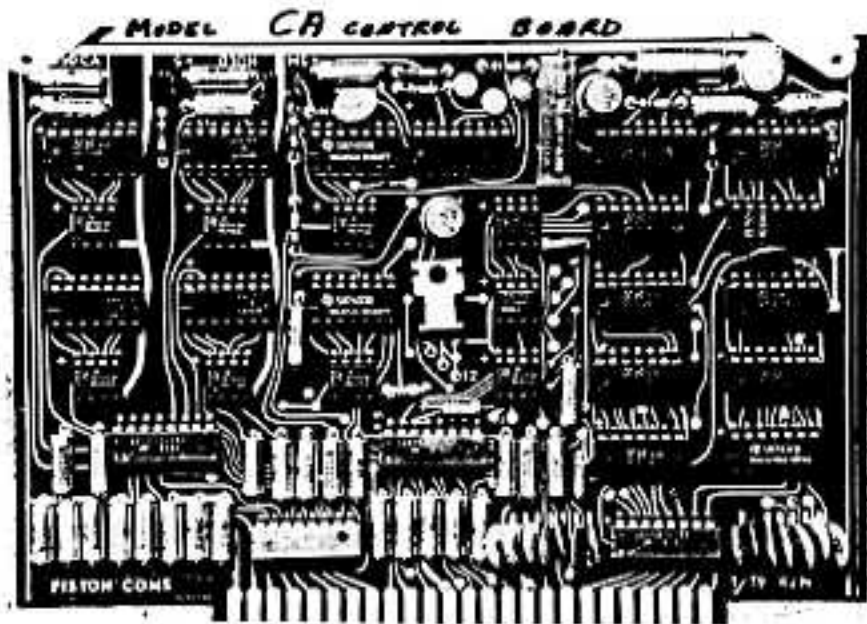


fig. 5

#### THE CONTROL BOARD

Located in the first slot of the memory box, the control board is the interface between the pistons and the other circuit boards. The type of control board problems are usually more general in nature than those of memory or reversible boards. A few examples could be: (1) All pistons dead...nothing operates; (2) Pistons work, but no new combinations will set; (3) Swell (or some other) divisional pistons dead. The list goes on, but generally speaking, control board problems have to do with problems common to a specific function rather than a specific stop or coupler. Replacement control boards are not supplied with each organ, however in many cases control board failure can be determined indirectly by checking the other boards in the box. Sometimes, a functional problem can be caused by a failure on one of the memory boards, or perhaps the reversible board.

Anytime you have a problem that does not deal with one specific stop or coupler, you should check the system operating voltages (dealt with later in this writing) and perform the board substitution procedure: Remove memory board #1, and insert the spare memory board. (You will then have to reset the combinations for all the stops on board #1.) Check out the console operations setting pistons or whatever and see if replacing memory board #1 eliminated the problem. If the trouble still prevails, pull the spare board back out of slot #1, and replace the original. Remove memory board #2 and insert the spare. Repeat this process inserting the spare into each memory board position and checking the console out each time until the problem is eliminated, or, until all the memory boards have been substituted. Try not to mix up the circuit boards....it may make a difference in troubleshooting. Never unplug more than one circuit board at a time, as it affects the operating voltages. When all of the memory boards have been substituted, remove the reversible board from its slot and insert the spare reversible board if provided. If no spare reversible board has been provided, simply remove the reversible board and operate the system without it. If you find your problem disappears while substituting any board, send that board back along with a detailed description of the problem, including the exact location of the board removed. If the problem still exists after substituting all the boards, and the operating voltages are within their specified tolerances, the control board itself would be the next area to investigate.

#### THE PROTECTOR BOARD

This circuit board is found only a few all-electric consoles. Its purpose is to prevent a continuous running on of all the kicker solenoids should there be a total failure of the 5 volt system while the organ is running. Such a failure would cause a "cancel" condition to occur pulling all the drawknobs and rocking tablets to their "off" position, and holding them there. If the organ were left running, even for a few seconds, all the kicker solenoid fuses would blow. The protector board prevents this unlikely condition from happening.

**PROTECTOR BOARD**

fig. 6

Should you wish to test the operation of the protector board, proceed as follows: Locate the line plug for the 18 volt transformer that drives the solenoids. This is the large transformer mounted on the console back just under the action frame. The receptacle for this transformer is located in the upper left corner under the action frame, and has a fuse and cover associated with it. Be prepared to unplug the transformer. Pull out several drawknobs so you can watch the cancel action of the kicker solenoids. Unplug the protector board from the box, but leave it in the card guide slots so that it can be pushed back in quickly. Unplug the batteries. Unplug the power cord that goes to the 5 volt power supply located in the memory box. The knobs that you previously pulled out will now jump in (cancel). If you try to pull any out they will jump back in. Plug the 5 volt power supply back in. The knobs should now be free to stay where you

leave them. If not, unplug the 18 volt transformer. Re-insert the protector board. Unplug the 5 volt power supply line cord once again. You should now be able to move the knobs freely. Reconnect the batteries. Reset the pistons. If at any time the console goes into a "cancel" mode that you can't stop, unplug the 18 volt transformer immediately in order to prevent the blowing of the fuses. Do not plug the transformer back in for more than 3 or 4 seconds at a time until you have the condition remedied. As long as the 5 volt supply is working, this continuous cancel condition will not occur. If you have a protector board that fails to prevent the cancel mode from occurring when the 5 volt supply is off, return it to the factory for repair.

One point to remember: air consoles do not have protector boards....they do not need them. However, the cancel condition can still occur. If you have an air console that appears to have the general cancel stuck, the 5 volt may be off and the batteries run down. (This circuitry is located on the control board on all Model CA systems).



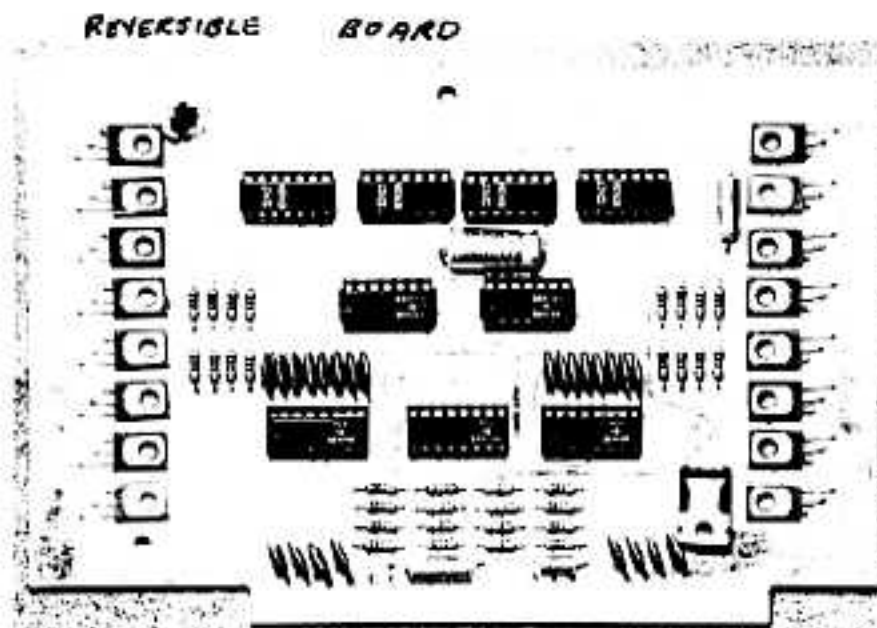


fig. 7

#### THE REVERSIBLE BOARD

The circuit board located right next to the 5 volt power supply is for all reversible functions such as: Great to Pedal, Full Organ, 32's off, etc. On some larger consoles, two reversible boards are installed side-by-side, and are so marked on the marker strip across the top of the memory box. The memory board index also contains reversible circuit number information.

If you should have a failure with one of the reversibles, exchange the spare reversible board with the active one, and see if the problem is corrected. Look on the index to determine the circuit number for the problem reversible. Send the faulty board back along with a description of the problem and the name of the reversible acting up.

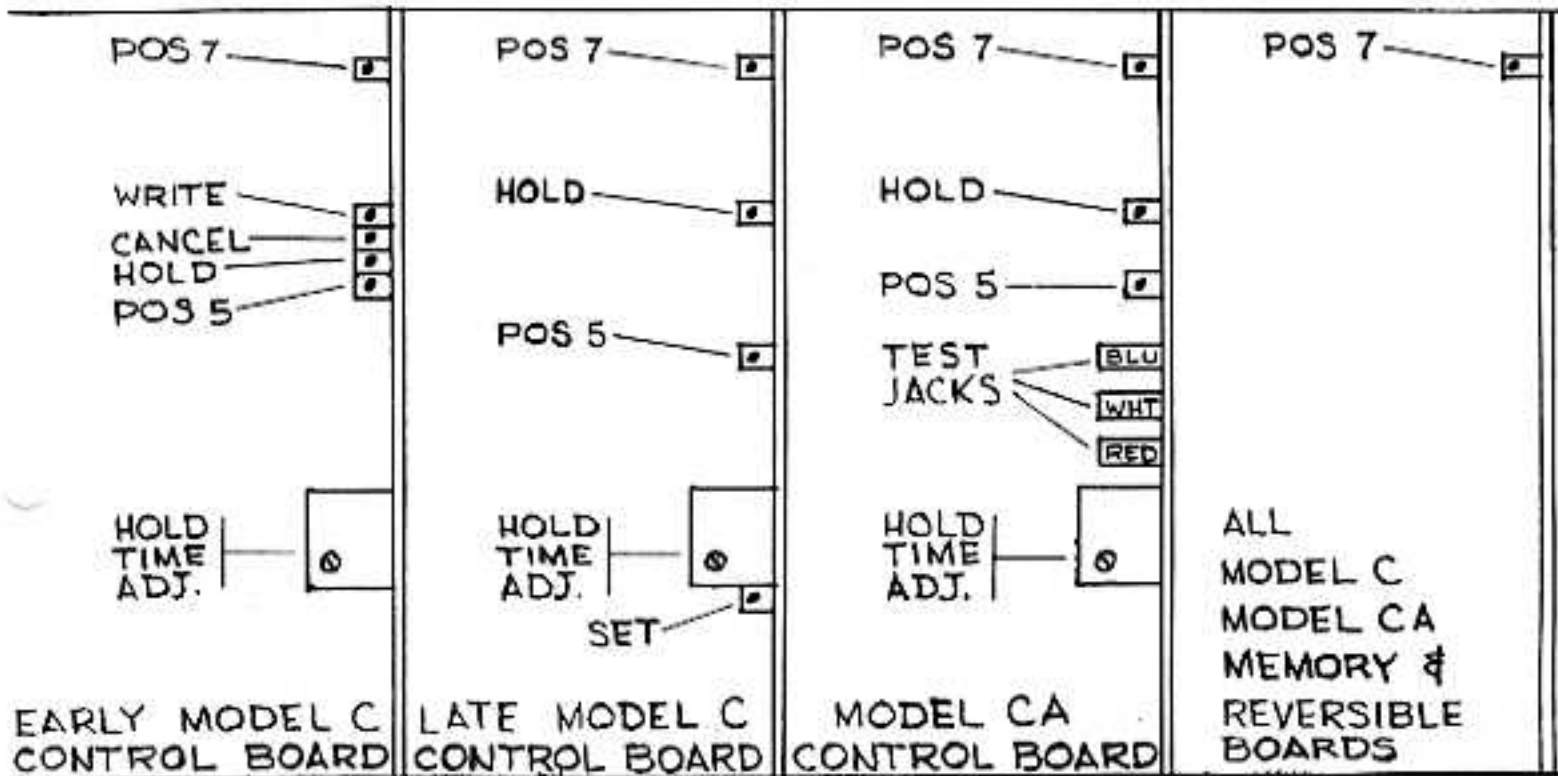


ILLUSTRATION SHOWS LOCATION AND PURPOSE OF ALL LED INDICATOR LITES VISIBLE FROM FRONT OF BOX. DRAWING ALSO SHOWS HOLD TIME ADJUSTMENT POT.

fig. 8

### CIRCUIT BOARD INDICATOR LIGHTS

There are several indicator lights located on the circuit boards which allow you to check some of the functions of the system at a glance. Refer to fig. 8 for their exact location.

"POS 7" The indicator located closest to the top of the circuit boards gets its source from the seven volt line on the back panel. Every board in the box, except the protector board, (if used) has this indicator. It really monitors the on board 5 volt regulator located on each circuit board, and if extinguished, tells you that the board is probably dead. This string of lights goes on and off with the organ, therefore, the organ must be running to see these lights.

"POS 5" Located only on the control board, this light must always be lit. Without it, the memory is lost. This light is fed from the 5 volt power supply located in the memory box, or by the backup batteries, and monitors the 5 volt line that feeds the memory chips themselves.

"HOLD" The hold circuit ensures that when a piston is depressed, it will remain "on" for a predetermined period of time. A certain amount of time is required to actually move all the drawknobs, etc. from one position to another. The hold circuit guarantees that, even if the piston is released early, all the knobs will continue to move into their new position, and that none will stop mid-way in their travel. Fig. 8 also shows the location of the hold circuit time adjustment. This is a screwdriver adjustment. You can change the hold time period by observing the hold indicator while repeatedly operating the pistons. At the same time, rotate the screw in the hold circuit pot left or right until the desired time period is set. The hold light will indicate how long the hold circuit is active. As you increase the time period, the hold light will remain on for a longer period of time. You will observe this each time you press a piston. This time period should be only long enough to ensure that all the knobs move fully. If the time period is too long, it will interfere with the rapid changing from one piston to another. Do not over-adjust the time period. Rotating the hold circuit pot too far can cause erratic hold pulses. Rotating the screw to the right (clockwise) increases the time period.

The hold light also shows the set pulse. If you observe the hold indicator while holding the "setter" button, and at the same time depressing a piston, you will see a very short pulse. This pulse is almost too quick to see. Repeat depressing the piston (while holding the setter in). Each time you hit the piston a very short pulse can be seen on the hold light. This is the set pulse, and without it, no new combinations can be set. The length of this pulse is not affected by the hold circuit pot.

SET & CANCEL

All Model C control boards have an indicator light for the setter button. Model CA does not. This light is labeled "Set" on late models, and "Write" on early models. It simply goes on anytime the set piston is depressed. Early Model C control boards also have a lamp for the "Cancel" button.

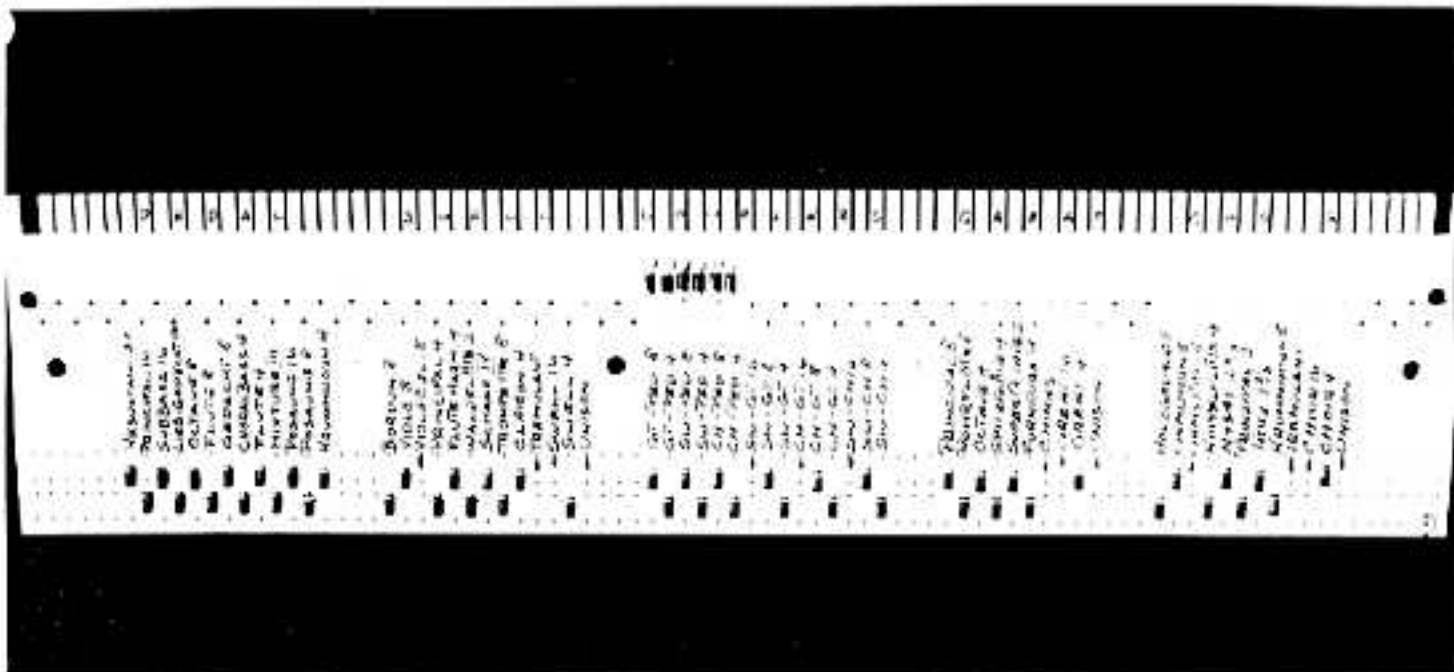


fig. 9

STOP ACTION BOARD

The stop action board doubles as a distributor bar for all stop action junctions in the console, as well as a buss for the sforzando. Fig. 9 shows a stop action board. The stop action wires are pulled into the slots across the top of the board, and then are wrapped onto the pins located below each slot. Each pin is then labeled across the center portion of the board.

