MultiLevel Capture
System
Installation Guide

MLC B, C & D

MULTILEVEL CAPTURE SYSTEM

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Introduction

The MultiLevel Capture System is available in three basic configurations; A, B, C, & D. This manual covers the installation of the type B, C, and D as the Format A has a different control interface.

In the package you will find an operating guide for the organist. Please leave this with the console when you have completed the installation. We are always happy to supply extra copies, should you require them. This document is concerned only with the installation of the system.

Some of the testing your installation needs to be completed before assembling the SSOS system. Please refer to the section on testing; see page 20, before completing the installation.

A Two Minute Guide

- The system is supplied with a black metal and wooden box called a rack that contains the circuit boards often called cards.
- Connection is made to external pinboards that plug into the rack via flat grey cables called ribbon cables.
- A variety of control panels and control inputs are provided based on the specification of the instrument.
- The system operates from the console/organ rectifier.
- Specific wiring information for this installation is at the end of this manual.
- You must test your wiring before installing the system.

Cleanliness

A short note about cleanliness in electronic systems: their long-term reliability is greatly improved if kept clean. Please try to keep the various parts of the system clean during the installation and afterwards and never touch the gold-plated edge-connectors if a card is removed from the system. Such care will increase the long-term reliability and will also assist those who will service the system in the future.

Damage from static electricity

We cannot stress too greatly the importance of protecting the system from damage due to static electricity discharges. All modern electronics are sensitive to the charges of static electricity we build up in everyday life, when the components are unprotected by the case, they are very vulnerable.

On an ordinary day an average person carries a charge of about 3,000 Volts simply by walking through the air. When we touch or even approach a new object we transfer the charge to it. We cannot feel charges as low as 3,000 volts. To a microchip it can be fatal. Or worse, it can bruise it, causing it to fail in years to come.

Anyone who tells you otherwise is not informed with current research and quality manufacturing practices.

When you open this system, the electronics will have never been touched by anyone who has not been adequately grounded.

Full Installation Guide

System Description
The system consists of a small rack that 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.

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.

The slots are numbered from the left-hand side when the open side of the rack is facing you. The slots are also numbered on the back of the circuit board where the ribbon cables plug in.

Pinboards
The printed-circuit pinboards are mounted on polished mahogany plywood frames and are connected to the rear of the system by ribbon cables. These cables contain 34 insulated wires bonded edge to edge and form a very reliable and simple method of connection. Labels are fitted to indicate the connector into which each cable is to be inserted.

If the system is fitted with punch blocks, you will find a special tool in the kit that will allow you to quickly and reliably wire the system into the console. There is further information on using the punch blocks later in the handbook.

Cards
There are four card types that may be used in the systems. The size and general requirements of the particular organ determine the actual type and quantities. Each card has a label describing which slot in the rack it must be fitted. Take care when inserting the cards into the rack.

Always use the antistatic wrist strap, see page 22. Handling the cards without being at the same electrical potential will damage them and cause premature failure.

The cards are inserted into the rack with the components to the right. There is a small key slot to prevent the card being inserted the wrong way round. The contacts cause the final insertion to be quite stiff. This is normal, push firmly with the palm of your hand about one third of the way up the card and wriggle it into place.

Processor Card 62302012

Every system has at least one Processor Card that is the heart of the system and contains the Microprocessor. Circuits to operate the processor, a section of Memory and batteries to maintain this memory are also contained on this card.

Block Card 623052A1

Every system requires some of these cards. Each card carries the electronics to drive 16 stops ON and OFF, the drivers for 16 drawstop actions and inputs from the stop switches and pistons, etc. Block Cards are sometimes also used for other functions such as driving Bargraph displays, lamps, etc.

Interface Card 623053A1

This card contains the electronics to receive signals from control panels and drive digital displays. One such card is required for each control panel and digital display.

Modules

Modules such as Control-panels, display panels, switches, etc. are provided as required with each system for mounting in suitable positions on the console. This manual provides information on the complete range of modules, not all of which are supplied with this particular system.

Primary Control Panel 623055A1

This module is used to control a format B or C system. Switch buttons are included for the adjustment of Crescendo stages and for the settable blind functions when incorporated.
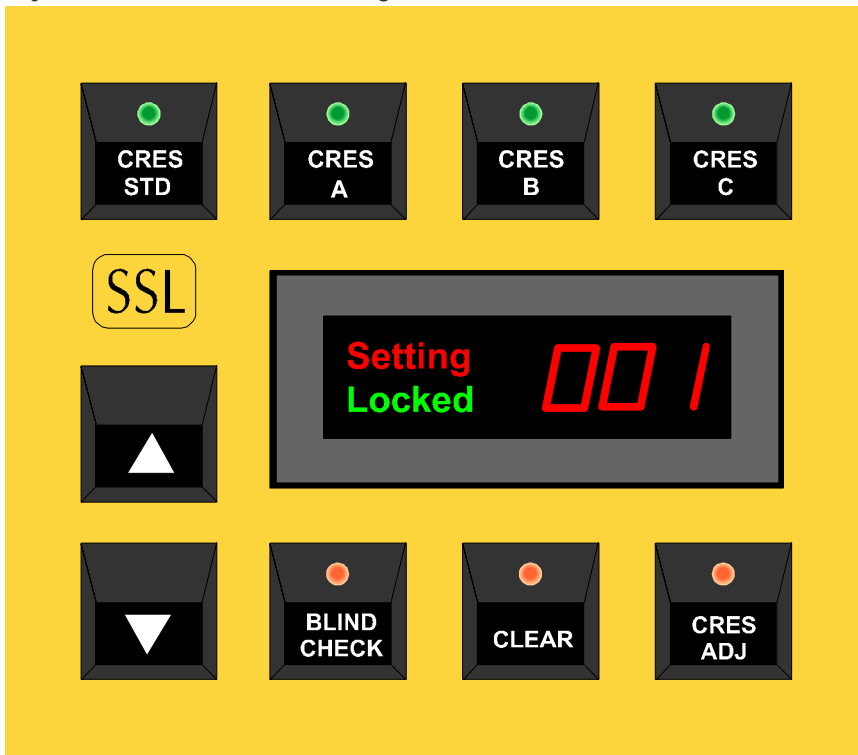
Dimensions:
Panel surface: 4.5" wide; 4.00" tall (115x102mm)
Panel cutout required: 3.9" wide; 3.75" tall
                             0.8" deep (99x96x21mm) plus cable access.

Crescendo Controller

The analogue encoder

The analogue encoder is now the standard unit available. Penny & Giles who are world leaders in quality instrumentation devices manufacture the analogue encoder especially for SSOS. This system allows us greater flexibility of design and will be used for a variety of functions.

The moving arm on the encoder is connected to the crescendo pedal via a link that should designed to prevent the organist forcing the encoder beyond its normal travel. The maximum travel is 104mm (4 1/8″).
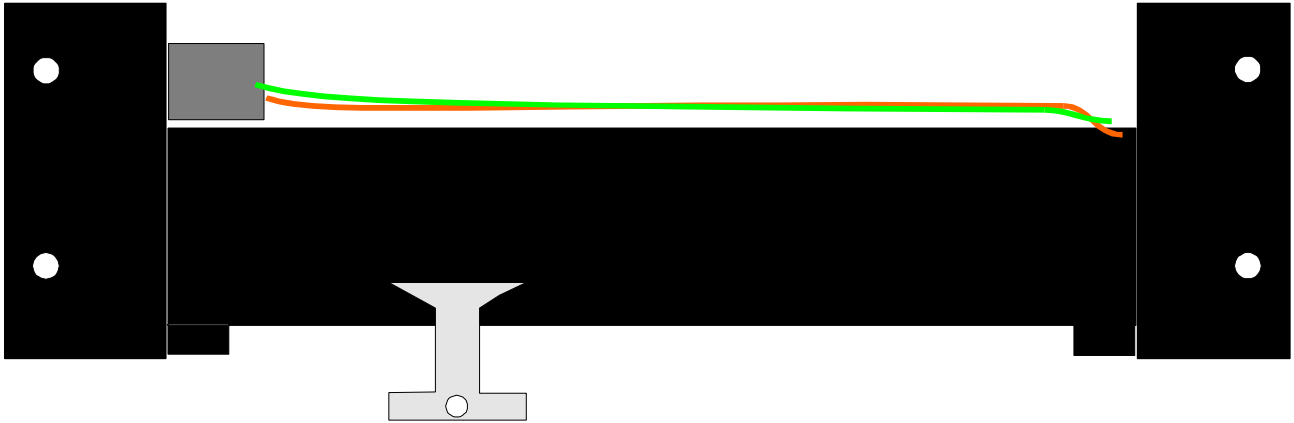
You will note that the moving arm is facing down. This is to help prevent dust entering the slot and causing premature wear.

A small slide switch is fitted to the assembly. This switch reverses the direction of the encoder. If you assemble the crescendo and find that the pedal operates backwards, simply switch off and move the switch to the alternate position and restart the system.

Connection to the plane is made using a small 3.5mm jack plug. Do not change this connection with the system power on, damage may occur to the encoder. Please note that although these plugs are readily available they are not all the same. This connector uses the professional standard and is not compatible with other designs. You may damage the system by using plugs other than those supplied by SSOS.

The other end of this jack cable plugs into an interface board that connects to the 34 way plug on the back of the rack as detailed in the connector listing at the end of this manual.

Remote Digit Display 623058A1

This small panel contains only 7-segment digital LEDs and is used for the independent display of Crescendo-stage number, last piston pressed, etc. as required. If the display is used for remote indication of memory level it can also show the "Setting" and "Locked" information normally available on the main control panel. The remote digit display may be wired to the rack using one or two cables as required.
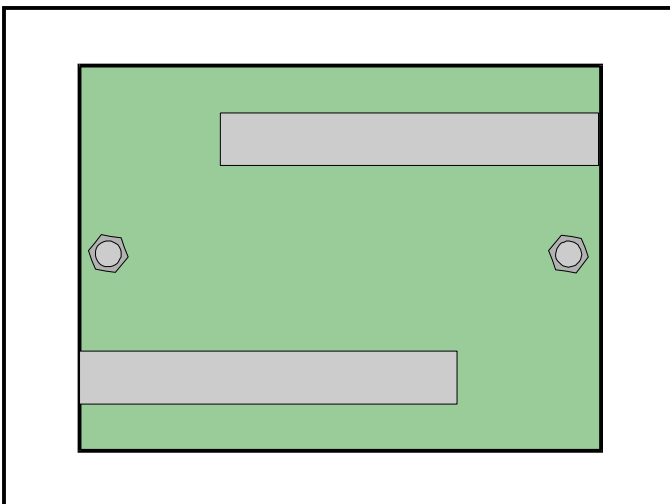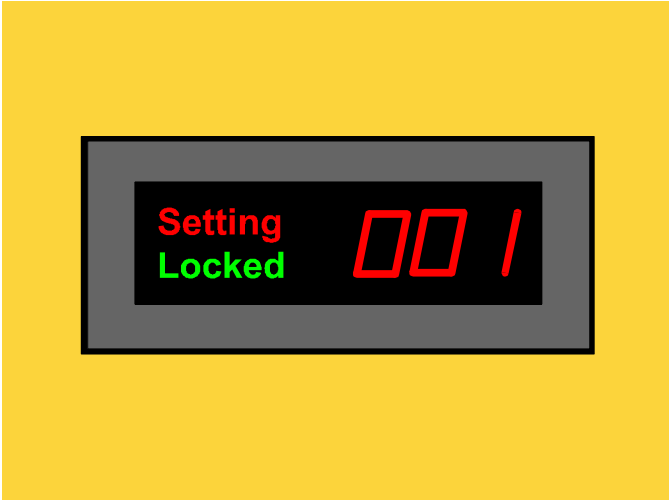
Cutout for panel
min size
70 x 53 mm
2.75" x 2.1"
centered
fixing provided by
2 x 3 mm bolts 62 mm
apart on center line
Total depth to rear of panel
25 mm or 1"

This drawing is full size and may be used
 as a template if an original, do not use
copies without checking dimensions.

List Control Panel 623057A1

This panel allows for the programming and recalling of sequences and lists of General pistons and is supplied when the full sequencer operation is incorporated in the system. Dimensions are exactly the same as for the Primary Control Panel.

Remote List Display 623063A1

Used primarily for an optional display of the list control information, this panel has the same dimensions as the Remote Digit display. The picture shows that the grouping of digits is different to the remote digit display and this panel may be used for other custom functions in the console.

Crescendo Bargraph Display 6230205

This is a bar-type display to indicate the Crescendo-pedal position in 30 steps. It is available in red as shown (62302051) or in green to special order (62302050). When mounting the bargraph be careful to fit it the correct way up. Segments 1 and 30 (Bottom & Top) are marked on the back of the circuit board.

Dimensions:
Panel surface: 4.0" long; 123/32″ wide (100x18mm)
Cut-out space: 3 3/4" long; 5/8" wide (96x16mm)

The bargraph unit is also supplied with a driver board that plugs into the bargraph after attaching it to the console. The bargraph driver board is connected to the rack with a 34 way ribbon cable supplied.

Miscellaneous Functions

Piston Coupling is carried out mostly within the system. When unusual coupling combinations are required however, separate RELAYS with detailed wiring instructions are provided.

Installation Notes

Installation of the Multilevel Capture-System is quite simple and straightforward, but certain procedures must be followed and it is important that these instructions are carefully read and understood before starting to assemble the system. Please call the SSOS office at 800-272-4775 for advice if anything is unclear. We are always happy to help.

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 ribbon 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 ribbon 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 that should be between 12 and 24 volts. This supply must be reasonably stable and free from electrical noise; most commercially available units are suitable. It is often cheaper in the longer term to replace the rectifier in the console at this stage.

The system will not operate satisfactorily from D.C. supplies that 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.

The thickness of cable used to connect the rack to the rectifier is absolutely critical. More problems are reported to our customer service engineers that turn out to be faulty power than any other area. It is difficult to be absolute on the wire size as it varies with the console and the length, but it is true to say that no adverse effects are created by the wire being too thick! A short run of less than 10ft (3metres) in a small console can be wired with 10AWG cable. Any increase from this should also see an increase in cable diameter or number of cores.

It is also crucial that the rectifier can provide enough current to move all of the stops on the console. As a rule of thumb divide the total number of stops & couplers by 2 to give the peak current that the rectifier must supply. SSOS engineers will be happy to advise, we also stock power supplies particularly suited to driving our equipment which are small and lightweight.

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. Stop action outputs are positive as they are often wired to electronic switching systems, which have a positive input.

Slot 1 Pedal	Slot 5 Choir	
Slot 2 Pedal/Swell	Slot 6 Positiv	Control
Slot 3 Swell	Slot 7 Chancel Couplers	
Slot 4 Great	Slot 8 Couplers	
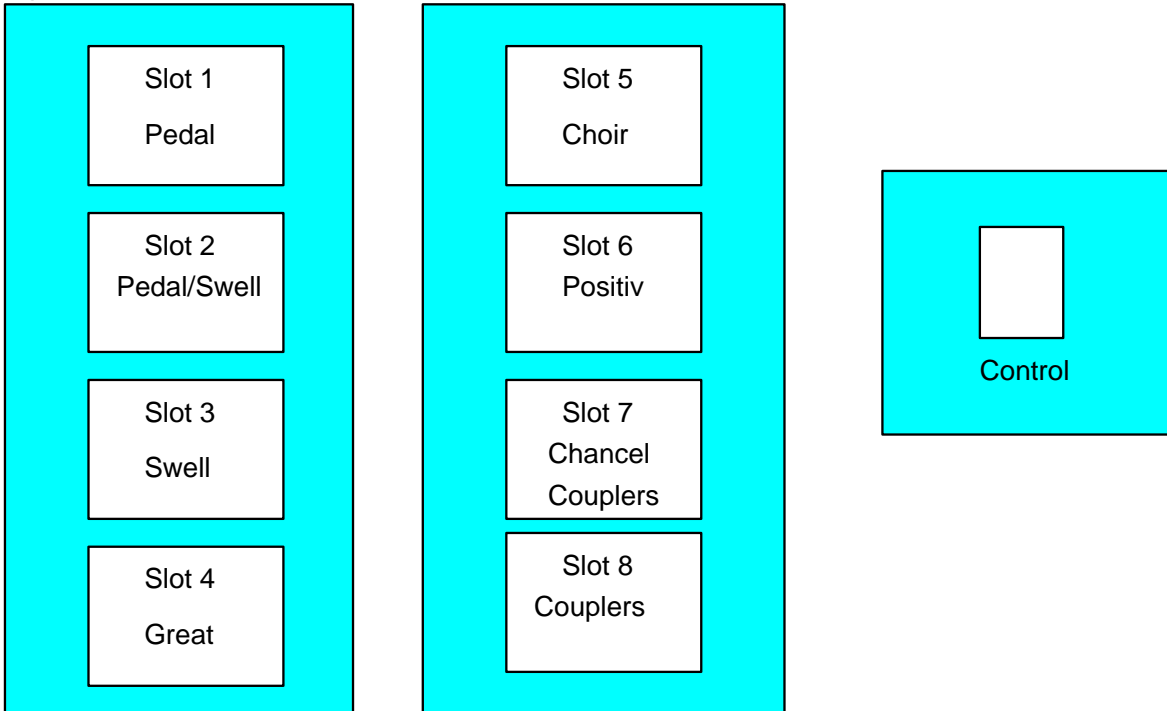
The pinboards associated with a typical system

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 an 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 may 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 the two "bypass 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, Ventils and Inhibits. These outputs are positive.

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. 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 B and C systems either have separate Control pinboards or these may be incorporated on one of the Block Card pinboards, when it is clearly marked on the layout sheets at the end of the installation guide. All Control inputs must be Positive (+ve).

Lamp outputs for Tuttis, etc. are normally Negative, but in some circumstances may be positive, when a clear instruction will be provided to indicate this. Row 3 outputs are normally taken from the middle connector on a block card that is always positive.

Lock switch

The lock switch is a momentary action key operated switch used for locking and unlocking levels. The lock indicator lights on the control panel when the 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
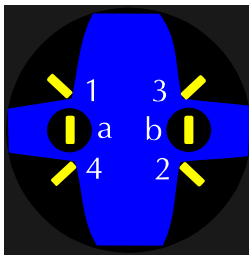
Lock switch showing connections, use only pins 3 and 4.

Using LED's

LED's are solid state devices that 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:

Resistance = ((T/R voltage - 2) x 100) ohms (Ω)

Power = ((T/R voltage - 2) ÷ 100) 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 (1000Ω) 5% 0.125W (min.)
15V	1K3 (1300Ω) 5% 0.25W (min.)
18V	1K6 (1600Ω) 5% 0.25W (min.)
24V	2K2 (2200Ω) 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.

Ribbon Connections

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

There are three ribbon 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 ribbon cable, which is clearly labelled with the plug position for it.

Always try and insert and remove the cables evenly at both ends to avoid breaking the ends of the connector and possibly bending the pins.

Wiring Information for Quick Connection "Krone" Blocks

The MultiSystem can be supplied with either standard solder pins or with quick connection krone 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.

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 are 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 from 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 a test lamp to negative

- Hold the test lamp 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 while 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.

Further testing is carried out after installation. See Commissioning on page **Error! Bookmark not defined.**.

Circuit Breaker

A Circuit Breaker is installed at the top of the rack. This is 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.

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.

Module Installation

Control Panels and Remote Displays
These are easily mounted and clearly marked, so little more information is required. Please take care to keep the printed-circuit boards of these modules clean while you are installing them and if possible, we recommend that the rear sides of the Control panels are enclosed by a small wooden or plastic box. This will help to keep the unit clean and prevent accidental damage during general maintenance of the console.

Crescendo Module
When a Crescendo function is included in the system, this module is supplied with the system and should be attached to the Crescendo-pedal or roller so that the slider operates over its full range (see note in "System Description"). No special instructions are required and its operation can be easily reversed by switching the small slider switch on the end of the crescendo module. We do recommend that the slot on the slider is not positioned facing upward to avoid dust entering and fouling up the contact surface. The crescendo module is connected to a small control board on the rear of the rack using the thin black cable supplied. SSOS offices stock a longer cable which is available as an upgrade if this cable is too short.

Cleanliness
A short note about cleanliness in electronic systems: their long-term reliability is greatly improved if kept clean. Please try to keep the various parts of the system clean during the installation and afterwards and never touch the gold-plated edge-connectors if a card is removed from the system. Such care will increase the long-term reliability and will also assist those who will service the system in the future.

Damage from static electricity

We cannot stress too greatly the importance of protecting the system from damage due to static electricity discharges. All modern electronics are sensitive to the charges of static electricity we build up in everyday life, when the components are unprotected by the case they are very vulnerable.

On an ordinary day an average person carries a charge of about 3,000 Volts simply by walking through the air. When we touch or even approach a new object we transfer the charge to it. We cannot feel charges as low as 3,000 volts. To a microchip it can be fatal. Or worse, it can bruise it, causing it to fail in years to come.

Anyone who tells you otherwise is not informed with current research and quality manufacturing practices.

When you open this system, the electronics will have never been touched by anyone who has not been adequately grounded.

How do you protect your system?

The system has been delivered with a disposable wristband. Follow the instructions on the packet. The most important thing is to be at the **same** potential as the system. Connect the wristband to the grounding tab in the system before starting work.

If you need to handle any electronics place them on a flat surface away from any man made fibres except those known to be antistatic material. Normal untreated plastic, Styrofoam, etc. must be eliminated from the environment. It is also not recommended to work on a metal work surface. Wood is the best alternative to an antistatic workbench or mat.

Always use the grounding wrist strap supplied, free replacements are available from SSOS on request.

The most important precaution is to ensure that you are at the same static charge as the processor before you touch it. If you can feel static, it is already 100 times greater charge than that required to destroy the sensitive components in this or any other modern electronic system. The damage may not become apparent until long after you have left the site.

Materials that will damage the system are:

- White Plastic

- Clear Plastic not marked as antistatic

- Styrofoam

Materials that are neutral are:

- Pink plastic especially for electronics packaging

- Wood

- Metal

Materials that protect the electronics are:

- Metal boxes

- Black antistatic bags that are sealed

- Silvered clear antistatic bags that are sealed

Setting -Up

Inserting the cards

After the wiring is complete and tested as recommended above, the cards should be inserted into the rack with the components to the right. Each card is marked with its slot number. When delivered, the cards are contained in anti-static envelopes. This protects the components 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. See page 22 for details.

FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN IRREPARABLE DAMAGE TO THE SYSTEM.

Plugging in the ribbon cables

Normally each pinboard has three ribbon cables marked TOP, MIDDLE, and BOTTOM. The pinboards are labelled with the slot number of the card they connect to, and these are shown in order at the end of this manual.

The cables must be inserted the correct way round. Location pins are normally fitted to prevent accidental reversing of the plugs. To be sure, check that the red line on one side of the ribbon cable is at the top.

The displays are somewhat confusingly marked with a different code. If you see Q50, Q51 or Q52 use the following chart.

Connector Marking	Connection to rack
Q50	TOP
Q51	MIDDLE
Q52	BOTTOM

Power Connection

Follow the directions on page 12 for the rectifier wiring and sizing. It is now time to switch on.

Switching on for the first time!

When the system is started the control panel will light up with the last memory level used. This will normally be 001 if the system is fresh from the factory.

If you see 001, great move on to the next section. If not here are some possible problems.

Display is blank

Check the processor card, there should be one red LED lit. If not check to be sure that the power is getting to the rack. Switch off and check that the processor card is pushed all the way into the connector. If the card is completely seated in the connector there will be a 12mm (1/2″) space between the edge of the rack and the card.

Display is blank but processor red led is on

Put on some stops, can you cancel them with General Cancel? If so check the display is connected correctly. If not check other pistons and see if any of them operate. Remember that they will initially have no memories set, and will only move stops off.

Display shows 01 not 001

Check that the crescendo encoder is set correctly. Move the shoe, do the numbers change? 01 indicates the first crescendo position in systems where the display automatically swaps to crescendo.

Display shows 000

The processor has failed to initialise correctly. Try restarting. If the problem remains try removing other cards. Otherwise call SSOS.

Checking the system

The most fundamental check of the system is to see if General Cancel moves all the stops. This is a good test that the power supply is adequate. Also weak and slow stops will show up by not cancelling.

Information on how to set pistons and other functions is given in the operation manual, except where that information is only required during the initial commissioning. Refer to the operation manual packed with the system for this information.

Test the divisional pistons by setting alternate patterns of on and off with the stops.

Test that the display scrolls up to the required memory level.

Test that all the reversers operate correctly. The system senses the position of the stop before it applies power to the coils. So if the stop switch is not operating correctly the system does not think the stop is on, it will therefore not turn off.

Setting the processor
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 Fifth LED is Green - marked HOLDING. The small pre-set 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, and 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 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 Third LED is Yellow and indicates the rollover of the Memory-level display when the UP or DOWN button are held is enabled.

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

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 Operation 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.

Blind functions

Before setting up the memory defaults it is necessary to set the blind functions such as Tuttis and the Crescendo.

Set the required values in memory level 001 for the following functions if used:

- Crescendo A (You cannot set Crescendo Standard this time)

- All tutti/full organ controls

- All blind cancels such as Ventils

Crescendo Standard Setting
Firstly, define the OFF end of the Crescendo encoder.

Hold the "Set" button and press the "Crescendo Adjust" button, when the Control panel will indicate the Crescendo stage number corresponding to the Crescendo shoe position.

If position 00 is shown when the pedal is open, switch off the power.

If the system is fitted with a digital encoder (see page 7) remove the Processor Card (remembering to wear the Anti-Static Wrist Strap) and insert the link on Header P 112 as shown in the "Header Layout" section of the following layout sheets. Replace the Processor Card into the rack and check that stage 00 is indicated when shoe is closed. The number of stages may also be increased to 60 at this time if required, as described in the Header Layout section.

If the system is fitted with an analogue encoder (see page 7) change the slide switch setting on the encoder.

The setting of the Standard Crescendo is quite simple:

1. Select Crescendo A, hold the "Set" button and press "Crescendo Adjust" on the Control-panel.

2. If the "Blind Check" lamp lights, press its switch to the OFF state each stage may now be set independently 1-30 or 1-60, depending on the previous setting.

3. While in the "Crescendo Adjust" mode, the UP and DOWN buttons will select the next or previous stage without the need to move the shoe. When the shoe is next moved the display will revert to the appropriate stage number.

4. Now check the settings, press the "Blind Check" button to light the lamp, and check each stage by pressing the UP and DOWN buttons.

This setting will need to be transferred to the default memory using the page zero function before it can be accessed from Crescendo Standard. See page 28 for more details.

After storing the crescendo in Crescendo Standard the organists are now free to insert their own settings into Crescendos A, B, & C.

Copying a Crescendo

It is possible to copy a crescendo. For example, if you wish to copy from A to B then follow this example:

- Set up a crescendo in A and then choose Crescendo B

- Push Set and Crescendo Adjust for Crescendo B

- Push and hold the Memory Up button and also push Crescendo Adjust again. Release the Memory Up button.

- Crescendo A memory has now been copied to Crescendo B

Copying from B to C is the same procedure. It is also possible to copy from B to A and C to B using the same procedure with the Memory Down button.

The default memory (Page Zero)

Each system has a hidden memory level known as page zero. It is not directly accessible by the organist and is used to store the default setting for the console. When the organist clears a memory level the system makes a copy of page zero and writes it into the current memory level, destroying all of the current settings. This includes normal piston settings so be careful to make sure that all pistons have all stops set off in them at this stage on memory level one.

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

Set the Memory-level to 001.

It is best but not essential to ensure that all stops and couplers are OFF, then holding the "Set" piston; press every Divisional and General piston, setting everything OFF. General and divisional pistons are not settable in Page 0.

1. Run through the memories and make sure that none are clear by setting a piston on each level. This will then allow you to clear them again copying the new Page 0 in.

2. Select memory level 2 then select any stop, set this stop on any General Piston.

3. Now set this same stop on each Memory-level provided in the system.

4. Return to memory level 1 and press the "Blind Check" button on the control-panel. Set up the tutti functions as required.

To set a tutti, first the system must be in blind check. Now the tutti pistons operate in the same way as a general piston.
1. Select the stops you wish to use for the one tutti.
2. Press and Hold to Set switch.
3. Press and release the Tutti you wish to set.
4. Release the Set switch.

Press the Blind check again to release the Blind Check system.

5. NOTE: Blind functions are those that operate stops without actually moving them. "Blind" functions usually light an indicator lamp when they are in use.

6. When all the functions have been set, you may check them by pressing each piston in turn with 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.

7. Now, touch the pin marked "Page 0" with a positive test-lead, all the LED's on the edge of the Processor will flash and "Setting" on the Control-panel will light momentarily to confirm that these functions have been transferred to a section of memory which is not otherwise accessible. Blind check must be on during this process. The Blind Check function should now be cancelled by pressing the button (or touching the appropriate pin on the Control-pinboard), when it's light will go out.

8. With Blind check off touch the pin marked "Page 0" with a positive test-lead again. This time clearing the piston memories in Page 0, all the LED's on the edge of the Processor will flash and "Setting" on the Control-panel will light momentarily.

9. The default memory can now be set into each memory level by selecting each level in turn, holding the "Set" and "Clear" buttons. When a Memory-level is Clear, the switch lamp will light.

This will store the default settings of all the pistons including blind functions but not crescendo. The crescendo is stored independently by the following process.

NOTE: 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 Cleared Memory-level.

Setting Crescendo Standard

Crescendo standard can only be set from Crescendo A and copied to the Page Zero default level. Use the following procedure to store the Crescendo Standard.

- Select level one.

- Set Crescendo A as detailed in the "Crescendo Adjust" section of the operating manual.

Within the system, momentarily connect a positive lead to the Page Zero pin, while Crescendo adjust is still lit. This will cause the current crescendo A, which has just been set, to be stored in Crescendo standard for later use.

Storing crescendo standard will not copy tutti or regular pistons provided that the crescendo adjust lamp is lit during the process.

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.