

MULTILEVEL CAPTURE SYSTEM

MULTILEVEL CAPTURE SYSTEM INSTALLATION GUIDE

FORMAT A

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INTRODUCTION

Thank you for purchasing a MultiLevel Capture System from Solid State Organ Systems. This system is known as the Format A and is fitted with 8 levels of memory. The exact size of the system is dependant on your installation, but all systems offer 2 Tutts, Blind Check, Clear, and General Cancel as standard. You'll find the following information in this manual:

- a) A brief description of the design
- b) Some important notes on the installation
- c) Commissioning of the system
- d) The layout details for the particular system

There is a separate handbook covering the operation of the system and is supplied for use by the organists.

SYSTEM DESCRIPTION

The system consists of a small rack which contains all the cards and one or more frames of pinboards. To these may be added one or more small control-panels, display modules, switches, etc. depending upon the functions required.

Racks

Small and moderately-sized systems require a small rack with 10 slots; larger systems have a larger rack with 20 slots. The dimensions are:

10-slot rack 11" wide, 11" deep and 13" high (280x280x330mm)

20-slot rack 20" wide, 11" deep and 13" high (510x280x330mm)

Two or more racks are supplied for very large systems as required. A 5 slot rack may be supplied for small system but has the same dimensions as the 10 slot rack.

The racks must be installed in a vertical position with the flanges at the bottom. The position must allow for ready access to the front of the rack with a clear space for removing and replacing the cards, and reasonable access to the rear. Very little heat is generated within the system, but a reasonable airflow is desirable to maintain a steady temperature.

MOUNTING THE RACK

The Rack must be mounted vertically with the fixing flanges at the bottom and the printed-circuit cards standing vertically. There must be easy access to the front of the rack with adequate space in front to allow the free removal and insertion of the cards.

The rear of the rack should also have reasonable access for connection of the ribbonflex cables and servicing. The pinboards should be mounted within 300-600mm (2-3 feet) of the rack and the general appearance and ease of servicing will be much improved if a suitable trough or similar arrangement is provided to hold the linking ribbonflex cable neat and tidy. These cables can be safely folded to adjust their length as required.

When the console is detached from the organ, it is best to install the system in the console, since the vast majority of its functions are concerned with console controls. When the organ has an integral console, it should be installed as near to the console as possible to simplify the wiring from the pinboard to the drawstops, etc.

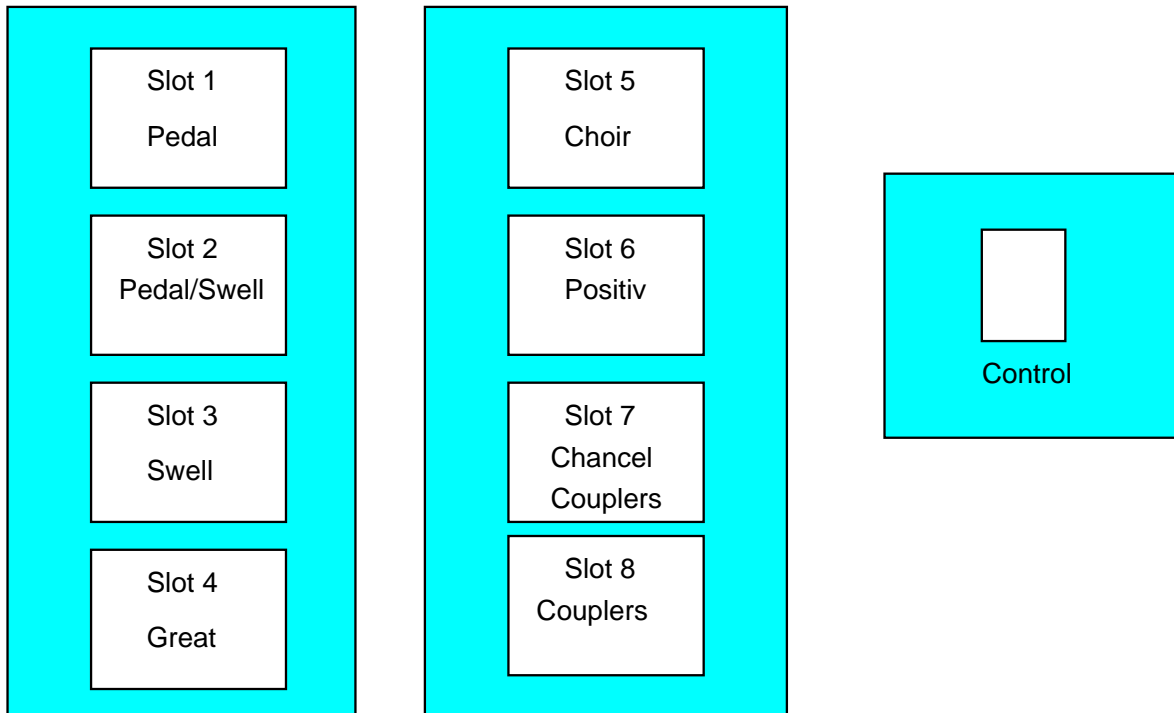
TRANSFORMER/RECTIFIER WIRING

The RACK has a pair of terminals for connection to the organ D.C. Power supply which should be between 12 and 24 volts. This supply must be reasonably stable and free from electrical noise; most commercially-available units are suitable.

The system will not operate satisfactorily from D.C. supplies which are provided from a rotary generator as the noise-level is far too high and can confuse the microprocessor into acting on false signals. If in doubt, please consult us at SSOS. If separate Transformers/Rectifiers are provided for the Organ and Console, the Negative (-ve) of each supply must be linked together, except when an SSOS MultiSystem is used where the console is remote.

CONSOLE WIRING

The SSOS standard of positive (+ve) inputs and negative (-ve) outputs applies to these systems. This implies that all switches have positive feeds and all magnets have positive returns.



The pinboards associated with a typical system

The actual connections for each pinboard are detailed in the layout sheets to be found later in this manual. The pinboard is normally arranged with one block of connections corresponding to each block card. Hence slot 1 is related to the first slot in the rack and to the block card in the rack labelled "slot 1". The slot numbers and their dedicated functions are detailed on the pinboard. A view of one block of the pinboard is shown below.

	Row 1 Drawstop Switches	Row 2 Piston Switches	Row 3 Stop Actions	Row 4 Off Coils	Row 5 On Coils
1	• 1	• D1	•	•	•
2	• 2	• D2	•	•	•
3	• 3	• D3	•	•	•
4	• 4	• D4	•	•	•
5	• 5	• D5	•	•	•
6	• 6	• D6	•	•	•
7	• 7	• D7	•	•	•
8	• 8	• D8	•	•	•
9	• 9	•	•	•	•
10	• 10	•	•	•	•
11	• 11	•	•	•	•
12	• 12	•	•	•	•
13	• 13	•	•	•	•
14	• 14	•	•	•	•
15	• 15	•	•	•	•
16	• 16	•	•	•	•

One block of the pinboard

Each Block Card has a pinboard with five rows of pins, normally designated:

- Row 1, Stop switch inputs
- Row 2, Piston inputs (including Reverser pistons)
- Row 3, Stop Action outputs (+ve)
- Row 4, OFF coil outputs
- Row 5, ON coil outputs

When illuminated stop buttons are used as the stop controls, the usual connections will be:

- Row 1, Stop switch and Reverser pistons
- Row 2, piston inputs
- Row 3, stop Action outputs
- Row 4, Lamp outputs
- Row 5, not used or as specified on the layout sheets

Please note that the maximum current permissible for each drawstop coil is 1.5 amps, which means:

- no less than 8 ohms on a 12-volt system
- no less than 12 ohms on a 18-volt system
- no less than 16 ohms on a 24-volt system

When wiring to the pinboards, please take great care to make no connections to pins that are unmarked or marked "X". These are either required for test purposes or will conflict with other functions if used.

Each pinboard is provided with two 16-way DIL sockets.

If a Block Card should become faulty in the absence of a replacement card, such card should be removed from the rack and two of the four "headers" supplied should be plugged into these sockets. These will have the effect of linking the drawstop contacts to the Drawstop actions, enabling use of them by hand until a replacement card is received.

STOP ACTION WIRING

The Stop Action magnets are driven separately in this system (Row 3) rather than directly by the Drawstop switch contacts. This allows the system to perform "blind" functions such as Tuttis, Ventsils and Inhibits.

Stop magnet returns, therefore are negative. Magnet currents must not, as in the case of Drawstop coils be greater than 1.5 amps. When slider-solenoids are used to operate stops, the solenoid control must have Positive-going inputs (see SSOS Catalogue section 1/4, Partcodes 623032A2, 621040A1, and 621041A1. If in doubt, please contact us at SSOS and we will be happy to advise.

CONTROL PINBOARD WIRING

All systems have pinboards that provide inputs for such controls as "Set", "General Cancel", "Page O", etc.

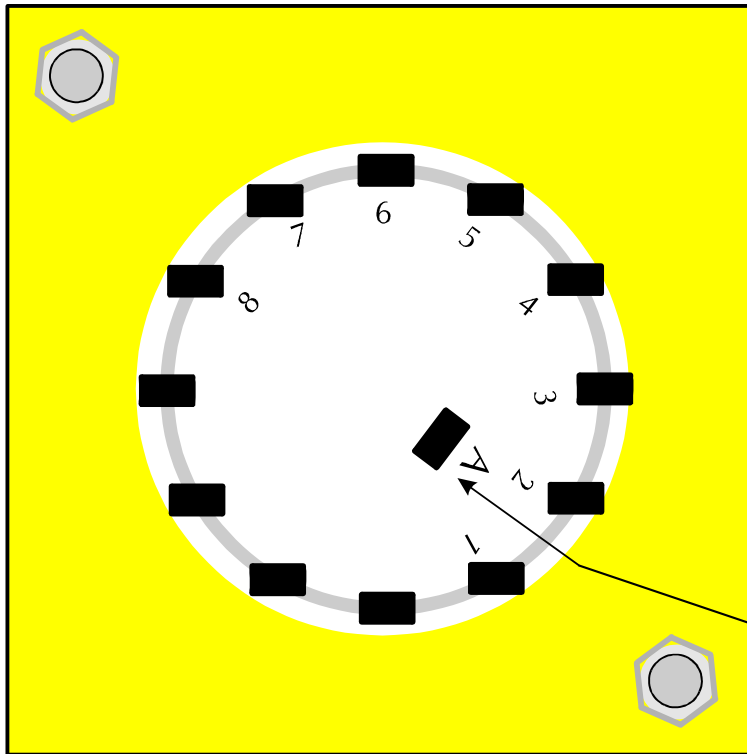
Format A systems have their own Control pinboard which contains pins for the connection of a Memory-Level selector switch, Set, General Cancel, Tutti 1, Tutti 2, "Clear" and "Blind Check" inputs and lamp outputs (-ve output) that can drive up to 1 amp.

8-WAY LEVEL SELECTOR



Memory level selection on the Format A system is by means of an eight way switch.

- The switch common should be wired to T/R positive.
- The eight contacts should be wired to the eight level select inputs on the MultiLevel Capture pinboard.



Connect 8 wires to control pinboard. Check connector list for details. Level Switch 1-8

Connect Positive to Tag marked A

The Memory-level switch tag marked A must be connected to positive or connected to the pin marked "Common" on the control pinboard, whichever is most convenient.

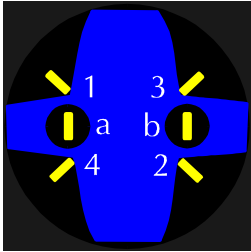
The type of switch used may be rotary (as normally supplied with the system), thumb-wheel (not binary code output type) or interlocking push-buttons.

Memory-selection by pistons is also possible if specified, lamp outputs are provided for illuminated pistons or separate lamps to indicate the memory-level in use.

BLIND CHECK AND CLEAR SWITCHES

Supplied with the Format A system are 2 switches for Blind Check and Clear. Each of these switches has a built-in lamp.

The Blind Check switch is only required on systems fitted with blind functions such as tuttis, ventils and sforzandos.



- One side of each switch should be connected to either the Blind Check input, or the Clear input on the control pinboard.
- One side of each lamp should be connected to the Blind Check Lamp output. There is no Clear Lamp output.
- The other side of the switch and the lamp should be connected to T/R positive.

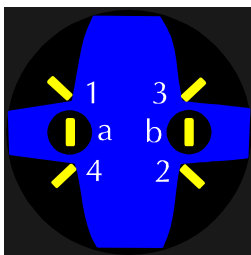
A rear view of the switch/lamp. The lamp connects to contacts a and b. Contacts marked 3 and 4 are normally open and should be used for the switch wiring.

LOCK SWITCH AND INDICATOR LAMP

The lock switch is a momentary action key operated switch used for locking and unlocking levels. The lock indicator lights whenever the currently selected level is locked.

The lock switch is usually supplied by SSOS.

- Connect Pin 3 to positive.
- Pin 4 connects to the lock switch input on the control pinboard.



The lock indicator lamp should be mounted next to the lock switch. It should be wired as follows:

- One side of the lock indicator lamp connects to positive.
- The other side of the lamp connects to the lock lamp output on the MultiLevel Capture system pinboard.

Lock switch showing connections, use only pins 3 and 4.

USING LED's

LED's are solid state devices which emit light. They may be used in place of lamps if certain conditions are met.

LED's only work one way round. The cathode connects to the negative end of the circuit and is indicated by the shortest lead, or by a "flat" on the body of the LED.

LED's work at voltages between 1.5V and 3.0V. To prevent damage, they require a resistor in series with them in order to limit the current flowing through them. The resistor has two values, its resistance measured in ohms, and its power measured in watts.

To calculate these two values use the following formulae:

$$\text{resistance} = ((T/R \text{ voltage} - 2) \div 100) \text{ ohms } (\Omega)$$

$$\text{power} = ((T/R \text{ voltage} - 2) \div 100) \text{ watts } (W)$$

Exact values are not necessary, but larger values are safer than lower ones.

Suitable resistors for a variety of T/R voltages are shown below

12V	1K0 (1000 Ω) 5% 0.125W (min.)
15V	1K3 (1300 Ω) 5% 0.25W (min.)
18V	1K6 (1600 Ω) 5% 0.25W (min.)
24V	2K2 (2200 Ω) 5% 0.25W (min.)

All of the above assume LED's rated at a current of 10mA. These values are safe for use with any LED.

Some LED's are recommended to have a higher current of 20mA. In this case, the value of the resistor will need to be reduced. The resistance should be halved, and the power should be doubled.

Some LED's are available with built in resistors. These will usually be labelled as 12V or 24V, and do not require a resistor when used at their rated voltage.

RIBBONFLEX (RIBBON CABLE) CONNECTIONS

Before connecting the Ribbonflex cables, please check the wiring as suggested in the section "Testing".

There are three ribbonflex cables for each Block Card pinboard and these should be plugged into the three sockets on the rear of the rack as indicated.

Each pinboard block has 3 ribbon cables marked with the relevant block (slot) number and either TOP, MIDDLE or BOTTOM indicating the position in the rack where the connector must be plugged.

The control pinboard (if separate) has its own ribbonflex cable, which is clearly labelled with the plug position for it.

WIRING INFORMATION FOR QUICK CONNECTION BLOCKS

The MultiSystem can be supplied with either standard solder pins or with quick connection blocks. It is important to make this decision at the time of ordering as it is difficult to alter this once the system is assembled.

The quick connection blocks supplied are of the highest quality available and should not be confused with cheaper alternatives available from other sources. This design has been in use with telecommunications systems throughout the world for over 50 years.

The blocks are arranged in groups of 4 circuits with slots in the top where the wires are inserted. Cable registers are supplied to arrange the cables prior to assembly. They can be removed from the system and discarded if not required.

The quick connection blocks will provide a very fast and extremely reliable connection if a few simple rules are used.

1. There is a limit to the range of wire size that can be used
2. The special insertion/removal tool supplied must be used
3. It is not necessary to remove the insulation from each wire

It is possible make 61 connections with this system in a little over one minute with very little previous experience.

TECHNICAL DATA

Stranded Wire Diameter Range	
Strands / Dia. (mm)	Overall Dia. (mm) Including insulation
7/0.15	1.10
7/0.20	1.20
7/0.25	1.20

Single Wire Diameter	
Copper conductor	0.40 - 0.65 mm 26 - 22 AWG
Over Insulation	0.7 - 1.40 mm

It is possible to use cables outside this specification but this must be checked with your local SSOS sales office. Two cables may be inserted into each slot for making parallel connections if required. The two wires should, however, be identical. The connection blocks will accept up to 100 re-terminations without damage.

These connectors comply with European and tropical climate tests to 40/92 DIN 50015 and in corrosive industrial or salt laden air to reliability test DIN 40046. They are also suitable for high vibration environments.

USE OF THE SPECIAL TOOL

In order to terminate the system correctly you will require a special insertion/removal tool. The tool supplied is a professional quality tool and should last a lifetime. Spare tools are obtainable directly from SSOS or other suppliers. They are manufactured by a European Company called Krone and the part number is 6089 2 030-21. Tools are also available from SSOS as part number 80CLAV6C.

**Use only the special tool to insert wires. Any other tool may damage
The blocks and cause unreliability.**

The tool has a number of functions. It can be used to insert wires or remove them from the blocks. It is also capable of cutting off excess wire if required.

If you wish **to cut off the excess wire**, remove the clip at the bottom of the tool and allow it to hang free on the string. If you wish to link the wire on to another point, make sure the clip is in place and this will prevent the cutters operating. Please be very careful not to allow the wire clippings to fall into the electronics where they may cause damage.

To insert a wire, place the wire over the top of the connection block. Insert the tool into the block with the grey plastic part closest to the cable register, and the cutters nearest the components. The small groove in the bottom of the tool should rest on the wire. Push the tool firmly into the block. If the cutters are enabled you will feel and hear a click as the excess wire is trimmed.

Removing wires is done with the other end of the tool. At the side is a black metal clip. Pulling this out in the same way as a penknife will reveal the removal tool.

Hook the wire between the block and the cable register and pull the wire out.

TESTING

We recommend that the following simple test is completed BEFORE THE RIBBONFLEX CABLES ARE PLUGGED INTO THE RACK.

When the stop controls are by drawstops or stopkeys :

Connect a test lead and test lamp to negative. With the test lamp held on to a Drawstop Switch pin, touch the ON and OFF coil pins of the same stop in turn with the test lead. If the connections are correct, the lamp will light after touching the ON coil pin and extinguish after touching the OFF coil pin. This will confirm that the drawstop is moving correctly and that the switch contact is operating correctly.

Repeat this test for every drawstop.

Note that whilst carrying out this test procedure it is important to ensure that the stops move ON from pins in Row 5 and OFF from pins in Row 4. We have known instances where the ON and OFF magnets have been inadvertently wired in reverse and the error not discovered easily because the stops still move ON and OFF. The system cannot work in those circumstances.

With the aid of an assistant, press each thumb and toe piston and all other controls, checking that the test lamp lights on the correct pin in each case.

When the stop controls are by illuminated stop tablets:

Connect a test lead and test lamp to negative. With the aid of an assistant, press each stop tablet in turn and check that the test lamp lights on the correct pin in Row 1, then touch each pin in Row 4 with the test lead and check that the correct stop lamp lights in each instance.

Note that with illuminated stop controls, reverser pistons should be connected to Row 1. The stop tablet switches in this type of system are reverser contacts.

CIRCUIT BREAKER

A Circuit Breaker is installed at the top of the rack. This a type of resettable fuse which will "blow" by popping out if a fault should develop in the electronic circuits. To reset, switch off the power, wait for about one minute, then press the red button until it clicks and then restore the power. If it should "blow" immediately or shortly after resetting, a fault has developed requiring further attention.

SUMMARY

You should now be able to complete all the wiring and connections for the system. If you are in any doubt at all about any of the wiring, please contact us at **SSOS** before applying power to the system. Incorrect connections can cause expensive damage.

Please read the section **WARNINGS** that follows the commissioning section before applying power to the system.

SETTING UP

After the wiring is complete and tested as recommended above, the cards must be inserted into the rack. Each card is marked with its slot number. When delivered, the cards are contained in anti-static envelopes. This protects the CMOS chips from the effects of static electricity that can so easily destroy them. Enclosed with this handbook you will find a disposable Anti-Static Wrist Strap which must be worn as instructed on the reverse of the packet, even before the cards are removed from their bags. **FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN IRREPARABLE DAMAGE TO THE IC's.**

The Processor Card has a number of LED's (Light Emitting Diodes) along its edge. The purpose of these is described here:

The Top one is Red and indicates that the power is ON. When the LED is steady, all is well, but if it flickers (when a piston is pressed, etc.), then it indicates that the power is not stable. In these circumstances, we recommend that you review the Transformer/Rectifier unit. If in doubt, contact us at SSOS. If this LED does not light at all, the power is either OFF or is not within the specified range of 12 to 24 volts DC.

The Second LED (Yellow, nearest the bottom of the card) determines the time lapse between pressing the UP or DOWN button and when the roll-over commences. Both speed and time may be adjusted by the adjacent presets. This LED also lights when the "Set" function is used.

The Third LED is Yellow and indicates the roll-over of the Memory-level display when the UP or DOWN button are held is enabled.

The Fourth LED is marked DEBOUNCE. This indicates the length of time during which the system will ignore switch contact-bounce on reverser pistons. This should be adjusted to suit the buttons being used and set to the minimum time to ensure that the reverser does not operate twice for a single press of each button. It is important to check particularly toe-piston reversers, as these contacts are sometimes less dependable than with thumb-pistons.

The Fifth LED is Green - marked HOLDING. The small preset control adjacent to it may be adjusted to provide the optimum time for which the ON and OFF coils are energised when a piston is pressed. Generally, if the Drawknobs have an incorporated toggle-action or stopkeys are used, the pulse should be adjusted for short duration. If drawstops without a toggle-action are used, then the holding-time may be adjusted to ensure that the knobs move into their new position, hold, then release, thus avoiding the possibility of bouncing. The optimum holding-time may be found by experiment.

The sixth and seventh LED's are reserved for special circumstances.

All the above controls are adjusted during the final test at our factory to an average position.

Operation of the system is fully described in the "Operators Instructions" manual supplied separately for the particular use of the organists. Certain fixed functions, however should be set by the organ builder when commissioning the system.

"ENGRAVED" FUNCTIONS

This is the term we have applied to fixed functions, usually operated by a piston engraved with its function such as "Doubles OFF", "Tutti", etc. which should normally operate on each Memory-level without having to be reset on each level when it is "Cleared". When provided, these functions may be reset by the organist on each Memory-level if desired, but when he "Clears" a level, they will revert back to the original setting if the following procedures are adopted.

The following procedure will ensure that standard functions revert to their original settings when a Memory-level is Cleared:

1. Set the Memory-level to 1.
2. Ensure that all stops and couplers are OFF, then holding the "Set" piston, press every Divisional and General piston, thus setting everything OFF.
3. Now select any stop and set this on to any General piston.
4. Now set this same stop on Memory-level 2 and each Memory-level provided in the system.
5. Return to Memory-level 1 and press the "Blind Check" button on the control-panel or separate switch if provided. If a format A system has no such switch, then touch the pin on the Control-pinboard marked "Blind Check" with a Positive test-lead. When a test-lamp is connected to Positive, it will light when touched on the adjacent pin.
6. Select the stops required by each preset piston in turn and set them in the normal way.
NOTE : Engraved functions include those that are "Blind" (operate stops without actually moving them) as well as those which move the stops. "Blind" functions usually light an indicator lamp when they are in use. In the case of, for example, a "Doubles Off" piston, the stops which are normally to cancel are drawn ON for the setting procedure, whilst the Blind Check is in use.
7. When all engraved functions have been set, you may check them by pressing each piston in turn whilst the "Blind Check" is still on to confirm that all is correct. All ON and OFF functions will cause their stops to move ON at this time.
8. Now, touch the pin marked "Page 0" with a positive test-lead, when all the LED's on the edge of the Processor will flash to confirm that these functions have been transferred to a section of Memory which is not otherwise accessible. The Blind Check function should now be cancelled by pressing the button (or touching the appropriate pin on the Control-pinboard), when its light will extinguish.
9. These Engraved functions must now be set into each Memory-level by selecting each Memory-level in turn, holding the "Set" and "Clear" buttons together (or touching the appropriate pins on the pinboard with a Positive test-lead). When a Memory-level is Clear, the switch lamp will light (or a test-lamp will light on the pin adjacent to the Clear pin on the Control-pinboard).

It is necessary when setting up standard functions into each Memory-level, to ensure that something (any one stop, even) is set into each Memory-level, as you cannot set these into a "Clear"ed Memory-level.

PAGE ZERO

The MultiLevel Capture System is equipped with an extra memory which allows the installer to save an image of the set-up that cannot easily be changed by the organist. This is known by us as "Page Zero".

Page Zero is accessed from an additional pin on the control pinboard (where SET and GENERAL CANCEL are connected). It requires a positive input.

Page Zero is used to store settings that must be restored to a memory when it is cleared. Typically this would be Tuttis and specific cancels.

When a positive charge is applied to the Page Zero pin, all of the settings stored in memory level 1 are copied to the Page Zero memory. Anything previously stored in the Page Zero memory is erased.

To operate Page Zero please follow the following instructions.

1. Select memory level number one.
2. Clear all the settings by setting all pistons with all stops off.
3. Select the "Blind Check" function to be ON. Check that the indicator is lit.
4. Set up the Engraved Functions to include preferred tutti and other settings, With "Blind Check" on, the engraved functions will operate as normal stops.
5. When you are happy that memory level one contains only the settings you wish to be restored into a cleared level, apply a positive charge to the Page Zero pin for a short while and all the lights on the processor will flash in recognition. On a system with a display Setting will be displayed.
6. Blind Check may now be set back to OFF.

When ever the level is cleared with SET and CLEAR the current memory level will be erased and the contents of Page Zero copied into it.

WARNINGS

After the cards have been inserted into the rack/s, never test or operate any part of the system without both Positive (+ve) and Negative (-ve) power connected to all the racks in the system. If this instruction is not observed, the inductive spike-suppression circuits cannot perform their important functions and the resultant un-suppressed spikes will almost certainly damage the electronics.

Always switch off the power for the whole organ before removing or inserting any of the cards from the rack or before plugging or unplugging any of the system modules.

Use only Resin-cored solder for your connections to the system pinboards. Many soldering-pastes and fluids leave corrosive residues which can seriously damage the printed-circuit boards.

It is also essential to wear the Anti-Static wrist strap that is provided with your system before handling any of the cards. You will find it in the plastic bag with the handbook. Failure to wear this will damage the cards and any other static sensitive devices.

Failure to observe these warnings will invalidate our Guarantee. If you are in doubt about anything, please contact us at SSOS. We pride ourselves on providing unsurpassed information and advice back-up.

GUARANTEE

Solid State Organ Systems uses the highest quality components and manufactures to the highest standards of workmanship. We guarantee to replace or repair (at our discretion) any defective component in the system for a period of one year from the date of purchase, provided that we are notified forthwith and that at our request, such goods are promptly returned to us. If the particular item is no longer available, we will do our best to provide a suitable alternative and the buyer shall be bound to accept such alternative.

In the case of goods or parts not of our own manufacture, the buyer shall only be entitled to the benefit of such warranty as may be given to us by our own supplier.

This guarantee does not apply if the goods have been altered or fitted with parts of different manufacture, or have not been used in accordance with our instructions. Any alteration, fitting of other parts or other use must first be agreed with us in writing.

In no circumstances whatsoever shall our liability extend beyond repairing or replacing the actual items of our manufacture. We shall not be liable for the costs of removal, shipment or re-installation of the items but shall repair or replace the covered materials.

Normal wear and tear or damage due to inexpert handling or non-observance of the foregoing Instructions and Warnings are excluded from this guarantee.