Model "D"

Field Service Manual

by

Schantz Organ Company

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PREFACE

The purpose of this manual is to provide the service man in the field with enough information so that he may effectively trouble shoot any problem he might encounter that relates to the model D combination action. Nearly every problem will be resolved by exchanging one or more of the circuit boards located in the memory box.

It is not the intention of this manual to deal with circuit board repair, nor is it the policy of the company to authorize such repair. Field service should deal with the exchanging of circuit boards and the repair of any items that are wired in to the memory box itself. The circuit boards can then be replaced on an exchange basis with the factory.

The model D memory box is almost entirely modular. That is to say that nearly every active component is located on one of the circuit boards that simply plug into the memory box. Perhaps ninety percent of the problems you might encounter will be solved by replacing the circuit boards.

This manual deals with the procedures to find faulty circuit boards. It also includes information regarding how the equipment is wired into the organ and how to make adjustments to voltage settings and timing circuits.

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 be on at all times, and that there is a battery pack that backs up the memory power supply to maintain power to the memory boards during power failures.

You should also be aware of the fact that the model D memory system uses CMOS technology, and that there is a risk of damaging the components with static electricity. Circuit boards should NEVER be changed with the power on. Any time you handle any part of the solid state equipment you should first ground yourself by touching the memory box chassis. This will reduce the hazard of static discharge that could damage components within the system. Further details regarding this are given in the section of the manual that covers circuit board replacement.

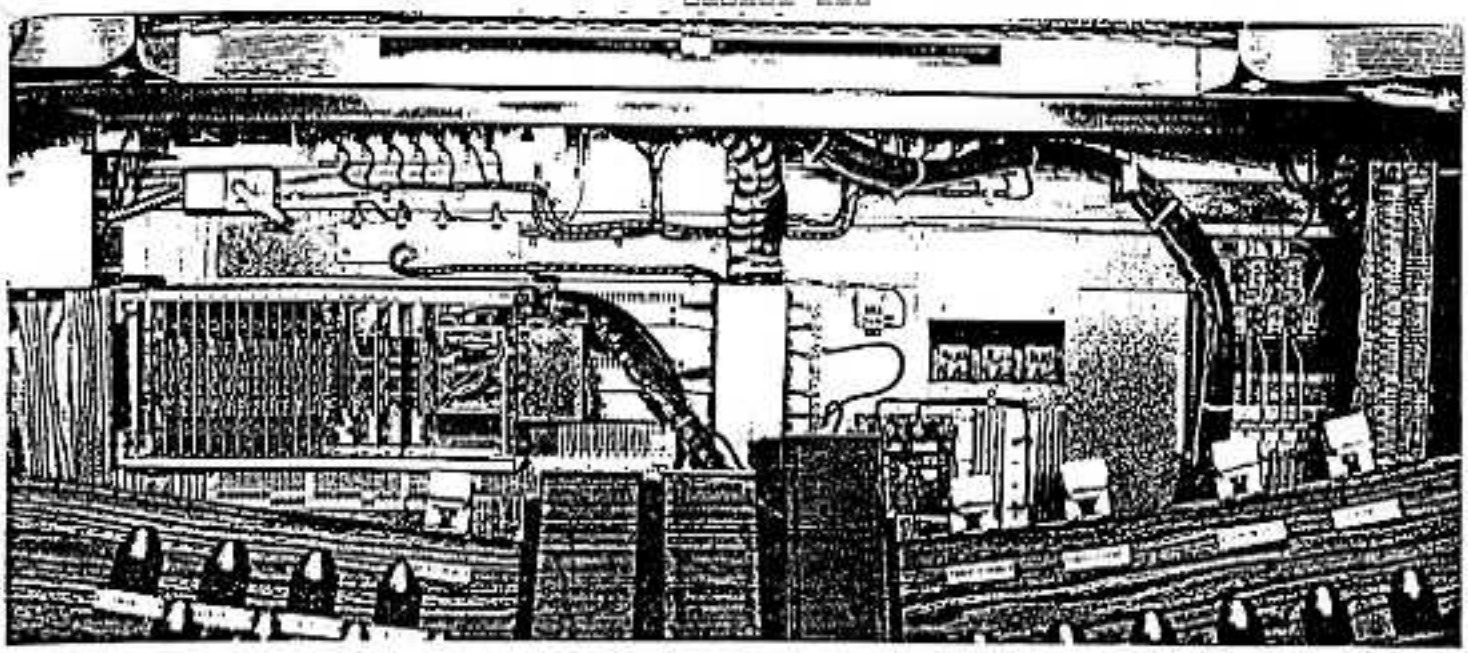
TABLE OF CONTENTS

PART ONE

PART TWO

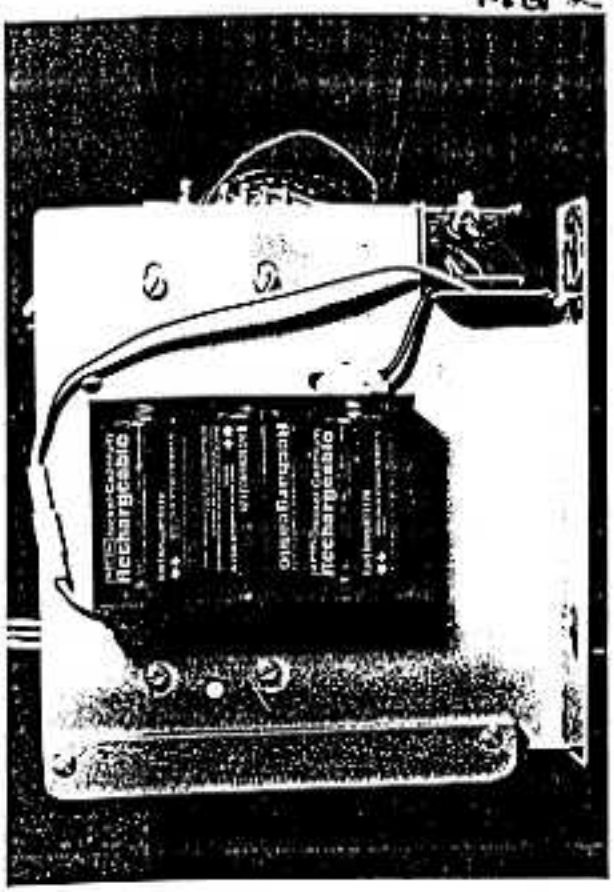
Part One

MEMORY BOX



The memory box consists of a back panel or "mother board" as it is sometimes called, attached to a rack which contains slots to guide the removable circuit boards into their respective sockets on the back panel. This box is generally located underneath the action frame or key desk of the console, behind the knee panel. Circuit boards can usually be replaced by removing the knee panel to gain access to the memory box.

The memory box is attached to the console with four screws that pass through keyhole slots in the box itself, then into iron brackets in the console. The box can be removed by simply loosening these four screws, lifting the box up, and passing the large opening of the keyhole slots over the screw heads. You will find about eight feet of cable connecting the memory box to the console. This cable is long enough to allow you to remove the box from the console and give you access to the wiring side of the back panel should the need arise.

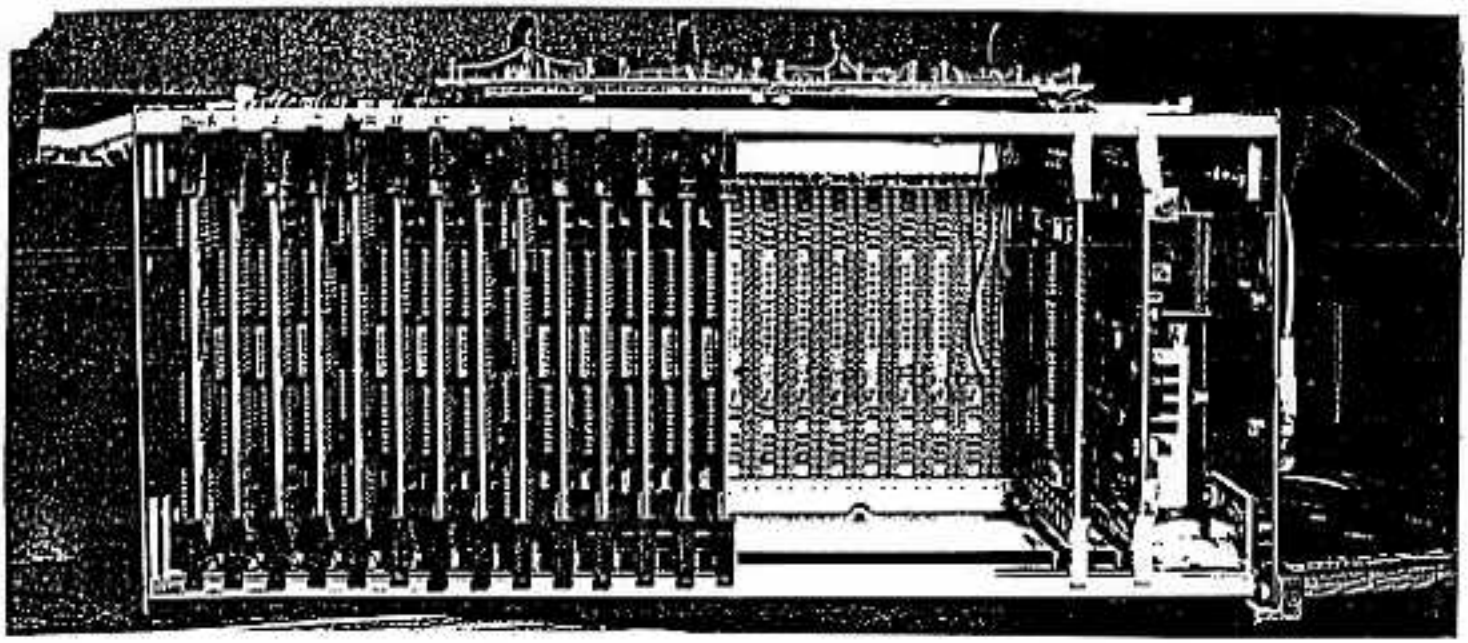


Strapped to the outside of the memory box cable is a power cord that plugs into an outlet somewhere inside the console. This cord provides the power to run the memory system, and must be plugged in at all times except when the system is shut down for service. Any time this cord is unplugged the batteries will provide the memory box with power. The batteries, therefore, must also be disconnected any time the equipment is shut down for service (fig.[2]).

Whenever the power is completely removed from the system, memory is going to be lost. Any time you must shut the equipment down for service you should either record the organist's piston settings on paper, or get permission to destroy the settings.

If you shut the system down to replace a circuit board, you will, of course, need to reset the organist's original piston settings. Before doing so, try setting up some pistons with patterns of stops that are easy to see such as all on... all off... odd on... even on... etc. Try different settings on each piston. Reset the pistons with something else. Work the pistons. When you are satisfied that everything is working, then reset the pistons as they were before you began.

CIRCUIT BOARD IDENTIFICATION AND REPLACEMENT



There are four types of circuit boards in the memory box. Each type of circuit board is interchangeable with any other board of the same type. There are spare replacement boards provided for the three most common types in the box. These spares will allow you to replace virtually any faulty board with a spare, thus solving your immediate problem. The defective board can then be sent back to SCHANTZ ORGAN COMPANY for repair. Upon repair, the board will be returned to you to become your new spare circuit board, and should be put back in the console.

Refer to figure [3]. You can see a white identification strip that runs across the top of the memory box. This strip contains information to help you to identify each of the circuit boards in the memory box. Each division contains a board that is called a "CONTROL" board. This board is the interpreter for the pistons and the memory board for that division. The abbreviations

on the identification strip such as: "CPLR"..."GT"..."SW", etc. refer to a control board for that particular division. The first control board at the left end of the box, usually labeled "CPLR" not only operates the coupler tab section of the console, but also handles the general pistons. The numbers on the strip refer to the memory boards. Each memory board has a unique number rather than starting the number count over at "one" in each division. This approach is less error prone than numbering by division when it comes to communicating with us about your problem. The label on the strip marked "REV" refers to the reversible board. This board takes care of the reversible functions such as "Gt to Ped Rev", "Sfz", etc. There is generally only one reversible board, however, on large organs there may be more depending on the number of reversibles. The final marking on the identification strip is "PWR" which stands for the power supply.

Each type of circuit board has its own color coded identification. The nylon pull-tabs which are used to remove the circuit boards from the box are colored. Control boards have BLUE pull-tabs. Memory boards have GREEN pull-tabs. The reversible boards have YELLOW pull-tabs, and the power supply board has WHITE. In addition, each type of board has its own unique key. This means that a control board will not fit into a socket designated for a memory board.

Do not, however, attempt to install any circuit board into any socket other than the proper type. Do not force any board in, or attempt to install any board that does not go in straight. Be

sure when you install a board that the color of the pull-tabs match that which you just removed, and that the board goes freely and fully into the socket.

INDEX CARD

BIRMINGHAM, AL ST. MARY'S ON THE HIGHLANDS

BD. #		CKT #1	CKT #2	CKT #3	CKT #4	CKT #5	CKT #6	CKT #7	CKT #8
1	CPL	GT-PD 8	GT-PD 4	SW-PD 8	SW-PD 4	CH-PD 8	CH-PD 4	SW-GT 16	SW-GT 8
2	CPL	SW-GT 4	CH-GT 16	CH-GT 8	CH-GT 4	SW-CH 16	SW-CH 8	SW-CH 4	———
3	GT	Quint 16	Diap 8	Bour 8	Oct 4	H. Flt 4	Twf 2 2/3	Fif 2	Mix IV
4	GT	Chime	Trem	GT 16	GT 4	Unison	———	———	———
5	SW	Viola 8	Rohr 8	V Cel 8	Fl Con 8	Fl Cel 8	Prin 4	Hohl 4	Spitz 2
6	SW	PJ III	Fag 16	Trom 8	Fag 8	Clar	Trem	SW 16	SW 4
7	SW	Unison	———	———	———	XXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX
7	CH	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	Nason 8	Dulc 8	Unda 8	Kopp 4
8	CH	Naz 2 2/3	Bloc 2	Terz 1 3/5	Krum 8	Trem	CH 16	CH 4	Unison
9	PD	Cont 16	Bour 16	Quin 16	Prin 8	Bour 8	Quin 8	CB 4	Flt 4
10	PD	Mix III	Trom 16	Fag 16	Trom 8	Clar	———	———	———
		REVERSIBLES							
		GT-PED	SW-PED	CH-PED	SFZ				

Refer to figure [4]. The index is a chart that will assist you in locating the proper circuit board when a malfunction occurs. It contains all the information necessary for you to locate the proper memory board if that failure relates to some stop or coupler. The index is on a card located in the box.

The first vertical column is labeled "BD#". This column is further divided into two columns. The column on the left contains the memory board numbers which correspond with the numbers written on the marker strip that runs across the top of the memory box (fig.[3]). The column on the right contains the

abbreviation of the division in which the board is used. Note that in our example, board #7 is listed twice... once for the Swell division, and once for the Choir. Under certain circumstances, memory boards can be split and used in two divisions. It will not be unusual to find this occurrence in any organ you might service.

The remaining columns labeled "CKT #1", "CKT #2", etc. identify the various circuits within the board, as to which circuit is used by which stop. This circuit number has no real bearing as to which board needs to be replaced, but does help us to pinpoint a problem once we receive a board for repair. The bottom line of the index contains the circuit numbers for the reversible board. If there were more than one reversible board in this memory box, the index would also reflect the reversible board numbers just the same as it does the memory board numbers.

Now let's suppose that you are trying to locate a defective memory board. Let's say that the Swell 8' Viole Celeste continues to come on even though you set it off again and again. This problem relates to a particular stop rather than some certain piston or something within a division, etc. Problems that relate to specific stops or couplers are generally associated with memory board failures. In this case you look at the index (FIG.[4]) and find that the Swell Viole Celeste is located on board #5, circuit #3. Replace the memory board #5 with the spare memory board and check out the combination action to see if the problem is fixed. (see page [2] last paragraph)

BOARD EXCHANGING PROCEDURES

There are a couple of precautions that you need to observe before you attempt to exchange any circuit board, or to do any work on the memory box. Exchanging circuit boards is very simple to do, and there is very little chance that static electricity will cause any damage to the equipment. There is some risk, however, so in order to prevent that "one little chance" we recommend that you handle the equipment as follows:

It should be pointed out here that earlier versions of our solid state combination action such as Model A, Model B, Model C & CA did not use CMOS chips, and therefore, did not require to have the power turned off to change circuit boards.

Model D requires that no circuit board may be removed or inserted while the power is on. This is going to force you to make some consideration for the organist's current piston settings... if they still exist. Before disconnecting the power you should either write down all existing piston settings, or get permission from the organist to destroy these settings. As soon as you remove all power from the memory box, all memory will be lost.

Did you ever walk across a room and get a shock when you touched the doorknob? Well that shock could cause us some harm, and that's what we are going to get rid of. Once you have the console opened up and are in a position to reach & exchange circuit boards, take a firm grip on the metal frame of the memory box and hang on for a second or two. The memory box is grounded

and "holding on" will allow any electrical charge in your body to escape to ground. Now that you are "safe"... stay still. Shuffling your feet or clothing builds those electrical charges back up. If you think that you are in a situation in which you might be building up static charges, keep periodically touching the memory box frame to keep yourself discharged.

Once you are discharged, you are ready to exchange a board. The next thing you need to do is to turn off the power to the memory system. Never remove or insert any board while the power is turned on. This means that both the power supply and the batteries must be shut down. The power supply is the last circuit board at the right end of the memory box. It has a red pilot lamp on it indicating whether or not the power is on. It also has a toggle switch on the front edge near the top. Turn the switch "off" (DOWN). The pilot lamp will go out. Now look at the right end of the memory box and pull the plug on the red wire that goes to the batteries. The memory box is now dead and it is safe to exchange circuit boards.

The power switch on the power supply board has AC Line voltage going to it (110 V). This can be hazardous and care should be exercised not to touch the circuit board on either side in the area of this switch. If you have any doubt as to where this is, unplug the power cord for the memory box. This will render the entire area safe to handle. If you are not certain just where this cord is located, you will find it strapped to the outside of the large cable which connects the memory box to the console. Simply follow this cord until you find the receptacle

where it is plugged in. This will most likely be under the action frame (key desk) of the console. When this cord is unplugged, the indicator lamp of the power supply board will be out no matter which way the little toggle switch on the power supply is set.

When exchanging circuit boards, you will find a rubber or plastic strip across the contact fingers of the spare board. This is there to protect the board from static discharge and removing this strip should be the last thing you do before inserting the spare into the memory box. As soon as the board has been inserted, the strip should be then placed onto the contact fingers of the board that was just removed.

When the board exchange is complete, turn the power back on and try out the system. The batteries may be left unplugged until you are finished with your work. That way they will not have to be unplugged again if you should have to shut down once more to exchange another board. (see page [2] last paragraph)

ELEMENTRY DIAGNOSTICS

If something should go wrong with your combination action, the problem can most likely be resolved by exchanging a circuit board. This can be done by anyone who is willing to take a few minutes to study the problem and perform the swap. No particular knowledge of electronics is necessary. Just simply follow the instructions that have been outlined in this manual.

Control boards (blue tabs) operate a group of memory boards for some division of the organ. If, for instance, you cannot get

Swell piston #3 to work, the problem probably relates to the control board for the Swell. Other similar control board problems would relate to any kind of thing that would affect an entire division, or even the entire organ as in the case of problems relating to the General pistons.

Memory boards (green tabs) manage piston settings. Each memory board is responsible for as many as eight stops. The stop controls that are operated by any particular memory board are usually in one certain division of the organ, however, these boards can be split up to operate not more than four stops in each of two different divisions. Memory board problems usually refer to "stop related" problems rather than "division related" problems. It was pointed out earlier in the section regarding how to read the index card that a certain stop was giving trouble. This kind of problem where some stop will not set on or off, or some stop won't cancel, etc. will most likely be fixed by replacing the memory board for that stop.

The reversible board controls the reversible pistons. If you have a dead reversible, or perhaps, one that will go on but not off, you should try to exchange the reversible board. Remember that the reversible board also operates stops that are run by the combination action. For instance, the Great to Pedal coupler tab has a memory board assigned to it as well as the reversible board. One board failure can affect the other. Do not overlook this fact when changing boards. If, for instance, you replace the reversible board because the Great to Pedal doesn't work right,

and that does not solve your problem, try replacing the memory board for the Great to Pedal also.

There are times when some problem doesn't follow any logic. You replace board after board, and the problem is still there. It may then be necessary to swap every board in the entire system in order to locate your problem. This technique is called "board substitution". If you should find that you must perform a complete board substitution, be systematic. Start at one end of the memory box and replace each board with its appropriate spare one at a time. After every exchange, check the system out to see if the problem has been solved. If not, remove the spare board and put the original board back in. Go on to the next board, and do the same thing. Repeat this process until you have either worked your way through the entire box, or until the problem has been found. This may take a little patience, but generally will locate a problem if the obvious attempts did not.

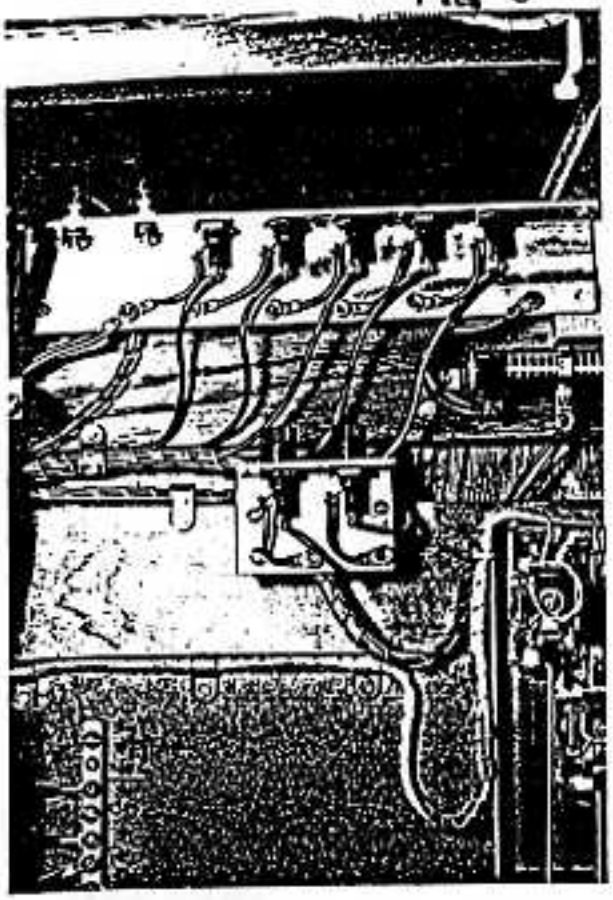
KICKER FUSES

All electric consoles have fuses installed to protect the circuitry that operate the devices which move the drawknobs and coupler tabs. The size of each fuse is determined by the number of controls that operate through it, and is set to a value that will cause the fuse to blow if there is continuous current through the fuse. These fuses are slow-blow type, and under normal operating conditions, will not fail. Rapidly changing from

one piston to another for extended periods of time can cause fuses to fail. Blown fuses will cause sections of drawknobs and rocking tablets to quit working through the combination action. That is, if you hit a piston or the General Cancel, and some of the controls do not move, you may have a blown fuse. The fuses are arranged so that entire vertical rows of drawknobs will be fed from one fuse. This will cause vertical rows of drawknobs to quit moving when the fuse for that particular row fails. Memory boards, on the other hand, are not usually assigned to some vertical row of controls. This means that if you have a single vertical row of controls, or even several rows that are dead, you probably have a blown fuse instead of circuit board problems.

The fuses for the coupler tabs are not arranged the same because they are all in a single row unless the console is extremely large. The fuses are generally divided up to feed the odd-numbered coupler tabs with one fuse, and the even-numbered tabs with the other. There are exceptions to this arrangement for consoles that require more than two fuses to operate the coupler tabs. Generally speaking, if

FIG 6



you have a group of rocking tabs in which every other tab is dead, you most likely have a blown fuse.

The fuses are located underneath the action frame (key desk), behind the knee panel, at the rear of the console. (see figure [5]) There is a row of fuse holders on each side of the console. You will find that these groups of fuses contain the same number of fuses as the number of vertical rows of drawknobs on each side of the console.

The fuse for the outermost row of drawknobs on the left side is located in the row of fuses on the left side of the console, and is the fuse at the extreme left end of that group. The fuse for the third row in from the outside on the right jamb, will be found in the right hand group of fuses, third fuse in from the right. As you can see, the fuses are arranged exactly as the rows of drawknobs are arranged on the jambs.

There is another fuse group for the coupler tabs, and this group is usually located on the right side below the group for the right jamb. This fuse group will most likely have only two fuses because of the smaller number of coupler tabs as compared with the number of controls that occupy an entire jamb of drawknobs. The arrangement as to which fuse operates which group of coupler tabs is somewhat more complex than the setup for the drawknobs. The solenoids that operate the coupler tabs are built in two rows even though there is only one row of coupler tabs. With the exception of very large consoles, each fuse will operate one row of kicker solenoids. Since the coupler tabs are connected to the kickers in an alternating pattern (ie: front,

back, front, back, etc.), a blown fuse will reveal itself with every other tab unable to be moved by the pistons or the cancel. You will probably need to check each fuse in this group to determine which one might be blown.

LIST OF FUSE VALUES FOR EACH VERTICAL ROW OF DRAWKNOBS (FROM LEFT TO RIGHT) FIG 6

2¼ AMP	2 AMP	2 AMP	½ AMP	½ AMP
PED 1	PED 2	SW 1	SW 2	SW 3

FIRST BAPTIST BROWNWOOD, TEXAS

½ AMP	½ AMP	¼ AMP	¼ AMP	¼ AMP
GT 1	GT 2	CH 1	CH 2	CH 3

CPLS FRONT 2½ AMP.	CPLS BACK 2½ AMP

There is a chart posted in the back of the console that will help you to determine what size fuse to replace should you find one that has failed. (see fig.[6]) Lets suppose that the third row of drawknobs in from the outside on the left jamb are dead. that is they will not move when pistons that should move them are operated, nor will the cancel bring them off. This happens to be the first row of knobs in the Swell division. Look at the chart. It is arranged in groups much in the same way that the fuse