



MLC-08 Installation Guide

North American Office:
5600 General Washington Drive
Suite B211, Alexandria, VA 22312
USA
Toll Free: (800) 272-4775
T: (703) 933-0024
F: (703) 933-0025



European Office:
Twickenham Avenue
Brandon, Suffolk
IP27 0PD
United Kingdom
T: +44 (0)1842 814814
F: +44 (0)1842 813802

www.ssosystems.com

MLC - 08



Stop Control from

Solid State Logic
—— Organ Systems ——

The MLC - 08 is the very latest technology in Capture Systems from Solid State Organ Systems, designed to satisfy popular demand for a compact but versatile system.

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Summary of Features

The maximum specification for MLC - 08 is fixed. However, within these limits the versatility of the system exceeds anything so far available.

8 levels or channels

42 pistons & Reversers that may be used in any way to create Generals or Divisional pistons

64 stops including couplers

General cancel

Set

Blind Pistons

Adjustable hold time (0.3 seconds / 0.9 seconds)

Test mode - moves every stop on & then off in sequence, allowing all stop connections to be verified.

On Site Configuration - all pistons can be configured to affect any number of stops i.e. generals, divisional and special functions. Blind pistons are also available for Tutts and similar functions. Each piston can also be configured to act as a reverser for any stop.

SCOPE feature allows the organist or organ builder to change the Scope (affected stops) of any piston.

SCOPE feature allows any stops to be neutralised on any piston.

A Lock switch can be used to prohibit the use of the SET switch on any level.

SSOS Silent Piston Transfer Relays may be added to the system and need to be ordered separately.

These solid state relays come in several forms and are suitable for most piston transfer functions including:

- Great and Pedal pistons coupled
- Generals on Swell toe pistons
- Pedal on Swell pistons

A Console pack containing an 8 way memory level selector switch, a Lock switch and luminous engraved pistons for Blind Check, Clear and Copy is available from SSOS as partcode 91PACK08.

Considerations before cutting holes in the console!

To those of you familiar with installing capture systems this system will be very straight forward. However, there are as always, a few things to be decided before reaching for the tools. The system will operate a total of 64 stops, which includes couplers and tremulants. The system has inputs for 42 pistons/reversers plus master functions SET, SCOPE, and General Cancel and two Blind Pistons.

Consideration One: This system is provided with a new control known as SCOPE. A decision must be made prior to installation as to whether the organist is allowed access to this control or not. SCOPE allows considerable versatility but because of this it can also set the system into a state where an inexperienced person would be led to believe the system was inoperative! Please read the section on SCOPE before deciding on a course of action. SSOS will of course be happy to advise based on experience.

Consideration Two: The SCOPE piston must be operated at the same time as the SET piston, while setting stops.

If the SCOPE piston is on the front of the console it needs to be within the span of one hand from the SET piston.

If the SCOPE piston is mounted inside the console it should be a latching switch to allow the system to be set by one person.

Consideration Three: Lock Switches.

The lock switch is used to lock the memory on each level. SSOS supply a suitable locking switch for this purpose as an additional extra. Any momentary action lock switch will be suitable, do not use a latching switch as it will not function correctly.

A lamp output is provided to indicate that a level is locked, it is strongly recommended to include this on the console when a lock switch is fitted as it will be confusing for the organist to not know if a memory level is locked.

Fixing the System into the console

The system arrives ready to operate, there is no assembly on site and what's more there are no ribbon cables to worry about.

The steel cabinet is fitted with two metal plates each attached by 2 fixed bolts. The system is intended to be mounted with the door hinge vertical, and on the left. The system will operate perfectly in any orientation to suit the space available. It is preferable not to mount the system upside down, as dirt, and possibly water will fall inside through the cable entry and become trapped.

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 vulnerable. On an ordinary day an average person carries a charge of about 3000 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 3000 volts. To a microchip it can be fatal. Or worse, it can bruise it, causing it to fail in years to come.

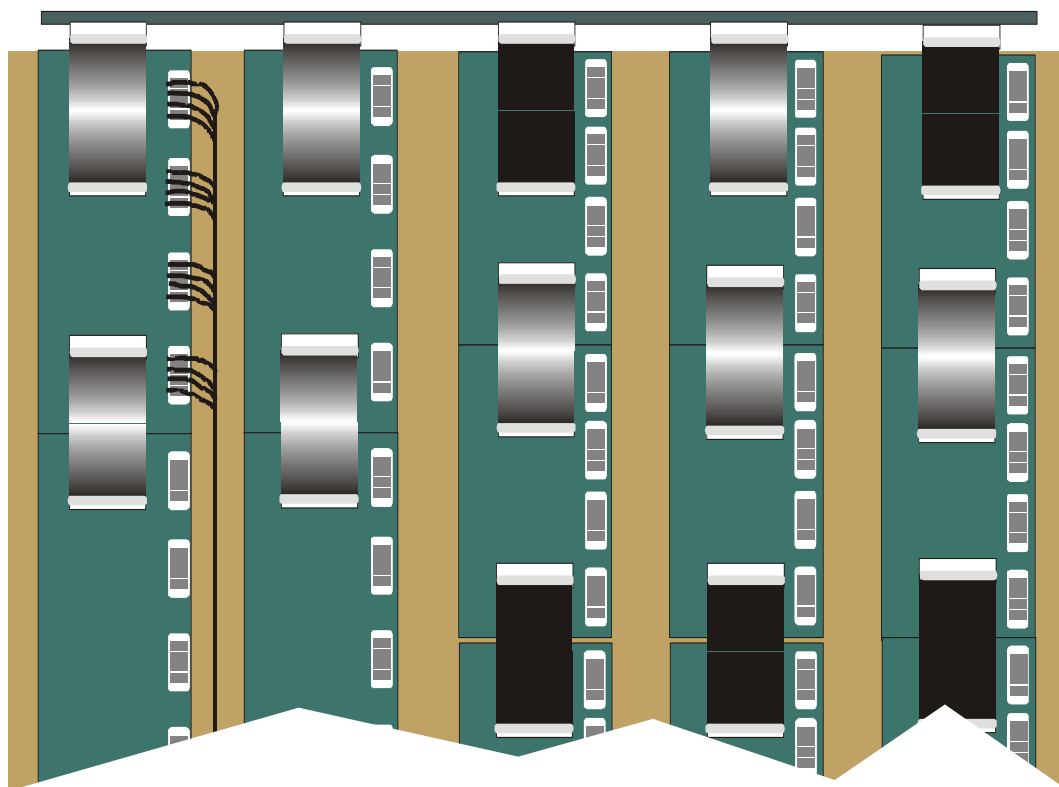
Anyone who tells you otherwise is not informed with current research and quality manufacturing practices.

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.

Replacement wristbands are available from SSOS.



All the wiring to the system is inside the box. This keeps the terminations free of dust and helps the system conform to European Union and FCC directives on emission of electromagnetic interference.

The cables must be passed up through the bottom of the box and onto the appropriate connection. A layout of the connections is detailed later in the booklet. The drawing above shows the first 16 pistons wired to the krone connections.

All inputs to the system must be fed from a positive supply.

Coil drivers for on and off from the system must be connected to a positive return.

Lamp drivers from the system must be connected to a positive return.

The stop actions to the organ are positive out and require a negative return.

Power Wiring

The plane is fitted with a pair of terminals to connect to the organ DC supply. This supply must be reasonably stable and free from electrical noise; most commercially available units are suitable. Unlike other SSOS products which are limited to a maximum of 24 volts the MLC - 08 will operate over a range between 12 and 36 volts.

The system will not operate satisfactorily from DC supplies which are provided by a rotary generator, as the noise level is far too high and can confuse the system.

The OV or negative of this supply must be connected to the black terminal of the system using a cable of at least 8 a.w.g (10 mm²).

Use of the Special Wiring 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.

Only use the special tool provided 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 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.

Tips on Wiring

Wiring the MLC - 08 is easier than other capture systems because it is not necessary to select the stops by division prior to wiring. Any stop may be wired to any set of four matching connections in the box. A matching set would be Stop Switch 1, Stop Action 1, On Coil 1 and Off Coil 1. When the system is configured the divisions will be set.

Important Notice: Do not test the stop magnets with a negative test lead, without the rectifier feeds being connected to the system. If you do, the system will be damaged.

To assist those who service the system after you, we have provided a chart at the end of this handbook in which to record the names of the stops wired to each circuit of the system.

There is no need to leave gaps for additional stops. If a new stop is required on the Great after the system has been installed it may simply be added to the first vacant space at the bottom of the columns.

Likewise the pistons are also wired in any sequence that is convenient.

Drawstops and Tabstops

Drawstops and tabstops require four connections to the MLC-08 as well as one power connection per stop.

- The switch contact of the stop unit connects to the stop input on the MLC-08
- The on coil of the stop unit connects to the on coil output on the MLC-08
- The off coil of the stop unit connects to the off coil output on the MLC-08
- The switch feed and the on and off coil returns all connect to T/R positive
- The stop action output on the MLC-08 connects to the coupling/switching system

The switch inputs are suitable for use with mechanical switches, reed switches or electronic switches.

The on and off coil outputs are equipped with 'back EMF' or 'spark' suppression.

Luminous Stops

Luminous stops require two connections to the MLC-08 as well as one power connection per stop.

- The switch contact connects to the stop or coupler input Connector.
- The stop lamp connects to the on coil output
- The switch feed and the lamp return both connect to T/R positive.

The switch inputs are suitable for use with mechanical switches, reed switches or electronic switches.

Blind Functions

MLC-08 makes no differentiation between Inclusive Tutti switches, Exclusive Tutti switches, and Ventil switches. These are all referred to as Blind switches. Their function will be set during commissioning.

The MLC-08 documentation will list the switches as blind switch 1, blind switch 2, etc.

- Wire each blind switch to one of the blind switch inputs as listed in the MLC-08 documentation
- The feed to the switch contacts should connect to T/R positive

Reverser Pistons and associated stops

Reverser pistons and the stops they control should be wired to the system in the same way as other stops and pistons, but mark the chart at the back of this handbook to indicate that the piston is a reverser. It is not necessary to choose the piston when wiring.

At the bottom of columns 1 and 3 are the special functions.

SET (Column 1 pin 45)

The SET input is used to store the piston settings, it takes its feed from the rectifier positive via the SET piston.

SCOPE (Column 1 pin 46)

SCOPE is used to configure the system, a more detailed explanation of this pistons' operation is contained in a special section. For wiring purposes the SCOPE piston is wired to a positive feed.

General Cancel (Column 1 pin 47)

General Cancel will cause the system to send an off signal to all the stops that are drawn. It requires a positive feed from the rectifier.

Level Switch (Column 1 pin 48 to pin 55)

An 8 way switch can be provided to select levels, the system defaults to level one when no signal is given the level control pins. A positive feed is required to the switch. More details of the switch wiring are given at the end of this section.

Pin 56 Extended Hold Time. This pin will normally be left unconnected, but if the drawstops are slow, or the rectifier is weak, a positive feed to this pin will extend the time current is applied to the stops after a piston is pressed. The time is normally 0.3 seconds and will be extended to 0.9 seconds.

Pin 57 Blind Check. Blind check allows the organist to view and set the blind pistons on pins 43 and 44 of column one. A switch can be provided to be fitted on the console which must be wired to positive, this is a reversible input. An indicator lamp is provided in the switch and this is fed from Column 3 pin 67. The lamp output is negative and requires a positive feed.

Pin 58 Lock Switch. The lock input is a reverser, and requires a momentary contact, one for on and another for off. We will gladly supply a suitable Lock switch for the purpose, our part number is 33HRD23D. The Lock switch also requires a positive feed and has a lamp output on Column 3 pin 68 which is negative.

Pin 59 Clear. A clear switch can be provided and when wired to positive it's operation will clear the current memory level, if used with Set. A lamp output is provided on Column 3 pin 69 to indicate a clear level. The lamp output is negative.

Pin 60 Copy. A copy switch can be provided and when wired to positive it's operation will copy the current memory level, it is also used to "paste" the copy into another memory level. A full description is available in the operating instructions. A lamp output is provided on Column 3 pin 70 to indicate a clear level. The lamp output is negative.

Pin 61 Locking Enable. If locking is required connect this pin to positive. If no locking is required leave this pin un-connected.

Pin 62 Blind Functions HFO. Connect to positive if you require the blind pistons (col 1 pin 43, 44) to be operated from a latching input.

The two blind pistons normally operate as intercanceling reversibles. This means that if you push Blind piston one it will operate but then pushing blind piston two will operate number two and cancel number one.

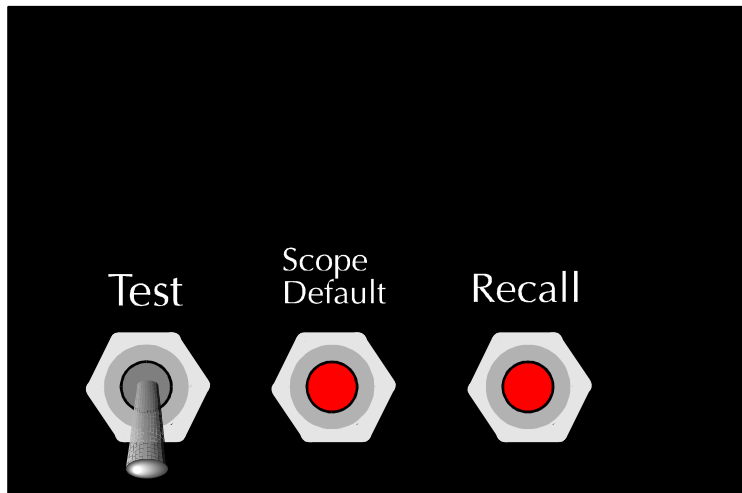
With a positive on pin 62, HFO, the blind pistons operate independently and do not reverse, when the switch is released the blind function will stop operating.

Pin 63 Lamp Protection Bypass. The MLC-08 is provided with short circuit protection on some negative outputs. Certain lamps draw excessive current for a brief period when lighting, the protection system prevents the lamp from lighting. If you have problems with lamps lighting connect this pin to positive.

Pin 64 Clear All Memory. Not a pin to use lightly! This pin is used in the factory to clear the test patterns from the system prior to shipping. It may be used on site after commissioning, but beware, it clears all the SCOPE settings as well. It is not normally recommended to use this pin. The information is given for the sake of completeness. To operate press SET and then apply a positive to pin 64.

Configuration Switches

On the inside of the door are three switches. These switches are deliberately hidden away because they should only be used with care. Incorrect use will do no physical harm to the system or the organ, but it is possible to lose the memory settings.



Test: The test switch allows the wiring to be tested by running through all the stops one at a time in the order they are numbered on the connector list. Pressing general cancel will start the test program. Each stop will be reversed three times in sequence. This may be used to check for wiring faults. Stops are not moved if the system thinks they are already in the correct position. A stop will not move off if either its off coil or stop switch are not connected. If the test program stops at any stage, pressing general cancel will restart it. The service section of this manual covers some typical faults and how they will be discovered using this program.

UP - Test Mode on

DOWN - Test mode off

Scope Default: The scope facility is very flexible and can allow the organist to set the system in many different ways. It is possible for the original SCOPE settings to become overwritten and confusion to reign. To help solve this problem we have introduced two red push buttons. The first of these allows you to store your preferred SCOPE settings in a secret & safe memory location which can then be used to reset the organ at a later stage.

To save the settings of the current level as the default settings for the organ.

1. Press and hold SET
2. Press Scope Default
3. Release SET

Recall: If at any stage you wish to copy the settings from the safe location into the current level this can easily be accomplished by pressing Recall. You do not need to press SET.

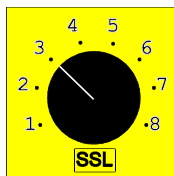
It is of course possible to use this facility to copy SCOPE settings from one memory level to another.

To copy from Memory Level 1 to Memory Level 2:

- Select Level 1
- Press SET and Scope Default as above to store the settings
- Select Level 2
- Press Recall

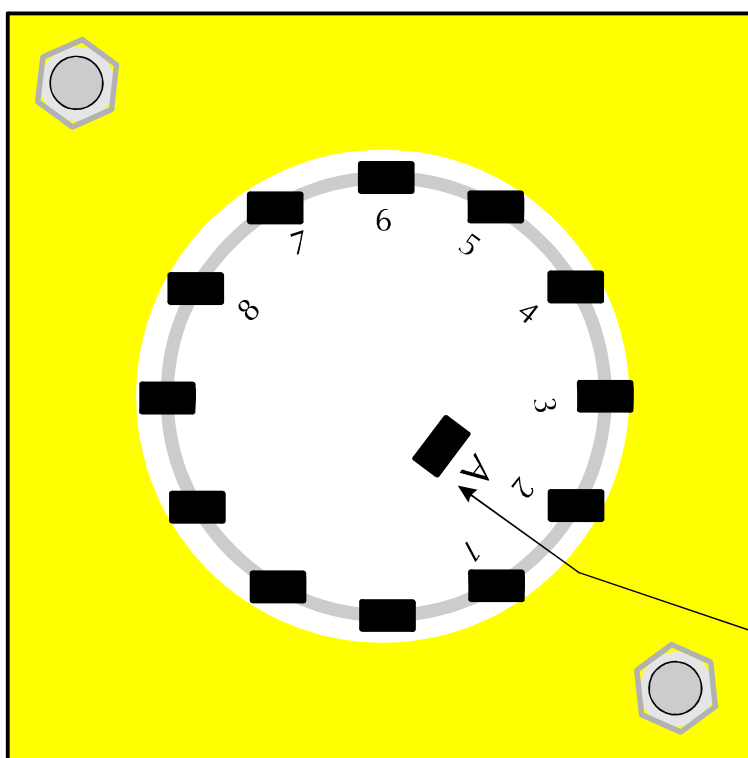


8-Way Level Selector



Memory level selection on MLC-08 is by means of an eight way switch. If you have purchased the Console pack, then the switch connectors will be as described below:

- The switch common should be wired to T/R positive
- The eight contacts should be wired to the eight level select inputs



Connect 8 wires to
Memory Level 1-8
on column 1 pins
48-55

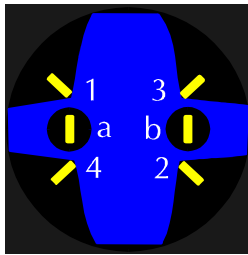
Connect Positive to
Tag marked A

Blind Check, Clear and Copy Switches

The optional Console pack contains three switches, one each for Blind Check, Clear and Copy. 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, ventsils and sforzandos.(tutti, full organ).

- One side of each switch should be connected to either the Blind Check input, the Clear input, or the Copy input.
- One side of each lamp should be connected to either the Blind Check Lamp output, the Clear Lamp output, or the Copy 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 three and four close when the switch is pushed and should be used for the switch wiring.

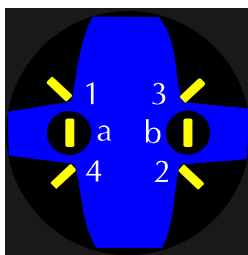
Lock switch and Indicator Lamp

The Lock switch contained in the optional Console pack is a momentary action, key operated switch used for locking and unlocking levels. The lock indicator lights whenever the currently selected level is locked.

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

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



Lock switch showing connections, use only pins 3 and 4.
The Lock indicator lamp is not supplied by SSOS.

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 in one manner. 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 2V and 3V. 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) × 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% 0.25W (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.

Wiring Information for Quick Connection Blocks

The MLC-08 is supplied with quick connection blocks. 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. 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 to make 60 connections with this system in a little over one minute with very little previous experience.

Technical Data

Single Wire Diameter.

Over Insulation 0.7 - 1.40 mm

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

Copper conductor	40 - 0.65 mm 26 - 22 AWG
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It is possible to use cables outside this specification but this must be checked with the 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.

Scope

There are two ways of installing the SCOPE feature.

1. Using SCOPE purely as a set up facility
2. The Organist able to use SCOPE interactively

If the Organist is to use SCOPE then the piston must be fitted on the console where it can be operated by the same hand as the SET piston. If not, then a latching switch inside the console would be helpful when setting up the system.

The SCOPE piston adds a new degree of flexibility to the capture system. SCOPE adjusts the "SCOPE" a piston operates over.

This may sound a little complex, consider the difference between a general and a divisional piston. The general piston will alter all of the stops. A great divisional piston will only effect the stops on the great. The SCOPE of the great piston is the stops on the great. Until now the SCOPE of the pistons was fixed by the manufacturer, but advances in technology have allowed SSOS to introduce this remarkable feature at an affordable price.

SCOPE IS used in a similar way to SET, but also it is normally used together with SET.

How to use the SCOPE piston.	
To Set the SCOPE of a piston	Select all the stops to on, that are required to be in the SCOPE of that piston. Push and hold SET. Push and hold SCOPE. Push the piston to be set. Release SET and SCOPE in any sequence.
To check to SCOPE of a piston:	Push and hold SCOPE Push the piston and check which stops are now on.
To set a piston as a reverser.	Set the SCOPE of that piston to be the only the stop required to be reversed. The system will interpret a one SCOPE piston as a reverser.
To set more than one Piston with the same SCOPE. (Setting up a Division)	Select all the stops to on, that are required to be in the SCOPE of the pistons. Push and hold SET. Push and hold SCOPE. Push the pistons to be set, one at a time. Release SET and SCOPE in any sequence.

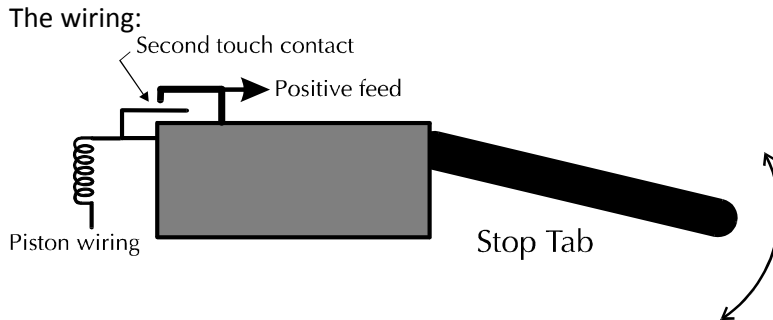
Helpful Hints

1. Setting up a stop tab with second touch using SCOPE

These instructions apply when a contact has been fitted to the stops to provide a second switched circuit when the stop is moved against a spring pressure.

Some assumptions:

1. When activated the second touch cancels a selection of other stops.
2. The stops are arranged in divisions, for simplicity we will study the Great and Swell divisions, but the instructions will work equally well for any group of stops.



The second touch switch is wired into a spare piston input on the capture system. The Scope facility allows you to choose any stop that is not wired elsewhere. The function of the piston will be set later.

The second touch switch must provide a positive input to the stop when operated.

The second touch switch outputs normally have the same common for each division. This provides one piston for each division. Sometimes the feed from the second touch switch is taken through a disable switch, this switch will break the feed to the capture system.

Great Division

1. Press General Cancel to clear all stops
2. Set all Great stops on, (include couplers etc. only if you wish them to be cancelled with a second touch)
3. Press SCOPE (or apply a positive feed to SCOPE input) and hold it on
4. Press SET and hold it on
5. Press one of the Great stops down far enough to close the second touch contact
6. Release SET and the stop tab, in any sequence
7. Press General Cancel
8. To check that the SCOPE has been set correctly; with SCOPE still on, (if you have released SCOPE press it again now), press Great stop 1 through to second pressure. All the other Great stops should come on

If not check the wiring and repeat from stage 1.

9. Now the memories must be set. First press General Cancel
10. With all Great stops off, press SET and apply a positive feed to the Great second touch piston input as previously wired. Do not move the Great stops to do this
11. Test the system. Put all Great stops on and push the first stop down to second touch, all the remaining Great stops will now cancel. Repeat for each of the remaining stops on the Great

In conclusion. To set cancels on second touch, a separate piston input must be provided with a SCOPE of the division to cancel and memory containing all stops off.

The same procedure may now be repeated for both the Swell and Pedal divisions.

Fault Finding

Using the Test Switch.

The test program is started by the Test Switch on the inside of the door. The switch is set to be active in the up position. The main use of the test program is to check that all of the stops have been wired correctly.

The test program moves through the stops one at a time reversing the position of each stop three times before moving on to the next stop. It does this by firing the on coil and then the off coil. Typical errors are:

- 1. The stop moves on but not off.** Suspect the off coil wiring. It could be that the coil wiring has been crossed over. Try drawing all the stops on the console and running the test again. You may find that a different stop goes off to the one that you expect, simply re-wire the affected area.
- 2. The stop moves off but not on.** Suspect the on coil wiring. It could be that the coil wiring has been crossed over. Try cancelling all the stops on the console and running the test again. You may find that a different stop goes on to the one that you expect, simply re-wire the affected area.
- 3. Nothing happens.** Check to see if the red light is lit on the SSOS power converter inside the door. If not, check that the power wiring is correct to the system. The converter is fitted with a fuse which will blow if the power supply is reversed and this can be replaced.
- 4. Lamps will not light.** The starting current surge for the lamps is tripping the short circuit protection. Connect column 1 pin 63 to positive, to disable short circuit protection.

Commissioning

Having wired all of the above, the system can now be commissioned.

The first stage is to check the connection of the on and off coils.

- Switch on the test mode switch inside the door of the MLC-08
- Press General Cancel
- In test mode each stop is reversed three times in sequence
- If correctly wired, each stop will move on and then off. In this way wiring errors can be easily identified and corrected before proceeding

A stop not moving on, may also not move off. Try putting stops on and checking to see if they go off during test. It is not necessary to stop the test to do this. A stop not going on but going off has a faulty off coil. A stop not moving at all may have the on and off coils swapped.

A stop not going off, but does go on, may have a faulty stop switch - not giving a positive to the MLC-08 stop input. Try testing each as follows:

Stop switch: With a test lamp connected to negative and all stops on, test mode not selected. Check each stop switch has a positive voltage, the lamp will light.

Off coils: After checking stop switches. Connect test lamp to positive. Switch first stop on, connect test lamp to first stop, push General Cancel, lamp should flash briefly, repeat for next stop until complete.

Referring to the User Manual, carry out the following steps:

- Select Level one
- Set the Scope of every ordinary piston
- Set the Scope of all blind pistons
- Set all the blind pistons

Have someone hold in the set piston whilst you press the Scope Default switch inside the door of the MLC-08. This will cause the current scopes and blind functions, which have just been set on level one, to be stored for later use.

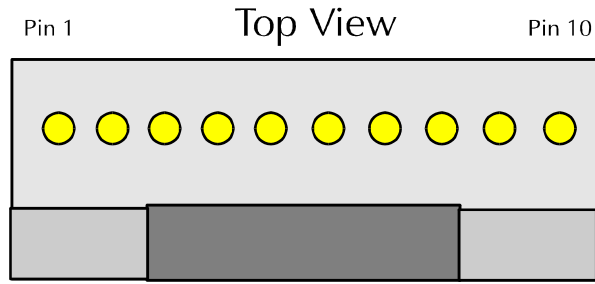
Referring to the User Manual, now carry out the following steps:

- Select Level two
- Clear Level two
- Clear Level two a second time
- Repeat the above operations for the remaining levels (3-8)

This will set the default scopes and blind functions on each of the levels. It will leave all of the pistons blank, ready for use.

It is also possible to set different Scopes in different levels. Full instructions for this and other functions may be found in the user manual.

Internal wiring



Molex KK 10 Way Connector - Pin Locations

Molex Connector Q104		
From: Processor Panel	To: Processor Q104	Colour of wire
5 Volts	1	Not wired
	2	
Scope Default	3	Purple
Recall to Current Level	4	Yellow
	5	
Test Mode	6	Blue
	7	
	8	
	9	
0 Volts	10	Black

Installation Settings

Wiring configuration for _____ Organ.

Column 1 Pistons 1-32 & Controls		Column 2 Stop Switches Column 3 Stop Actions Column 4 On Coils Column 5 Off Coils
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	
	32	

Column 1 Pistons 33-42 Plus blind Pistons 1 and 2. & Controls		Column 2 Stop Switches Column 3 Stop Actions Column 4 On Coils Column 5 Off Coils
	33	
	34	
	35	
	36	
	37	
	38	
	39	
	40	
	41	
	42	
Blind Piston One	43	
Blind Piston Two	44	
Set Switch	45	
SCOPE Switch	46	
General Cancel	47	
Memory Level One	48	
Memory Level Two	49	
Memory Level Three	50	
Memory Level Four	51	
Memory Level Five	52	
Memory Level Six	53	
Memory Level Seven	54	
Memory Level Eight	55	
Extended Hold Time	56	
Blind Check	57	
Lock Switch	58	
Clear Switch	59	
Copy Switch	60	
Locking Enable (con to +ve)	61	
Blind Functions HFO	62	
Not Used	63	
Clear All Memory	64	
65	Col 3 only Blind P 1 Lamp	
66	Col 3 only Blind P 2 Lamp	
67	Col 3 only Blind Chk Lamp	
68	Col 3 Only Lock Lamp	
69	Col 3 Only Clear Lamp	
70	Col 3 Only Copy Lamp	