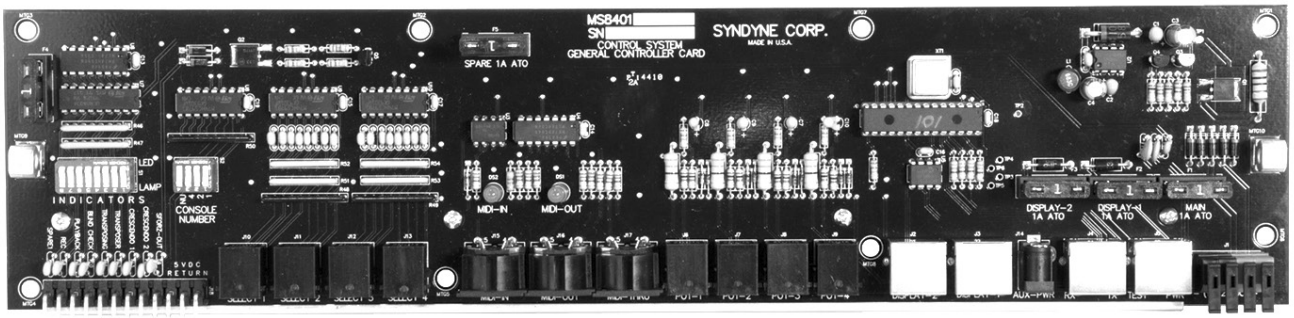
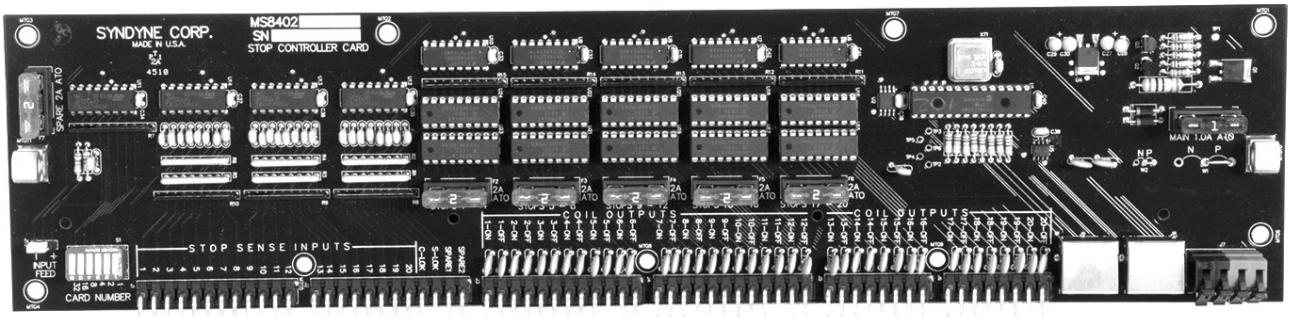
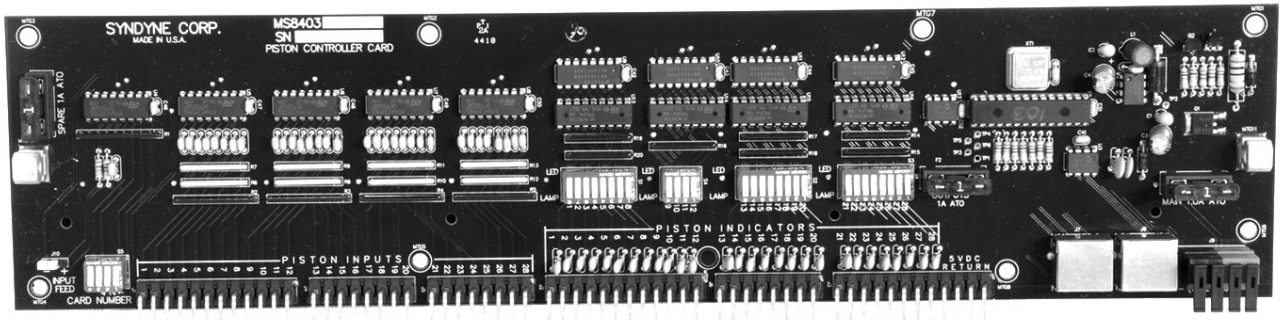
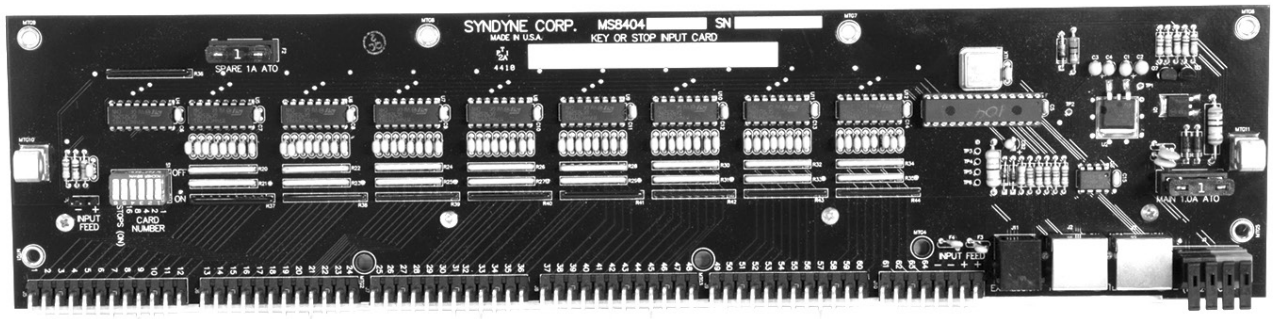
MS8400 Control System
Organ Builder Manual









This manual provides an organ builder with the tools necessary to install and configure an MS8400 Master System.

For additional documentation, find us on the web at www.syndyne.com

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Getting Started

Copyright

Any resident content on the MS8400 as well as this manual and any applicable documentation, is considered copyright by Syndyne Corporation.

How The MS8400 Documentation Is Organized

Knowing how our documentation works is vital to quickly finding the information you need when questions arise. The MS8400 system documentation is made of the following parts.

MS8400 Quickstart Guide

We recommend following our MS8400 Quickstart Guide to improve the overall efficiency and experience of installing and configuring the MS8400 System. The guide was designed as a big picture view, which references the rest of the MS8400 documentation when more information is required. Please have all the MS8400 documentation on hand during the installation and configuration process. This guide was intended for all organ builders, regardless of their familiarity with using the MS8400. For first time users, it provides a road map to follow throughout the installation process. For familiar users, it acts as a checklist insuring that no crucial steps are forgotten. The Quickstart Guide covers the majority of standard installation steps, which makes it important to read and reference the rest of the MS8400 documentation.

MS8400 Builder Manual (You Are Here)

The builder manual provides detailed instructions on the installation and configuration of the MS8400 Organ Control System. The MS8400 Builder Manual is broken up into several subsections described as follows:

Getting Started: This section talks about the system in general and how the documentation is structured.

Installation: The installation section handles the physical mounting, wiring, addressing, and connecting of the MS8400 system. Please note that the processes covered in the installation section should be completed before proceeding to the configuration section.

Configuration: The configuration section, covers the MS8400 configuration process. Before attempting the configuration steps in this section, please follow all steps in the Quickstart Guide from “Getting Started” through “Startup/Verification.” The configuration section is organized by the actual MS8405 Touchscreen navigation. It is broken out into three parts: Using the MS8405 Touchscreen, The Main Menu, and The System Configuration Menu. Each topic in the Main Menu section relates to a specific button within the Main Menu on the MS8405 Touchscreen. Each topic in the System Configuration Menu section relates to a specific button within the System Configuration Menu on the MS8405 Touchscreen.

Test and Diagnose: This section helps test and diagnose potential installation and wiring problems. The majority of this section follows the buttons within the Test and Diagnose Menu on the MS8405 Touchscreen.

Appendices: The topics in the appendices help to provide additional instructions and documentation that may be considered useful to builders as a reference.

MS8400 User Manual

The MS8400 User Manual is intended to be left with the Organist for training and reference on how to control the instrument with the MS8400 system. This manual is smaller in size than the rest of the MS8400 documentation to be more conducive to storage at the organ console.

Unpacking, Handling, and Safety Information:

Static Warning

The Syndyne MS8400 System contains electrical components that are susceptible to damage by static discharge. To avoid damage, use antistatic handling materials and make sure you are well grounded at all times. It is recommended that all electrical components be kept in their original packaging until installed.

Dropping, Bending, or Rough Handling

Use care when handling Syndyne products. Dropping or other rough handling can result in the products becoming damaged. Bending electrical components can weaken onboard components and connections within the circuit board itself. These problems can cause a significant amount of additional time and expense and may show up at an unknown time after the installation is completed.

Unboxing System Components and the Packing List

Each shipment from Syndyne Corporation includes a packing list which details the contents of the shipment. The packing slip is located on the outside of one of the boxes in the shipment. Occasionally, the packing list may be included inside one of the packages. If you are having trouble locating the packing list, please contact Syndyne for help in getting a new packing list.

Once the packing list is located, carefully remove all items from each package one by one, checking each item off the packing list as it is removed from its box. It is very important to check the entire contents of each box including shipping peanuts and materials. Failure to carefully inspect the shipment may result in parts being accidentally discarded.

As each item is removed, inspect it thoroughly, especially if there is visible damage to any of the boxes in the shipment. If any items appear to be damaged, contact Syndyne for help with pursuing a claim with the shipping carrier. If anything is listed on the packing slip but cannot be found within the contents of the shipment, first recheck each box carefully. If the missing parts are still not found, please call Syndyne immediately for help in resolving the issue.

Board Inspection Identification

For identification purposes, each component is labeled with a part number, a serial number, and a name/description.

Touchscreen

- Do not disassemble the MS8405 Touchscreen. Separating the touchscreen boards will void the warranty.
- Keep the MS8405 away from water.
- The Touchscreen is designed to be touched firmly using a finger.
- A stylus can be used on the touchscreen, but it may decrease screen life faster than a finger.
- Do not use any item sharper than a stylus or a finger on the touchscreen.
- Long and/or sharp fingernails may also decrease the life of the touchscreen.
- Do not use a pen, pencil, marker, or other item that can mark on the screen.
- Use a damp cloth to lightly clean the screen.
- Do not use cleaning solutions that are caustic or leave a residue.

USB Drives and Devices

USB drives must be formatted as FAT32 and the primary partition should be no larger than 2GB in size. If using a USB drive which is larger than 2GB, the drive must be repartitioned on a computer. There are too many USB drives and devices available on the market to have tested them all. Although the majority of USB drives should work with the MS8400, we cannot guarantee that all USB drives will work. If you have a problem when using a new USB drive that is not approved by Syndyne, make sure the same problem occurs using a Syndyne approved flash drive before attempting to contact Syndyne for support.

MIDI Files and Devices

Currently the MS8400 only plays MIDI type 0 single track files. MIDI type 1 files can be converted to type 0 files using a computer. The MS8400 should work with general MIDI Devices, however some devices rely on non-standard MIDI messages which may cause undesired results. For more information on MIDI in the MS8400 system, please read the installation and configuration sections.

How the MS8400 Master System Works

Distributed Computing

The MS8400 Master System does not have a central processing unit. Instead, computing is done by multiple cards throughout the system, which provides scalability benefits. As an instrument grows, so does the number of stops, keys, pistons, and pipes which need to be controlled. In response, the MS8400 adds computing power as more boards are added to accommodate additional stops, pistons, and keys. In addition to computing power, having more than one processor provides protection against a single point of failure.

Main System Components

With any organ control system, it is important to know how the physical equipment works on at least a basic level. Below, is a brief explanation of the main system components within the MS8400 Master System.

MS8401 General Controller Card: One of these cards is required per console. It primarily provides power to the touchscreen control, input for Crescendo, and miscellaneous LED/lamp outputs. There are also connectors which can be used for MIDI Pitch/Volume, rotary memory/Transposer control, and MIDI In/Out/Thru.

MS8402 Stop Controller Card: Each card can control up to 20 stop/coupler controls.

MS8403 Piston Controller Card: Each card controls up to 28 pistons including LED/lamp outputs for lighted pistons.

MS8404 Keying Controller Card: One of these cards is required per division of keying.

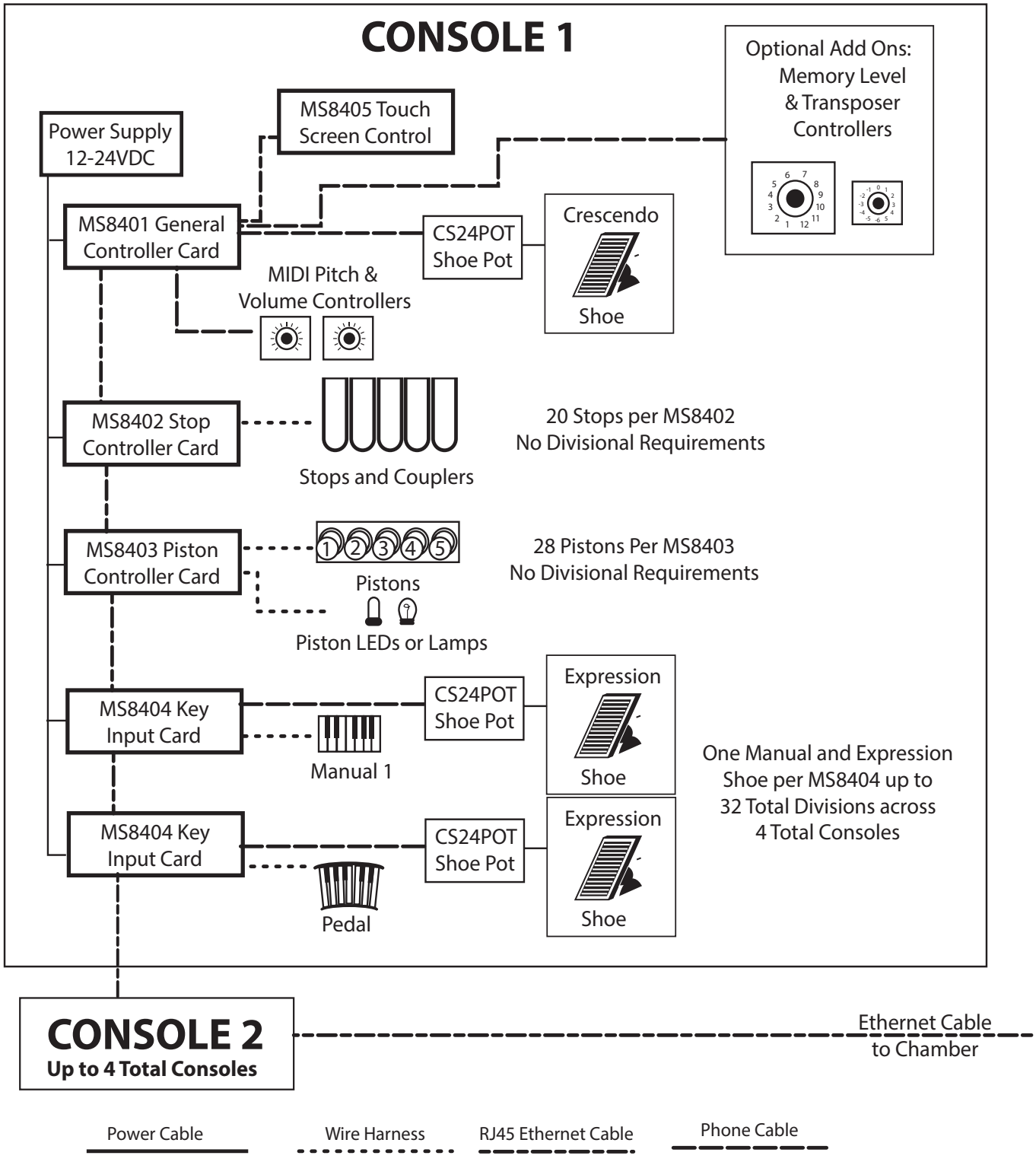
MS8405 Touchscreen Controller: The touchscreen is used by the organ builder to configure the system, and the organist to control the instrument.

MS8406 Chamber Driver: Each card has 80 configurable outputs for note magnets, stop lines, shade motors, and more.

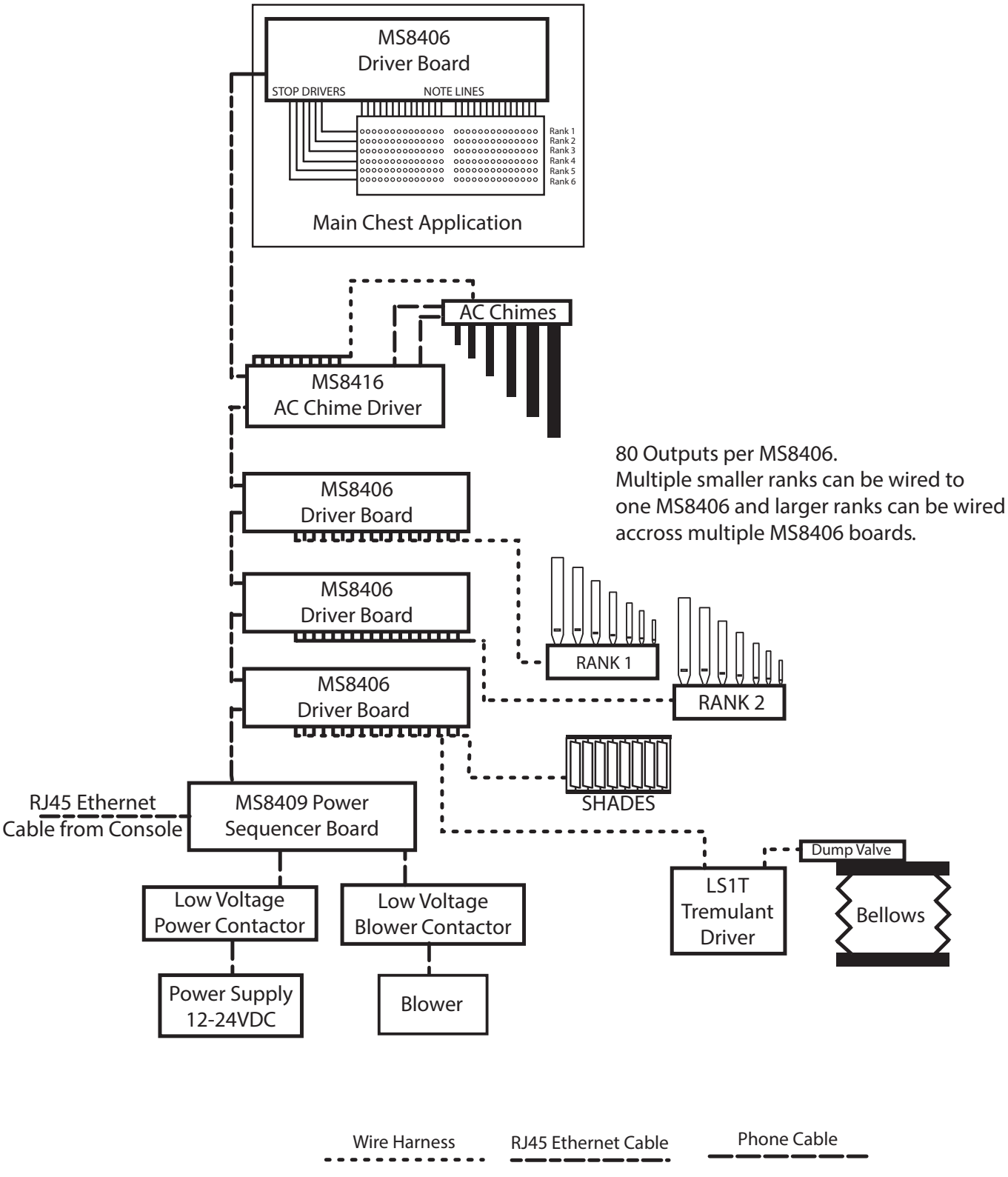
Data Connection

The MS8400 system uses a customized version of the incredibly robust and reliable CAN Buss Protocol to communicate data between the system components. CAN was originally developed for harsh environments where data integrity is critical, such as keeping airplanes in the sky and automobiles safely on the road. See the Installation section for more details on CAN Data within the MS8400 System.

Console Diagram



Chamber Diagram

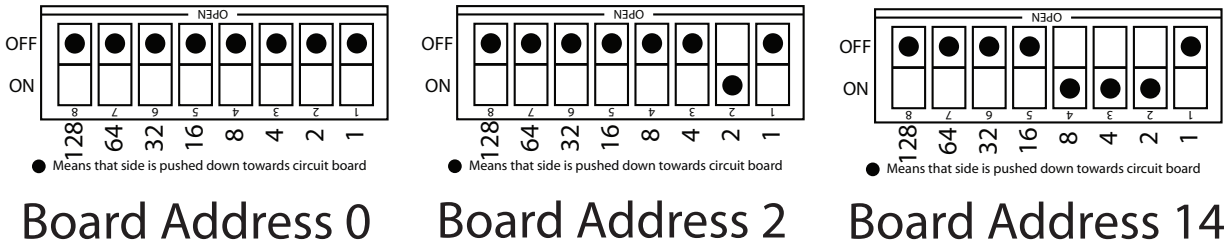


Installation

Setting Board Addresses

Addressing through DIP Switches

Each type of board in the MS8400 System requires a unique address number that is assigned through onboard DIP switches. To assign an address, turn on the DIP switches on each board so that the numbers add up to the desired address. It is important to remember that address 0 is a valid address. Here are some examples: To select address 0, turn all the switches off. To select address 1, turn all the switches to off except for switch number 1. To select address 3 turn on both switch number 1 and switch number 2. To select address 7, turn on switches 4, 2, and 1 which add up to 7. Below is a more visual example of numbering boards in the MS8400 System.



Duplicate Addresses

Duplicate addresses of the same board type can cause issues with configuration and operation later. No long-term damage or harm can come from having duplicate numbers, but the system will have problems until the duplicate addresses are corrected. Boards of different types can share the same address number, so two MS8401 General Controller boards cannot share the same address, but an MS8401 General Controller and an MS8402 Stop Controller can both have the same address number. Also, the MS8403 Piston Controller cards can have duplicate address numbers if used in separate consoles. Addresses do not need to be in order, which means that addresses can be skipped for organizational purposes. For example, in an organ with a separate Great and Swell relay panel, board addresses 10-17 may be located in the Great relay panel and board addresses 20-29 may be located in the Swell relay panel.

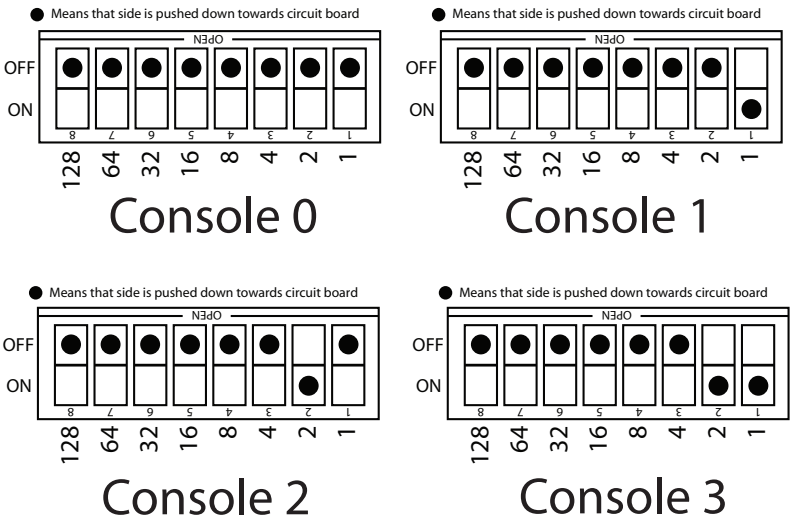
Assigning Console Numbers

8401 Console Numbers

There is one MS8401 board for each console in an MS8400 system. MS8401 boards must each be assigned a unique console number between 0 and 3. The console number is assigned by onboard DIP switches.

Setting Console Numbers through DIP Switches

To assign a console number, turn on the DIP switches on each MS8401 so that the switch numbers add up to the desired console number. To select the Console Number 0, turn all the switches off. To select Console Number 1 turn on switch number 1. To select Console Number 2 turn on switch number 2. To select Console Number 3 turn on switch number 1 and switch number 2. To the right is an example of setting console numbers in the MS8400 System.



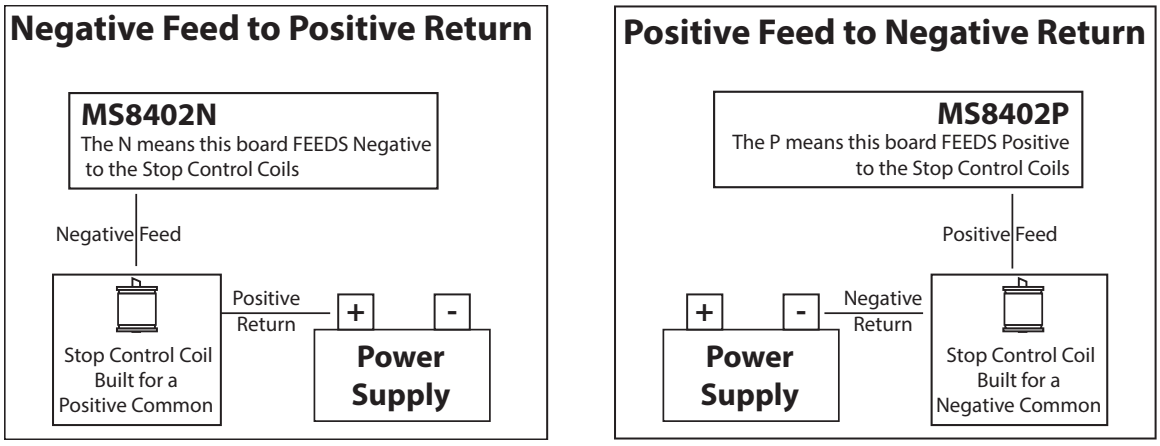
Understanding Feeds, Returns, and Commons

Before we begin, it is important to note that this topic may be elementary for some, and may be new information for others. Please feel free to skip this explanation of feeds, returns, and commons if it is already understood.

Feeds and Returns

With the MS8400, as with all organ control systems, electricity is required. Electricity is used to move drawknobs by energizing coils, sense whether a key is on or off through a key contact, and much more. Using electricity to control an instrument is only possible if that electricity is correctly connected and directed to each component. Our documentation will occasionally mention feeds, commons, and returns in relation to how part of the organ is connected to the MS8400.

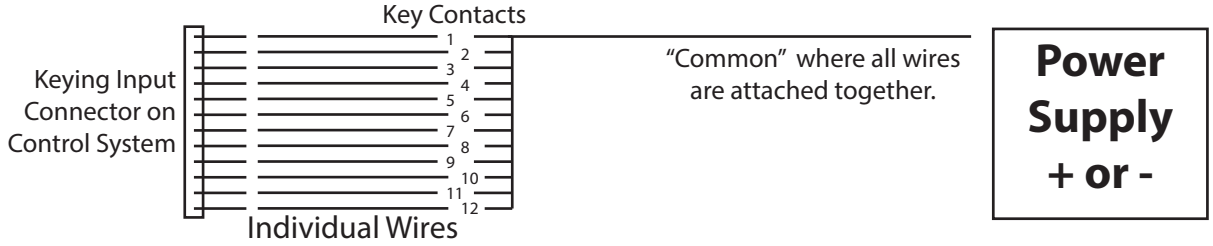
People typically think of pipe organ electrical connections as simply positive (+) and negative (-) polarities. In days past, manufacturers would often produce systems only capable of handling one polarity. This made documentation simple and would therefore only have to describe the connecting process as "Hook up this wire to positive and this wire to negative." The MS8400 can be built to drive either negative or positive magnets, which is useful when rebuilding an older instrument with stop controls being built with a preexisting polarity. Also, the MS8400 system can sense either positive or negative from keys, pistons, and stop control switches using a settable feed shunt (or jumper). This created the need for words that describe the incoming connection, or "Feed," and the return path, or "Return." These words allow people the flexibility of describing how organ components are wired, without forcing the builder to use a specific polarity. Here is a quick example of how feeds and returns work in reference to stop control coils.



At this point, it is understandable to ask why polarity even matters and why manufacturers build products with different polarities. The easy answer is that, in manufacturing, there can be different components or physical constraints in a design which force them to use a specific polarity to accomplish a task. A good example of this is in stop control coils. When electricity energizes stop control coils, they magnetize any iron in the middle of the coil. When the positive and negative connections on a coil are swapped, the magnetic poles also swap. Stop controls often rely on a north or south pole specifically to have enough force to turn the control on or off. If the poles swap, this can have negative side affects on how the stop control was designed to function.

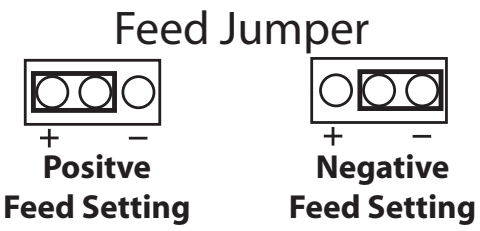
Commons

Commons can be deceptively simple. First off, commons can be either negative or positive. Secondly, commons can be either a feed, or a return. The term "Common" in wiring, literally describes the side that many wires have in common with each other. For example, when connecting keys to an organ control system, each key contact on a keyboard must be wired into the control system individually on one side, while the other side of all the key contacts are connected to a "Common" place on a terminal block or directly to the power supply.



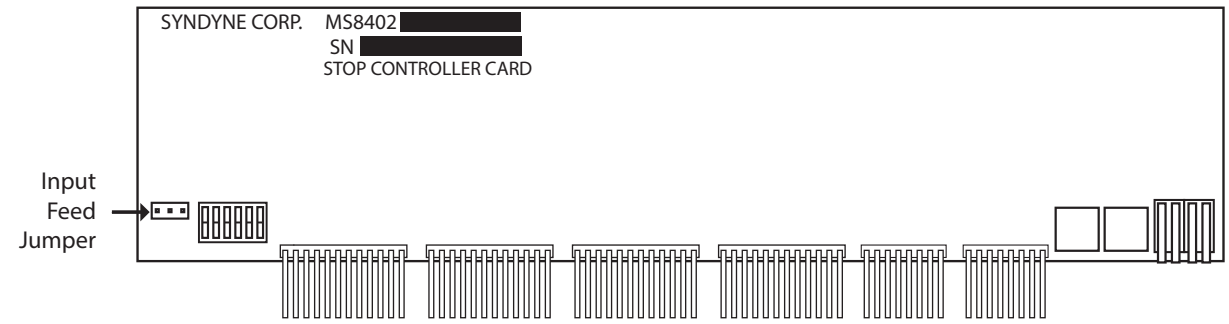
Setting Feeds

The MS8400 has the ability to sense positive or negative feeds for inputs, such as pistons and keys. This is helpful when rebuilding existing consoles which are already connected to a specific polarity. Feed polarity in the MS8400 system is set via a jumper (or shunt) on several different system cards. There is a label on the card that describes which side of the jumper is positive and which side is negative. See the illustration for an example of jumper settings for both positive and negative feeds.

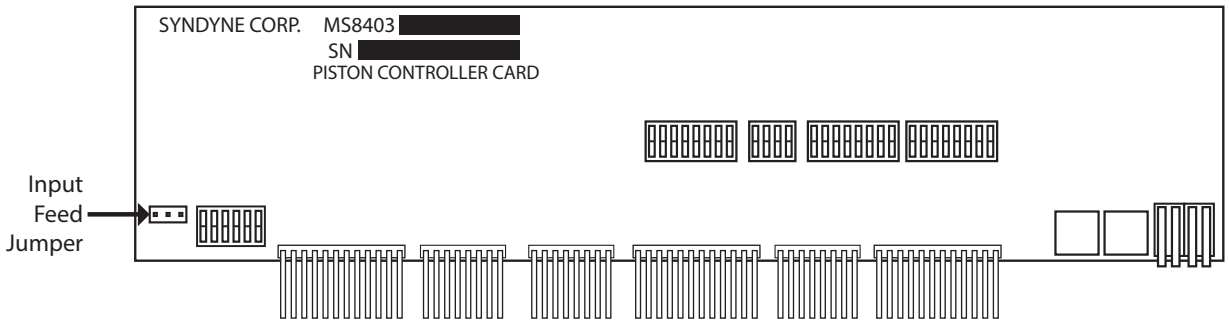


It is critical to set feed jumpers on all applicable MS8400 cards. We recommend setting the feed jumpers prior to installation because they can be easier to access. If feeds are set to the wrong polarity, the system will not work correctly, but no long-term damage is sustained. In order to more easily identify all boards that require feed jumper setting, please see the following illustrations.

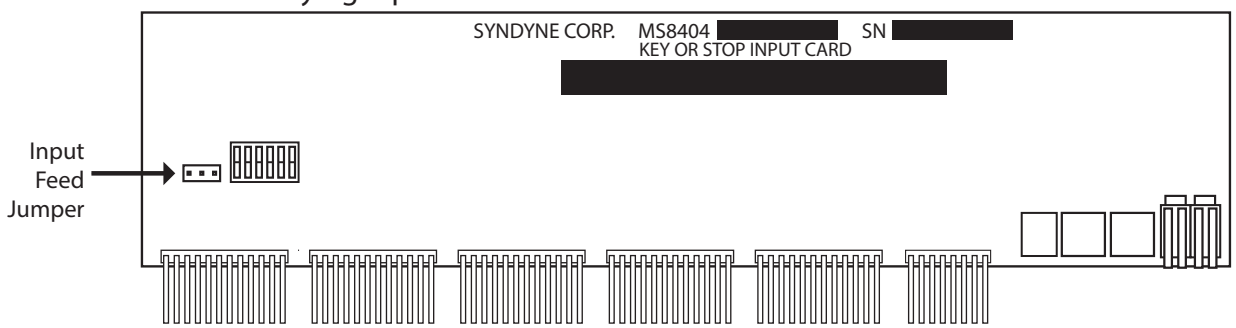
MS8402 Stop Controller Card



MS8403 Piston Input Card



MS8404 Keying Input Card



Cards in the MS8400 system are manufactured with SPECIFIC OUTPUT POLARITY, such as for driving stop control coils and pipe magnet coils. The MS8400 can accommodate either positive or negative output, but the components must be ordered with the correct polarity from the factory.

Mounting and Installing MS8400 Equipment

Mounting MS8400 System Chassis

The main MS8400 system components come in self-containing chassis which help improve system installation speed, lower overall size requirements, and aid in the efficiency and cleanliness of the wiring process. The chassis are made of steel, are modular on a per card basis, and have press-fitted edge guides that guide and support installed cards. Thumb screws can be used to attach each card into the chassis securely. The chassis is fitted with mounting holes that allow it to be mounted straight to a flat mounting surface such as a sheet of plywood. Each card comes with an aluminum PCB stiffener that helps the card remain rigid within the chassis. Do not forget, Syndyne offers a wide variety of wiring and preassembly services that can make your installation easier.

System chassis are modular and can be expanded on an individual card basis. We do not recommend ordering any chassis sized to fit over 11 cards due to overall weight, physical size, and potential chassis twisting. When more than 11 cards are required, Syndyne will automatically recommend splitting the system into two or more chassis. We recommend mounting the chassis with the cards positioned vertically. This limits the system exposure to dropped screws, dust build up, liquid spills, and potential rodent threats. Chassis can be positioned in any location within the console, but proximity to controls and power should be considered prior to chassis installation.

Mounting any Equipment without a Chassis

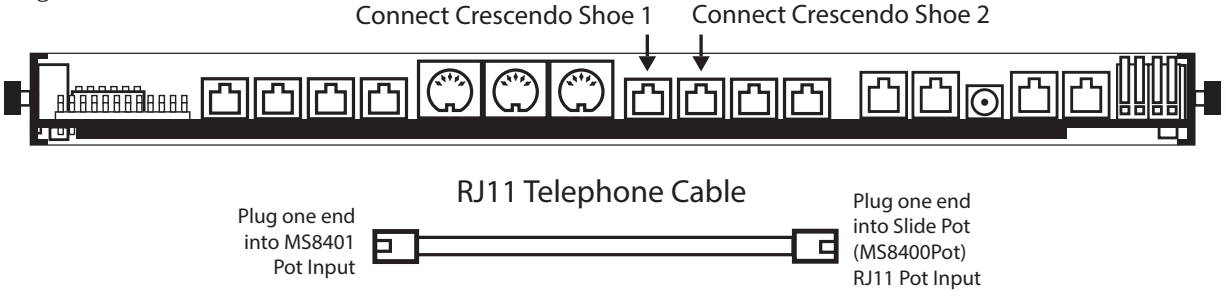
There are many products within the MS8400 system that are mounted outside of a chassis, such as displays, indicators, shoe potentiometers, Rotary Selectors, and more. Boards mounted outside the chassis will typically have mounting ears, or standoffs with obvious points for inserting screws. Even boards typically mounted in a chassis can be ordered and flat mounted without a chassis, but this is not recommended. It is a good idea to space any flat mounted boards at least 1/2" away on any edges without connectors and 2" away for any edges with connectors. This will leave sufficient room for wiring to exist between boards. It also provides enough room in the event that additional wires must be added after original wiring has been completed. Providing enough room prevents mistakes such as routing wires underneath boards.

Never route wires underneath an MS8400 system board. Shorting is likely to occur which could cause damage to the board, risk of fire, injury, and even death.

Wiring Crescendo, Expression, and Other Potentiometers

MS8401 Connections for Crescendo 1 & 2, and MIDI Pitch & Volume

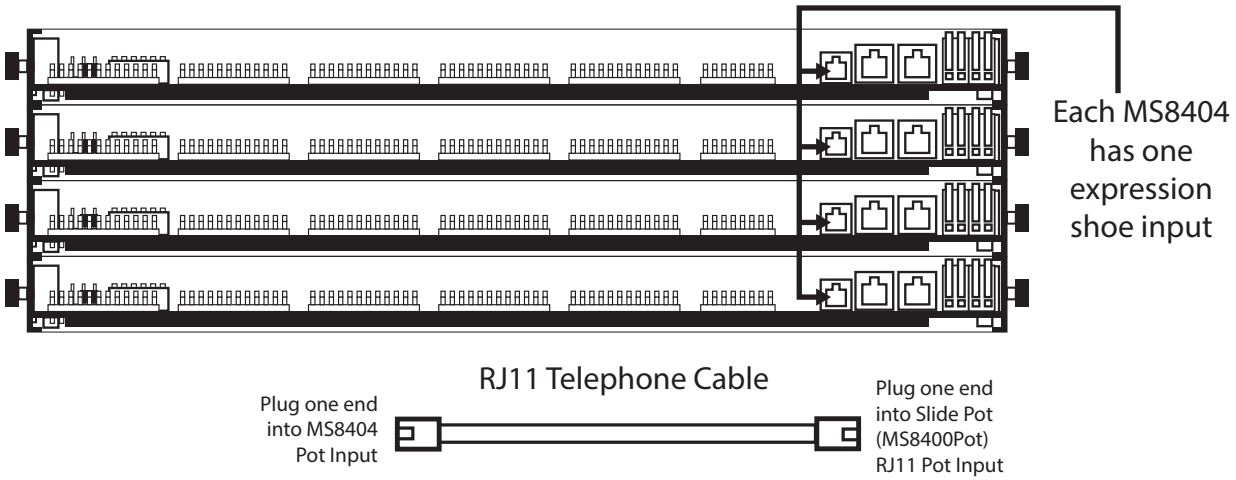
The MS8401 has four RJ11 (telephone) connectors for potentiometers. These are configurable using the touchscreen to control Crescendo Shoe 1, Crescendo Shoe 2, MIDI Pitch or MIDI Volume. Crescendo Shoe 1 and Crescendo Shoe 2 are preconfigured by the factory as shown in the illustration below, however, these can be changed later if desired. Connect the correct MS8400POT or other potentiometer to the correct input on the MS8401 using the provided RJ11 telephone connector cable(s) provided by Syndyne. For more information on the MS8400POT slide potentiometer, please see the section Using the MS8400POT for Crescendo and Expression Shoes. For more information on how the RJ11 telephone cable is wired, see the Wiring Other Potentiometer section.



Please do not attempt to connect expression shoes to the MS8401 General Controller card. Expression is connected to the MS8404 Keying Input card(s).

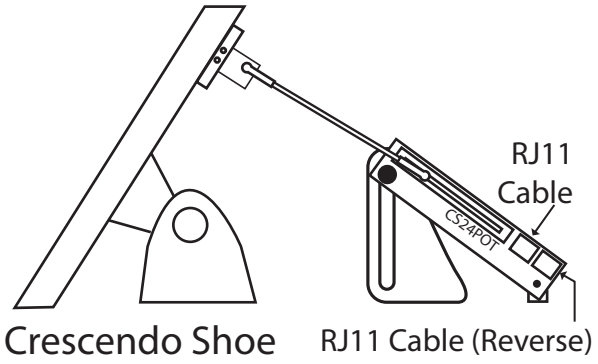
MS8404 Connection for Expression

Each MS8404 Keying Input card has one RJ11 (telephone) connector for an expression potentiometer. The system can handle up to 32 expression shoes, divided across up to four consoles. Expression is configurable via the MS8405 Touchscreen to control outputs on any MS8406 Chamber Driver card. For more information on wiring the Swell shade (expression) motors, please see the section, Wiring Swell Shade Outputs.



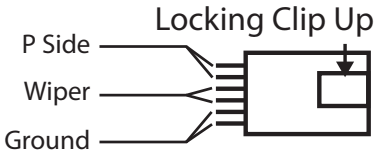
Using the MS8400POT for Crescendo and Expression Shoes

The MS8400 system can have up to two Crescendo shoes per console. Syndyne offers an adjustable slide potentiometer for connecting a Crescendo or Swell shoe to the MS8400 system. The MS8400POT is connected to the MS8401 General Controller using an RJ11 (telephone) cable. See the previous section on MS8401 Potentiometer Connections for an illustration of which connector on the MS8401 to use. The MS8400POT has two RJ11 Plugs in order to easily swap shoe direction. Plug the RJ11 cable into the first RJ11 connector on the MS8400POT and check the operation. If the operation is backwards, reverse the operation by using the other RJ11 connector on the MS8400POT. For connecting to Crescendo shoes using a potentiometer other than Syndyne's MS8400POT, see the following section on wiring other potentiometers.



Wiring Other Potentiometers

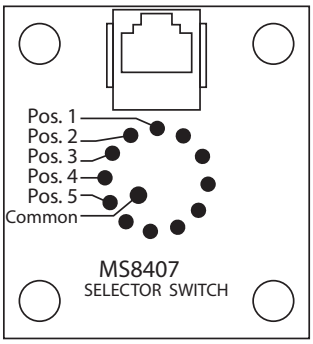
The MS8401 has four RJ11 connectors for connecting potentiometers. In addition to two Crescendo shoes, the MS8400 system can also accommodate MIDI-Pitch, MIDI-Volume, and MIDI-Tuning (for certain MIDI sound modules). These functions are connected using a standard 5k or 10k potentiometer. Connect the P side of the potentiometer, the Wiper, and the Ground to a 6-wire RJ11 connector as shown in the drawing. Note the position of the locking tab on the RJ11 in relationship to the wire positions. Configuration is done through the touch screen control panel and is not connector specific.

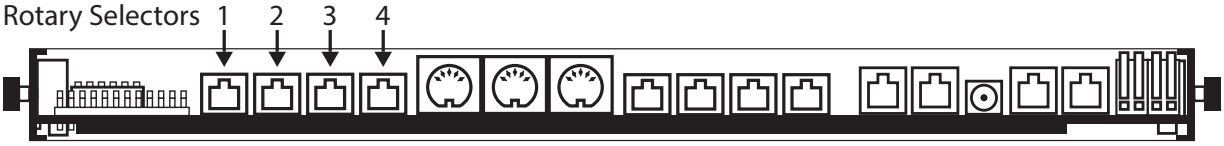


Wiring Rotary Selectors

MS8401 Rotary Selectors

The MS8401 has four RJ11 connectors that can be used for Rotary Selectors. An RJ11 cable is provided by Syndyne Corporation which is used to connect between the MS8401 and the MS8407 Rotary Selector switch. Possible functions for the Rotary Selectors are external Transposer, memory control, or AC chime volume. The function of each Rotary Selector is configured by the touch screen control panel and is not port specific. Any MS8407 rotary switch can be connected to any of the four ports on the MS8401. The MS8407 Rotary Selector board can be special ordered without the switch if the builder would like to use their own rotary switch. Please see the illustrations on where to connect Rotary Selectors and how to wire the MS8407 to a custom switch. When wiring to a custom switch, the common must be negative.





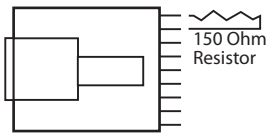
Connecting System Data Cables (CAN Buss)

All cards in the MS8400 system use a CAN buss connection to communicate with each other. This communication is made via standard Cat5e cables having RJ45 connectors on each end. These can be purchased at a variety of lengths from Syndyne, most computer stores, or from companies online. The CAN buss is powerful, but it does have limitations, as with any communication method. Please note the following limitations before ordering, laying out, and connecting the MS8400 system. If any of these limitations seem confusing, please continue reading the rest of this section, which helps explain these limits in more detail.

1. System data cable length is recommended to not exceed 500ft between any two termination resistors. (See the section on CAN Repeaters and Fiber Optics for systems having over 500ft of data cable.)
2. Maximum of 100 circuit cards/boards (80 recommended) per CAN repeater network. (Systems can have more than 100 circuit cards/boards using CAN repeaters.)
3. Do not use more than 1 CAN repeater (MS8408) between any two termination resistors.
4. Each Repeater adds roughly 80ft of cable length toward the 500ft max length.
5. Do not have more than one DC negative connection to earth ground.
6. Very low resistance connections to the negative side of organ power improves data integrity.
7. Fiber optics are available for long cable runs.
8. Each fiber optic converter adds roughly 160ft of cable length toward 500ft max regardless of fiber length.
9. Max fiber length per converter is roughly 650ft.
10. The cable length to each MS8405 touchscreen needs to be doubled when calculating total system data cable length.
11. Use only Cat5e rated cable with Cat5e rated connectors or Cat6 rated cable with Cat6 rated connectors. (Using Cat5e rated cable with Cat6 rated connectors or vice versa can cause data communication problems.)

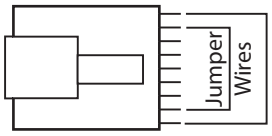
Termination Resistor Connector

The last board in every CAN run will have a vacant CAN port due to the fact that it is the last board to be connected. This empty CAN port must have an MS8400DTR Termination Resistor inserted. Every CAN connector in the MS8400 must be filled with either a data cable or a termination resistor to prevent communication problems.



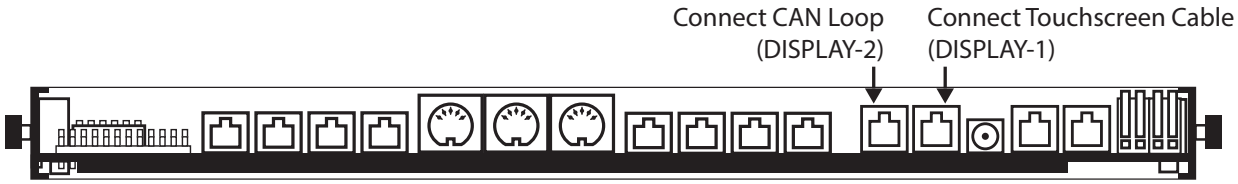
MS8405 Touchscreen Connection and CAN Loop

The connection for the MS8405 Touchscreen is located on the MS8401 General Controller. The MS8405 Touchscreen connects using a standard Cat5e or Cat6 cable, however, it does not have two data cable connections like the vast majority of components within the MS8400 system. For the touchscreen, the CAN buss data is routed from the general controller to the screen and back again to the general controller through a single data cable. This is why a special



MS8400DJMP
CAN LOOP

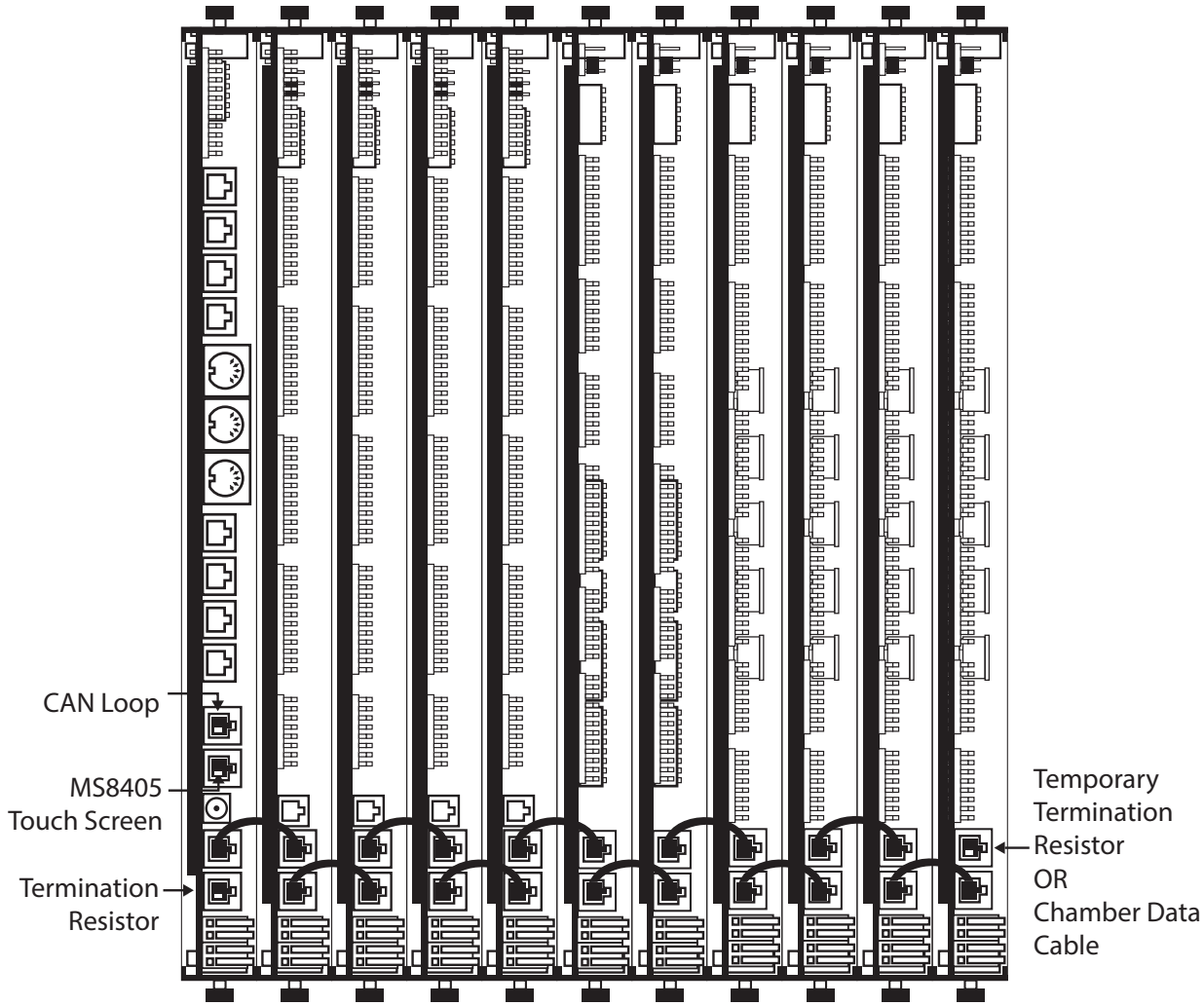
MS8400DJMP RJ45 connector is required to populate an unused touchscreen connector port rather than a standard termination resistor. Attach the touchscreen to the DISPLAY-1 connector on the general controller and install an MS8400DJMP CAN Loop (see illustration in this section) in the DISPLAY-2 connector. There are ports for two separate touchscreen displays, but at this time, the system is only capable of utilizing a single touchscreen. Power for the screen is also sourced through this data cable. Please note that the length of data cables connected to a MS8405 Touchscreen must be doubled when calculating total length. See the illustration below for how to connect the MS8405 Touchscreen to the MS8401 General Controller.



IMPORTANT!! Every CAN port in the system has to have a Cat5e or Cat6 ethernet cable, CAN loop, or CAN termination resistor. If any ports are left open this will cause communication problems throughout the entire system.

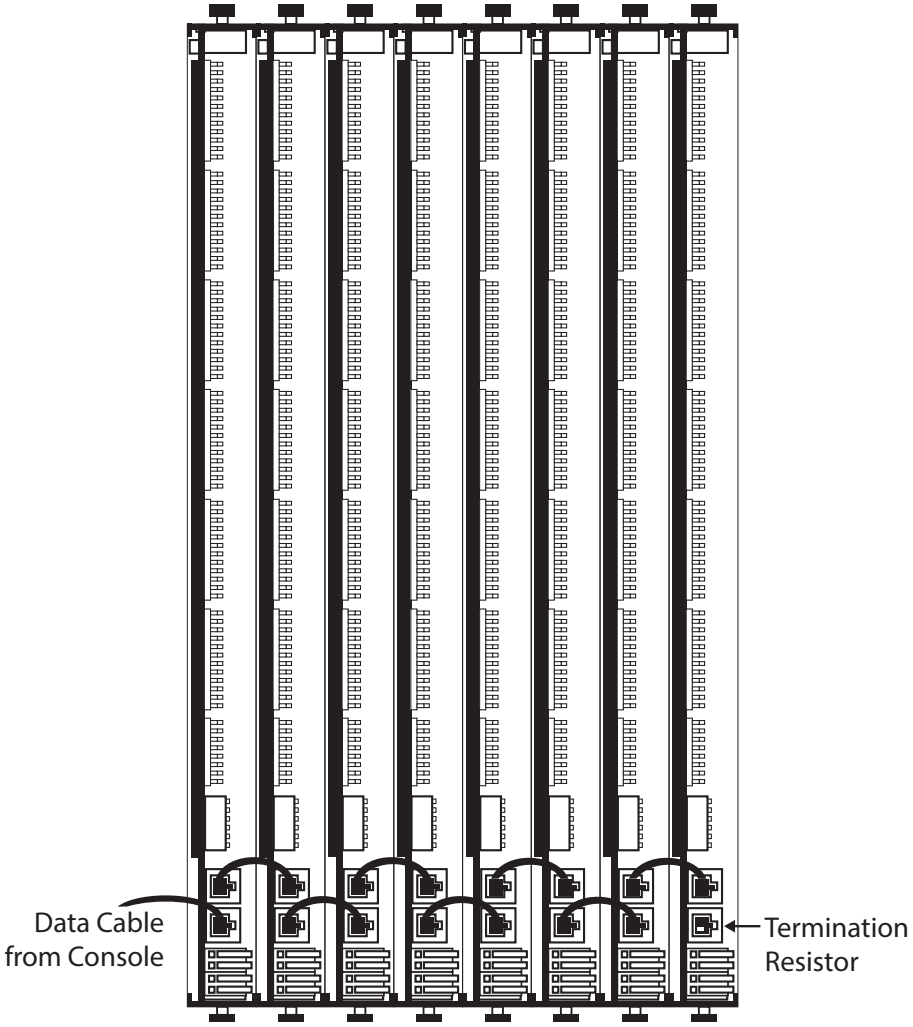
Console Chassis Data Cable Connection

Cards within a console chassis are connected together using 6" long Cat5e data cables. The illustration below shows these cables in a standard single console configuration.



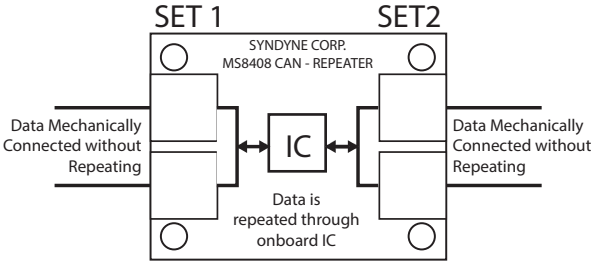
Chamber Chassis Data Cable Connection

Cards within a chamber chassis are connected together using 6” long Cat5e data cables. The illustration below shows these cables in a standard single console/single chamber configuration.

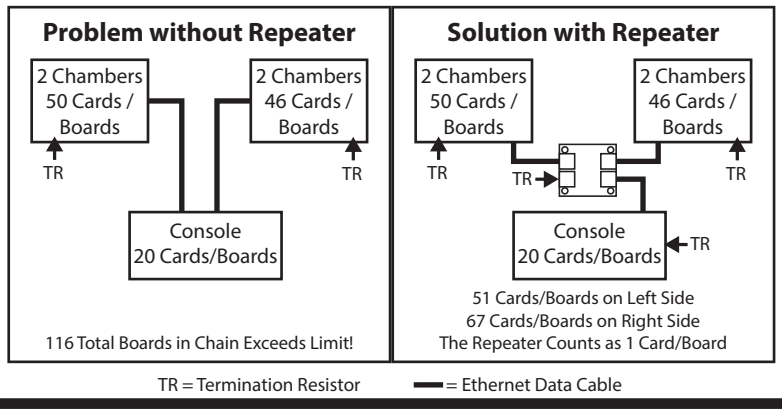


MS8408 CAN Repeater

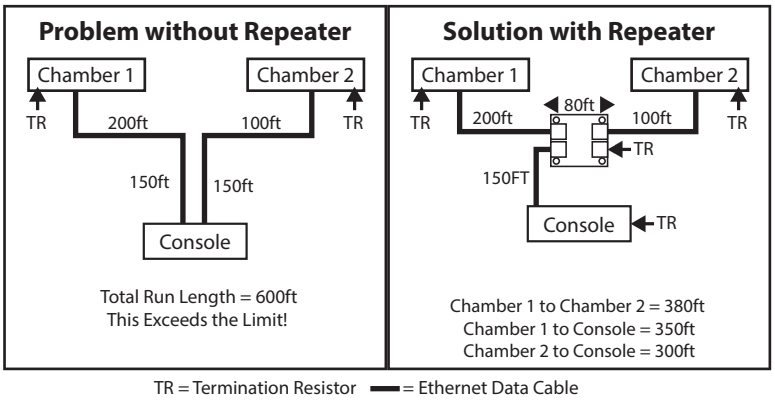
The MS8408 CAN Repeater is designed to boost the CAN signal, and/or split a CAN network into more efficient and manageable sized networks. It has two sets of two RJ45 ethernet jacks that accommodate a standard ethernet cable or plug. The two jacks within a set are directly connected together mechanically. On the repeater, there is an IC that takes power from the ethernet cables and repeats (or boosts) the CAN data between the two sets of jacks. See the illustration for a visual representation of how the two sets of two jacks operate.



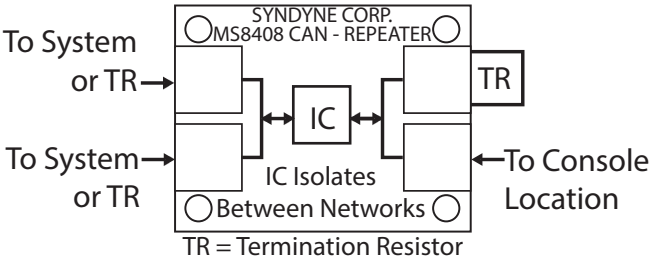
MS8408 CAN Repeaters are used in a system for three reasons. First, repeaters can expand the total number of CAN-based circuit cards/boards beyond the recommended limit of 80. Using a repeater, the CAN buss on SET 1 can have 80 cards/boards and the CAN buss on SET 2 can have 80 cards/boards. More repeaters can be added to expand the total number of cards the system can accommodate. The repeater itself does count toward the 80 board limit on both SET 1 and SET 2. See the illustration showing how to use repeaters to manage large amounts of circuit cards/boards.



Second, the CAN buss is only recommended to travel a total of 400ft (550ft theoretical maximum) in a run of cables between two termination resistors. Repeaters create T connections which can minimize total cable runs where necessary. It is important to remember that the repeater process from Set1 to Set2 on the CAN repeater is the equivalent of roughly 80 feet of cable.



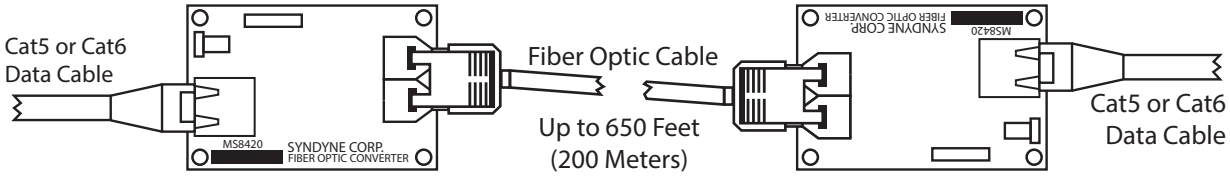
Lastly, repeaters can provide a console plug-in location which can be left open without causing communication problems throughout the rest of the control system. Any location where it is desirable to leave a CAN port open requires an MS8408 CAN Repeater. For example, if two console locations exist and either one of them could be left open depending on where the console is moved, two repeaters are required. Please see the illustration showing how to connect a console plug-in location with a CAN Repeater



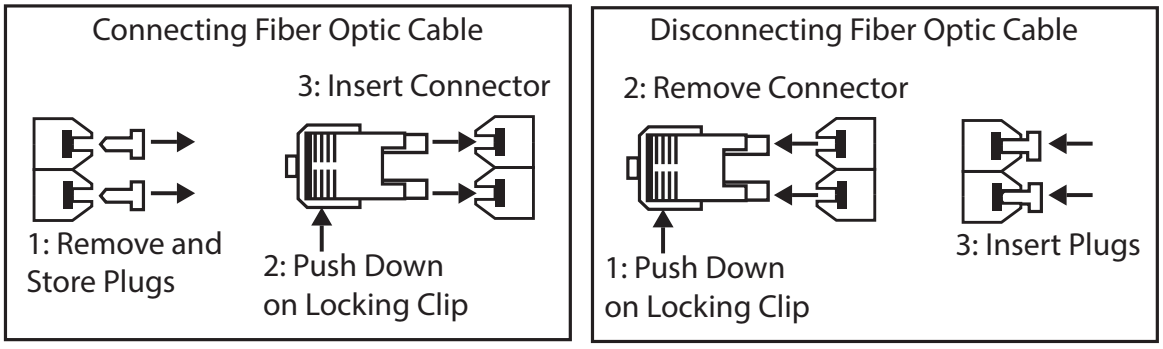
Please see the included illustrations showing how the MS8408 CAN Repeater is used to correctly accommodate large system communication requirements and multiple console plug-in locations.

MS8420 Fiber Optic Converter

The MS8400 system's standard communication uses Cat5e or Cat6 cables, which are readily available, easy to work with, and cost effective. However, the MS8400 is capable of communicating via fiber optic cable using the MS8420 Fiber Optic Converter produced by Syndyne. This adds the strength of fiber optics when needed for lightning isolation without the inconvenience of working with fiber optic components. Each MS8420 has a wall pack power connector to allow the converter to remotely power on the organ from the console if desired. See the illustration below which depicts a typical installation of fiber optics in the MS8400 system. Note that two converters are required per cable run.



The following illustration shows the steps required when installing or removing a fiber optic cable into an MS8420 Fiber Optic Converter. Please note the converter has rubber plugs which help keep away dust and debris from the fiber connector. It is critical to use these plugs whenever the fiber optic cables are removed. Leaving the fiber connectors empty can cause significant data problems by contaminating the internal fiber optic sensors in the connector with dust.



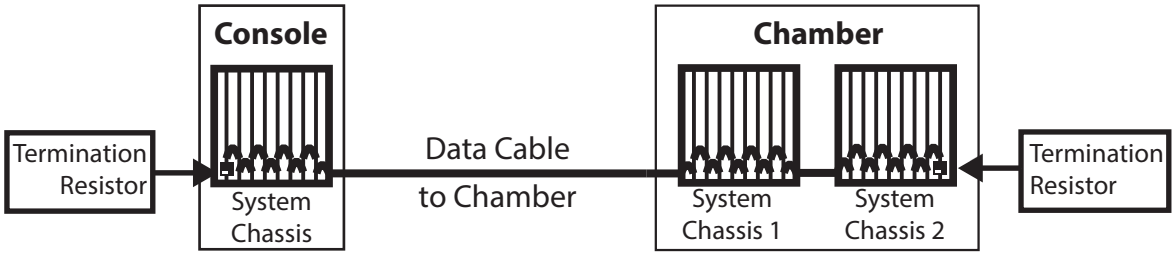
IMPORTANT!! Fiber Optic Cables are Fragile, especially when bending! Please handle with care!

System Layout Examples

The following examples are from real instruments we have worked with over the years. Every organ is unique in how it is designed and connected to a control system. These examples are intended to be used as patterns with different specifics depending on the individual installation requirements.

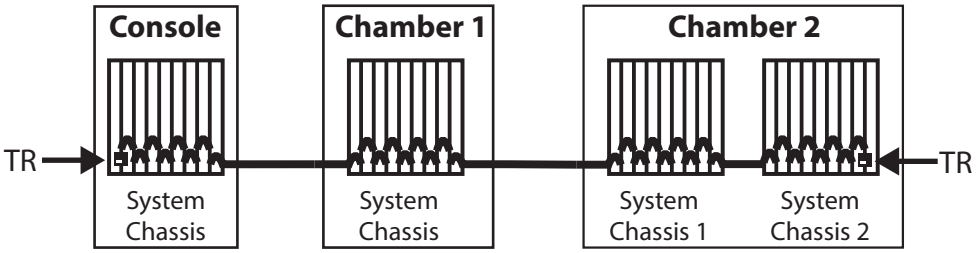
Simple Layout - 1 Fixed Console / 1 Chamber

This is a basic example of a smaller organ with one fixed console and one chamber connected with one data cable.



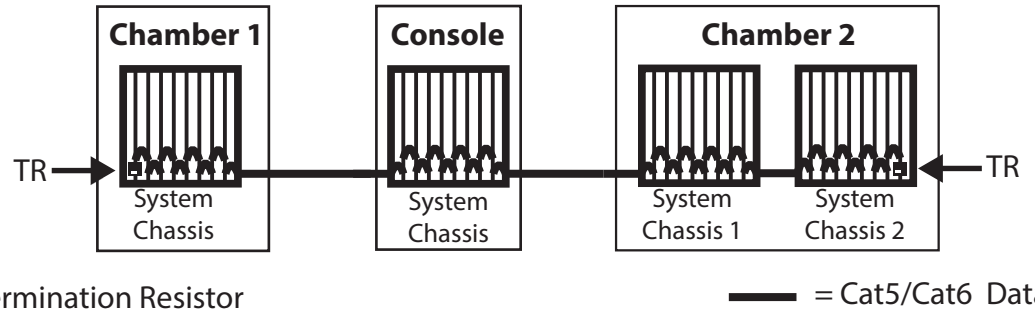
Layout for 1 Fixed Console / 2 Chambers / Example A

This instrument layout has a single fixed console with two separate chambers. In this case, it was simple to get a data cable from the console to the first chamber, and then get a data cable from the first chamber to the second chamber.



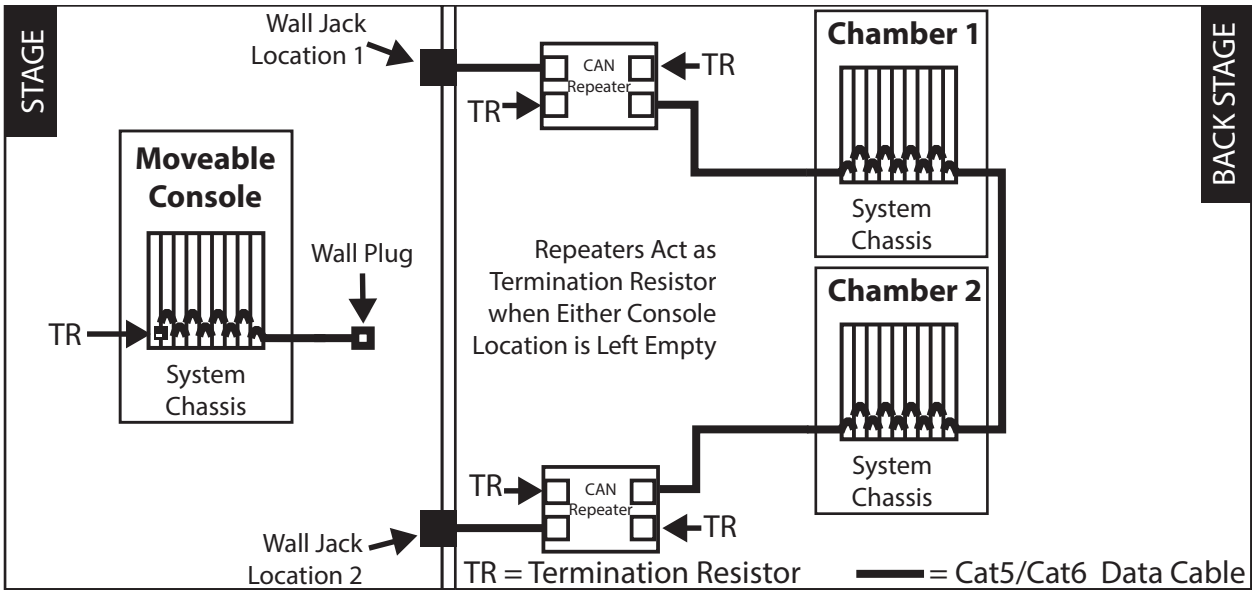
Layout for 1 Fixed Console / 2 Chambers / Example B

This instrument layout has a single fixed console with two separate chambers. For this instrument, there was no way to run a data cable between the two chambers. In this instance, there was a separate conduit running from the console to each individual chamber.



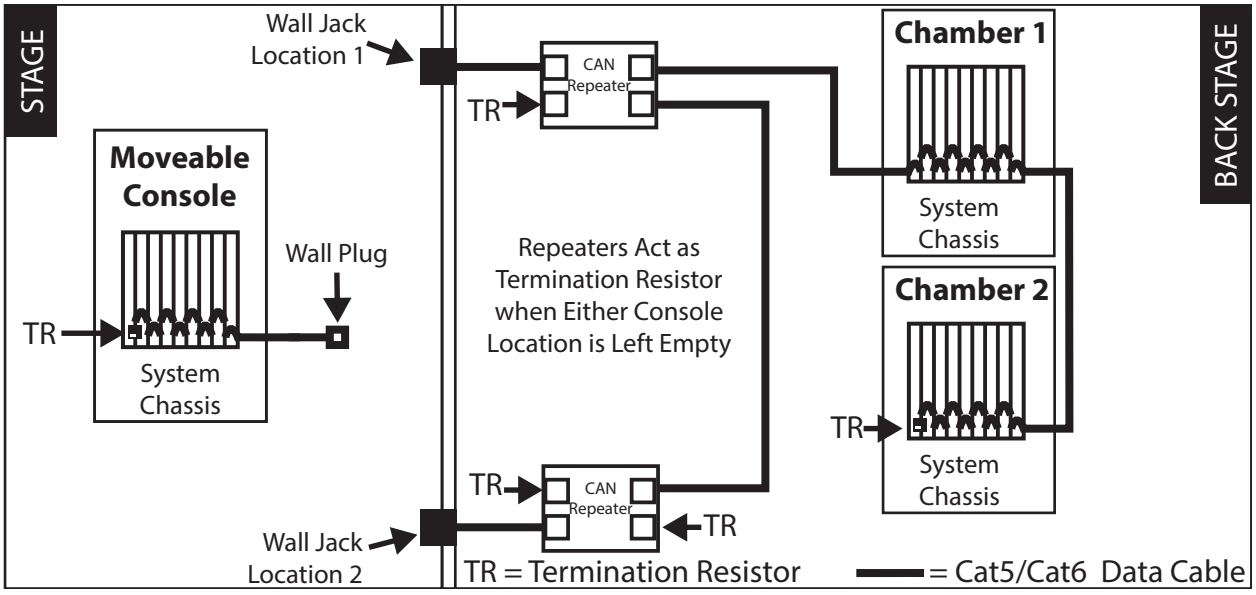
Layout for 1 Movable Console / 2 Chambers / Example A

This example includes a movable console on a stage with two console plug-in locations. These plug-in locations are on the rear wall on the left and right side of the stage. When having a movable console with multiple plug-in locations, an MS8420 CAN boost board is required in order for the system to function with one CAN plug left empty. In this example, it was easier to have the data cable go between the two repeaters, inside each chamber behind the stage wall.



Layout for 1 Movable Console / 2 Chambers / Example B

This example includes a movable console on a stage with two console plug-in locations. These plug-in locations are on the rear wall on the left and right side of the stage. When having a movable console with multiple plug-in location, an MS8420 CAN boost board is required in order for the system to function with one CAN plug left empty. In this example, it was easier to go from one console location to the next, and then into the chamber.



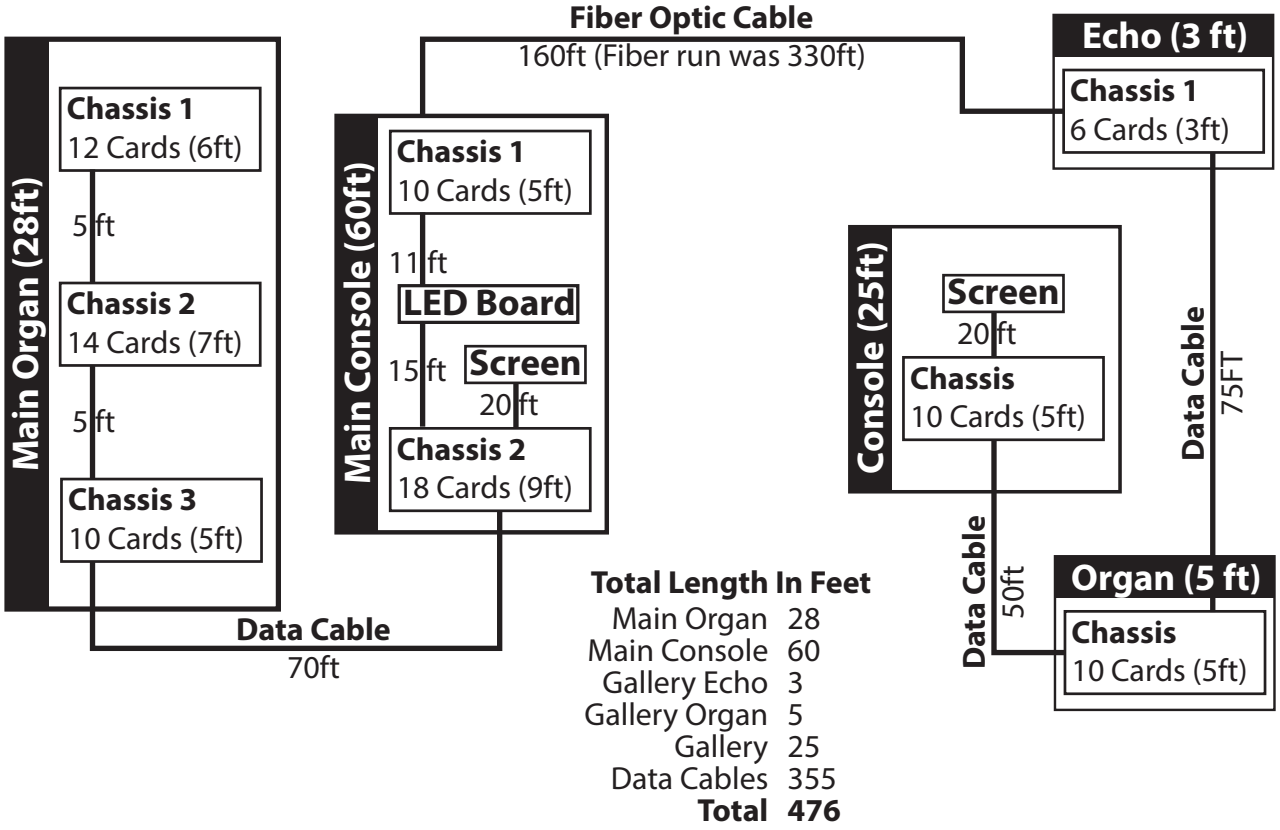
Calculating Data Cable Length

In addition to the system layout examples, please see the following information which can aid in correctly estimating total system data cable length. It is highly recommended to estimate and plan for data cable lengths before bidding a job to make sure that all necessary equipment is included in our quote. Please contact Syndyne if additional help is required in data cable planning.

- Count all boards within each Chassis and multiply them by 6" of cable.
- Add double the length of any data cables connected to an MS8405 Touchscreen.
- Add any cables used to connect multiple chassis together within a console or chamber relay.
- Add the length of any data cables connecting each console and chamber together.
- Add 80ft for any MS8408 CAN Repeater.
- Add 160ft for any Fiber Optic Converter (do not include fiber optic cable length.)
- Measure conduit and run lengths accurately because bends, curves, rises, and drops can drastically increase cable lengths.
- Total distance is recommended to stay under 500ft between any termination resistors.

Length Example for Large Instrument

This is an example of how a larger instrument with multiple consoles and chambers spread throughout a larger church was accommodated. This instrument had 280 Stops and 84 Pistons in the Main Console, 80 Stops and 56 Pistons in the Loft Console, 2880 Chamber Outputs in the Main Organ, 400 Outputs in the Echo, and 720 Outputs in the Swell. Conduits running down into the basement added significant cable length. A fiber optic converter reduced the large 330ft run down to 160ft and also isolated the 66 boards in the main console/organ from the 25 boards in the gallery console/organ. This reduced the total number of cards and the total distance to a reasonable level.



Wiring System Power

Without power, even the most advanced and sophisticated organ control systems are reduced to paper weights. Properly distributing, protecting, and managing power is vital to a successful system installation. This section gives guidelines and general recommendations of how to connect power to our control system. Requirements vary greatly depending on what type of organ is being controlled, and the driving requirements of the organ's individual components.

It is critical to research, know, and adhere to local and regional codes. Any recommendations we give are general and are subject to local and regional codes. If any local and/or regional codes differ from our recommendations, FOLLOW THE LOCAL AND REGIONAL CODES.

Choosing the Correct Power Supply(s)

The majority of problems we deal with in a system installation stem from a faulty or insufficiently sized power supply. It saves everyone time and money to start with good clean power. A good power supply should be clean and well-regulated between 12 Volts and 24 Volts DC. They should also be well-filtered, eliminating spikes, ripples, and/or large dips in voltage. Remember that an off-the-shelf multimeter is not capable of seeing quick spikes or drops in voltage, so relying on a meter alone to determine whether an old or suspect power supply is good enough to continue using is not a good idea.

Power Supply Sizing

Calculating the correct size power supply(s) requires a good grasp on the number of stop controls, magnets, system boards, and any other entities that need power to operate. It can be problematic to try and purchase a power supply before the organ specifications are tied down detailing all of the organ's needs. In cases where organ specifications are likely to change, we recommend estimating on the high end of necessary controls when calculating power supply needs. A supply which is too large will still function fine, while a supply that is too small will not.

Before figuring the size of supply needed, we recommend determining how many separate supplies are practical in an installation. It is best to limit the run of any main cable from a power supply to system boards to 10 feet. As cables grow longer than 10 feet from the power source to a system board the risk of voltage drop increases, and it can be difficult for the power supply to regulate voltage. At minimum, we recommend limiting main cable runs from a power supply to system boards to less than 20 feet. It might be possible to go beyond these recommendations, but it may end up costing much more to fix problems resulting from an insufficient number of power supplies. The cables going from the system boards to the chest magnets can be longer, but must be sized properly to limit voltage drop. See the section on Wire Gauge Recommendations for more information.

Once the number of power supplies is determined, use either of the following sheets to determine the total number of AMPS required by each power supply. Remember, calculate the requirements of each power supply separately depending on the number of controls to be powered by each individual supply.

Console Power Supply Calculation Sheet (Based on 12-Volt System)					
Console Control Type	**Amps**		**Qty**		**Amps X Qty**
Syndyne SAM or Drawknob	0.5	x		=	
MS8400 Circuit Boards	0.1	x		=	
*Harris™ Drawknob	0.75	x		=	
*Peterson™ SAM or Drawknob	0.75	x		=	
*OSI™ Coupler Switch (per tablet)	0.5	x		=	
Add all Numbers in Right Column for Supply AMPs Total					

*We do not control designs, documentation, or information on controls for other companies. These amperage requirements for non-Syndyne controls should be double-checked by the organ builder

Conservative Chamber Power Supply Calculation Sheet (Assuming 12-Volt System)					
Chamber Magnet Types	**Amps**		**Qty**		**Amps X # Ranks X # Notes at Peak**
*MS8406 Chamber Driver Card	*4	x		=	
Slider Motor (Enter Amps)		x		=	
DC Swell Motor (Enter Amps)		x		=	
Add all Numbers In Right Column for Supply Amps Total					

*We would not recommend going below 3 Amps per Chamber Driver Card, unless under special circumstances. If concerned, please contact Syndyne Corporation for help in determining the correct power supply.

These recommendations are general from our experience in the industry and will not fill the needs of all situations. Each specific installation's power requirements are highly affected by the type and aggressiveness of the organist using the instrument. The minimum requirements are good for many instruments because the organ in general is not played near its limit. A large instrument being played at full organ by a concert organist may push the limits of what an organ can handle and must be accommodated by the organ builder.

Surge Protectors

It is highly recommended to use a reliable surge protector with a large joule rating on the AC side of the organ power supply(s). This is even more important in installations at high risk of lightning strikes. When selecting a surge protector, it is important to find a protector that does not diminish in protection as power surge events occur. A lot of the retail surge protectors available online are meant to last very short life-cycles in comparison with an organ installation. These surge protectors may only protect against one power surge and then completely stop functioning without even an indication that they no longer provide protection. It is important to get a surge protector that either is designed to last multiple power surge events, or gives an indication that it is no longer functioning so it can be replaced before another power surge event. When in doubt, replace the surge protector before significant damage to the organ occurs.

Over-Current Protection and Fusing using the MS8400

Protecting an electrical circuit in case of accidental shorts and faults is critical to safety in any organ system installation. The primary method for protecting a circuit is installing over-current protection devices such as fuses and current limiters.

Syndyne designed the MS8400 system with the **NEC®** in mind, which can be helpful for builders who are required to comply with the **NEC**. Although our design is intended to aid in **NEC** compliance, the decision of whether Syndyne's method of onboard over-current protection meets the requirements of local or regional codes is up to the interpretation of each individual governing authority. For example, our interpretation of the **NEC** Article 650.8 Over-current Protection is that the term "over-current devices" include self-resetting fuses. The **NEC** did not state the type of over-current protection required, which by our interpretation is because they find self-resettable fuses and other over-current protection devices sufficient for use in pipe organs. Some inspectors may require the use of fusing that requires human intervention to reset or replace, such as circuit breakers or non-resettable fuses.

As a builder, any wiring, harnessing, or other work you provide, must be properly protected. Although the MS8400 has fusing which helps protect many of the circuits in an organ, our fusing does not protect against every potential fault and condition in an organ installation.

Syndyne includes non-resettable "main" blade fuses on each board with varying sizes depending on the product. These main fuses are sized such that the minimum wire sizes required by the **NEC** are sufficiently protected. For example, the MS8406 Chamber Driver has an onboard automotive (blade) style 15-AMP fuse. Mains are required by the **NEC** to be no smaller than 14 AWG, which is sufficiently protected by a 15-AMP fuse. Builders can also elect to replace our provided onboard fuses with fuses that are rated lower for additional protection. This is only recommended if the builder has a solid understanding of the reasons for and consequences of replacing a provided fuse with one of a smaller AMP rating.

NEVER REPLACE AN ONBOARD FUSE WITH A FUSE THAT IS CAPABLE OF A LARGER AMP LOAD THAN THE BOARD WAS DESIGNED TO HANDLE. THIS IS A FIRE HAZARD AND CAN CAUSE DAMAGE TO THE EQUIPMENT, DAMAGE TO PROPERTY, BODILY INJURY, AND/OR DEATH!

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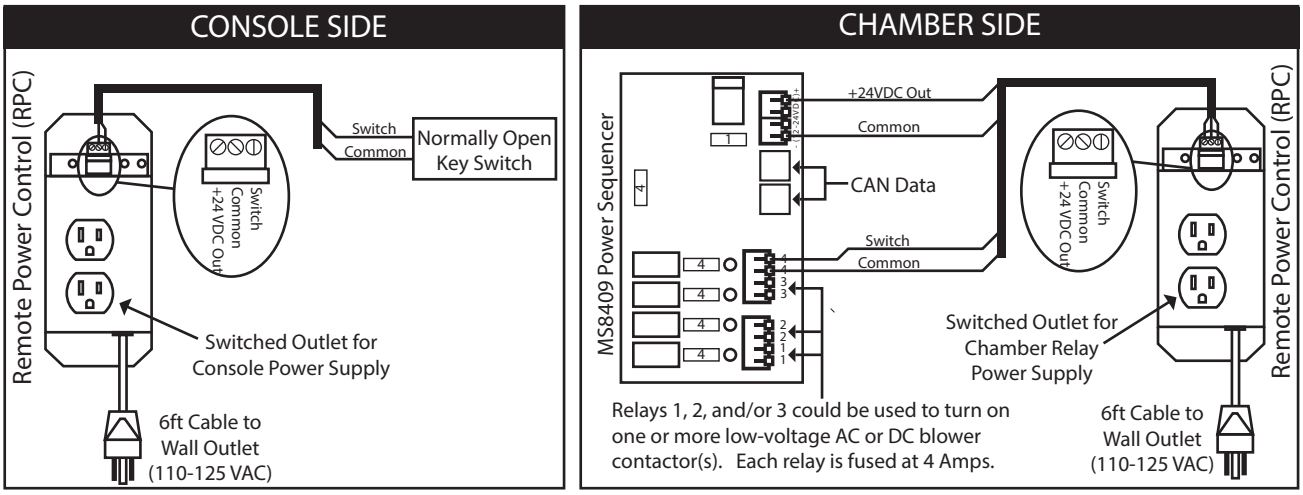
In addition to main fuses, most system outputs intended to drive a magnetic load, are protected by self-resetting fuses which provide more conservative protection than the maximum 6-AMP **NEC** requirement. In some cases, Syndyne provides additional protection in case multiple over-current faults occur simultaneously. The MS8402 Stop Controller has a 2 AMP automotive fuse for each set of 8 magnet outputs. If any one output shorts and sources too much current, the individual output's self-resetting fuse will provide protection. If multiple magnet outputs short, the 2-AMP non-resettable fuse will provide protection. Please see the section, Electrical Code Compliance in the appendix for more information.

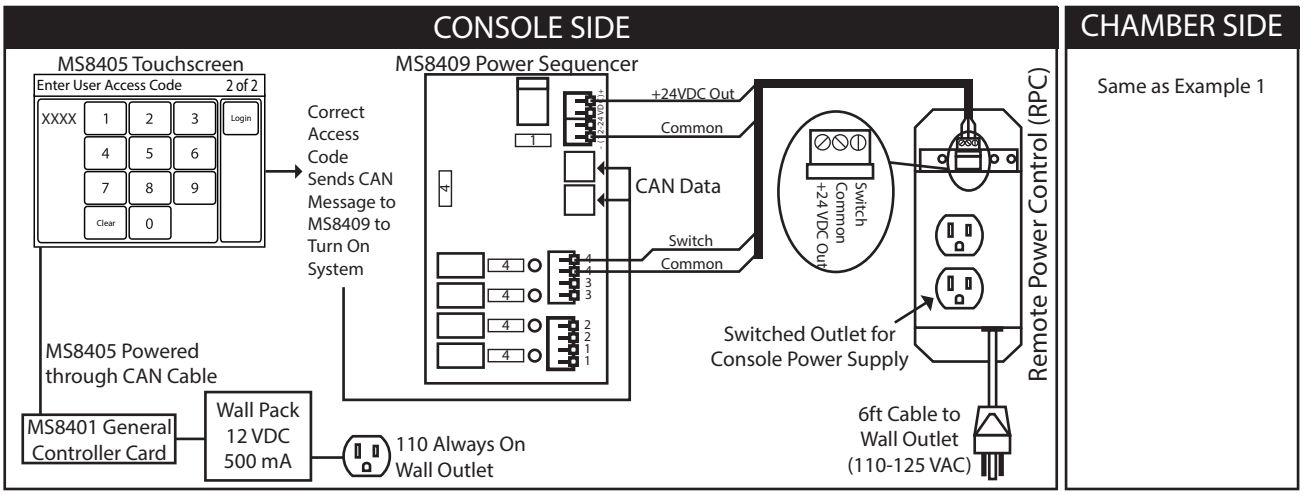
Power Control Using the MS8409

The MS8400 System can control power supplies throughout the system using one or more MS8409 Power Sequencer boards. Each MS8409 has four relays which provide a 4A AC or DC normally open contact. Each relay can be configured with a delay timer, a trigger method (CAN Traffic, Manual, etc), a relay name (for identification), and more. For more information on the MS8409 Power Sequencer board, see the System Components Section of the Organ Builder Manual. The following examples show typical installations utilizing the MS8409 to control power in the MS8400 System.

Example 1: Turning on the console power supply and the chamber power supply using a single key switch in the console. This example uses a key switch, an MS8409 Power Sequencer board, and two Remote Power Controls. The key switch in the console is wired to a Remote Power Control device, which turns on the console power supply. As the MS8400 system powers up, the data stream automatically tells an MS8409 Power Sequencer board in the chamber to turn on one of its four relays. This relay activates the second Remote Power Control device which turns on the chamber relay power supply.

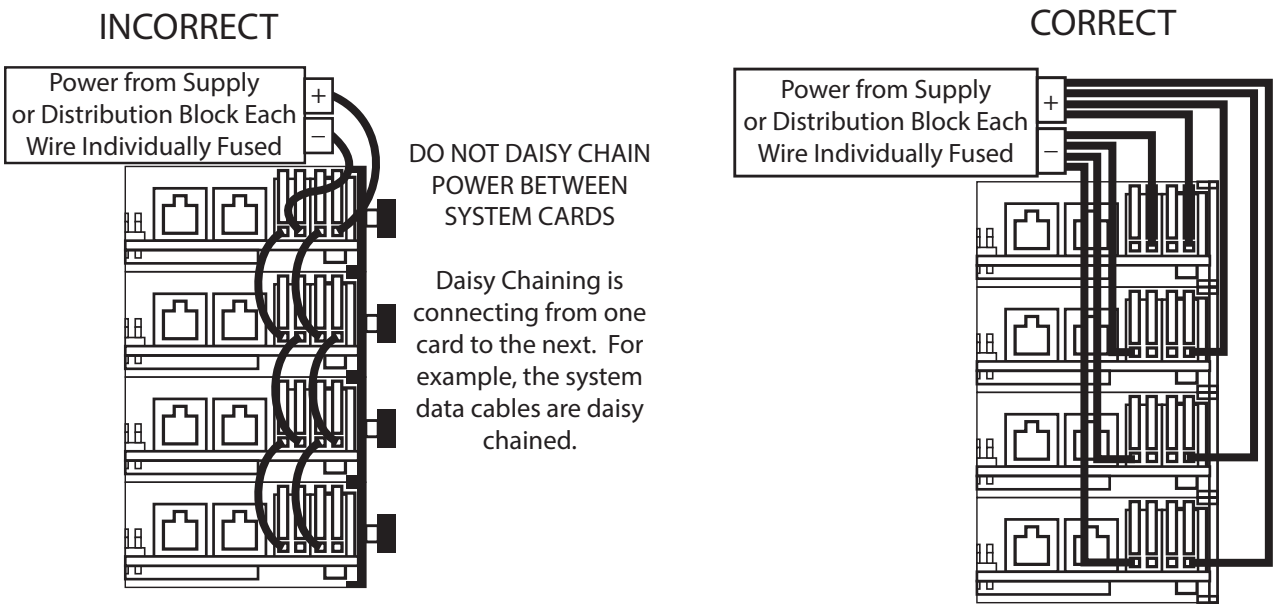


Example 2: Powering on the Organ using the MS8405 Touchscreen and a 4 digit passcode. This example uses the MS8405 Touchscreen, an MS8409 Power Sequencer board, and a Remote Power Control. When a user enters a correct access code into the MS8405, the Master Power Screen is displayed. This screen sends a power message to the MS8409 Power Sequencer which turns on the Console Power Supply using a Remote Power Control (RPC). A wall pack power supply is required to provide continuous power to the MS8405 Touchscreen. The wall pack is connected to the MS8401 General Controller which powers the MS8405 Touchscreen through its CAN Cable.



Connecting Power to the Chassis Boards

First, determine the proper gauge (size) of wire to use to connect power to the system boards within the chassis. Please see the section Wire Size Recommendations in the appendix for recommendations and information on how to properly select a wire size. Once the correct wire gauges have been determined, run power wiring to each board within each chassis. Do not daisy chain power from system card to system card. This is not an acceptable form of wiring power as the load and distance accumulates toward a large power requirement and voltage drop. Syndyne offers power distribution blocks to make this job easier. Syndyne also offers prewired power and system wire harnessing to save time and increase installation speed. Please see the illustration below depicting an incorrect daisy chained power connection and a correct power connection.



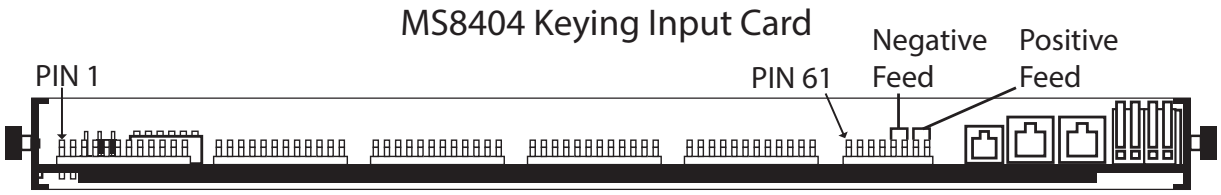
To properly protect the supply wires, we recommend each wire on either the positive or negative side with an appropriate fuse for the wire gauge.

It is highly recommended to protect the wires running to the chassis boards with fusing because any fusing before the distribution block was likely designed to handle much more power than the individual wires can handle. If two of the opposite polarity wires (+ and -) were shorted together, there would be no protection and the wires would most likely burn up under very dangerous circumstances. Syndyne's harnessing department typically choses one polarity of source wires (either + or -) and protects them using a distribution block with built-in fuses. The polarity is chosen based on the type of boards and the driving polarity of any magnetic loads such as stop controls. Syndyne also sells these fused distribution blocks to builders to aid in cleanly doing their own wiring.

Wiring Keyboards and Pedal Keys

The MS8400 system is capable of handling up to 32 divisions total. Each keyboard, pedal board, and floating division counts as a division. In the MS8400 system, each keyboard and pedal board is wired into a separate MS8404 Keying Input Card. These cards are given a card number (from 0-31) via a set of onboard DIP switches. The MS8400 system can have up to 32 divisions of keying. These divisions can either be a assigned to a keyboard, a pedal board, or a floating division. The MS8400 can have up to four separate consoles, and the 32 available divisions are assignable to any of the four consoles.

When wiring a keyboard or pedal board, connect the key contact from the lowest key (typically Low C) to pin 1 of the MS8404. Wire each key contact consecutively up to the largest key. Please note that the connectors are grouped into octaves until the last connector which houses the 61st key input, some unused pins, and pins for key feed.



The last four pins are available to wire as the key feed. Wire to either the + or the - pins on the MS8404 depending on the input feed jumper position that was set on the board. For more information, see the Setting Key Feed section in this manual. Do not use both the + and - pins on a board, as this is not how key feeds work. These pins are short circuit protected, so no damage will occur by shorting the + and - pins together, but it is generally better not to tempt fate. The key board will not function correctly attached to both + and - feed pins simultaneously.

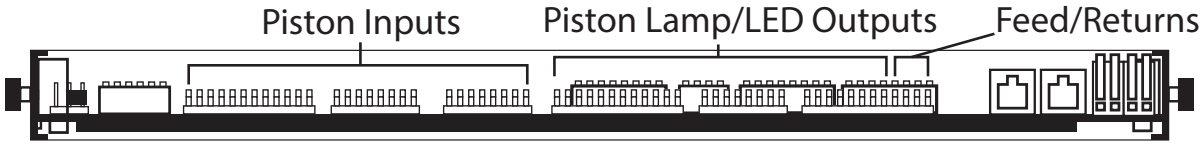
Each MS8404 Keying Input Card has an RJ11 connector for expression input. Please see the Wiring Expression section in this manual.

Floating Divisions are not wired into the system, but are set up via configuration using the MS8405 Touchscreen.

Wiring Pistons and Piston Lamp/LEDs

Pistons are normally open switches with momentary action, which means they have an internal switch which makes connection while the piston is pressed in, and break connection when the piston is released. Although some pistons on an organ have “latching” style actions, such as Tutti, the MS8400 system handles the latching operation while the piston is still simply a momentary switch.

The MS8400 system is capable of handling up to 224 pistons per console. Pistons are connected into MS8403 Piston Controller cards, which are able to drive up to 28 lighted pistons per card. See the following illustration showing the side view of the MS8403 Piston Input and an overview of its connections.

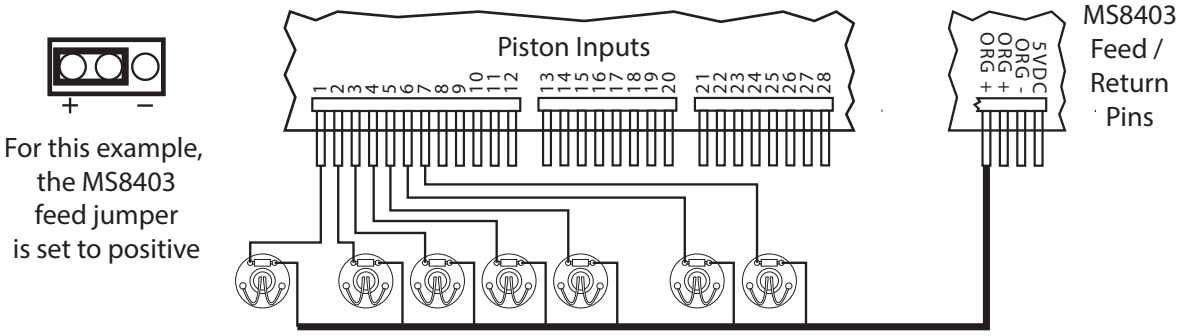


Piston Inputs (Piston switch connection)

Piston switches are wired into the MS8403 Piston Input card on the pins labeled “Piston Inputs.” These pins are numbered 1 through 28. Any piston can be wired to any piston input number, because pistons are individually configured using the MS8405 Touchscreen. There are no required locations to wire specific types of pistons. Simply wire one side of a piston’s switch contact to one of the piston input pin on the MS8403. The other side of the piston switch is wired to a piston common (feed). The piston common can be connected to organ positive or negative, but must match the feed jumper setting on the board. See the Setting Feeds section for more information. The MS8403 also has convenient pins available to be used for a piston common feed. It has two pins for Organ +, one pin for Organ -, and one pin for 5 Volts. The piston switch common

side should be wired to the Organ + pin or the Organ - pin. The 5VDC pin is intended for a 5-Volt lamp return only. DO NOT use the 5VDC pin for piston switch return. Please see the following illustration for an example of wiring piston inputs into the MS8400 system. Please note the piston feed jumper on the MS8403 Piston Card is set to "Positive" for this example.

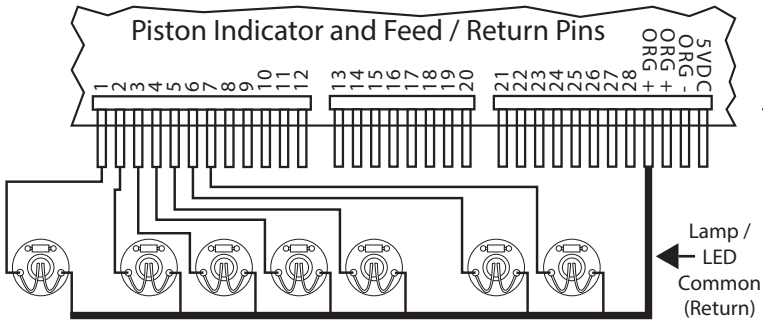
Wiring Syndyne Thumb Pistons to an MS8403 Card



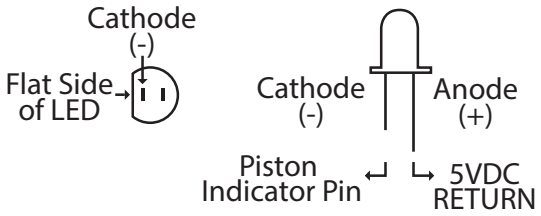
Piston Indicators (Lamps or LEDs)

Lighted pistons have a lamp or LED that indicate whether the piston is on or off. Typically, this is only used for piston functions which have a "latching" operation. Before wiring the piston indicators, first use the MS8403 DIP switches to select whether the pistons are lighted with a lamp or an LED. Once the DIP switches on the MS8403 are set correctly, proceed to wire one side of the piston indicators to the pin on the MS8403 with the correct number. When using LEDs, it is important to wire the "Cathode" side of the LED to the piston indicator pin on the MS8403 and the "Anode" side to the indicator common (feed). The pin number of the piston indicator and the pin number of the piston input must match. The common side of the piston indicators MUST be wired to a positive return. The 5VDC pin on the MS8403 can be used for 5-Volt lamps.

Wiring Syndyne 14-Volt Lighted Piston Indicators to an MS8403 Card



LEDs Legs Must Be Connected to the Correct Polarity

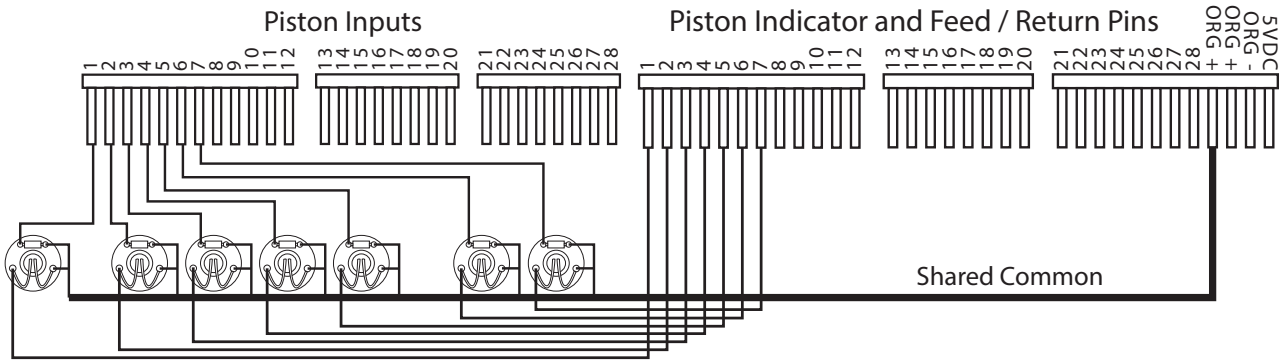


In the majority of organs, it is unlikely that many pistons will be lit simultaneously. Please insure the proper wire gauge for the common feed if more than eight pistons could be lit simultaneously.

Recommendations for Piston Wiring

There are a few recommendations for wiring piston inputs which could be useful to builders depending on preference. First, we recommend following a logical order especially for numbered pistons such as generals and divisionals. Second, if it is desirable for keyboards to be able to separate from each other during removal, make sure to wire pistons from separate piston slips onto separate connectors or use an adapter or junction board. Syndyne sells adapter boards with two rows of pins which can make it easy to junction or separate pistons in a variety of ways. Lastly, if at all possible, use 14-Volt lamps/LED pistons and set the MS8403 Feed Jumper to Positive. This makes it possible to use a single common for both the piston inputs and the piston indicators, which can save wire costs, space in the piston slips, and time. See the following illustration for an example.

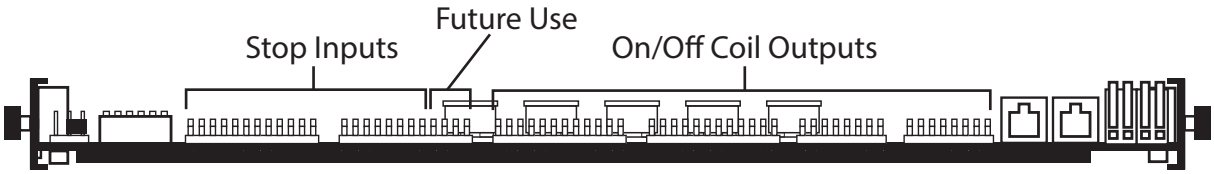
Example of Wiring Syndyne Thumb Piston with Shared Common



When using a reversible piston to control a stop control, it is not recommended to also have a lighted indicator such as a lamp or LED. The stop control acts as indication of whether the reversible is on or off. If it is absolutely necessary to use both a stop control and a light, the piston lamp/LED must be wired into the reversible stop control's input on the correct MS8402 Stop Controller card. This will allow the piston lamp/LED to turn on or off when the stop control is hand registered.

Wiring Stop Controls (Drawknobs, SAMs, Coupler Rails, Etc.)

The MS8400 system can accommodate up to 1280 stop controls including couplers. These are connected to MS8402 Stop Controller cards which can control up to 20 stop controls per card. The MS8402 is capable of sensing either positive or negative stop input feed via an onboard jumper, see section Setting Feeds for more information. The coil common for the MS8402 can accommodate either positive or negative, but must be ordered from the factory with the desired polarity.



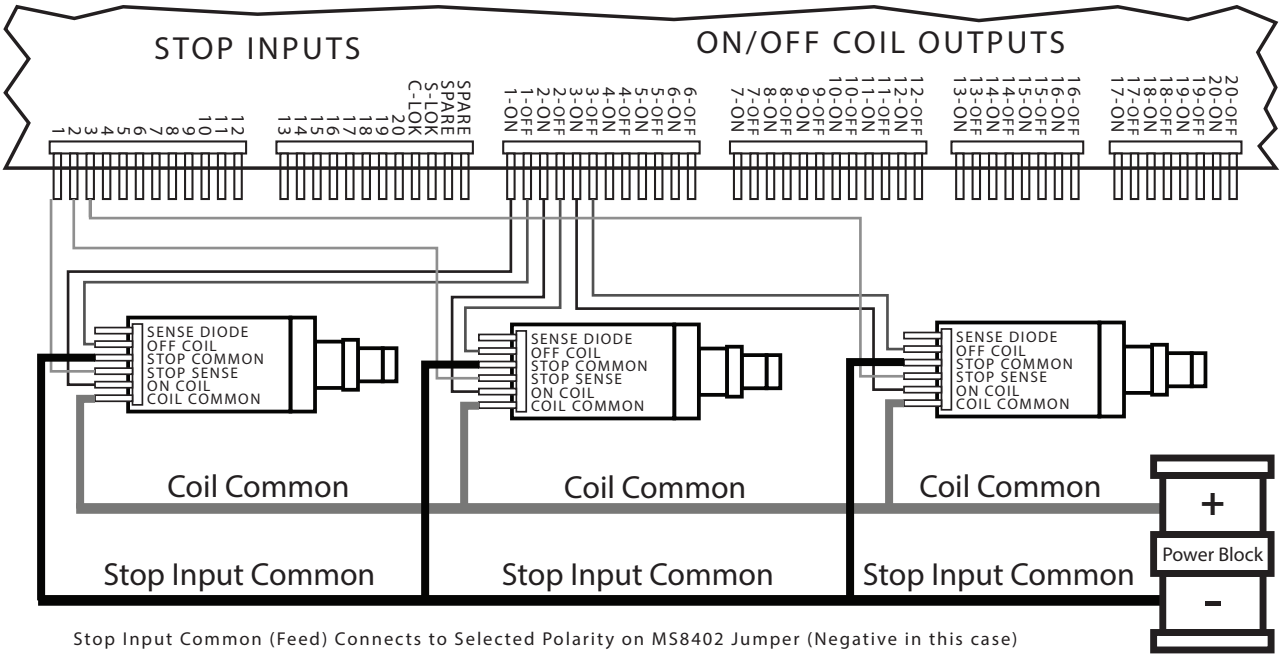
Wiring Stop Sense Inputs

Stop control switches (such as reed switches) are wired into the MS8402 Stop Controller card on the pins labeled “Stop Inputs.” These pins are numbered 1 through 20. Any stop control can be wired to any stop input number, because stop controls are individually configured using the MS8405 Touchscreen. There are no required locations to wire specific types of stop controls. Simply wire the stop control’s stop sense pin to one of the stop input pins on the MS8402. Wire the stop control’s stop common pin to a stop sense common (feed) on the power distribution block, or the power supply. See the included example of wiring Syndyne SDKs to the MS8402 for more information. Please note that the stop sense input number and the stop on and off coil number must match.

Wiring Stop On and Off Coil Outputs

Stop controls have two coils. One coil turns the stop control on and one coil turns the stop control off. The MS8402 Stop Controller card has 20 sets of pins for on and off coils. These numbered coil outputs correspond with the numbered stop sense inputs on the MS8402 Stop Controller card for each of 20 stops. The on and off coil input pin numbers must match the stop control input pin number. Wire the on coil pin from the stop control to the correct numbered on coil pin on the MS8402. Wire the off coil pin from the stop control to the correct numbered off coil pin on the MS8402. Wire the stop control’s coil common pin to a coil common (return) on the power distribution block, or the power supply. See the included example of wiring Syndyne SDKs to the MS8402 for more information.

Example: Wiring Syndyne Draw Knobs to MS8402N Stop Controller Card



Stop Input Common (Feed) Connects to Selected Polarity on MS8402 Jumper (Negative in this case)

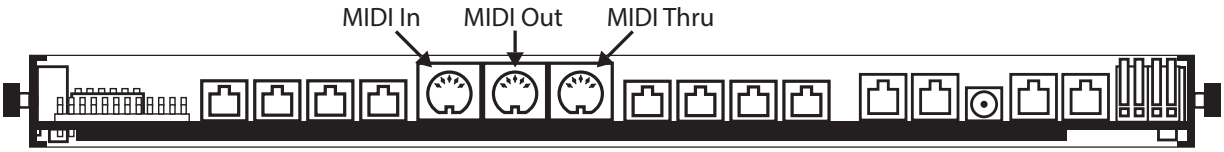
Coil Common (Return) Connects to the Opposite Polarity of the MS8402 Output (Positive in this case)

Connecting MIDI Cables

MIDI is a universal interconnection standard developed for the music industry. It is incredibly common to find MIDI In, Out, and Thru ports on all sorts of musical instruments. MIDI connections are available on two different boards in the MS8400 system. It is important to note that the MIDI connections on these two boards serve entirely different purposes.

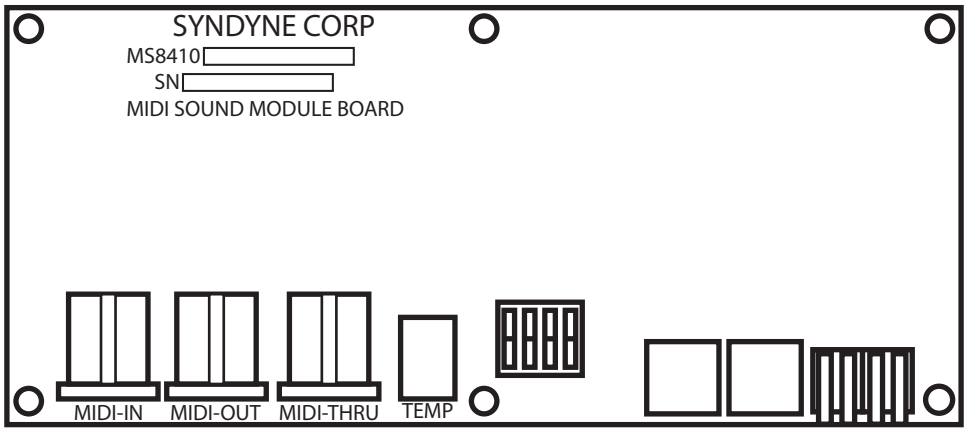
MS8401 MIDI Ports

The MS8401 has MIDI ports in the console that are rarely used, but are available for a variety of functions including external organ control and external record/playback. The MIDI In port can be connected to MIDI Keyboards to control the organ remotely. If an MDF-3 is being used, it can be connected to the MIDI In and MIDI Out ports to record and playback the organ. Please note that the MS8405 Touchscreen has its own record and playback function which is much faster than the MDF-3 or any other product that is reliant on MIDI communication methods. The recordings are made in Standard MIDI format, but recorded at a potentially faster rate than MIDI components can handle. Any recordings made on the MS8405 could have problems playing back on instruments with older control systems. Customers have also connected the organ to a laptop computer using the MIDI In and MIDI Out ports to track organ performances with motion pictures. Syndyne does not offer solutions for these different functions, we simply provide the MIDI ports and customers use them with other MIDI systems. See the following illustration of the MIDI In, MIDI Out, and MIDI Thru port locations on the MS8401 General Controller.



MS8410 MIDI Controller Board Ports

The MS8410 is designed to convert data from the MS8400 system data stream, such as keying and stop control data, to MIDI messages for use with MIDI sound modules. In a typical installation, the MIDI-OUT port on the MS8410 is connected to the MIDI-IN port on the sound module with a standard MIDI Cable. This allows information to come from the MS8410 to the sound module. On rare occasions the MIDI-IN port on the MS8410 is connected to the MIDI-OUT port on the sound module. This would be in situations where our system needs information from the sound module.



We developed the MS8410 to be able to control sound modules that utilize standard MIDI messages and communications, however, we also developed an architecture capable of easily adding new customized sound modules as they become available. Syndyne can only develop connections with MIDI sound modules which provide Syndyne with information on how its MIDI implementation works. If it is unclear how the MIDI sound module operates, we will not be able to gather this information through study of the unit itself. Please consult with the factory on a particular sound module before purchasing an MS8410 to be sure it will function as desired.

Wiring Chest (Note) Magnets

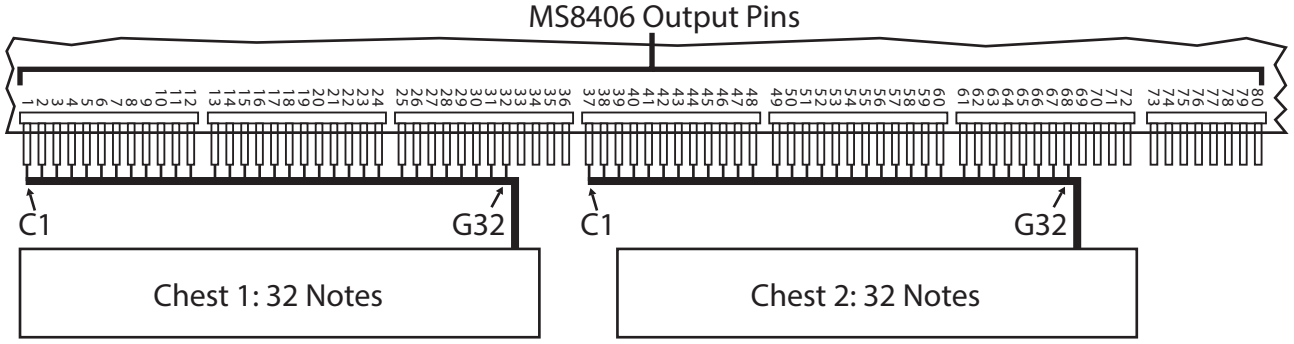
Overview of the MS8406 Chamber Driver Card

The MS8406 Chamber driver card is a multipurpose chamber driver card with 80 programmable outputs. These outputs can drive note magnets, stop line magnets, slider magnets, Swell shades, and more. Each of the 80 outputs can drive down to a 10 Ohm load at 15 Volts. Self resetting fuses for each output are on the circuit card and provide over-current protection at 2 AMPS. When programming an MS8406 to drive note magnets each card is capable of running seven different note programs (pitches) for each stop control in the system. This makes synthetic mixtures, resultants, borrowing, and tricky wiring much easier to accommodate. Note magnets can also be programmed to span across multiple cards. It is important to understand how the MS8406 Chamber Driver is configured prior to wiring. Please see the Configuration Section of this manual for more details on configuring the MS8406 prior to wiring.

Wiring Chests Magnets to MS8406 Outputs

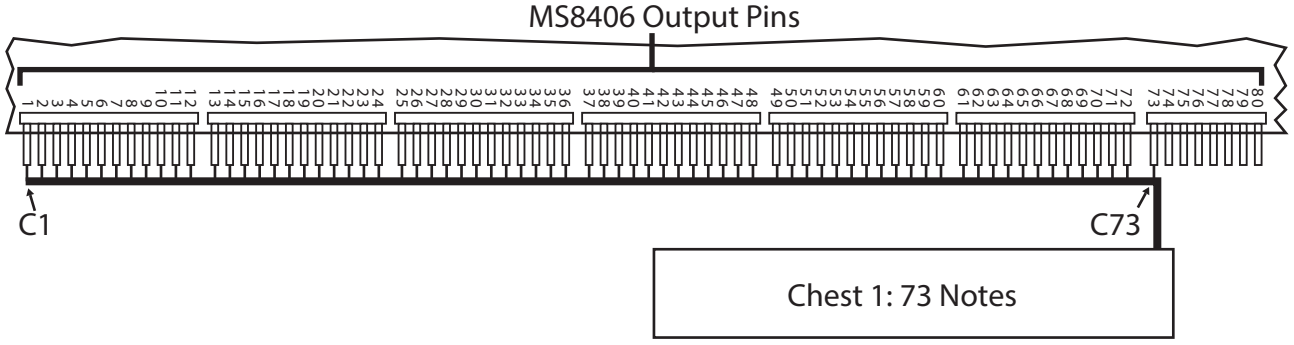
The MS8406 Chamber Drivers can be configured to operate differently depending on the installation, which means chest magnets can be wired to the MS8406 outputs in a variety of ways. However, there are recommendations which can help simplify an installation, as well as limitations to the system's flexibility. Please see the following examples which describe many common scenarios and the recommended method for wiring.

Maintain Octaves on 12-Pin Connectors Where Possible



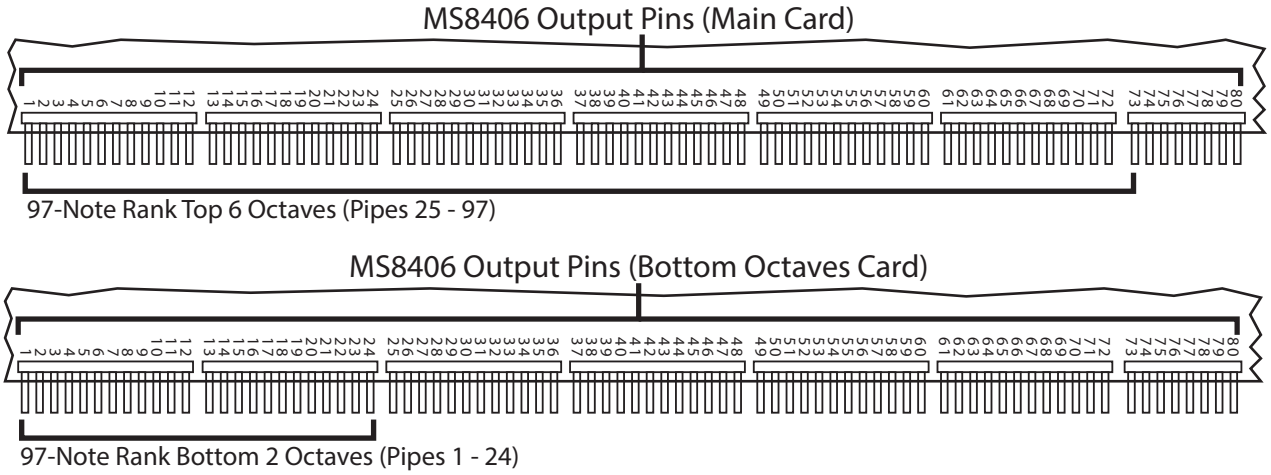
Notice how Pins 33 through 36 are left unwired. If wiring for Chest 2 is started on pin 33, then the connectors no longer represent 12 note octaves. This makes troubleshooting, system configuration, and overall organization more difficult and less clean. Unused pins can be used to drive stop lines, or other functions that are not associated with octaves.

The Lowest Note Connects to the Lowest Pin Number



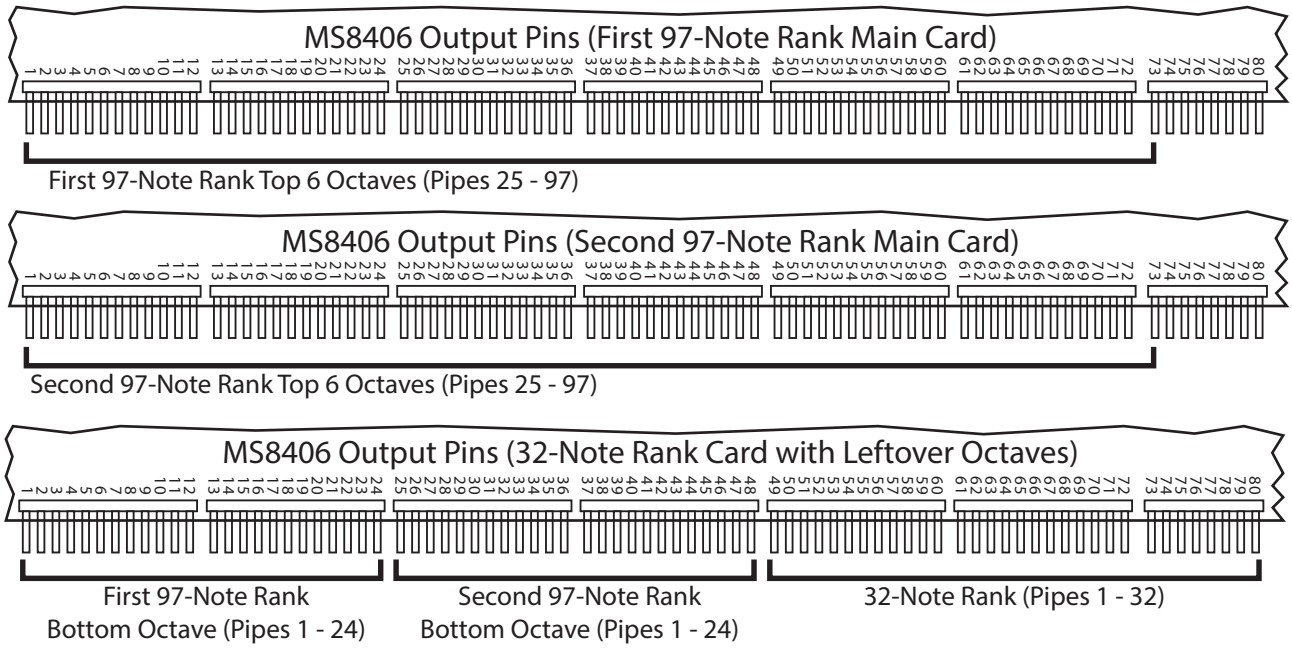
The system is designed to have the lowest note connected to the lowest pin number. It is not possible to wire the outputs in reverse order.

For Ranks Over 73-Notes, Move the Lower Octaves to Another Card

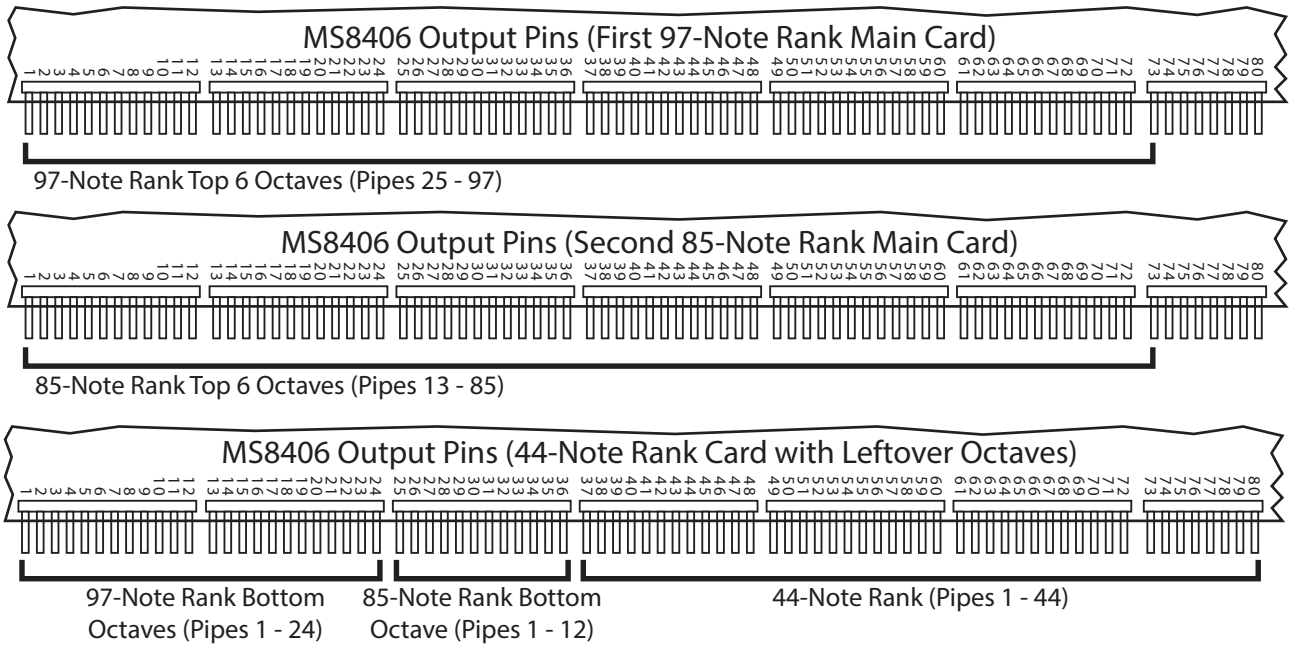


When using an 80-output driver card, a common concern is what to do with ranks that have more than 80 notes. Many builders who start out using the system wire the first 80 notes of a larger rank to one card, and then attempt to place the upper notes on a separate card. This can generate more wasted pins and make it harder to keep octaves attached to 12 pin connectors. We recommend placing the bottom octaves of larger ranks on another card instead. Please see the following examples of how this method can help decrease the number of extra output pins. Keep in mind, that extra output pins can be used to control Swell shades, stop lines, relays, and other chamber functions.

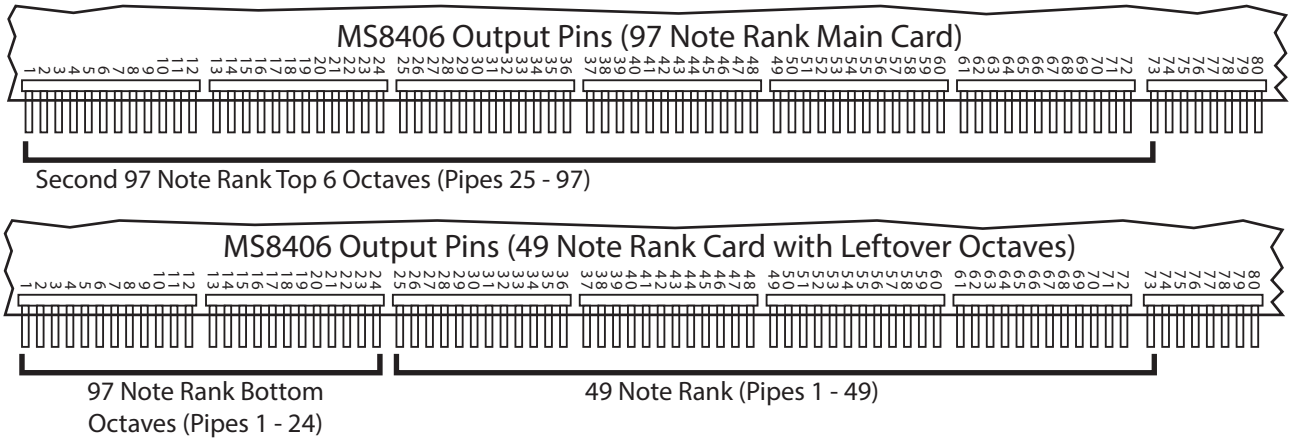
Over 73-Notes Example: Two 97-Note Ranks and One 32-Note Rank



Over 73-Notes Example: One 97-Note, One 85-Note, and One 44-Note Rank



Over 73-Notes Example: One 97-Note Rank and One 49-Note Rank



Diatonic Wiring (Form A or Form M)

We highly recommend wiring diatonic chests in their proper note order as opposed to wiring each side of the chest in order with odds on one half and evens on the other. We do have a feature which allows the builder to wire in diatonic ranks in this way, but it has several critical limitations. For example, this mode cannot accommodate offset chests or borrows. If you intend to use this feature, please make sure you know how it works and contact Syndyne Corporation with any questions bout how it works. We have found that the troubleshooting complications that stem from not wiring the chests in the proper note order far outweigh the installation savings of wiring the odd notes on one side and evens on the other.

Wiring the Chest's Magnet Returns

The output polarity for driving the note magnets is indicated in the cards part number, so an MS8406P feeds positive to the coils and an MS8406N feeds negative to the coils. The output polarity of the card is built at the factory and cannot be changed. The vast majority of MS8406 cards we sell are MS8406P positive output because there are electrical and cost benefits to using positive drivers. Negative drivers are available, but are special order.

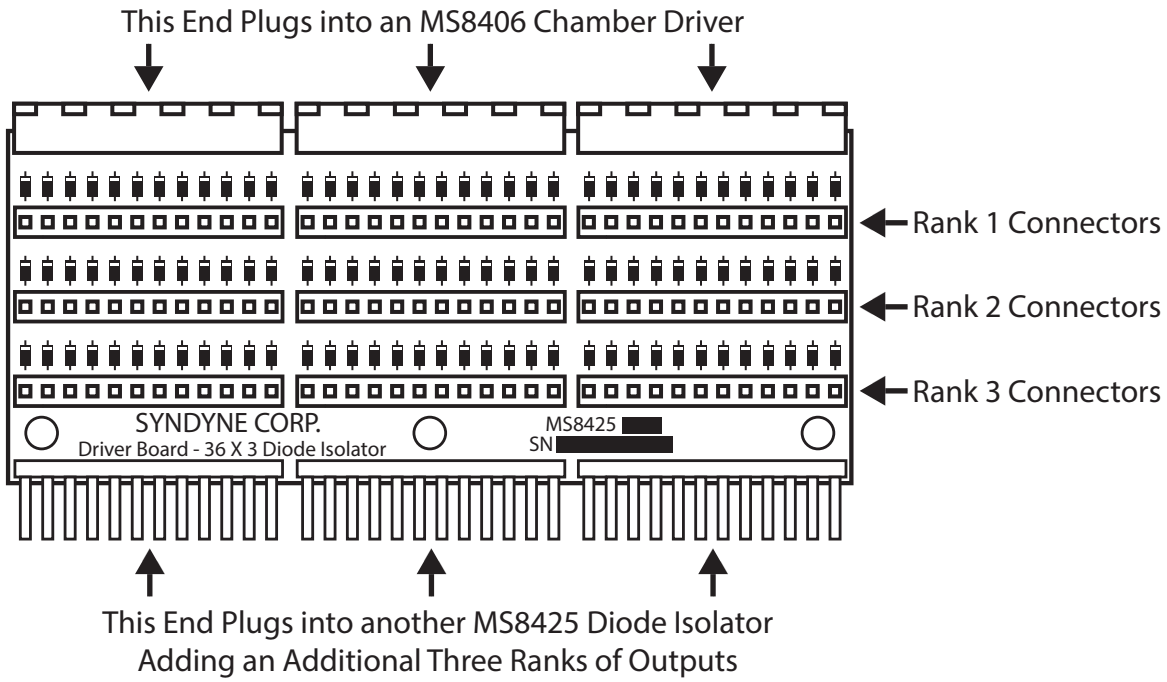
Chest returns are connected to the opposite polarity of the Chamber Driver's output polarity. When using an MS8406P, connect the chest magnet returns to organ power negative. When using an MS8406N, connect the chest magnet return to organ power positive. Chest returns must be a minimum of 14AWG wire. See the Wire Size Recommendation section in the appendix for more information on wire sizes for chest returns.

Synthetic Mixtures, Resultants, and Multi-Pitch Stops

The system is capable of operating seven different note programs (or pitches) per stop control per MS8406. This can be used to create synthetic mixtures, resultants, and mult-pitch stops without having to hardwire them. We recommend reading the configuration section for more information on programming chamber drivers in multi-pitch mode.

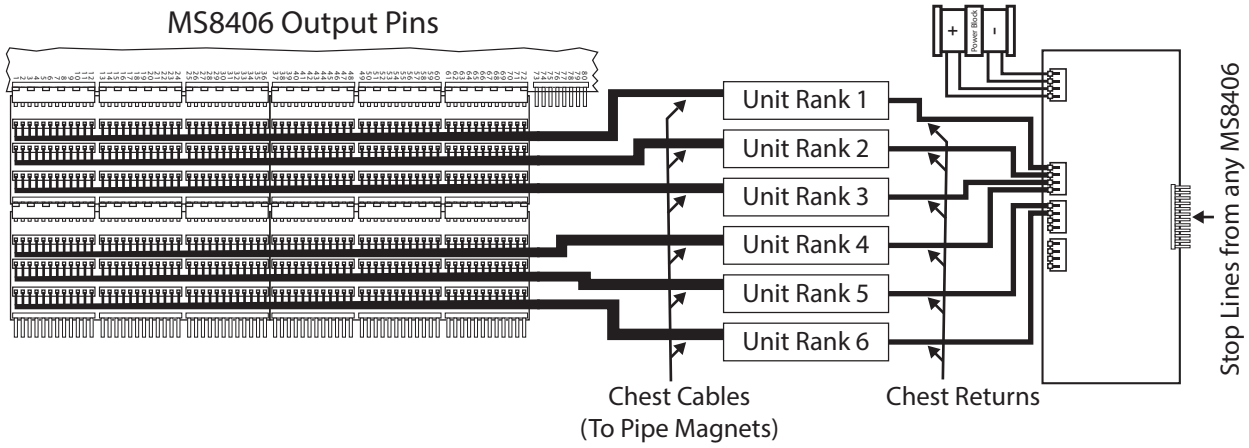
Wiring Multiple Note Unit Ranks as a Straight Chest to Save Money

Syndyne sells a diode isolator system which can be used to drive several separate unit ranks using one MS8406 Chamber Driver card. The ranks operate like a primary, which means the ranks must be played straight with no borrowing. This system includes the MS8425 Diode Isolator card, the MS8426 Output Boost card, and the MS8406 Chamber Driver card. Special consideration is required when estimating wire gauge and determining required current using this method because multiple chamber magnets will be driven per each output on the MS8406. Please note that this scenario is only recommended when on a tight budget and is not recommended for all installations. It is still better to wire unit ranks into separate MS8406 cards because it allows more flexibility down the road, as well as a cleaner looking installation. Please see the following illustration of the MS8425 Diode Isolator board.



The MS8425 Diode Isolator board has three sets of 36 diode isolated pins which means it takes two MS8425 diode isolators side by side to control 61-note unit ranks. Each set of diode isolated pins are connected to a separate unit rank which means one MS8425 is capable of driving up to three unit ranks. If more than three unit ranks are to be connected, another MS8425 can be plugged onto the first MS8425 to add another three ranks worth of pins. The MS8425 is plugged directly onto an MS8406 Chamber Driver card on one end, and the other end is capable of plugging into another MS8425 if required. The unit ranks are each wired into one of the sets of pins on the diode isolator(s).

The chest return for each rank must be controlled by a stop line, which requires connection to an MS8426 Output Boost board. The MS8426 has 12 individually 4 AMP fused connections for returns, each controlled by an associated stop line input. Wire the chest return from each rank into a separate fused connection on the MS8426. Wire the stop line for each rank into the corresponding stop line input on the MS8426. We recommend limiting current to 1.5 AMPS per output and a total of 12 AMPS per MS8406 driver card on at one time. It is best not to use this method for magnets less than 60 Ohms. Due to the increased current involved in this method of chest control, it is extremely important to use the correct size wire gauge and to have a good knowledge of managing power in an organ system.



When using the MS8426 boost board to control 12 separate chest returns (the max number of pins on the board) we recommend using two 12 gauge wires for positive and two 12 gauge wires for negative from the power distribution block to the MS8426 main power connector. This is the maximum gauge wire that will fit on the MS8426. We also recommend limiting the distance of the wire to the MS8426 main power connector to under 5 feet. This will help to minimize voltage drop which is introduced into the magnetic circuits when switching the chest returns. Switching chest returns with the MS8426 introduces an estimated additional voltage drop of 1.5 Volts due to the diode and transistor. It is highly likely that your power supply will have to be run at an increased voltage to counter act this additional voltage drop.

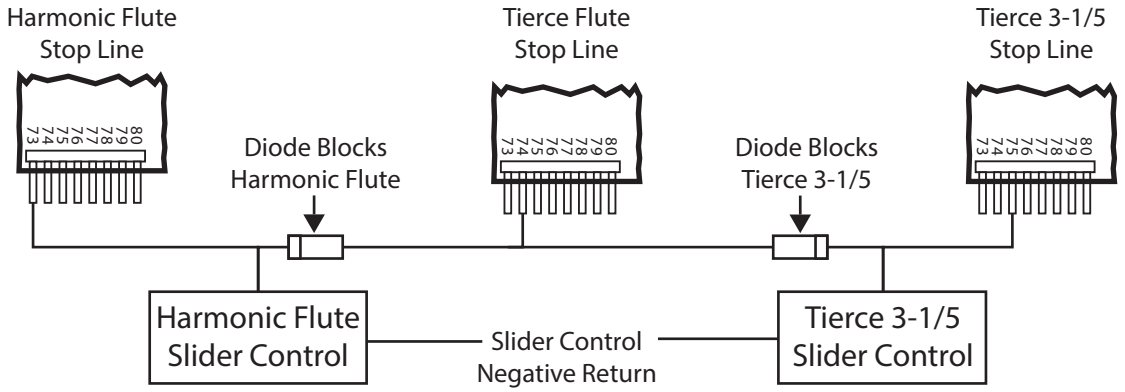
Wiring Stop Lines (Outputs in Chamber Tied to Stops in the Console)

Any stop control can be configured to turn on one or more outputs in the chamber. These outputs can be used to apply wind to a chest, turn on/off a Zymblestern, activate a relay, etc. In the MS8400 system, any stop control can be configured using the touchscreen to control an output on any MS8406 Chamber Driver card. A stop control can turn on/off an output on more than one MS8406 card, but it can only control one output per MS8406 card. If more than one stop line needs to be controlled using a single stop control, the outputs will need to come from more than one MS8406 card. It is possible to wire two stop lines to a single output, but it is not recommended to drive over 1.5 AMPS total on one output.

To wire a stop line, select an unused output on an MS8406 Chamber Driver card. Use a properly sized wire to connect the stop line to the desired output on the MS8406. It is important to follow the instructions from the manufacturer of the stop line control to determine how to properly connect the output, as well as the amperage required in determining the proper wire gauge. Remember that the output on the MS8406 feeds the polarity that is written on the driver card. This is set at the factory and cannot be changed in the field. The vast majority of systems sold by Syndyne are positive output drivers, which mean the "return" from the stop line controls should be connected to negative. If the MS8406 happens to be a negative output, the stop line control's return will be connected to positive. Depending on the device, this could be done through wiring, or part of the device's main power connector.

Under certain conditions, such as a Nasard Gamba, it may be necessary to attach two separate stop line controls to a single output on an MS8406 Chamber Driver card. In these dual stop conditions it is necessary to install a diode to isolate the dual stop lines from the individual stop lines. See the illustration below for an example of wiring stop lines for a dual stop scenario.

Example: Wiring Stop Lines for a Dual Stop such as a Tierce Flute (Positive Output)



Stop lines can come from one MS8406 Chamber Driver card or more than one.

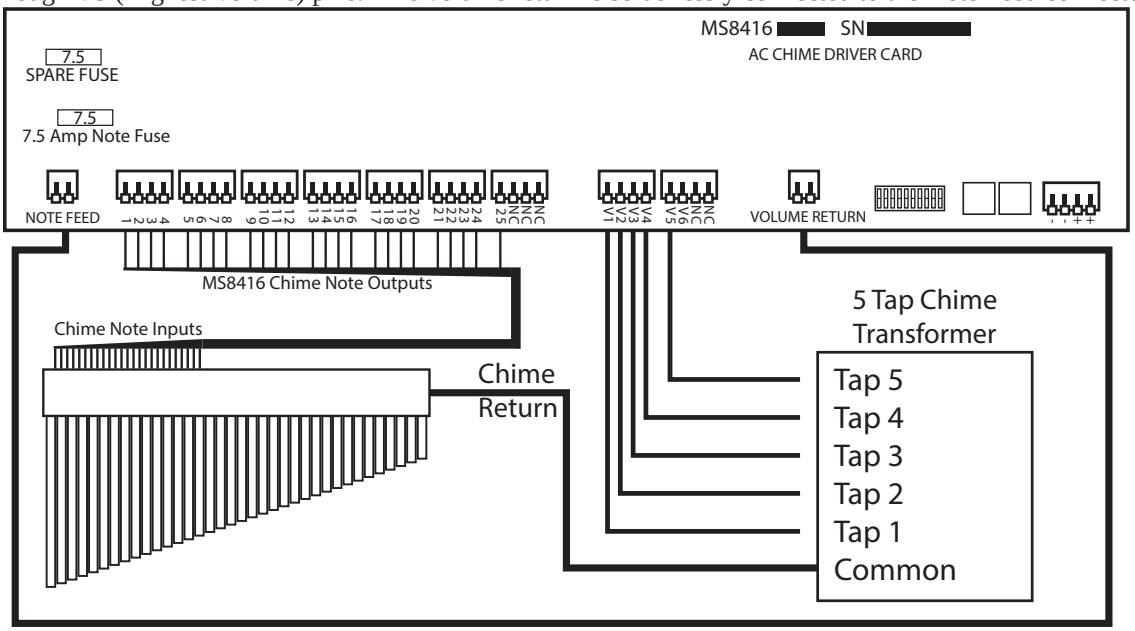
Wiring AC Chimes

The MS8416 AC Chime driver is used to control AC Chimes in the MS8400 system. It operates on 12-24 Volts DC which is connected to the main power connector. It also requires a typical 28VAC chime transformer to be connected as detailed in the diagram's below. Chimes are solderlessly connected to 25 output pins on the MS8416. The chime magnet return wire is connected to the common terminal on the chime transformer.

Be careful to connect the chime magnet return, note feed, volume return, and transformer common correctly!
Do not connect the Chime Return to the Note Feed Connector on the MS816!
Do not connect the Transformer Common to the Volume Return!

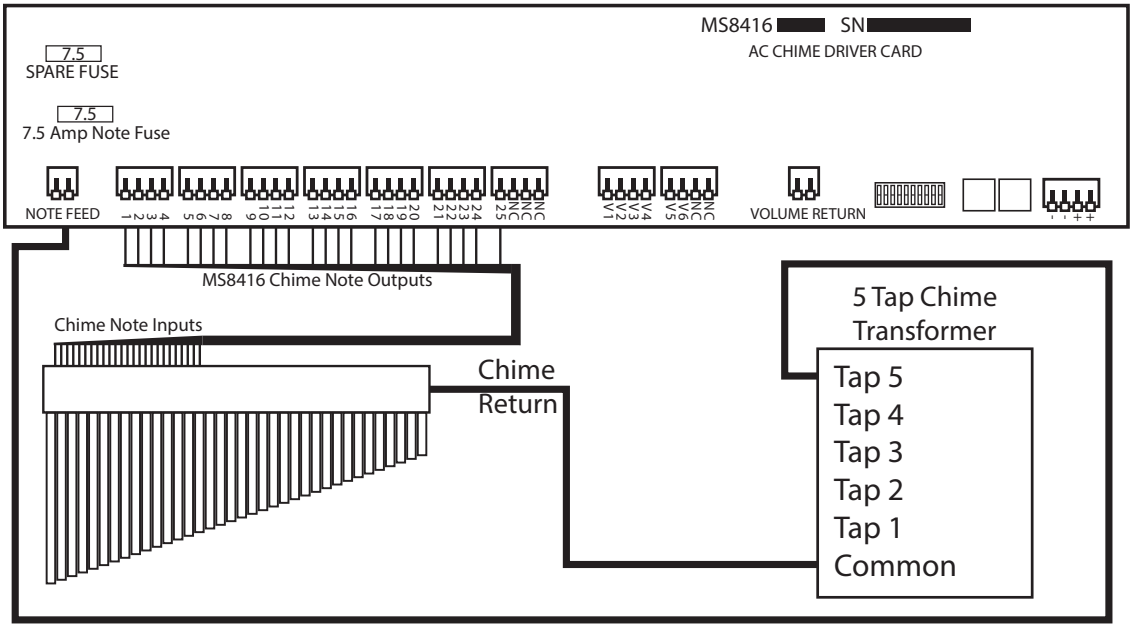
Wiring AC Chimes with Volume Control

When wiring the MS8416 with volume control, the chime transformer taps are solderlessly connected to the V1 (Lowest Volume) through V5 (Highest Volume) pins. The volume return is solderlessly connected to the Note Feed connector.



Wiring AC Chimes without Volume Control

When wiring the MS8416 without volume control, attach the desired tap from the transformer to the Note Feed connector. The selected tap will be the volume level of the chimes at all times.



Wiring Swell Shades

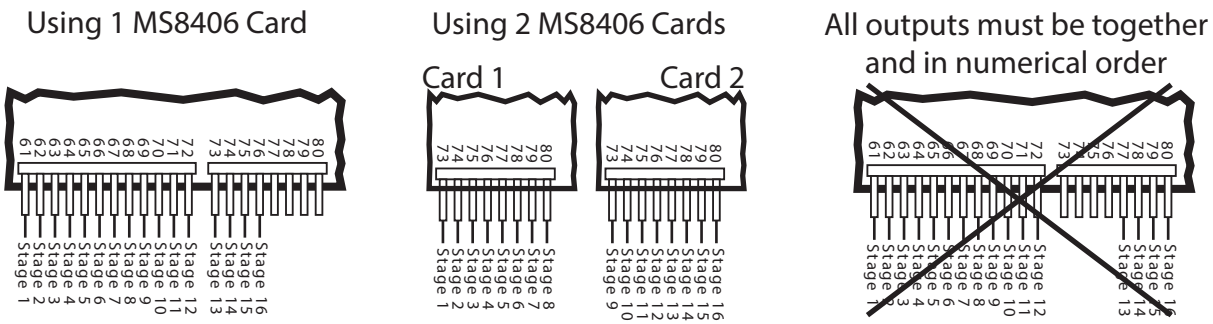
Before wiring expression outputs, it is important to understand how expression outputs are configured. See the configuration section for more details on configuring expression output stages.

Incremental Expression Stages

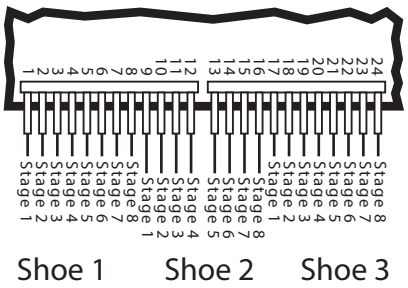
The MS8400 can drive outputs for 1 to 16 stages of expression per shoe. Expression is driven using outputs on any MS8406 Chamber Driver card(s). MS8406 expression outputs must be wired incrementally from lowest stage on the lowest pin number to highest stage on the highest pin number. Multiple MS8406 Chamber Driver cards can be used to drive expression for a single shoe, but each MS8406 can only be configured with one set of outputs for each expression shoe. It is not possible to use more than one group of outputs on a single card. See the illustration for examples of how to wire (and not to wire) expression shoe outputs.

When configuring an expression shoe's outputs, it is possible to invert the operation of the shoe. This means that instead of the outputs being normally off with the shutters closed, the outputs will be normally on with the shutters closed. During normal operation, all outputs will be off while the shutters are closed, then output 1 turns on with stage 1, output 2 turns on with stage 2, etc. During inverted operation, all outputs will be on while the shutters are closed, then output 1 turns off with stage 1, output 2 turns off with stage 2, etc.

Example: Wiring Swell Shoe's 16 Stages of Expression



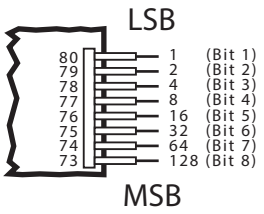
Example: Wiring Three Expression Shoes to One MS8406 Card (8 Stages per Shoe)



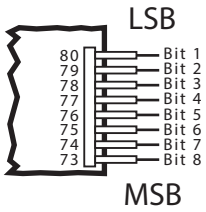
8-Bit Binary Expression Output

MS8406 Chamber Driver cards can be configured to drive Expression outputs in 8-bit binary. The 8-bit binary outputs must be in order with the least significant bit on the lowest output pin and the most significant bit on the highest output pin. When using less than 8 bits of binary, use the least significant bits.

MS8406 8-Bit Binary Expresson Outputs



MS8406 8-Bit Gray Code Expresson Outputs



8-Bit Gray Code Expression Output

MS8406 Chamber Driver cards can be configured to drive Expression outputs in 8-bit Gray code. The 8-bit Gray code outputs must be in order with the least significant bit on the highest numbered output pin and the most significant bit on the lowest numbered output pin. When using less than 8 bits of gray code, use the most significant bits.

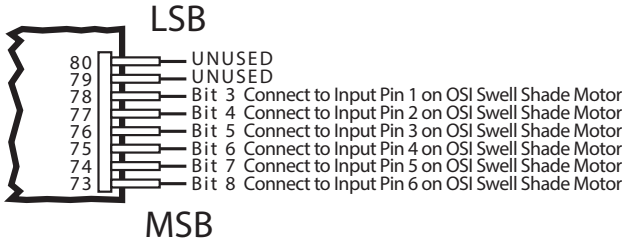
OSI Swell Shade Motor - 6 Bit Gray Code

The MS8400 can control the OSI swell shade motor. Syndyne studied the OSI documentation and contacted OSI regarding the information required to control the motor using Gray code. This information was correct at the time this section of the manual was written and Syndyne cannot be held responsible for changes OSI makes for its motor controller in the future. If you have any problems controlling the OSI motor, please download the latest motor controller documentation from the OSI website, or contact them for the latest copy. Do not attempt to connect to the OSI swell shade motor without reading and understanding the documentation from OSI.

MS8406 Chamber Driver cards can be configured to drive expression outputs in 8-bit Gray code. These outputs have to be in order and are only available with the least significant bit on the highest numbered output pin and the most significant bit on the lowest numbered output pin. In cases such as the OSI swell shade motor, where less pins are available, the most significant bits are used. Please see the example below for more information.

In this example, the MS8406 Chamber Driver is configured for Gray Code starting on pin 73. This dedicates the last connector on the chamber driver for Gray Code operation. The OSI swell shade motor is connected to use 6 bit Gray code, which is what we recommend.

MS8406 8-Bit Gray Code Expresson Outputs



OSI Swell Shade Input Pins

16 See OSI Manual For Connections on Pins 9 through 16
15
14 See OSI Manual For Connections on Pins 9 through 16
13
12 See OSI Manual For Connections on Pins 9 through 16
11
10 See OSI Manual For Connections on Pins 9 through 16
9
8
7
6 Connect to Pin 73 on MS8406 (Bit 8) MSB
5 Connect to Pin 74 on MS8406 (Bit 7)
4 Connect to Pin 75 on MS8406 (Bit 6)
3 Connect to Pin 76 on MS8406 (Bit 5)
2 Connect to Pin 77 on MS8406 (Bit 4)
1 Connect to Pin 78 on MS8406 (Bit 3) LSB

Important note: In order for the OSI swell shade motor to operate in Gray code mode, certain input pins on the OSI unit must be wired to either the +12VDC or -12VDC pins on the OSI unit depending on the scenario. Please see the OSI documenation for more information.

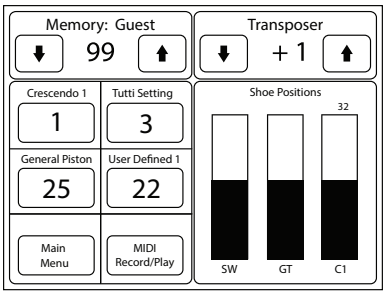
Configuration

Using the MS8405 Touchscreen

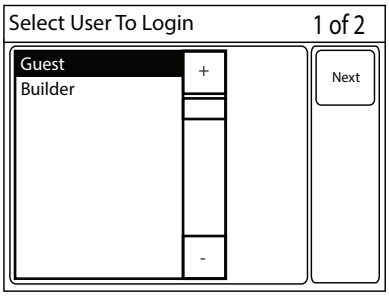
Powering on the MS8405 Touchscreen

The MS8405 Touchscreen receives power from the MS8401 General Controller through a standard Ethernet Cable. Power must be connected to the MS8401 either through the main 12-24VDC power connector or the AUX-PWR connector. Please see the MS8400 Installation Manual for more details. When the MS8405 is powered on, it will display one of two states. In the majority of situations, the MS8405 Touchscreen will turn on and display the Performance Screen. If you have changed the access code to login to the Guest Organist account, the MS8405 Touchscreen will display the Login Screen at power-up. Also, when using the touchscreen to power the instrument on and off using an MS8409 Power Sequencer, the Login Screen is displayed at power-up.

Performance Screen at Power-up



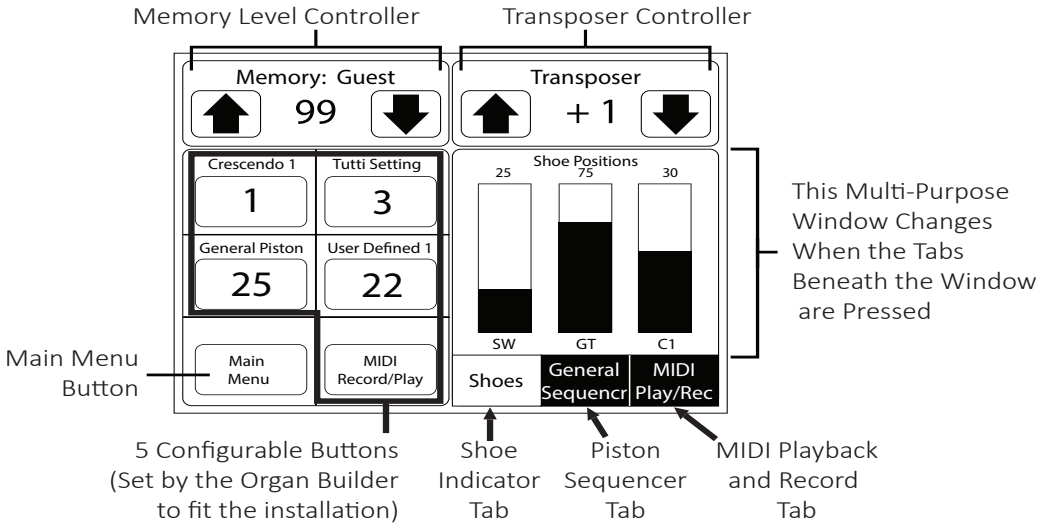
Login Screen At Power-up



The Performance Screen

Once the organ is powered on and you have logged in using the touchscreen, the performance screen is displayed. The performance screen is where the organist spends the vast majority of their time playing the instrument. An organist may access the Main Menu occasionally to do advanced features, but the performance screen is where the indicators and major organ performance features are controlled. Please note that the performance screen can be customized to fit the particular installation, but it is shipped out by default as shown below. The Main Menu button is always located on the lower left of the Performance Screen.

Parts of the Performance Screen

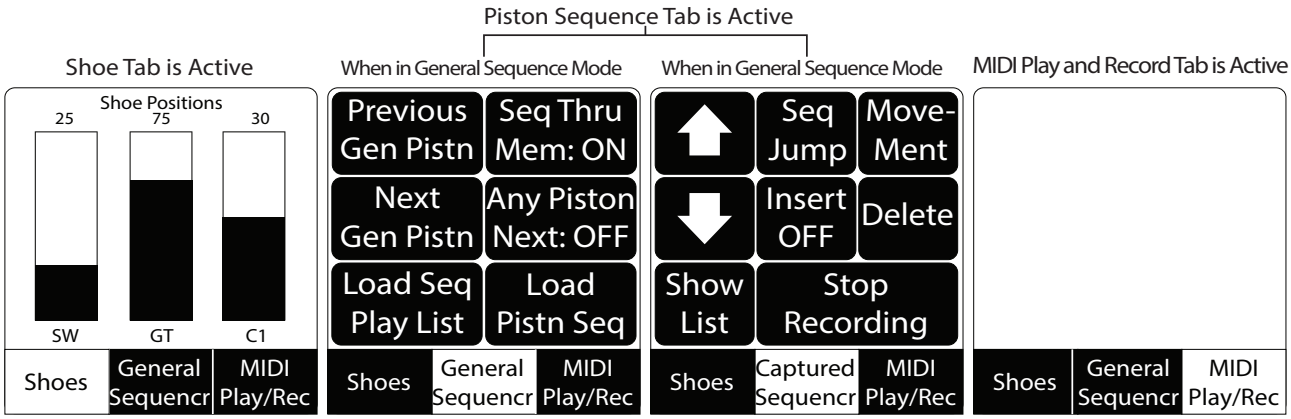


Configurable Buttons

There are five configurable buttons on the performance screen, which the builder can change on an organ-by-organ basis. Buttons can be used to display and control a variety of functions such as Crescendo memory level and Tutti memory level. These buttons can also link to menu items throughout the system to aid in quickly navigating to a desired location in the system menus. Please take care to avoid using menu buttons that should not be accessible by certain organists. Since these buttons are not configurable on an organist basis, an organist who does not have access to the button could use the performance screen to link to the restricted button and an error could occur. For more information on configuring these buttons, please see the Performance Screen (Changing Configurable Buttons) section.

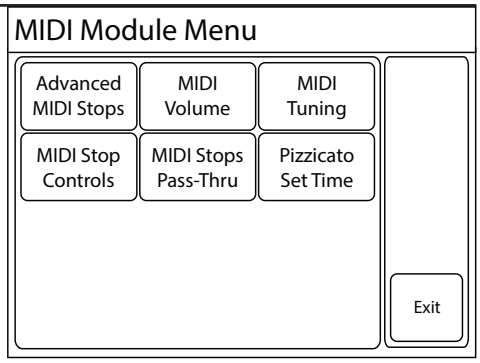
Multi-Purpose Window

The multi-purpose window changes contents depending on which of the three tabs along the bottom are pressed. The window displays the Swell and Crescendo shoe positions when the Shoes tab is pressed. The Piston Sequencer tab changes the window to display controls for the General Piston Sequencer or the Captured Piston Sequencer. The MIDI Playback and Record tab allows the organist to play or record the instrument while accessing the rest of the functions on the performance screen. Please see the following illustration for an example of the different contents which can be displayed in the multi-purpose window. Also, see the Organist Manual for more information on how these functions operate.



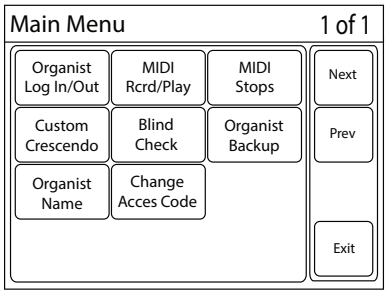
Logging In as the Builder

The MS8400 can be configured with different organist access levels to protect itself from unauthorized access via a 4-digit access code. By default, the system has a "Builder" account with an access code of 1234 which has full access to all System Configuration Menus. It is highly recommended to write this code down in a safe place if it is changed from the default 4-digit code. Unless the builder gives access to another organist, only the builder will have access to the System Configuration Menu. Also note that the builder access code of 1234 can be used to access any organist account in the system. This can be used to access an organist account in the case of an organist forgetting their passcode.

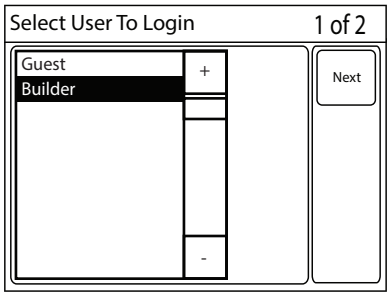


To log in as the Builder, enter the Main Menu by pressing the Main Menu button on the performance screen. Once on the Main Menu, press the Organist Log In/Out button. This brings up a list box containing all organists currently set up in the MS8405 Touchscreen. Select Builder from the list box and press the Next button. Enter the builder access code using the keypad and press the Login button.

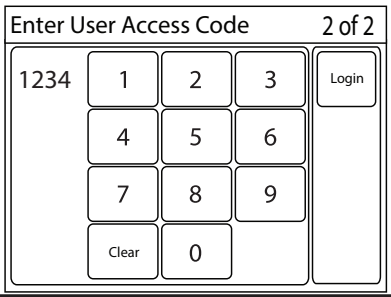
Press Organist Log In/Out



Select Builder



Enter Access Code



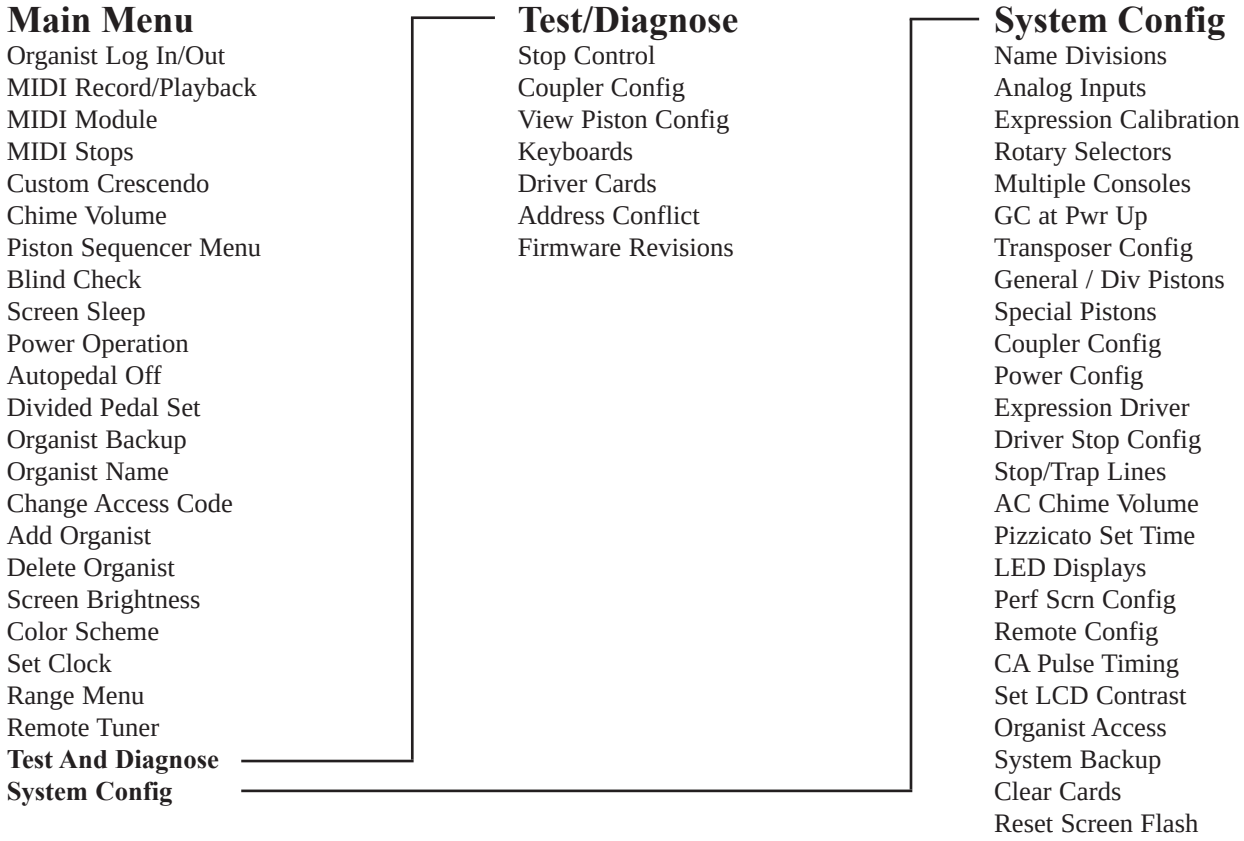
The Main Menu

The Main Menu on the MS8405 Touch Screen provides an organist access to a large number of features. The buttons on the Main Menu can be individually hidden on an organist-by-organist basis. This is useful when a system does not have optional hardware for a specific feature, or when an organist wants a simplified or clean menu list. The builder has access to all buttons throughout the system and cannot lock themselves out of any screen.

Although these Main Menu buttons are mostly used by organists to play the instrument, organ builders will occasionally need to access the Main Menu when configuring the MS8400 system. This section of the manual details the buttons that are applicable to organ builders. If a button is not described, or for more information on a button's function, please read the MS8400 User Manual.

MS8405 Main Menu Button Listing

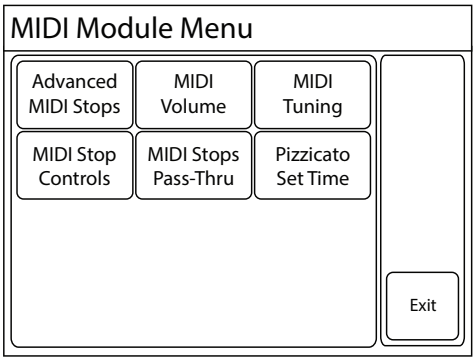
The MS8405 menu system begins at the Main Menu. Under the Main Menu, there are two other menu lists which include the Test and Diagnose and System Config Menu.



MIDI Module

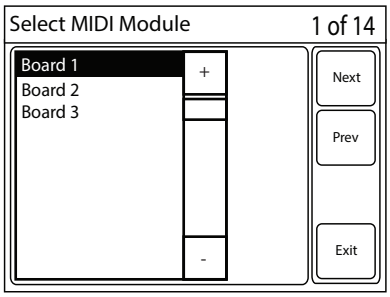
MIDI Module Menu

The MIDI Module Menu is used to configure a variety of MIDI functions. Unless an Organist is familiar and comfortable with MIDI, the MIDI Module Menu button should be hidden from the organist. It is important to note the difference between the MIDI Module button and the MIDI Stops button on the Main Menu. The MIDI Stops button on the Main Menu is intended for an organist to change a MIDI Stop which has been pre-configured by the builder. Before an organist can use the MIDI Stops button, the builder must create an Unlocked MIDI Stop using Advanced MIDI Stops from the MIDI Module Menu. Please read the following section for details on each button within the MIDI Module Menu.

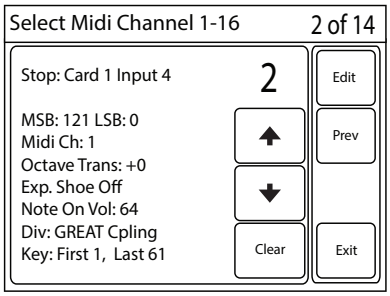


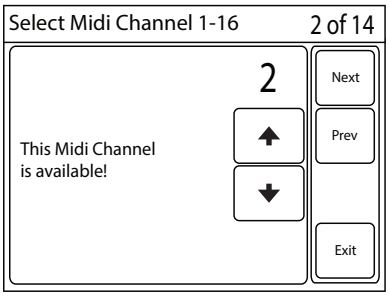
Advanced MIDI Stops

The Advanced MIDI Stops button is used to create a MIDI Stop. There can be a MIDI Stop assigned to each of the 16 available MIDI channels, and any stop in the MS8400 system can be configured as a MIDI Stop.



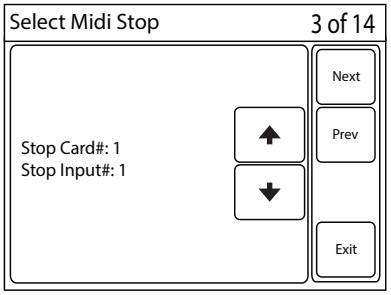
Step 1: The MS8400 system can have up to eight separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device. Once the desired MS8410 is selected, press the Next button.

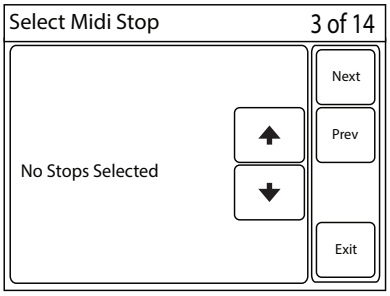


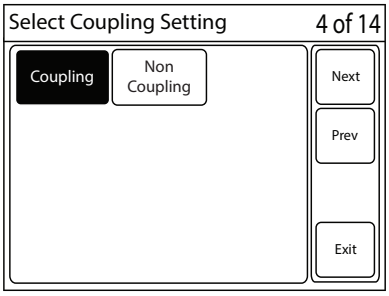


Step 2: MIDI has 16 available channels to work with. Each MS8410 can be configured to operate one stop for each MIDI Channel. Select the desired MIDI Channel to configure. If the selected MIDI Channel is already configured with a MIDI Stop, the configuration data will be shown on the screen. The Clear button can be used to clear the configuration data for the selected MIDI Channel. Once the correct MIDI Channel has been selected, press the Next button.

Step 3: Select a stop to configure as a MIDI Stop on the selected MIDI Channel. If no stops are turned on, the screen will display a warning that no stops are on. If one or more stops are on, the screen will display the currently selected stop's card number and input number. If more than one stop is on, the up and down arrows can be used to scroll through and select the desired stop from all stops that are turned on. Once the desired stop is selected, press the Next button.

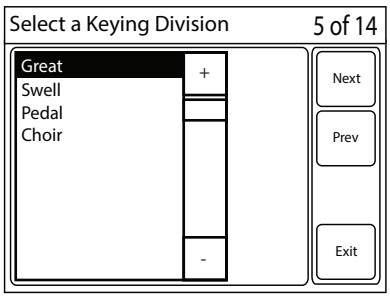


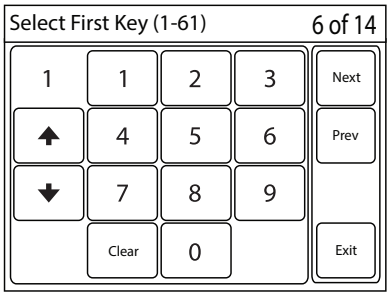




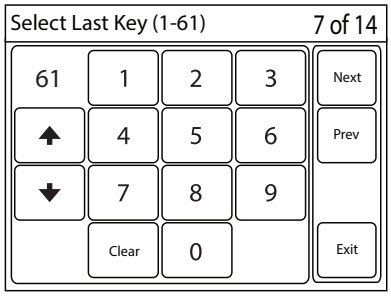
Step 4: Select whether the selected MIDI Stop is affected by couplers, or is non-coupling. Once the correct selection has been made, press the Next button.

Step 5: Select a division to use for keying the MIDI Stop. The division selected here will be used to play the configured MIDI Stop. Once the correct division has been selected, press the Next button.

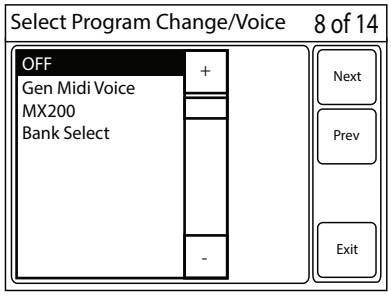




Step 6: Select the first key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the keypad. For example, if the MIDI Stop is supposed to play starting on Low C, press Low C and the number will automatically be changed to 1. If the MIDI Stop is supposed to play starting at Tenor C, press Tenor C and the number will automatically change to 13. Once the first key has been selected, press the Next button.

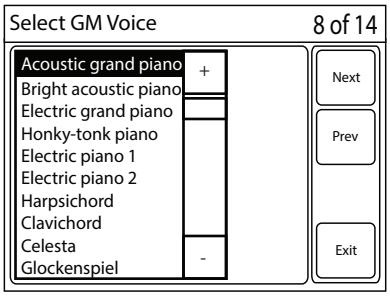


Step 7: Select the last key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the keypad. For example, if the MIDI Stop is supposed to play up through the last note on the keyboard, press High C and the number will automatically be changed to 61. If the MIDI Stop is supposed to play bottom octave only on this driver card, press Low B and the number will automatically be changed to 12. The last note can be set to a value higher than the end of traditional keyboards in order to play any notes that would be coupled or transposed above note 61. For example, setting the last note to 73 will allow coupling or transposition up to an octave above the last note on the keyboard. Once the last key has been selected, press the Next button.

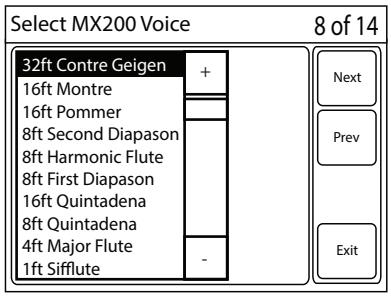


Step 8a: Select the Program Change / Voice method to be assigned to the selected stop. Depending on which option is selected, the following several screens will be different. Here is a description of each available option.

Step 8b (OFF): This option will only send MIDI keying messages for the selected stop. Patch Change, or MIDI Voice messages will not be sent if this option is selected. This is used in cases where the MIDI Voice is selected on the MIDI Sound Module or other MIDI Device. Note that if this option is selected, no additional screens will be displayed to configure the Voice method. The Octave Transpose screen will be displayed upon selecting the OFF option.

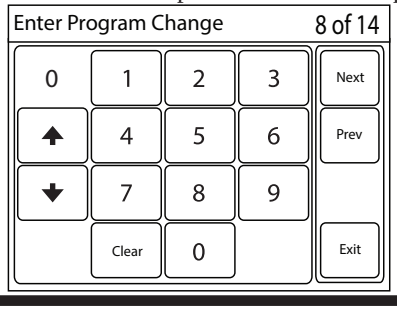


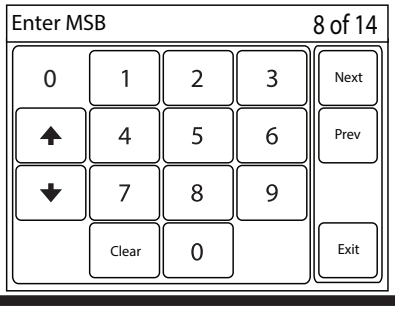
Step 8b (General MIDI Voice): This option allows the selection of a standardized general MIDI Voice from a list box. Selecting a standard voice from the list box will automatically send the correct messages to activate a standard MIDI Voice on a standard MIDI Sound Module or other MIDI Device. Once the correct General MIDI Voice has been selected, press the Next button.

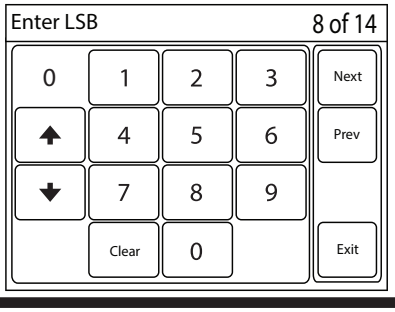


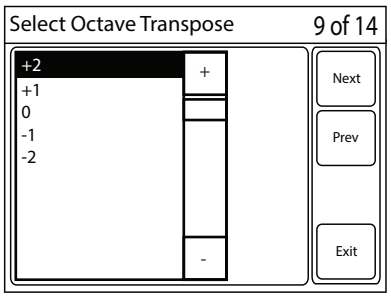
Step 8b (MX200): The Roland MX200 Sound Module has its own list of MIDI Voices. This option allows the selection of one of the MX200 MIDI voices from a list box. Selecting one of these MIDI Voices will automatically send the correct messages to activate a MIDI Voice on an MX200 Sound Module. Once the correct MX200 Voice is selected, press the Next button.

Step 8b (Bank Select): This option is used to manually enter the Program Change, MSB, and LSB for the desired MIDI Voice. In some cases, MIDI Devices have a list of sounds or voices that can be activated using MIDI messages. This list of sounds should reference a Program Change number, an MSB (Most Significant Byte), and an LSB (Least Significant Byte). Enter the values for Program Change, MSB, and LSB in their respective screens and press the Next button.

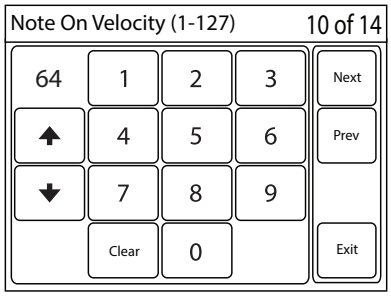




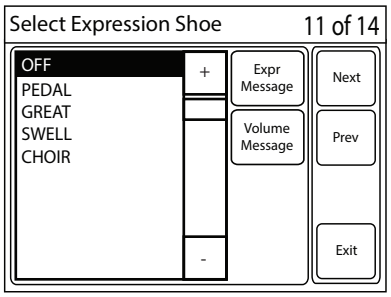




Step 9: Select the desired level of Octave Transpose. The MS8400 system can transpose MIDI Device keying +/- two octaves, an octave at a time. Selecting 0 will turn off Octave Transpose. Once the correct level of Octave Transpose is selected, press the Next button.

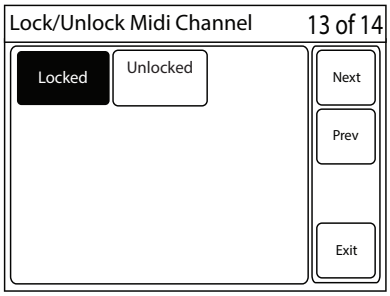


Step 10: Enter the Note On Velocity (between 1 and 127) to be transmitted with the MIDI Keying for the selected stop and channel using the numeric keypad. The default velocity is 64. A velocity of 0 is equivalent to a Note Off. Once the correct Note On Velocity has been entered, press the Next button.



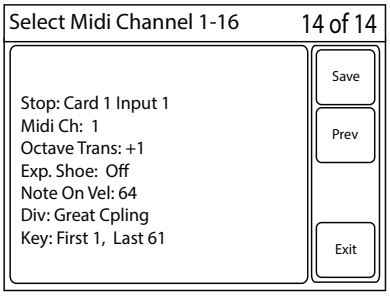
Step 11: Select an expression shoe to control MIDI Volume or Expression if desired. Selecting OFF from the list will send no Volume or Expression messages on the current MIDI Stop. The expression shoe inputs displayed in the list box come from the RJ11 inputs on the MS8404 Keying Cards. Pressing the Expr Message button will assign the selected shoe to MIDI Expression for the current stop, while pressing Volume Message will assign the selected shoe to MIDI Volume for the current stop. Once the desired selections are made, press the Next button.

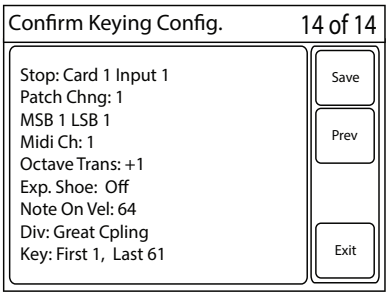
Step 12 (Optional): If an expression shoe was selected in step ten, enter the minimum expression or volume (between 0 and 127) to be transmitted with the MIDI Keying for the selected stop and channel using the numeric keypad. The default minimum expression or volume is 64. An expression or volume of zero might be equivalent to a note off depending on the MIDI sound module being used. Once the correct minimum expression or volume has been entered, press the Next button.



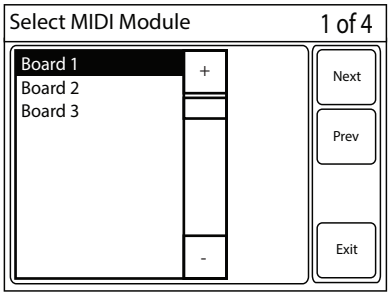
Step 13: Select whether the MIDI Stop is going to be locked or unlocked. A locked MIDI Stop will not show up in the MIDI Stops screen from the Main Menu. This is useful when digital voices or bass extensions are being used, and it is not desirable for anyone to change or even see that the stop is a MIDI Stop. An unlocked MIDI Stop will show up in the MIDI Stops screen from the Main Menu and is useful when an organist will be allowed to change the MIDI Voice assigned to the stop. For example, if a stop is physically engraved or labeled “MIDI Stop” on the organ and is intended for an organist to use as a Piano, Harpsichord, or other MIDI sound.

Step 14: There are two confirmation screens that could display depending on what option was selected during step 8b. If you selected OFF, the confirmation screen will appear similar to the screen displayed below on the left without any MIDI Voice information. If you did not select OFF, the confirmation screen will appear similar to the screen displayed below on the right. Please note the if the stop is a locked MIDI Stop, the word “LOCKED” will appear next to the MIDI ch: # line on the confirmation screen. Confirm that the configuration settings are correct. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the Main Menu. Once the configuration settings are correct, press the Save button to commit the configuration to memory.





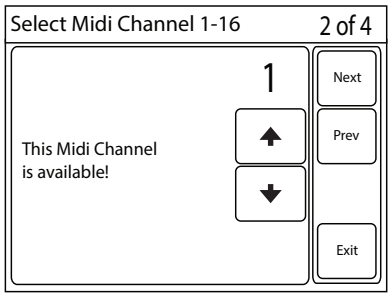
MIDI Volume

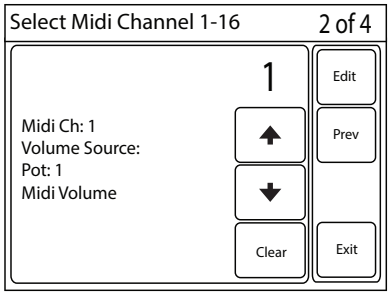


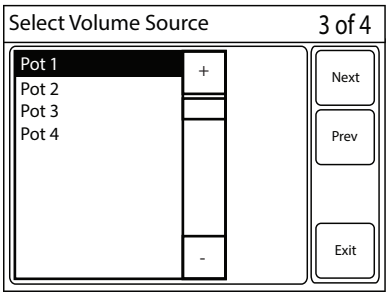
MIDI Volume: The MIDI Volume screen is used to configure a potentiometer to control the MIDI Volume level that is transmitted by the MS8400 System. The MIDI Volume level can be assigned to any of the four potentiometer inputs on the MS8401 General Controller card. DO NOT configure MIDI Volume using this screen if you have already set up MIDI Volume to operate on an expression shoe on the same channel in the Advanced MIDI Stops screen.

Step 1: The MS8400 system can have up to eight separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device. Once the desired MS8410 is selected, press the Next button.

Step 2: Each of the 16 available MIDI Channels can be configured with a potentiometer input to control MIDI Volume. Select the desired MIDI Channel to configure. If the selected MIDI Channel is already configured with a MIDI Volume control, the configuration data will be shown on the screen. The Clear button can be used to clear the configuration data for the selected MIDI Channel. Once the correct MIDI Channel is selected, press the Next button.

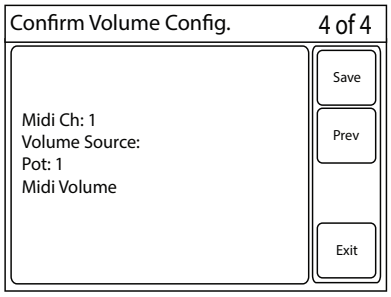






Step 3: Select the source to control MIDI Volume on the selected MIDI Channel. MIDI Volume can be controlled manually with a potentiometer attached to any one of the four potentiometer inputs on the MS8401 General Controller.

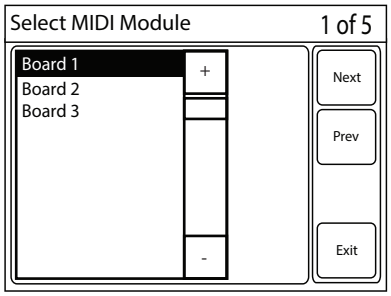
Step 4: Confirm that the configuration settings are correct. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the Main Menu. Once the configuration settings are correct, press the Save button to commit the configuration to memory.



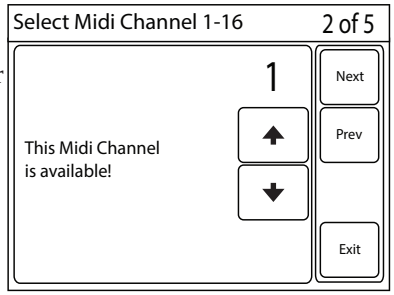
MIDI Tuning

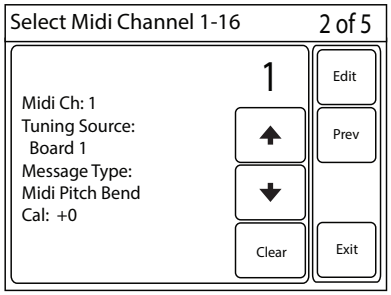
MIDI Tuning: The MIDI Tuning screen is used to configure how the MS8400 System handles MIDI Tuning. Pipe Organ tuning changes depending on temperature and other factors in the organ chamber. MIDI Devices are electronic and do not go out of tune naturally to match the organ. The MS8400 system can be configured to manually or automatically tune MIDI Devices by using a MIDI Pitch Bend Message. These pitch bend messages can be controlled manually by a potentiometer, or automatically by attaching a CS6406 Temperature Sensor to the MS8410. Syndyne offers a temperature sensing device.

The MIDI tuning screen is used to configure the system to automatically or manually tune MIDI stops to match physical pipe stops.

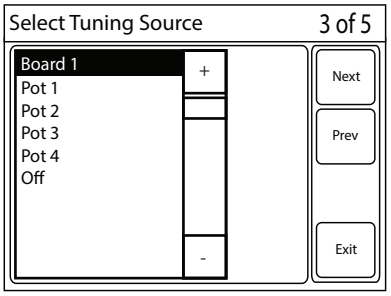


Step 1: The MS8400 system can have up to 8 separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device. Once the desired MS8410 is selected, press the Next button.

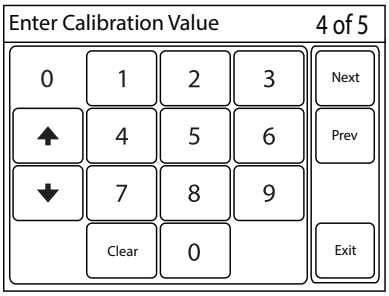




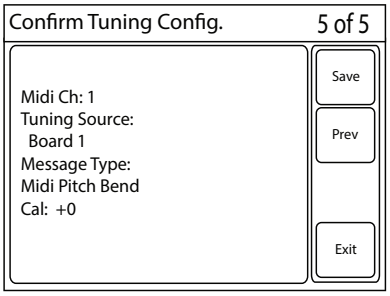
Step 2: Each of the 16 available MIDI Channels can be configured with a Potentiometer Input to control a MIDI Tuning message. Select the desired MIDI Channel to configure. If the selected MIDI Channel is already configured with a Tuning Message Potentiometer, the configuration data will be shown on the screen. The Clear button can be used to clear the configuration data for the selected MIDI Channel. Once the correct MIDI Channel is selected, press the Next button.



Step 3: Select the source to control MIDI Tuning on the selected MIDI Channel. MIDI Tuning can be controlled manually with a potentiometer attached to any one of the four potentiometer inputs on the MS8401 General Controller. Each MS8410 has a temperature sensor input that can be used to automatically keep the digital stops in tune with the pipe organ stops. Selecting a board from the list will configure its temperature sensor input to control tuning messages on the selected MIDI Channel. Once the correct Tuning Source is selected, press the Next button.



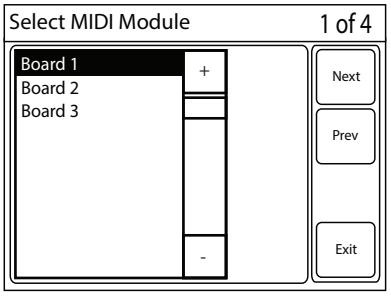
Step 4: MIDI tuning is accomplished using a MIDI Pitch Bend Message. The Calibration Value is used in conjunction with the Auto-Tuning feature described in the previous step to tune the digital stops to the pipe stops or as a coarse tuning adjustment for a Tuning knob. Once the correct Calibration Value is entered, press the Next button.



Step 5: Confirm that the configuration settings are correct. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the Main Menu. Once the configuration settings are correct, press the Save button to commit the configuration to memory.

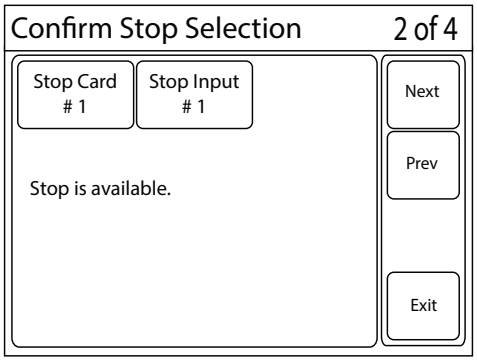
MIDI Stop Controls

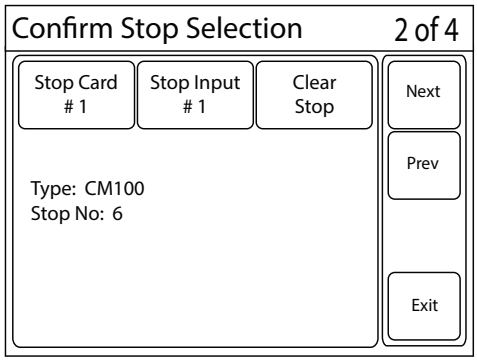
Stop Controls: The MIDI Stop Controls screen is used to configure Stop Controls in the organ to turn stops on and off for specific sound modules. This option is not common because it requires a CM100 sound module which was specifically accommodated by custom code in the MS8400 system. When configured, turning on a Stop Control in the organ will turn on a stop in the specified sound module. The Stop Controls screen is used to control stops on and off with certain Sound Modules designed to work with the MS8400.



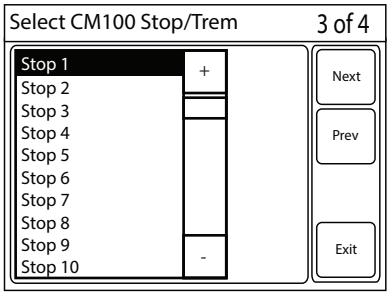
Step 1: The MS8400 system can have up to eight separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device. Once the desired MS8410 is selected, press the Next button.

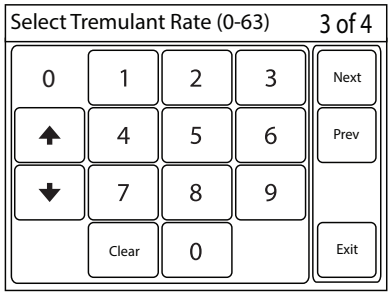
Step 2: Turn on the Stop Control on the organ that is desired to control a stop on the sound module. If the Stop Control has already been configured, the data can be reviewed. The Clear button is used to clear the Stop Control configuration data. Once the correct Stop Control is selected, press the Next button.



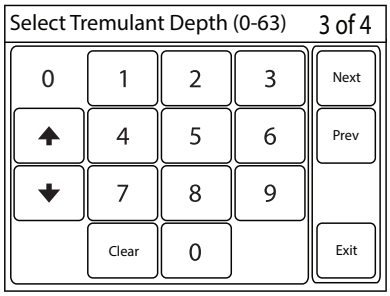


Step 3: At the time this manual was written, the only available MIDI Sound Module designed to be directly controlled by the MS8400 system was the Viscount CM100. Select the CM100 Stop to control. The list of stops 1-12 and Tremulant correspond with the CM100 stops listed from left to right. Once the correct CM100 Stop is selected, press the Next button.

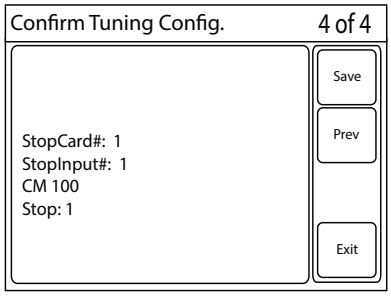




Step 3b (Tremulant): If Tremulant was selected, enter the desired Tremulant Rate. The rate of the Tremulant controls the time between each Tremulant Pulse. A larger number increases the length of time between pulses. Once the correct Tremulant Rate is entered, press the Next button.

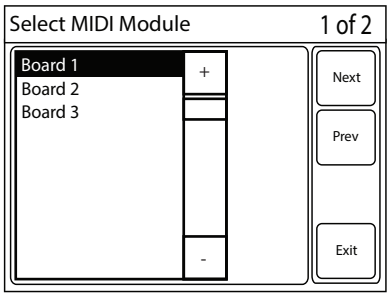


Step 3c (Tremulant): Enter the desired Tremulant Depth. The depth of the Tremulant controls the length of the Tremulant Pulse. Entering a larger number will result in a longer pulse length. Once the correct Tremulant Depth is entered, press the Next button.

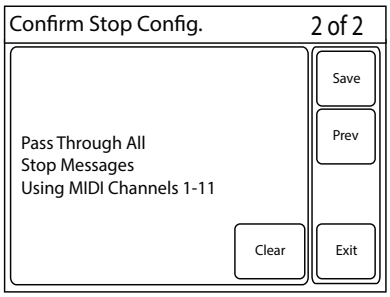


Step 4: Confirm that the configuration settings are correct. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the Main Menu. Once the configuration settings are correct, press the Save button to commit the configuration to memory.

MIDI Stops Pass-Thru

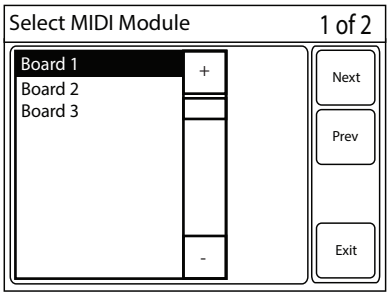


Step 1: When using certain digital voice products with a learning mode, such as Hauptwerk™ (a trademark of Milan Digital Audio LLC), stops can be transmitted as a MIDI General Controller Message. Turning this feature on will send up to 128 stop messages per channel, up to 11 channels total (1280 stop MS8400 system capacity). The MS8400 system can have up to eight separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device and can individually output stop controls via MIDI General Controller Messages. Once the desired MS8410 is selected from the list box, press the Next button.

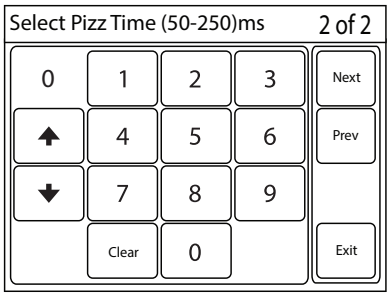


Step 2: Press save if you would like to set up stop pass-through on MIDI to operate on the selected MS8410. If you have previously set up stop pass-through on MIDI on this card, you can press the Clear button to remove stop pass-through on MIDI. There is no confirmation screen. Exit will take you back to the Main Menu and Previous will take you back to the MIDI Module selection list box.

MIDI Pizzicato Set Time



Step 1: When using Pizzicato on an instrument, it can be necessary to have MIDI stops follow the same Pizzicato timing. The MS8400 system can have up to eight separate MS8410 MIDI Sound Module boards, each one identified by a number which is set via onboard DIP switches. Each MS8410 is used to connect to a MIDI Sound module or other MIDI Device and can have a different Pizzicato set time. Once the desired MS8410 is selected, press the Next button.



Step 2: Using the numeric keypad, enter the desired Pizzicato set time (between 50-250) in milliseconds. Once the correct Pizzicato set time is entered, press the Next button to save the configuration. There is no confirmation screen.

Custom Crescendo

Basic Information

Here are the basic steps to customize the Crescendo. Check below the basic instructions for more detailed information on each button.

Step 1: Select the desired Crescendo shoe, Crescendo memory level, and Crescendo stage.
Step 2: Turn on all the stops that are desired to be captured on the Crescendo stage.
Step 3: Press the Set Stage button. (A box will pop up while the stops are being saved.)
Step 4: Repeat the processes for all the stages of Crescendo.

It is necessary to set all 60 stages of both Crescendos!

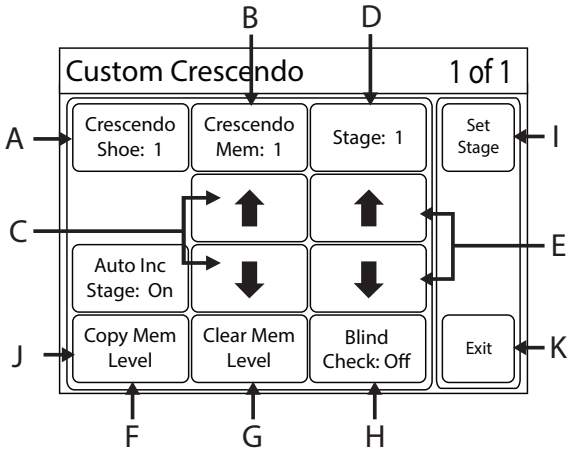
Detailed Information

A: The MS8400 can have two different Crescendo shoes per organ console. Pushing the Crescendo Shoe button toggles back and forth between Crescendo shoe 1 and Crescendo shoe 2.

B: In the MS8400, each user has the ability to save four different Crescendo settings per Crescendo shoe. The Crescendo Mem button displays the current Crescendo memory level that is being worked on.

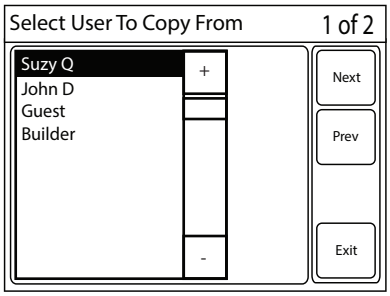
C: Pressing these up and down arrows move the Crescendo memory level up and down.

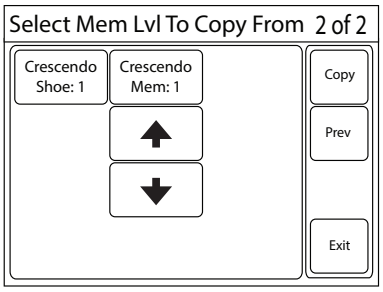
D: Each Crescendo memory level has 60 programmable stages. Each stage can capture the entire registration of the MS8400 system. The Stage button shows the selected stage that is currently being worked on.



E: Pressing these up and down arrows moves the current Crescendo stage up and down.

F: To copy a Crescendo memory level first select the new shoe and memory level to be created then press the Copy Mem Level button. After pressing the Copy Mem Level button, select the desired organist from the list box to copy from their Crescendo Memory Levels. Once the desired organist is selected, press the Next button. Now select the desired Crescendo Shoe and Crescendo Memory Level to copy. Once the desired settings have been selected, press the Copy button. If you attempt to copy the exact same shoe, and memory level that is currently on, the screen will say "Invalid Memory Level."





G: The Clear Mem Level button clears the Crescendo for the entire Memory Level.

H: Blind Check Mode can be toggled on and off by pressing this button. When Blind Check Mode is activated, the button will change color and the text will say "Blind Check: On." While Blind Check Mode is active, all the stops programmed onto the currently selected Crescendo shoe, Crescendo memory level, and Crescendo stage, will physically turn on or off (only if the organ has moving stops). As you scroll through different shoe, memory level, and stage settings, the stops will continue to change to show what stops are programmed on each setting. Pressing the Blind Check Mode button will deacti-

vate Blind Check Mode and the text on the button will say “Blind Check: Off.”

I: The Set Stage button captures the registration onto the currently selected Crescendo stage, shoe and memory level. Once the Set Stage button is pressed, a box will appear showing that the stops are being captured. After the stops have been captured and the system is ready for another stage, the box will disappear.

J: If the Auto Inc Stage button is ON, then the Set Stage button will automatically increment to the next stage in order to speed up the configuration process. When the Auto Inc Stage button is OFF, then the Stage will stay the same when the Set Stage button is pressed. Pressing this button toggles the auto increment mode on and off.

K: Pressing the Exit button will return you to the Main Menu.

Blind Check

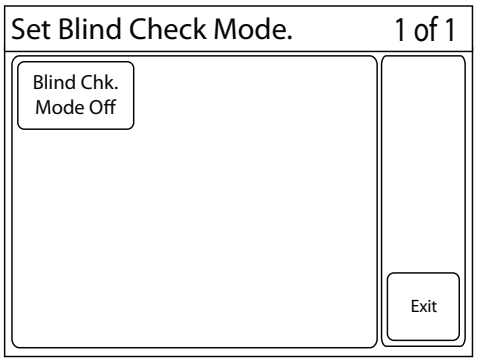
Functions such as Sforzando (SFZ), Tutti, and Crescendo blindly control stops. This means the stops are turned on without physically moving the stop control. The Blind Check feature allows the organ builder to view what is set on a particular blind function. This feature can be extremely useful when trying to tell what stops turn on with each level of Crescendo or for copying a Tutti memory level.

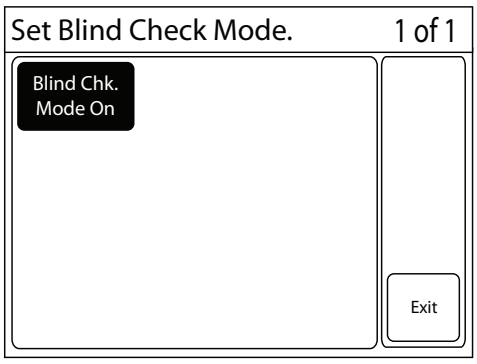
To turn blind check on and off, first enter the Blind Check Mode screen from the Main Menu. Press the Blind Check button once to turn Blind Check mode on. This will cause the blind check button to change color and the button text to change to “Mode On.” Pressing the button a second time will turn Blind Check Mode off. This will cause the blind check button to change back to a normal unpressed color and change the text back to “Mode Off.”

Pressing the Exit button will return the screen to the Main Menu. Exiting this screen does not turn off blind check. If Blind Check Mode is on when the Exit button is pressed, blind check will remain on. Blind check will need to be turned off by re-entering the Blind Check Mode screen. It is highly recommended to turn off Blind Check Mode before playing the organ. It is also recommended to make sure Blind Check Mode is off before leaving the instrument so any other users will not be confused.

It is recommended that only one blind function is active at a time while Blind Check Mode is on to avoid confusion. For example, make sure the Crescendo is turned off if you are trying to view the Tutti. Also, when Blind Check Mode is active, stops can be manually moved. This allows easy setting of the Tutti piston by viewing what stops turn on with the Tutti, changing the stops to a new registration, and then setting the Tutti piston again. However, if the Crescendo shoe is moved, or any other blind function is turned on, the blind check will change the registration to match the new setting. Any manual changes to the registration will be lost.

There is an option to control Blind Check Mode with a reversible or momentary blind check piston. Please see the Special Pistons section for more details.



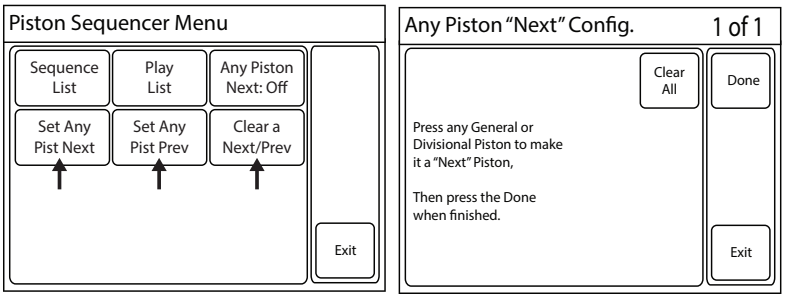


Piston Sequencer Menu

Piston Sequencing, as a general term, refers to an organ moving easily from one piston to another using a Next or Previous piston. The organ industry has adopted two modes of piston sequencing. General Piston Sequencing Mode (or European Mode) simply runs through each General piston in numerical order as a Next Piston is pressed and in reverse order if a Previous piston is pressed. Captured Piston Sequencing Mode (or American Mode) allows an organist to capture a sequence of piston presses and scroll through them in the captured order. The MS8400 system can operate in either General Piston Mode or Capturable Piston Mode. Also, there is a special function on some organs called Any Piston Next Mode. When this mode is activated, general and divisional pistons are changed into Next or Previous pistons depending on how they are configured by the organist.

When the organ turns on, it starts in General Piston Sequencing Mode and Any Piston Next Mode is deactivated. The order of general pistons is set up by the builder when pistons are configured using the System Configuration Menu. These numbers are typically engraved on the general pistons. When an organist opens or creates a new captured piston sequence, the organ is placed in Captured Sequencing mode. This mode scrolls through a captured list of piston presses. These piston sequencer features do not need much configuration by the organ builder to operate. The organ builder may wish to configure which general and divisional pistons are Next or Previous during Any Piston Next Mode. When Any Piston Next Mode is activated, any general or divisional piston which is pressed can either be set to become a Next piston, a Previous piston, or neither.

Step 1: From the Piston Sequencer Menu, press the Set Any Pist Next button.



Step 2: We recommend pressing the Clear All button at this time to clear any pistons which have been configured to operate as Next pistons during Any Piston Next mode. This provides a clean state to begin setting Next pistons. Rest assured, this will not clear any pistons configured as dedicated Next pistons from the Special Pistons menu.

Step 3: Press all of the pistons which should act as a Next piston during Any Piston Next mode. Please note that only general and divisional pistons can be configured as Next or Previous.

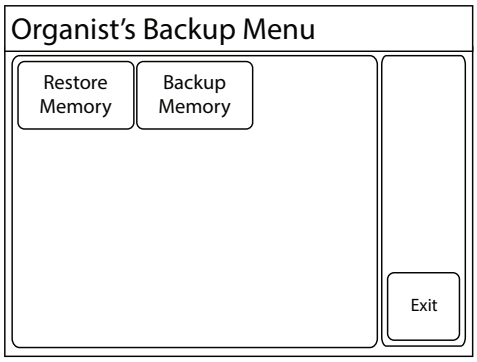
Step 4: Once all the desired pistons are configured, press the Done button to return to the Piston Sequencer menu.

This process is the same for setting Previous pistons. Clearing individual piston's Any Piston Next setting is similar, with the exception that pressing the Clear All button will clear every piston in the system to no longer operate as a Next or Previous during Any Piston Next mode.

Organist Backup

Each organist can have up to 100 memory levels within the MS8400 system. Using USB flash drives, the organist can gain an infinite amount of memory levels. The Organist Backup button is used to create a copy of an organist's combinations by backing it up to a USB flash drive. This can be done using the following steps.

Backup Memory



Step 1: From the Main Menu, hit the Organist Backup button.

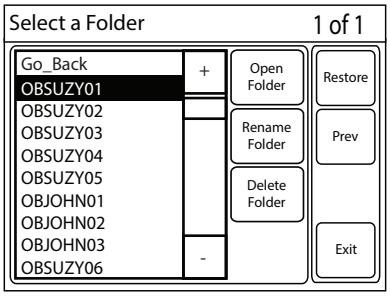
Step 2: The Organist Backup Menu screen will be displayed. Press the Backup Memory button.

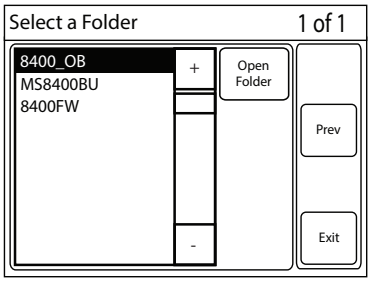
Step 3: Name your backup using the alphanumeric keypad or accept the default name and hit Create Backup. Names can be up to eight characters in length. Once the backup is complete you will be taken back to the Main Menu.

Restore Memory

Step 1: From the Main Menu hit the Organist Backup button and then hit Restore Memory.

Step 2: A File Manager window will appear. Backups are saved to the 8400_OB folder. Select 8400_OB from the File Manager list box and press the Open Folder button.



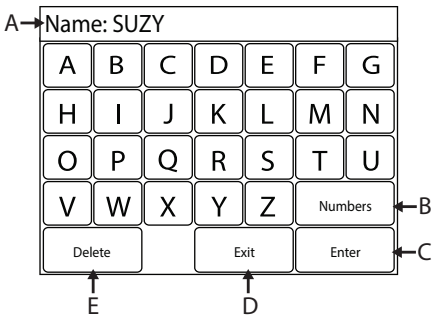


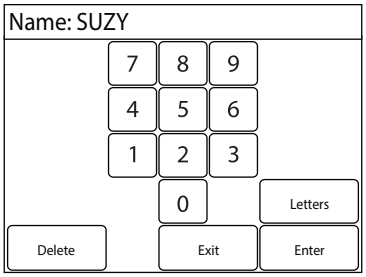
Step 3: All the organist backups in the system are displayed in this folder. Select the desired backup from the list box. Please note there is a Delete Folder and Rename Folder button that will allow you to delete or rename the selected backup. Please be careful not to accidentally change or delete someone else's backup. After selecting the desired backup file, press the Restore button. Once the restore is complete, the screen will return to the Main Menu.

Organist Name

The MS8400 allows an organist to change their name quickly and easily. The organist name can contain up to 12 characters. Simply use the letters and numbers to change the name and press the enter button to save.

Before typing in a new name, press the Delete key until the original name is cleared. If new characters are pressed before the delete key has been pressed, the new characters will by added to the end of the current name.





A: The Name Display box starts by showing the organist name that was previously entered. As letters and numbers are pressed, they are added to the end of the name display box. The Delete button deletes the last letter or number from the Display Name box.

B: The Numbers/Letters button toggles the screen between showing letters and numbers.

C: Once the name has been entered correctly, press the Enter button to save the name.

D: Pressing the Previous button will exit the naming screen and return to the Main Menu.

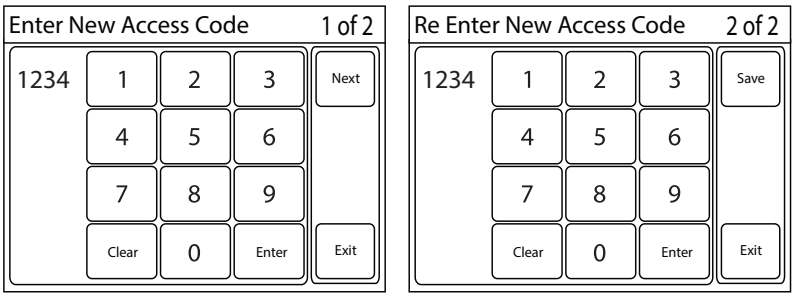
E: The Delete button deletes the last letter or number from the display name box.

Change Access Code (Organist Access Code)

The MS8400 allows organists to protect their pistons, memory level, and settings with a 4 digit access code. The organist access code screen can be used to change this code.

To ensure that the code is typed in correctly, the system requires that the code be entered in twice. This prevents an organist from mistyping the code and locking themselves out of their settings.

Once in the Enter New Access Code screen, simply use the number pad to enter in a new code. If a mistake is made during number entry, the Clear button can be used to clear all the selected numbers to start over. Once the access code has been entered correctly, press the Next button. Repeat the process to confirm the access code using the number pad and then press save. This saves the new access code.



Pressing the Exit button exits the screen and returns to the Main Menu without changing the access code.

Note that if the organist access code is set to 0000 then an access code is not required by the system to login as that organist.

FORGOTTEN ACCESS CODES: It is possible for the organ installer to reset an organist access code. Please contact your installer for more information. If you are an installer and are looking for information on resetting an organist access code, please see the System Configuration Manual.

Add an Organist

About Organist Accounts

The MS8400 can have up to 50 different organist accounts. In most cases, the ability to add a new organist is reserved for the organ builder, but in some cases others may be allowed to create additional organists. This is common for organ curators, organ professors, and other people who have to manage multiple organists using a single instrument.

By default, the MS8400 will have two organist accounts (the builder and the guest) which cannot be deleted. The default access code for the guest is 0000 and the default access code for the builder is 1234. The builder has access to all menus, buttons, and functions throughout the system and cannot be limited.

The MS8400 system allocates memory levels per organist in blocks of 100. It is important to note that organists show up in the list box in the order that they are entered into the system. If you want to change the order later, this can be difficult as the system retains combinations for each organist even after they have been deleted in the MS8405 touchscreen. If an organist order must be changed, a backup for each individual organist would have to be made first. Then all organists would have to be deleted. Next, all organists would have to be re-entered in the correct order. Finally, each organist would have to be individually restored.

Before Adding Organists

In order to save time during the process of adding organists to the MS8400 system, we recommend following these steps:

Step 1: Login as the builder and set up the builders Crescendo and Tutti. This is important because the Crescendo and Tutti settings are automatically copied from the builder to any new organist when they are added. This saves time when setting up the system, but also helps prevent miscommunication stemming from organists expecting the Tutti piston and/or Crescendo to work even before they have customized it.

Step 2: Login as the guest organist and copy the builder's Crescendo to the guest and set the guest's Tutti. This is an important step that installers often forget. This helps prevent the embarrassing situation of a guest organist playing a concert and expecting the Tutti piston to turn on full organ, but finding that the piston has no configuration. As you can imagine, this is not well received.

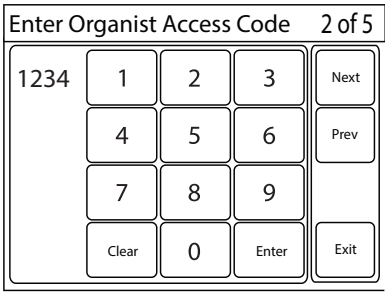
Step 3: While you are still logged in as the guest, set up the access levels for the guest organist. It is easy to forget this step, which can limit the guest account from accessing necessary features. Please note that the access levels of the guest are copied to any new organists when they are added, but can immediately be changed during the organist addition process. Some customers temporarily grant extra access to the guest in order to speed up adding organists and then go back later to limit the guest to the correct access levels.

Adding an Organist

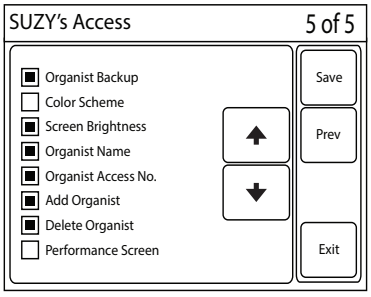
Step 1: From the Main Menu, press the Add Organist button. Enter the organist name using the Naming Screen and press Enter. Organist names can contain up to 12 characters. For more information on the Naming Screen, see section Changing an Organist Name.

Step 2: Enter the organist access code using the numeric keypad and press Next. The screen requires the code to be entered twice to help prevent lost access codes.

Note that if the organist access code is set to 0000 then an access code is not required by the system to login as that organist.



Step 3: Enter the organist memory levels between 1 and 100 using the numeric keypad and press Next. Please note that this screen will limit the available memory levels for the organist to the number entered.



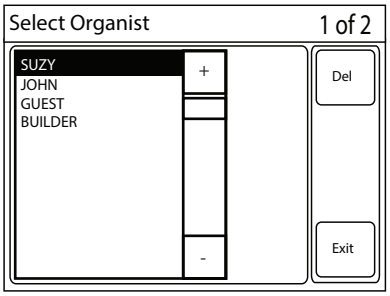
Step 4: Set the organist access to various screens by checking and unchecking the boxes provided. When this screen is loaded, access is automatically matched to the same access settings of the organist currently logged in. It is important to note that only screens and functions available to the currently logged in organist will be available to select for the new organist. It is not possible to give access to a restricted button by creating a new organist. Use the Up and Down arrow to access the available options. Pressing the Previous button will return you to the previous screen. Pressing the Exit button will return to the Main Menu. Pressing the Save button will save the new user and return to the Main Menu.

Here is a list of available Main Menu access options. Some of the items on this list may not show up in the screen depending on how the organ was originally configured.

MIDI Module	Color Scheme	Power Config
MIDI Record/Play	Set Clock	Expression Config
MIDI Stops	Range Menu	Driver Stop Config
Custom Crescendo	Remote Tuner	Chime Driver Volume
Chime Volume	Test and Diagnose	Stop Trap
Blind Check	System Configuration	Pizzicato Set Time
Screen Sleep	Name Divisions	LED Display Config
Power Operation	Analog Inputs	Perform Scrn Config
Autopedal	Expression Calibration	Remote Config
Organist Backup	Rotary Selectors	Pulse Timing Set
Organist Name	Multiple Consoles	Set LCD
Change Access Code	GC at Power-up	Organist Access
Add Organist	Transposer On/Off	System Backup
Delete Organist	Div & Gen Pistons	Clear Cards
Screen Brightness	Special Pistons	Reset Screen Memory
	Coupler Config	

Deleting an Organist

Before deleting an organist, please read the section on adding an organist. This section talks about how organist accounts work within the system, giving valuable information related to deleting organists.



Step 1: Press the Delete Organist button from the Main Menu screen.

Step 2: Select the organist to be deleted from the list box. When sure the correct organist is selected, press the Del button. Please note that there is no warning screen, and you cannot undelete an organist.

Please note that there is no warning screen, and you cannot undelete an organist.

The System Configuration Menu

The System Config Menu allows the builder to change an organ's configuration at will. Using this menu, a builder can change how pipes are played, how couplers function, how stops associate with pistons, and more. The System Config menu is to be accessed by builders only with rare exceptions. We highly recommend limiting access to the System Config menu for the guest organist account and any created organist accounts unless there is a specific reason. Allowing organists access to this menu leaves a system vulnerable to accidental configuration damage. The builder account has access to all buttons throughout the system and cannot limit access to any buttons in any menus.

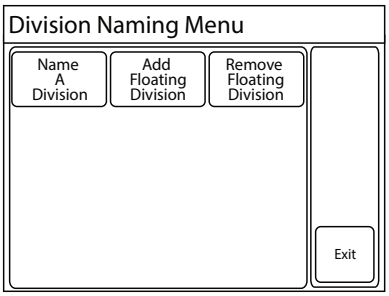
MS8405 System Config Menu Listing

The System Configuration Menu is accessible from the Main Menu using the builder account. Below is a list of all the buttons in the System Configuration Menu.

Name Divisions
Analog Inputs
Expression Calibration
Rotary Selectors
Multiple Consoles
GC at Pwr Up
Transposer Config
General / Div Pistons
Special Pistons
Coupler Config
Power Config
Expression Driver
Driver Stop Config
Stop/Trap Lines
AC Chime Volume
Pizzicato Set Time
LED Displays
Perf Scrn Config
Remote Config
CA Pulse Timing
Set LCD Contrast
Organist Access
System Backup
Clear Cards
Reset Screen Flash

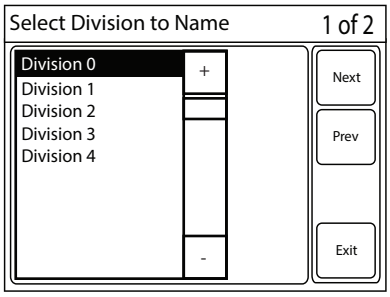
Name Divisions (or Add Floating Divisions)

The MS8400 system can have up to 32 divisions. These divisions can be either represented by a keyboard or can be a floating division without a keyboard. Each division can be given a 12-character name in order to more easily configure the system. The system automatically creates and names a division for each MS8404 keying card attached to the system. This name is based on the card number (assigned via DIP switches on each MS8404 during installation). The Naming Division screen is also used to create floating divisions which are not associated with an MS8404 card.

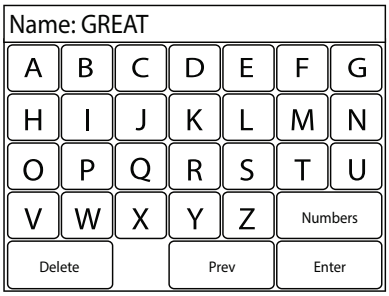


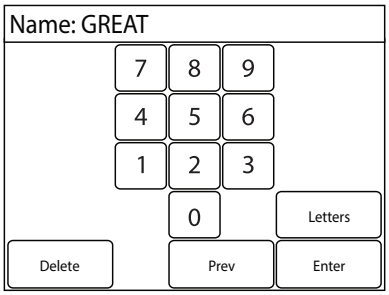
Naming a Division

Step 1: Press any key on the desired keyboard or pedal and the system will select its division from the list box. You can also select the desired division manually from the list box. Once the desired division is selected, press the Next button.

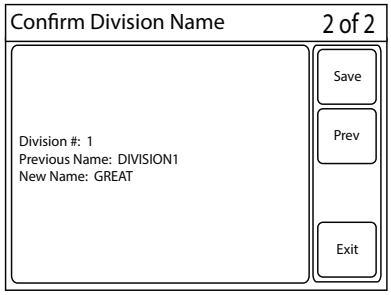


Step 2: Name the division using the alphanumeric keypad.



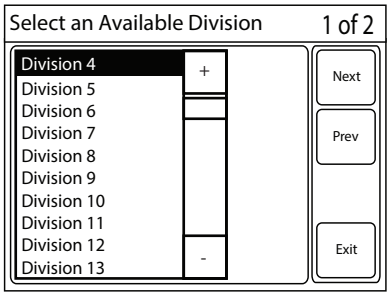


Step 3: Confirm the name and press the Save button.



Add Floating Division

Step 1: Select the desired division from the list box and press the Next button. The list box includes all possible divisions in the system (up to 32) that are not associated with an installed MS8404 card.

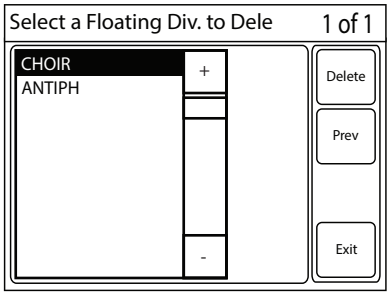


Step 2: Enter a Name using the alphanumeric keypad.
(See the screens in Name a Division for an example.)

Step 3: Confirm name and press the Save button.
(See the screens in Name a Division for an example.)

Remove Floating Division

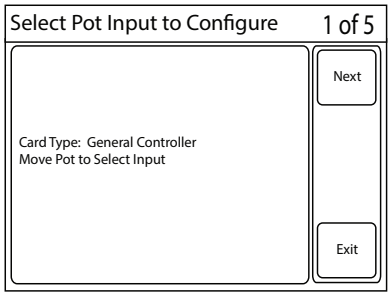
Step 2: Select the desired floating division from the list box and press the Delete button. There is no confirmation screen when deleting a floating division. The floating division is simply deleted.

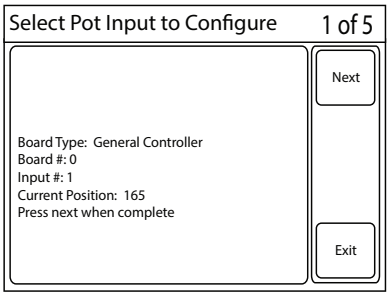


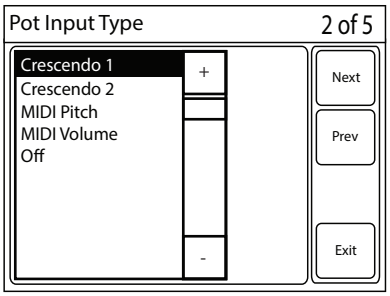
Analog Inputs (Assigning and Trimming Crescendo Shoe and MIDI Volume/Pitch Potentiometers)

The MS8401 General Controller has four analog inputs that can be used to control Crescendo Shoe 1, Crescendo Shoe 2, MIDI Pitch, or MIDI Volume. The Analog Inputs screen is where these inputs are configured and calibrated. By default Analog Input 1 is configured as Crescendo 1 and all other inputs are set to Off. A potentiometer must be connected to an Analog Input before that input can be configured. Please note that this is not where expression shoe pots are calibrated or configured.

Step 1: The screen will prompt to "Select Pot Input to Configure." Move the desired Crescendo shoe or MIDI pitch/volume knob to select it for configuration. The screen will now display the board and input number on which the potentiometer is attached, as well as its current position. Once the correct potentiometer is selected, press the Next button.

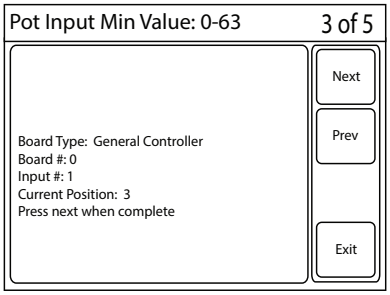


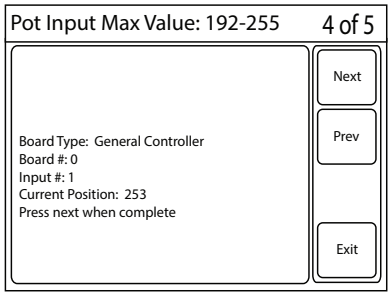




Step 2: Next, select the Pot Input Type. The input can be configured to either Crescendo 1, Crescendo 2, MIDI Pitch, MIDI Volume, or Off. Using the list box on the screen, select the desired input type and press the Next button.

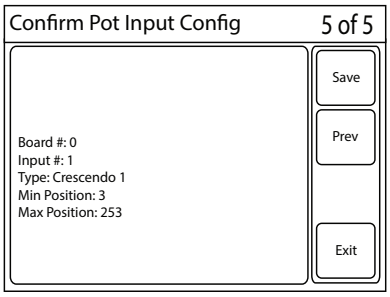
Step 3: Potentiometers are mechanically limited and rarely open and close to their full range from the manufacturer. To set this range, the screen will ask for a minimum value between the range of 0-63. Turn the potentiometer as far "off" as it will go (for Crescendo shoes, push down on your heel until the top of the shoe is as far from the console as possible). This value should be close to 0. It is recommended to back off the shoe a little bit from its furthest position in order to make sure that the highest "Off" position is accessible. If the shoe is pushed "Off" as far as possible, it can be difficult for the system to reach the full "Off" position. Once the minimum value is selected and within range, press the Next button.





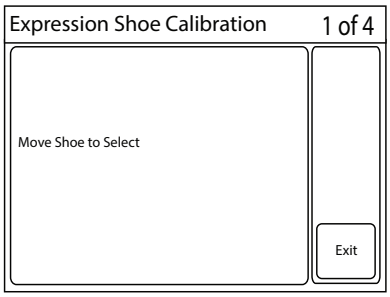
Step 4: The screen will now prompt to set the maximum value between 192-255. Turn the potentiometer as far "on" as it will go (for Crescendo shoes, push down on your toe until the top of the shoe is as close to the console as possible). This value should be close to 255. It is recommended to back off the shoe a little bit from its furthest position in order to make sure that the highest "On" position is accessible. If the shoe is pushed "On" as far as possible, it can be difficult for the system to reach the full "On" position. The screen will only accept a value between 192 and 255. Once the maximum value is selected and within range, press the Next button.

Step 5: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

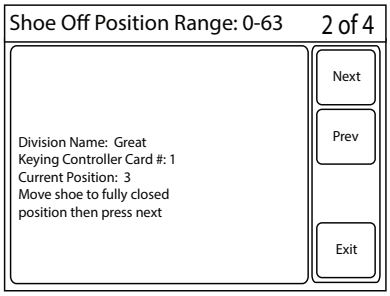


Expression Calibration (Trimming Expression Shoe Potentiometers)

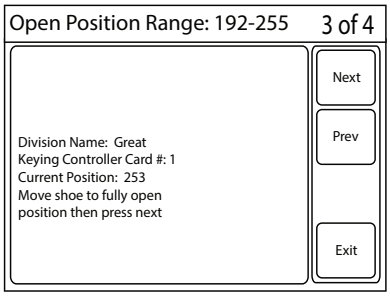
The MS8404 Keying Input cards each have an input for an expression shoe. The Expression Calibration screen is used to configure these inputs and calibrate a potentiometer that is connected to one of these expression inputs.



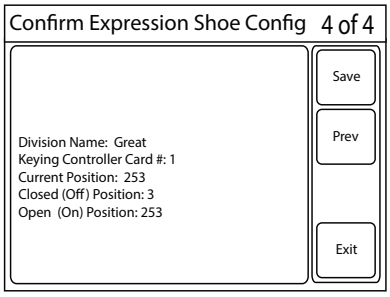
Step 1: The screen will prompt to "Move Shoe to Select." Move the desired shoe and the system will automatically select it for configuration and advance to the next screen.



Step 2: Potentiometers are mechanically limited and rarely open and close to their full range from the manufacturer. To set this range, the screen will ask for a minimum value between the range of 0-63. Turn the potentiometer as far "off" as it will go (for Crescendo shoes, push down on your heel until the top of the shoe is as far from the console as possible). This value should be close to 0. It is recommended to back off the shoe a little bit in order to make sure that the "Off" position is not at the very end of the potentiometer. Once the minimum value is selected and within range, press the Next button.



Step 3: The screen will now prompt to set the maximum value between 192-255. Turn the potentiometer as far "On" as it will go (for Crescendo shoes, push down on your toe until the top of the shoe is as close to the console as possible). This value should be close to 255. It is recommended to back off the shoe a little bit in order to make sure that the highest "On" position is not at the very end of the potentiometer. The screen will only accept a value between 192 and 255. Once the maximum value is selected and within range, press the Next button.

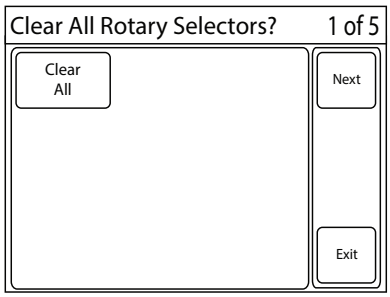


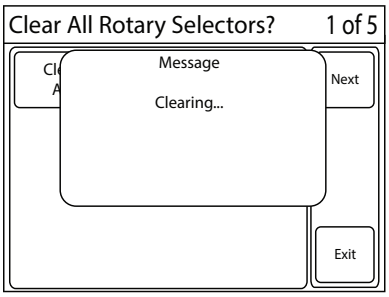
Step 4: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

Rotary Selectors (Optional Rotary Memory Level or Transposer)

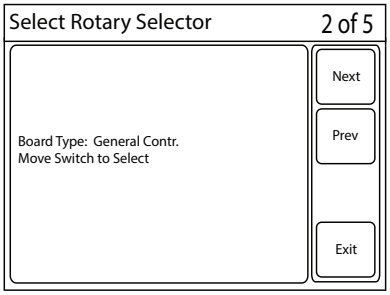
The General Controller has four inputs for rotary selectors. They can be configured to control Transposer, Memory Level, Memory Bank, or Chime Volume. The Rotary Selectors screen is used to configure these inputs. It is necessary to have a rotary selector connected to a selector input before it can be configured.

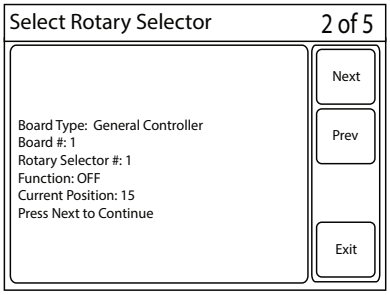
Step 1: The screen first asks to clear all the Rotary Selectors. Pressing the Clear All button will clear the settings for all rotary selector inputs on the MS8401 card that the screen has been assigned (see multiple consoles for more information how to assign the screen to an MS8401). After pressing the Clear All button, a dialog box will appear showing that the selectors are being cleared. Once clearing is complete, the screen will automatically advance to the next screen. To continue configuration without clearing rotary selectors, press the Next button.



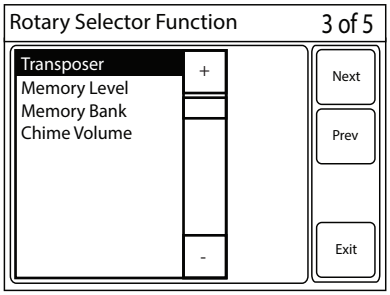


Step 2: Rotate the selector switch to be configured so that the screen can identify it. When the screen has identified a rotary selector it will display it's configuration and current position. Once the correct rotary selector is selected, press the Next button.

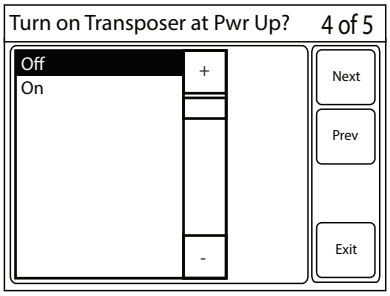




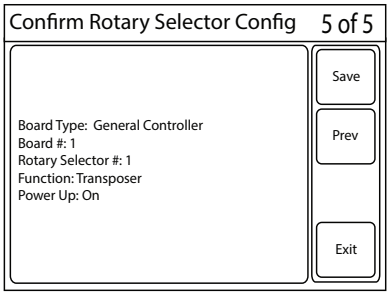
Step 3: Next, choose the desired function for the selector switch. The available functions are Transposer control, Memory Level control, Memory Bank control, and Chime Volume. Depending on the selected function, a different set of screens will be displayed.



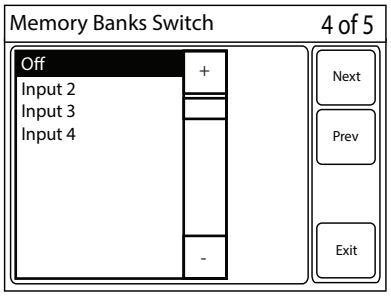
Step 4 (Transposer): The Transposer in the MS8400 can be set to turn on or off by pressing a reversible piston. When configuring a rotary selector as a Transposer controller, the system must be configured with whether to turn the Transposer on or off on power-up. Selecting On, will cause the Transposer to come on when the organ is powered up. Selecting Off, will cause the Transposer to be off when the organ is powered up. Regardless of whether the Transposer is on or off, the organ will not transpose when the control is set to 0. If there is no reversible piston to turn Transposer on or off, it is recommended to select On, so the Transposer can function when the organ is turned on. Otherwise, the Transposer will not function.



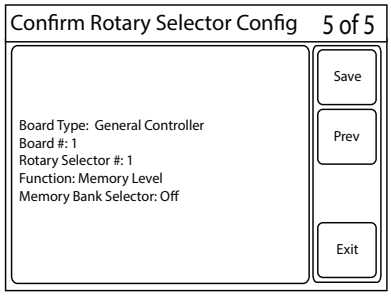
Step 5 (Transposer): The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.



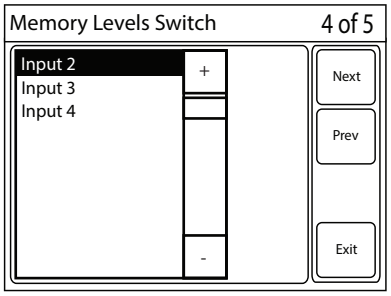
Step 4 (Memory Level): Normally, the MS8405 Touch Screen controls the system memory levels. Selecting the memory level function will allow a 12-position rotary selector to set the current memory level in the system instead of the Touch Screen. Select the Memory Level option from the list box and press the Next button. Select the desired rotary selector from the list box provided and press the Next button to continue. If memory banks are used, select the desired rotary input to control them. If memory banks are not used, select Off from the list box.



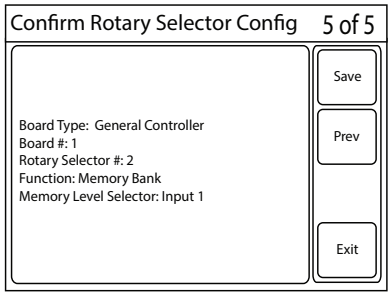
Step 5 (Memory Level): The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to the System Configuration Menu without saving changes.



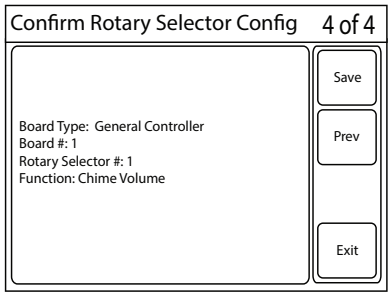
Step 4 (Memory Bank): Memory banks can be used to increase the total number of memory levels available for rotary control. Select the Memory Bank option and press the Next button. When using memory banks, memory levels must also be used. Select the rotary selector input used to control memory levels.



Step 5 (Memory Bank): The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.



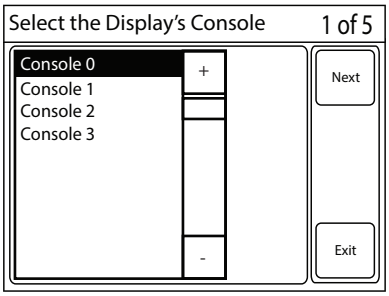
Step 4 (Chime Volume): Selecting the Chime Volume option will configure the rotary to control chime volume for the MS8400. The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

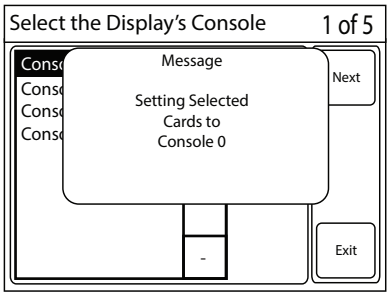


Multiple Consoles (Assigning Cards a Console Number)

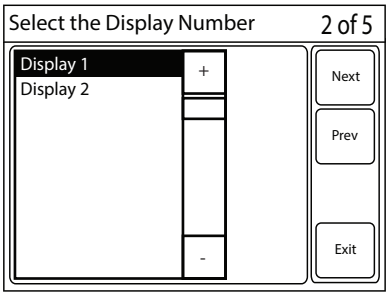
The MS8400 system can be configured with up to four consoles. The MS8405 Touch Screen, MS8404 Key Input Card, MS8403 Piston Controller Card, and the MS8402 Stop Controller Card must be assigned to a console number. By default, cards from the factory should be configured for Console 0, but it is good practice to set all boards in the system to the correct console even if only one console is being used. Also, the MS8401 General Controller Card is assigned to a console number by an onboard DIP switch. Make sure that these DIP switches are set correctly before configuring the system for multiple consoles.

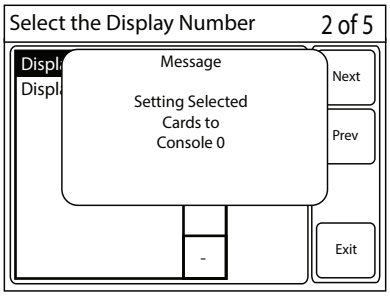
Step 1: The screen first asks to select the console number to configure. When configuring multiple consoles, each console must be configured from the MS8405 Touch Screen that is physically in the console. At this time it is not possible to configure another console from the MS8405. Select the console number from the list and press the Next button.



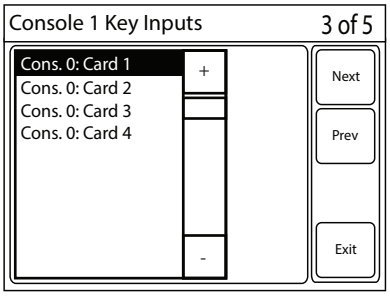


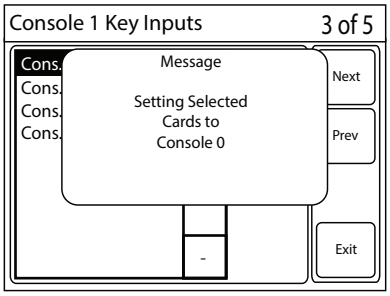
Step 2: The screen will now ask to select the display number for the MS8405. This feature is currently under development. Select display 1 from the list and press the Next button. A message box will be displayed letting you know that the boards are being configured to the console.



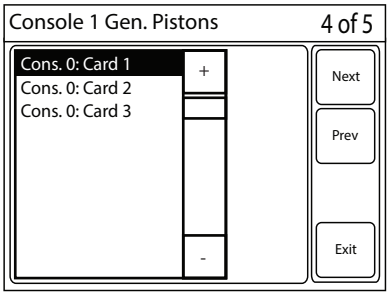


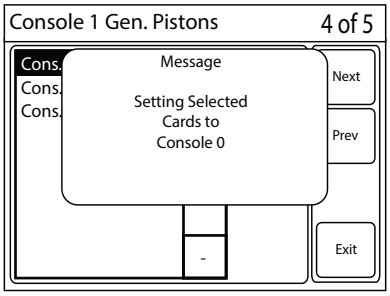
Step 3: Next, the screen will ask to select the Key Inputs for the selected console. The list is populated with all cards in the system. Each card in the list will display its currently configured console number as well as its address number (each board has an individual address set via DIP switches). Select all the boards from the list that are to be set up for the selected console. This list box allows multiple cards to be selected. Once all the correct boards are selected, press the Next button.



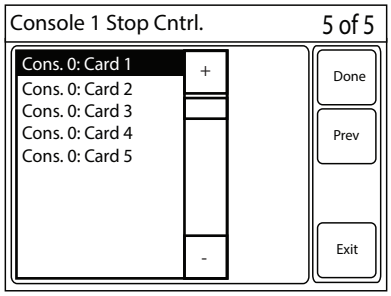


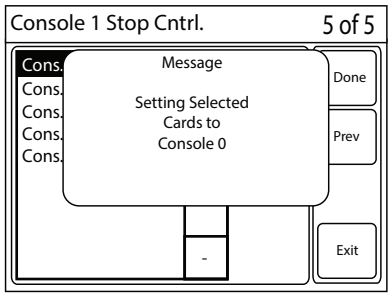
Step 4: Next, the screen will ask to select the Piston Controllers for the selected console. The list is populated with all cards in the system. Each card in the list will display its currently configured console number as well as its address number (each board has an individual address set via DIP switches). Select all the boards from the list that are to be set up for the selected console. This list box allows multiple cards to be selected. Once all the correct boards are selected, press the Next button.





Step 6: Next, the screen will ask to select the Stop Controller for the selected console. The list is populated with all cards in the system. Each card in the list will display its currently configured console number as well as its address number (each board has an individual address set via DIP switches). Select all the boards from the list that are to be set up for the selected console. This list box allows multiple cards to be selected. Once all the correct boards are selected, press the Next button.



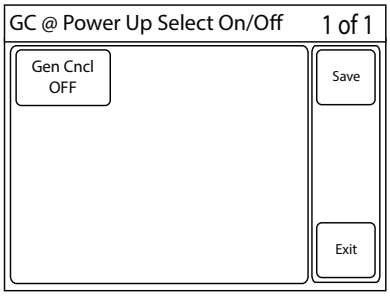


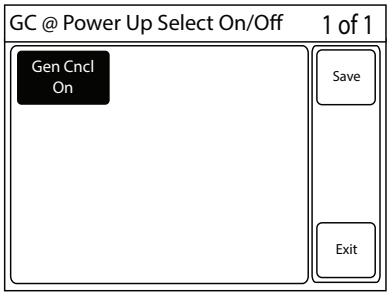
General Cancel on Power-up

The MS8400 system can be configured to cancel all stops when the organ is powered on.

Step 1: Press the General Cancel at Power-Up button (labeled GC @ Pwr Up) on the System Configuration Menu.

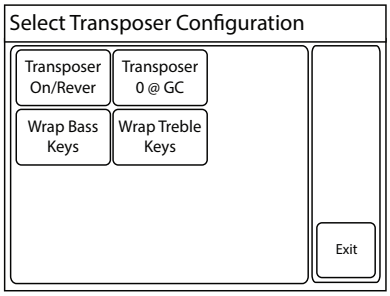
Step 2: The GC @ Power-up Select Screen will be displayed. Press the Gen Cncl button to configure the feature.

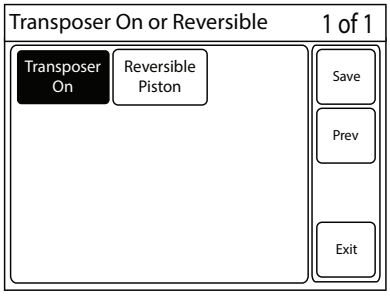


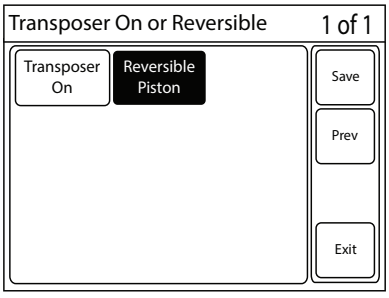


Transposer Configuration

The Transposer in the MS8400 system has multiple options that can be configured using the MS8405 Control Panel. The Transposer Configuration menu shows the four available Transposer configuration options. Transposer ON/Reversible is used to set up the Transposer as always on (transposition can still be set to zero) or to be turned on and off using a reversible piston. Transposer 0 @ General Cancel is used to revert the Transposer to the zero position when a General Cancel piston is pressed. This feature cannot be used when a rotary control is configured to control the Transposer as the position set on the rotary will override the MS8405 Transposer settings. Wrap Bass Keys is used to wrap the notes back up one octave when the Transposer goes beyond the bottom of the keyboard. Wrap Treble Keys is used to wrap the notes back down one octave when the Transposer goes beyond the top end of the keyboard. Note wrapping is individually configured for each keyboard. Select the option to be configured and press the Next button.

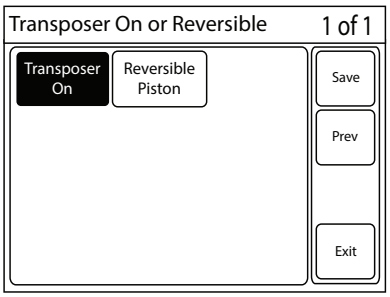


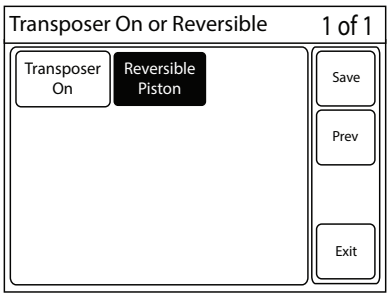




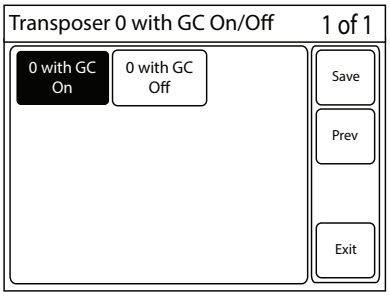
Step 3 (Transposer On/Reversible): Select the Transposer On button if the Transposer is not controlled by a reversible piston. Select the Reversible Piston button if the Transposer is controlled by a reversible piston. Once the desired selection is made, press the Save button.

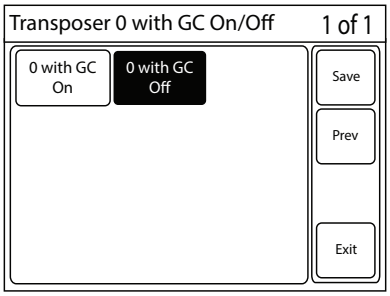
Step 3 (Transposer 0 @ General Cancel): Select the 0 with GC On button to set the Transposer to 0 when General Cancel is pressed. Select the 0 with GC Off button to leave the Transposer setting alone when General Cancel is pressed. Once the desired selection(s) are made, press the Save button.



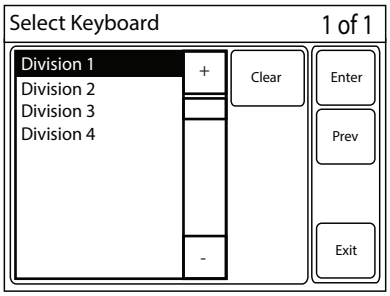


Step 3 (Wrap Bass Keys): The screen will ask which division of keying on which to configure bass wrapping. Select the desired division and press the Enter button to turn wrapping on. To turn wrapping off, select the desired division and press the Clear button. A message box will be displayed while the configuration is being saved. Repeat this process for each division in which the wrapping of bass notes is desired.





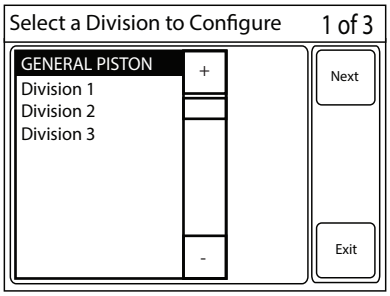
Step 3 (Wrap Treble Keys): The screen will ask which division of keying on which to configure treble wrapping. Select the desired division and press the Enter button to turn wrapping on. To turn wrapping off, select the desired division and press the Clear button. A message box will be displayed while the configuration is being saved. Repeat this process for each division in which the wrapping of treble notes is desired.

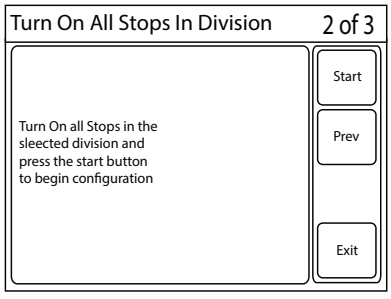


General and Divisional Pistons

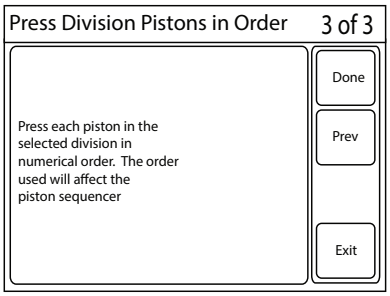
Any piston in the MS8400 system can be configured as a general piston, divisional piston, or special piston. This screen configures pistons as generals or divisionals.

Step 1: Select either general piston to configure generals or select the desired division to configure divisional pistons. Once the desired selection has been made, press the Next button.





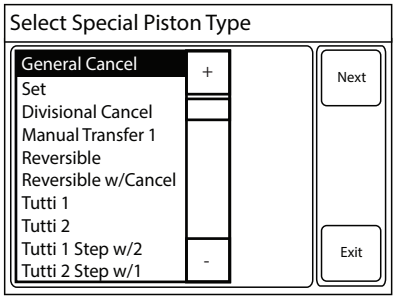
Step 2: Turn on all the stop controls in the selected division. Any stop that is turned on will be associated with the pistons pressed in the following step. For example, when configuring general pistons, turn on all the Stop Controls in the console. Once the desired stop controls have been turned on, press the Start button.



Step 3: Press each Piston in the selected division in sequential order. The sequence in which the pistons are pressed will determine the order used in General Piston Sequencing Mode. Once all the pistons have been pressed, press the Done button to complete configuration.

Special Pistons (Reversibles, Set, Cancel, etc.)

The MS8400 system has an extensive list of special piston functions that can be assigned to any piston within the system. To begin configuration, press the Special Piston button from the System Configuration Menu. This brings up a list box showing all the options available for special piston types. Depending on what selection is chosen, a variety of screens will be displayed in order to complete configuration. Select the desired Special Piston type from the list box and press the Next button.



As with all of Syndyne's products, additional features and functions are added continually to improve overall system capabilities. Here is a list of all the piston types available at the time this manual was written.

General Cancel - Cancels all stop controls associated with the piston's console.

Set - Holding this piston while pressing a General, Divisional, or SFZ/Tutti will capture a combination of stops.

Divisional Cancel - Cancels all stops associated with the selected piston. (Is not rangeable.)

Manual Transfer 1 - Transfers the keying and divisional pistons from one division to another.

Reversible - Reverses one or more stops. If multiple stops are configured, the reversible synchronizes all configured stops before reversing.

Reversible with Cancel - Can reverse a selected set of stops while canceling another selected set of stops. Canceled stops remain off, while reversing stops continue to reverse.

Tutti 1 - Reversible Action Full Organ Piston 1.

Tutti 2 - Reversible Action Full Organ Piston 2.

Tutti 1 Step w/2 - Reversible Action Full Organ Piston 1 which turns off Tutti 2.

Tutti 2 Step w/1 - Reversible Action Full Organ Piston 2 which turns off Tutti 1.

Sforzando 1 - Momentary, on while pressed, Action Full Organ Piston 1 (Uses the same memory as Tutti 1.)

Sforzando 2 - Momentary, on while pressed, Action Full Organ Piston 2 (Uses the same memory as Tutti 2.)

Autopedal - Turns on and off the autopedal coupler (IMPORTANT - If the MS8405 button is intended to control autopedal, this feature must be configured by selecting the autopedal piston type, and pressing the Autoped button on the screen when the screen asks to press a piston.

Transpose - Reverses the Transposer function on and off, allowing the Transposer to remain set to a specific level without engaging until this piston is pressed.

Blind Check Reversible - Turns on/off Blind Check mode as a reversible, showing all blind stops currently on in the system. It is important to only have one blind function on at a time when attempting to view what is set on a specific blind function.

Blind Check Momentary - Turns on Blind Check mode when pressed and turns it off when released, showing all blind stops currently on in the system. It is important to only have one blind function on at a time when attempting to view what is set on a specific blind function.

Sequence Next - Advances the general piston sequencer to the next general piston. If at the last general piston, the memory level will increase to the next level and the first general piston will be activated.

Sequence Previous - Returns the general piston sequencer to the previous general piston. If at the first general piston, the memory level will decrease to the previous level and the last general piston will be activated.

Memory Level Up - Can be used instead of the MS8405 Touchscreen buttons to control memory level. Pressing this piston increases the memory level by one.

Memory Level Down - Can be used instead of the MS8405 Touchscreen buttons to control memory level. Pressing this piston decreases the memory level by one.

SFZ/Tutti 1 Mem Lev Up - Increases the SFZ/Tutti 1 memory level by one. If at the fourth memory level, the memory level wraps back to the first memory level. Since there are only four levels, there is no down piston.

SFZ/Tutti 2 Mem Lev Up - Increases the SFZ/Tutti 2 memory level by one. If at the fourth memory level, the memory level wraps back to the first memory level. Since there are only four levels, there is no down piston.

Crescendo 1 Mem Up - Increases the Crescendo Shoe 1 memory level by one. If at the fourth memory level, the memory level wraps back to the first memory level. Since there are only four levels, there is no down piston.

Crescendo 2 Mem Up - Increases the Crescendo Shoe 2 memory level by one. If at the fourth memory level, the memory level wraps back to the first memory level. Since there are only 4 levels, there is no down piston.

Ventil 1 - A blind cancel piston that cancels any stops set on it regardless of whether the stop is on physically, or blind through Tutti/Crescendo. It is set in the same way as any general or divisional piston.

Ventil 2 - See Ventil 1.

Ventil 1 Step w/2 - This operates the same as Ventil 1, but it will also cancel Ventil 2 when turned on.

Ventil 2 Step w/1 - This operates the same as Ventil 1, but it will also cancel Ventil 1 when turned on.

Ventil 3 - See Ventil 1.

Ventil 4 - See Ventil 1.

Ventil 3 Step w/4 - This operates the same as Ventil 4, but it will also cancel Ventil 1 when turned on.

Ventil 4 Step w/3 - This operates the same as Ventil 1, but it will also cancel Ventil 3 when turned on.

Manual Transfer 2 - Transfers the keying and divisional pistons from one division to another.

MIDI Sustain - Pressing and holding this piston on sends a MIDI sustain message on all currently active MIDI stops. Releasing this piston halts sending any MIDI sustain messages.

MIDI Panic - A momentary action piston that transmits a MIDI "All Notes Off" message on all MIDI Channels.

Transposer Up - Can be used instead of the MS8405 Touchscreen buttons to control Transposer level. Pressing this piston increases the Transposer level by one.

Transposer Down - Can be used instead of the MS8405 Touchscreen buttons to control Transposer level. Pressing this piston decreases the Transposer level by one.

Duplicate a Piston - Configures a piston to point to another piston when pressed. This is useful in cases where generals are duplicated between toe pistons and thumb pistons.

Master Cancel - Cancels all stop controls on all consoles.

View Range - Pressing and holding the range piston while pressing a general or divisional piston will show the current range of stops associated with that piston.

Man. Reassignment 1 - Transfers multiple divisions of keying and pistons simultaneously, using a list created during Special Piston configuration.

Man. Reassignment 2 - See Manual Reassignment 1.

Blind Reversible - This is used in situations where a piston needs to take the place of a stop, but is not capturable, such as with a Zymblestern. It requires an unused stop input on an MS8402 Stop Controller card, but this input does not require a physical stop control to be wired.

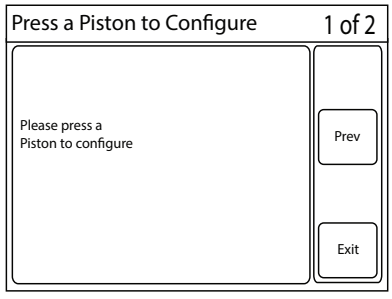
Blind Reversible - Only use if instructed by factory.

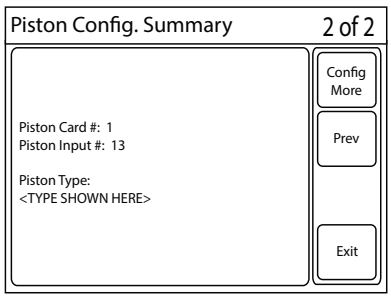
Registration Lock - When activated, the current registration is locked, allowing the manipulation of stops without changing active registration. Once the stops are registered correctly, deactivating registration lock updates the registration. This is mostly used for improvisation and manipulation of stops on the fly.

Clear - Clears the piston's configuration.

Configuring the Majority of Piston Types

Step 1: For most of the Special Piston types, the first step is to press the desired piston for configuration.

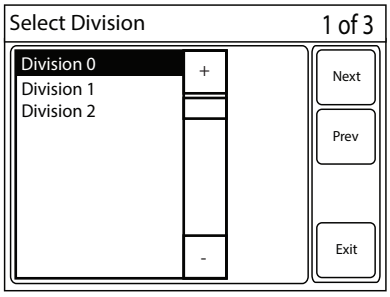


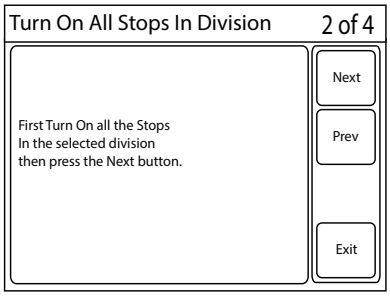


Step 2: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

Divisional Cancel

Step 1: A divisional cancel needs to be associated with a division. The next screen asks to select the division that is desired to cancel when the Divisional Cancel Piston is pressed. Select the division from the list and press the Next button.





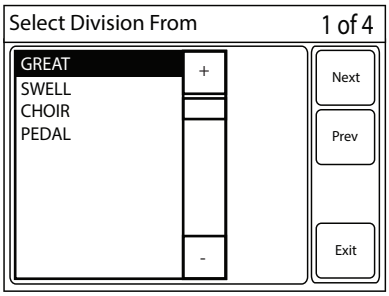
Step 2: Next, turn on all the stop controls in the selected division. Any stop that is turned on will be associated with the divisional cancel.

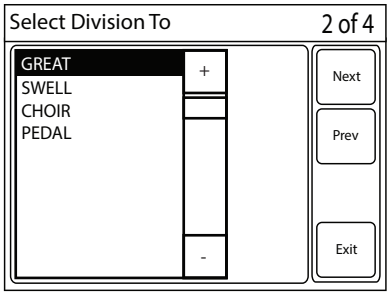
Step 3: Once the desired stop controls have been turned on, press the piston to be configured as divisional cancel for the selected division.

Step 4: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

Manual Transfers 1 & 2

Step 1: The system can have two Manual Transfer pistons. The screen will ask to select the "from" division for the manual transfer. Select the desired division from the list and press the Next button.





Step 2: The screen will now ask to select the "to" division for the manual transfer. Select the desired division from the list and press the Next button.

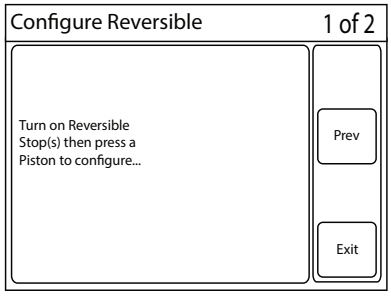
Step 3: Press the piston to be configured as the manual transfer.

Step 4: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

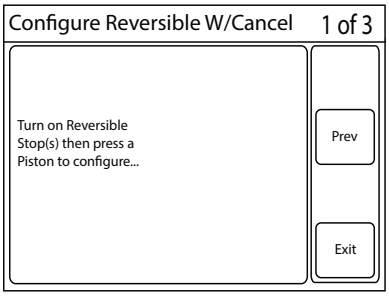
Reversible

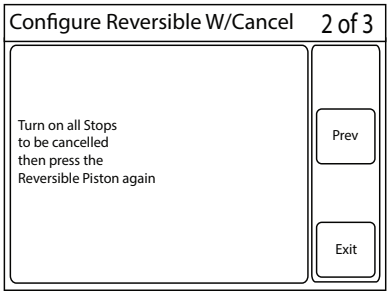
Step 1: Turn on the stop(s) that are to be reversed by the desired reversible piston. Once the stops are on, press the desired piston to be configured as a reversible.

Step 2: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.



Reversible with Cancel



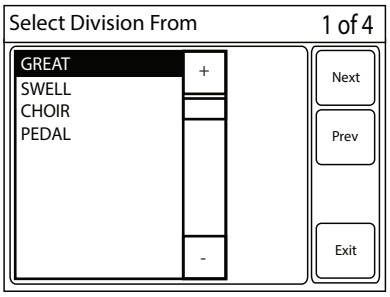


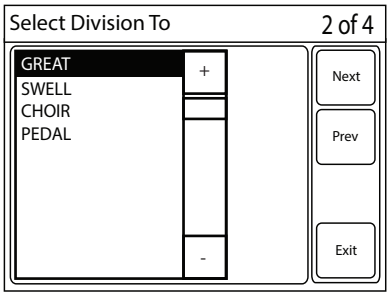
Step 1: Turn on the stop(s) that are to be reversed and then press the desired reversible piston.

Step 2: Turn on the stop(s) that are to be canceled, including the stops from step 1. Once the stops are on, press the desired piston to be configured as a reversible.

Step 3: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

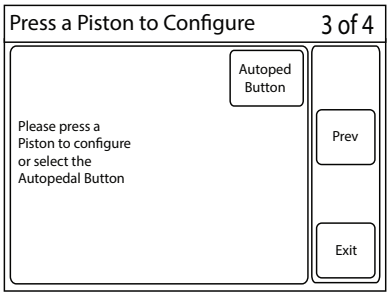
Autopedal





Step 1: The screen will ask to select the "From" division to get keying for the autopedal function. Select the desired division from the list and press the Next button.

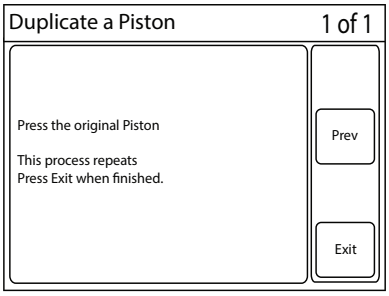
Step 2: The screen will now ask to select the "To" division to use as the Pedal. Select the Pedal division from the list and press the Next button. Although, the system can use autopedal on any division, it was intended to be used on the Pedal division.



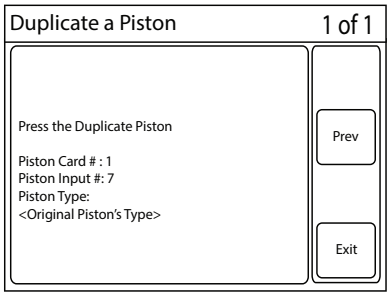
Step 3: Either a piston, or buttons within the MS8405 Touchscreen can control Autopedal. If Autopedal is to be controlled by a piston, press the Autopedal piston. If the Autopedal is to be controlled by the MS8405 buttons in the Main Menu and/or a button on the performance screen, press the button labeled Autoped Button.

Step 4: After pressing the desired piston the configuration is already saved into memory. If the Autoped Button option was selected, the screen automatically exits to the Special Piston list box. If a piston was pressed, the screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

Duplicate a Piston

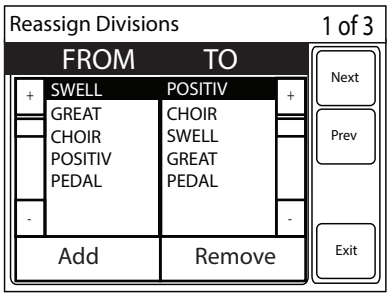


Step 1: This feature is usually used for Generals or Tutti, however it can be used for other piston in the system. The original piston must be configured with its desired piston type before attempting to duplicate. For example, if General 1 is on a toe stud and also on a thumb piston, one of these must be configured as General 1. After it is configured, it is considered the Original piston. When ready, press the original piston to be duplicated.



Step 2: The text on the screen should now display the original piston's card number, input number, and piston type. If this information is correct, press the piston that is intended to duplicate the original piston. This completes the process and saves the original pistons configuration information into the duplicate pistons memory. The process is now ready to begin again at step 1. Pressing the Prev button returns to the Special Piston list box, and pressing the Exit button returns to the System Configuration Menu.

Manual Reassignment 1 & 2

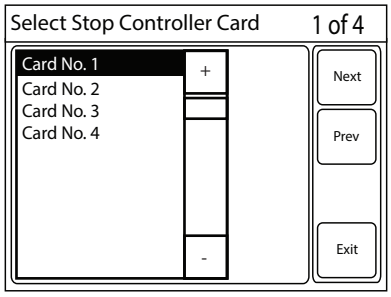


Step 1: The first step is to configure the order in which the divisions will play while the Manual Reassignment is active. The initial screen displays two list boxes. The "From" list box is populated with all the divisions in the system. The "To" list box should begin empty. The order of the "From" list box is numerical and does not change. The goal is to add divisions into the "To" list box in the desired order. To add a division into the "To" box, highlight it in the "From" box and press the Add button. This adds the selected division into the first row in the "To" box. Repeat this for the next division to be added and it will be placed into the second row of the "To" box. Once all divisions are added, press the Next button to continue. Please note that each division can only be added one time, all divisions must be added at least once, and the divisions are correlated to each other horizontally. For example, in the picture provided, the SWELL will be transferred to the POSITIV, the GREAT to the CHOIR, the POSITIV to the GREAT, and the PEDAL will remain the same.

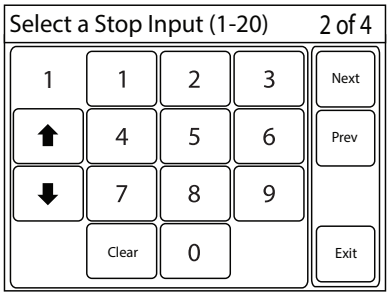
Step 2: Press the piston to be configured as the manual reassignment piston.

Step 3: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

Blind Reversible



Step 1: A blind reversible allows the MS8400 system to turn on a stop input on an MS8402 Stop Controller card without needing a physical stop control in or on the console. This does require an available stop input. First select the MS8402 Stop Controller card from the list box where the desired available stop input number is located.



Step 2: Select the desired available stop input number on the selected MS8402 Stop Controller card. There are 20 inputs on each card. It is a good idea to document the card number and input number selected, because they will be used later during configuration.

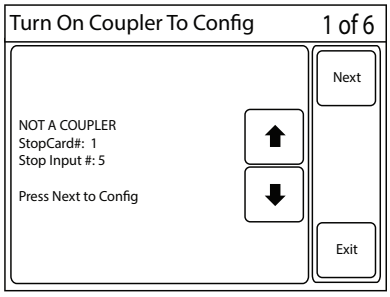
Step 3: Press the piston to be configured as the blind reversible.

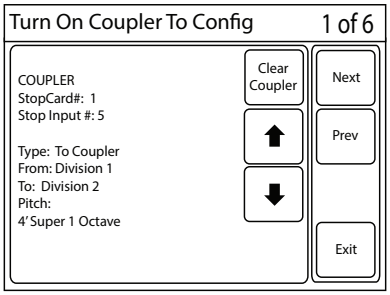
Step 4: After pressing the desired piston the configuration is already saved into memory. The screen will show the piston input number and card number as well as the piston type configured. Pressing the Config More button will return to the Special Piston Type list box to configure another special piston. Pressing the Exit button will return to the System Configuration Menu.

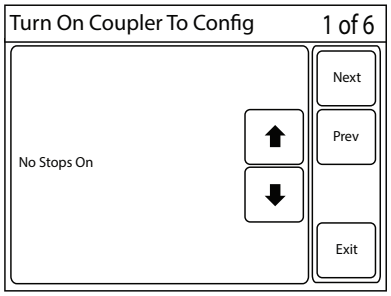
Coupler Configuration

Step 1: Any stop control in the MS8400 system can be configured as a coupler. There are many different coupler types that can be configured. The coupler configuration screen can also be used to clear a coupler. To begin configuration of couplers, press the Coupler Config button on the System Configuration Menu.

Turn on the stop control(s) to be configured as a coupler. If no stops are on, the screen will display the message, "No Stops On." If more than one stop is on, the up or down arrow will scroll through all active stops. When scrolling through stops, any stop that is not configured as a coupler will display a message, "NOT A COUPLER." Any stop that has already been configured as a coupler will display "COUPLER," as well as its coupler configuration information. A Clear Coupler button will also be displayed, and can be pressed to clear any coupler configuration for the selected stop control. Once the desired stop has been selected, press the Next button to configure or re-configure the stop as a coupler.







Step 2: Select the desired coupler type from the Coupler Type list box and press the Next button to start configuration of the selected stop control. Depending on which coupler type is selected, different steps are required. Please see the included list for a brief description of each coupler type and the following section for information on how to configure each coupler type.

TO Coupler - Couples stops from one division to another (or the same) division at a variety of standard pitches, selectable from a list box.

ON Coupler - These are commonly used to play floating divisions which have no keys of their own. The coupler plays the stops in the "From" division as if they are at home in the "On" division. Any "On" division inter-manual couplers will also affect stops in the "From" division.

Custom Super TO - Couples the same as a standard TO coupler, except the pitch can be defined as a custom step count. The pitch is defined by pressing a key above C25. The screen calculates the pitch using the difference in steps between the pressed key, and C25.

Custom Sub To - Couples the same as a standard TO coupler, except the pitch can be defined as a custom step count. The pitch is defined by pressing a key below C37. The screen calculates the pitch using the difference in steps between the pressed key, and C37.

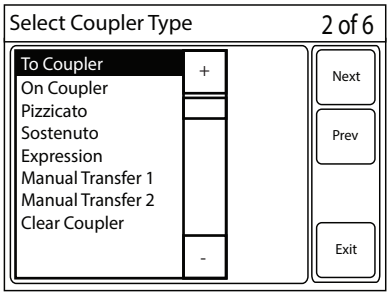
TO Coupler OFF - Same as TO coupler except it turns on when the stop control is off and turns off when the stop control is on.

ON Coupler OFF - Same as ON coupler except it turns on when the stop control is off and turns off when the stop control is on.

ON THRU Coupler - The same as an ON Coupler, except it couples thru any couplers in the FROM division. For example, lets say there is an Antiphonal ON-Thru to Great Coupler, a Pedal to Antiphonal 16' Coupler, and an Antiphonal to Antiphonal 4' Coupler active at the same time. The Pedal to Antiphonal 16' and Antiphonal to Antiphonal 4' would couple through to the Great Division.

Split Pedal @ 13 - Any stops coupled to the Pedal will not play below the split at note 13.

Split Pedal @ 25 - Any stops coupled to the Pedal will not play below the split at note 25.



Expression - Couples one expression shoe to another shoe. There is also an All Swells option which couples all Swell shoes to a single selectable Swell shoe.

Manual Transfer 1 - Transfers the keying and divisional pistons from one division to another.

Manual Transfer 2 - Same as Manual Transfer 1.

Reassign Manuals 1 - Transfers multiple divisions of keying and pistons simultaneously, using a list created during coupler configuration.

Reassign Manuals 2 - See Reassign Manuals 1.

Pizzicato - Operates the same as a "To" coupler except that it operates with a Pizzicato effect.

Sostenuto - An effect activated by a stop control. When activated, pressing and releasing a key or a group of keys will latch these keys on. These keys will remain latched until a new key or group of keys are pressed and released. The latching action occurs on key release.

Piano Sostenuto - An effect that activates by a stop control. It latches on any keys currently held down when the effect is activated. The keys stay on until the coupler is turned off.

Sustain - An effect that activates by a stop control. When on, it latches on any keys within a specific division until the sustain is turned off.

Any Piston Next - Activates any piston next mode on the piston sequencer.

Link to Rev Piston - Only use if instructed by Syndyne.

Console Control - Swaps console numbers on cards in the system so that the MS8405 Touchscreen, the Crescendo, and any rotary switches from one console affects the second console.

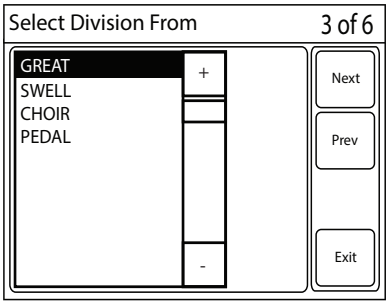
TO Coupler

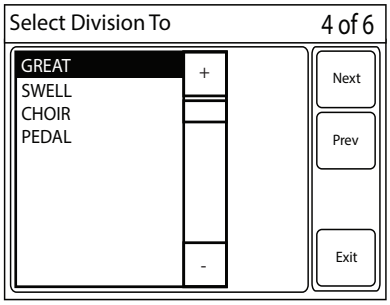
Step 3: Select the couple "From" division and press the Next button.

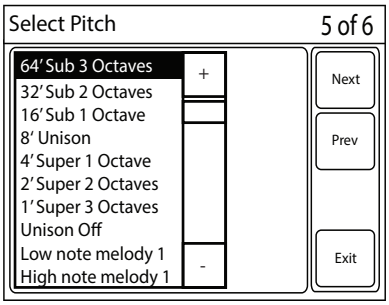
Step 4: Select the couple "To" division and press the Next button.

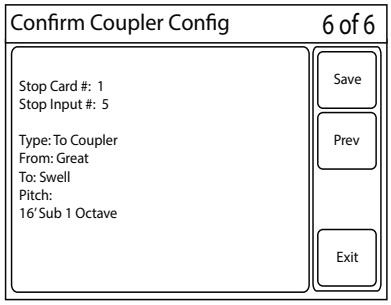
Step 5: Pitches can be selected from 64', 32', 16', 8', 4', 2', and 1'. There are also options available to make the coupler a unison off, a low note melody coupler (often referred to as autopedal), or a high note melody coupler. Select the coupler type from the list and press the Next button.

Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.







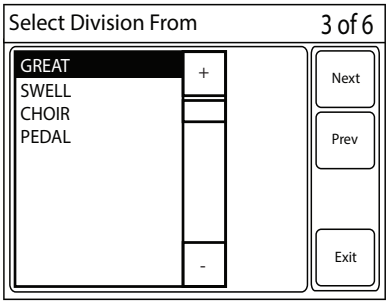


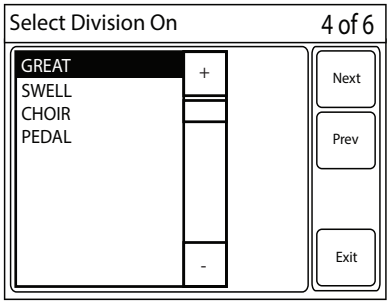
ON Coupler

Step 3: Select the couple "From" division and press the Next button.

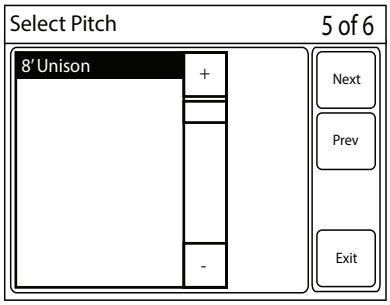
Step 4: Select the couple "On" division and press the Next button.

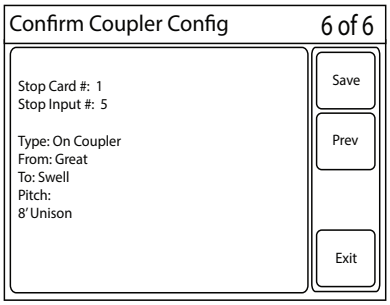
Step 5: Select 8' Unison (the only option at this time) and press the Next button.





Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.



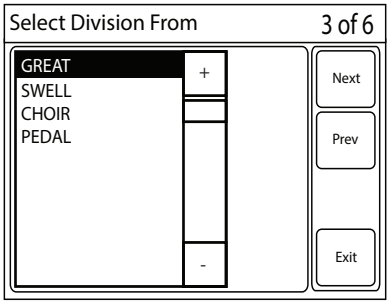


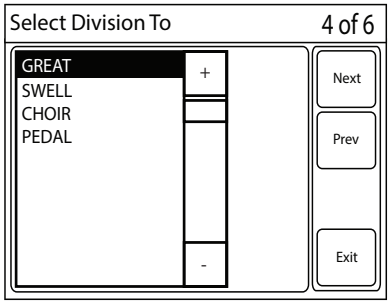
Pizzicato Coupler

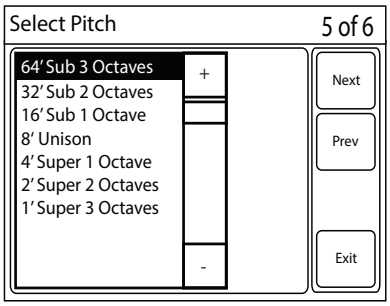
Step 3: Select the couple "From" division and press the Next button.

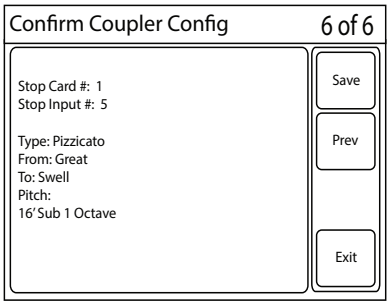
Step 4: Select the couple "To" division and press the Next button.

Step 5: Pitches can be selected from 64', 32', 16', 8', 4', 2', and 1'. There are also options available to make the coupler a unison off, a low note melody coupler (often referred to as autopedal), or a high note melody coupler. Select the coupler type from the list and press the Next button.





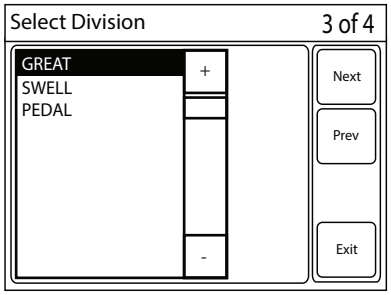


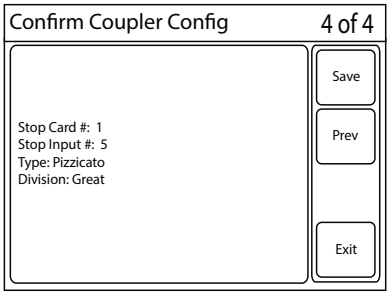


Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

Sustain Coupler

Step 3: Select the division on which the sustain function will be active and press the Next button.

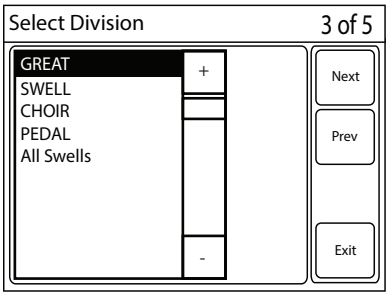


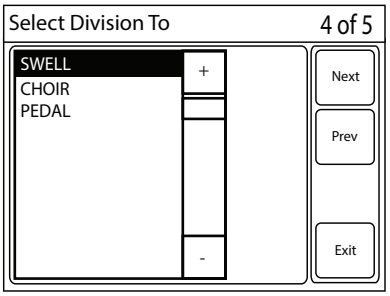


Step 4: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

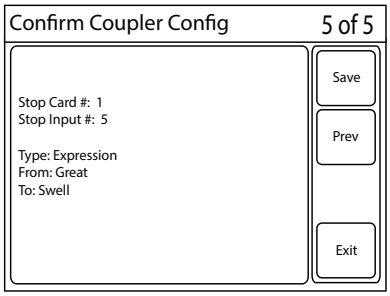
Expression Coupler

Step 4: Select the coupler from division and press the Next button. The All Swells option will couple all Swell shoes to the "To" division's shoe. Then select the couple to division and press the Next button.





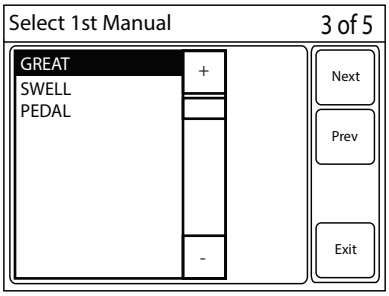
Step 5: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

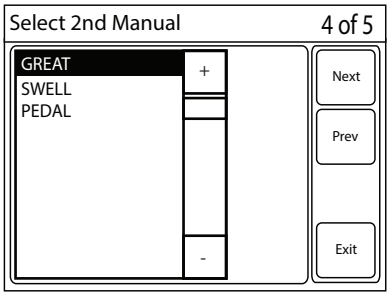


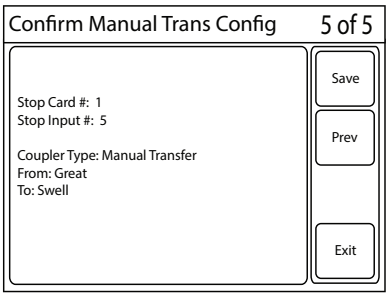
Manual Transfer 1 & 2

Step 3: Select the 1st division to be transferred and press the Next button.

Step 4: Select the 2nd division to be transferred and press the Next button.





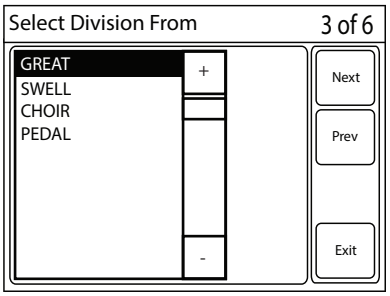


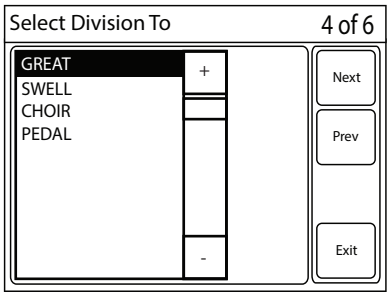
Step 5: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

Custom Super TO & Sub TO

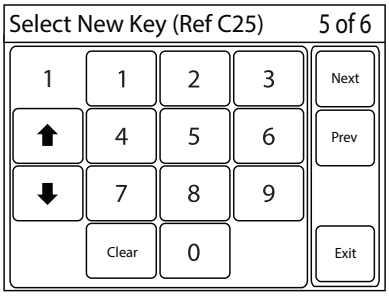
Step 3: Select the couple "From" division and press the Next button.

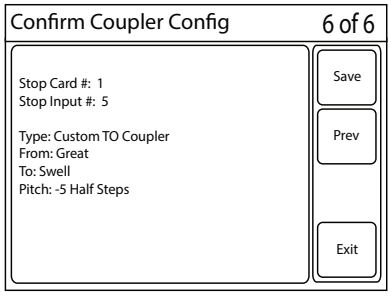
Step 4: Select the couple "To" division and press the Next button.





Step 5: Next, for a Custom Super TO coupler, press any key above C25 and for a custom sub TO coupler, press any key below C37. The pitch is calculated by counting the half steps between the selected key and the reference key (C25 or C37). For example, to create a 5th note super coupler press G32. The screen will display input number 32, and will calculate +7 half steps. ***Please note the number on the screen references the note input number on the keyboard, NOT the number of steps.***





Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

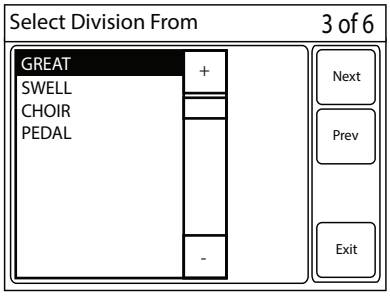
ON THRU Coupler

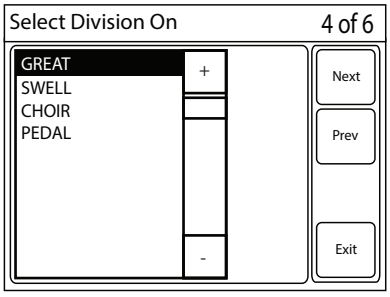
Step 3: Select the couple "From" division and press the Next button.

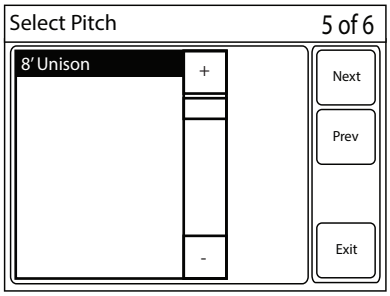
Step 4: Select the couple "On" division and press the Next button.

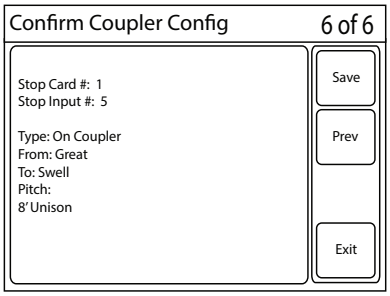
Step 5: Select 8' Unison (the only option at this time) and press the Next button.

Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.



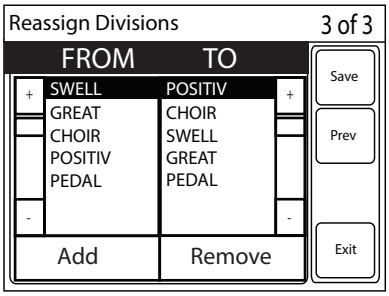




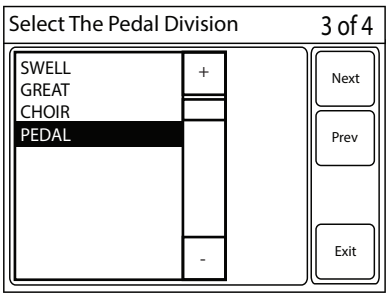


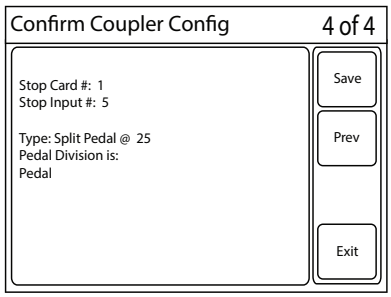
Reassign Manuals 1 & 2

Step 3: The first step is to configure the order in which divisions will play while the Manual Reassignment is active. The initial screen displays two list boxes. The "From" list box is populated with all the divisions in the system. The "To" list box should begin empty. The order of the "From" list box is numerical and does not change. The goal is to add divisions into the "To" list box in the desired order. To add a division into the "To" box, highlight it in the "From" box and press the Add button. This adds the selected division into the first row in the "To" box. Repeat this for the next division to be added and it will be placed into the second row of the "To" box. Please note that each division can only be added one time, all divisions must be added at least once, and the divisions are correlated to each other horizontally. For example, in the picture provided, the SWELL will be transferred to the POSITIV, the GREAT to the CHOIR, the POSITIV to the GREAT, and the PEDAL will remain the same. Once the configuration settings are correct, press the Save button to save the settings in memory and return to the System Configuration Menu. The Exit button will return to System Configuration Menu without saving changes.



Split Pedal @ 13 & @ 25





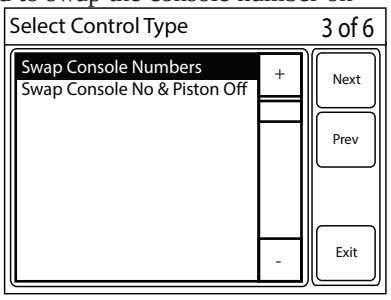
Step 3: Select the Pedal division from the list box and press the Next button.

Step 4: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes. Please note that the Pedal divide location can be changed by the organist on the fly, but the default on organ power-up is either 13C or 25C and is set when configuring the coupler as a split @13 or split @25 from the list.

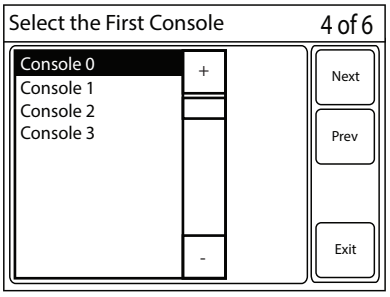
OFF Couplers (Opposite Action Couplers)

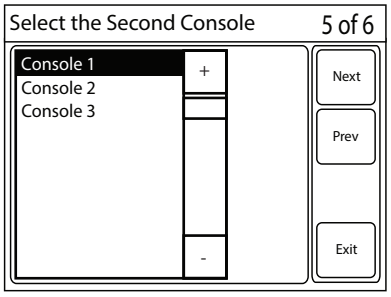
The OFF version of a standard coupler is rarely used, but can be helpful in specific scenarios that would otherwise require additional relays or extra hardware. A good example of how these OFF versions are used, is on an Antiphonal floating division. In some cases, the Antiphonal is supposed to be "at home" on the Choir division, playing from the Choir without any couplers on. Then there is an Antiphonal to Choir off coupler that stops the Antiphonal from coupling on the Choir division. How this would be configured would be to program the Antiphonal to Choir off stop control using the coupler type "ON Coupler Off" from the list box. In effect, this would cause the Antiphonal to be coupled on the Choir when the stop control is in the off position. When the stop control is pulled out, the Antiphonal no longer couples on the Choir.

Console Control



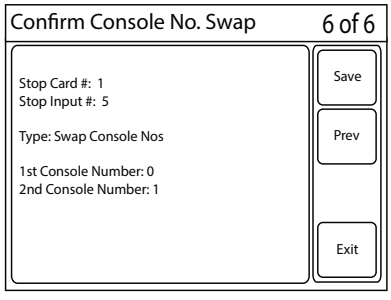
Step 3: Select the type of console swap function that should be performed when the stop is in the on position. There are two types of Console Swap functions. The type labeled "Swap Console Numbers" is used to swap the console number on the MS8401 General Controller card and the MS8405 Touchscreen of two selected consoles. This allows control of one console from any rotary memory level controls, Crescendo, or touchscreen controls of the other console. The type labeled "Swap Console No & Piston Off" does the same thing as the first type, but also disables all piston cards on the first selected console. This is helpful when pistons in the second console need to be used to control pistons in the first console. For example, if there is a main console (1st Console) that is much larger than a choir loft console (2nd Console), it may be desirable to have some of the choir loft console pistons send a message to control. This requires special wiring and additional hardware considerations, so please contact Syndyne for more information before purchasing a system that requires this feature.





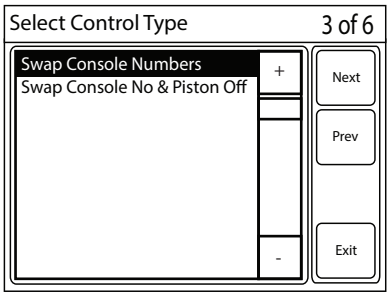
Step 4: Select the first console to be swapped and press the Next button. If the "Piston Off" type was selected, the first console will have all its piston cards disabled when the stop control is active.

Step 5: Select the second console to be swapped and press the Next button.

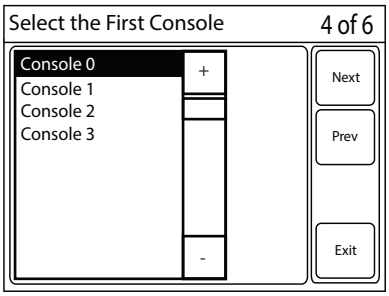


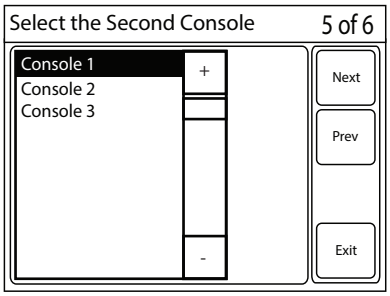
Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

Console Control



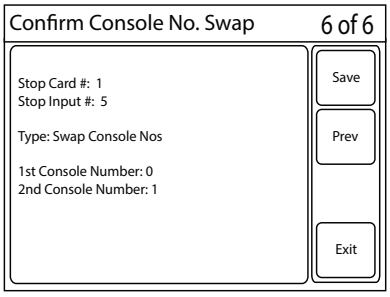
Step 3: Select the type of console swap function that should be performed when the stop is in the on position. There are two types of Console Swap functions. The type labeled "Swap Console Numbers" is used to swap the console number on the MS8401 General Controller card and the MS8405 Touchscreen of two selected consoles. This allows control of one console from any rotary memory level controls, Crescendo, or touchscreen controls of the other console. The type labeled "Swap Console No & Piston Off" does the same thing as the first type, but also disables all piston cards on the first selected console. This is helpful when pistons in the second console need to be used to control pistons in the first console. For example, if there is a main console (1st Console) that is much larger than a choir loft console (2nd Console), it may be desirable to have some of the choir loft console pistons send a message to control pistons in the main console. This requires special wiring and additional hardware considerations, so please contact Syndyne for more information before purchasing a system that requires this feature.





Step 4: Select the first console to be swapped and press the Next button. If the "Piston Off" type was selected, the first console will have all its piston cards disabled when the stop control is active.

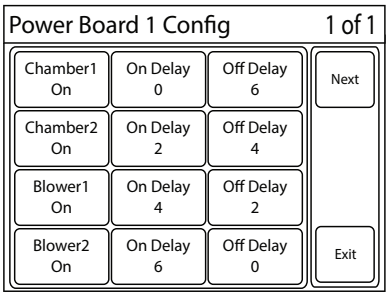
Step 5: Select the second console to be swapped and press the Next button.



Step 6: The screen will now ask to confirm the settings before committing them to memory. If the configuration settings are correct, press the Save button which will save the settings in memory and return to the System Configuration Menu. If the settings are not correct, use the Previous button to go back through the menus to change settings. The Exit button will return to System Configuration Menu without saving changes.

Power Configuration (Configuring MS8409 Power Sequencers)

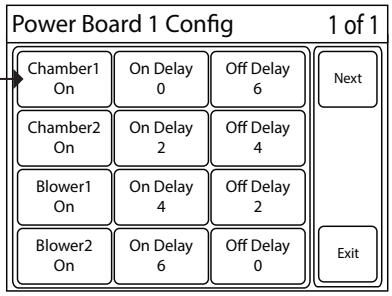
The MS8400 System can have up to eight separate MS8409 Power Controller cards. Each MS8409 drives up to four different relays with configurable On and Off time delays. These cards are designed to provide power control for chamber drivers, blowers, and other remote power requirements directly from the MS8405 Touch Controller. The Power Configuration screen is used to configure how the MS8409 cards operate.

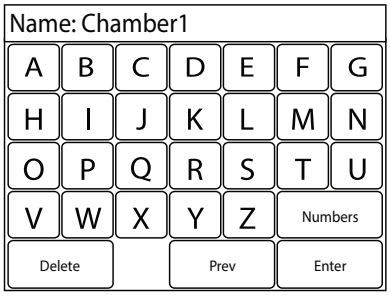


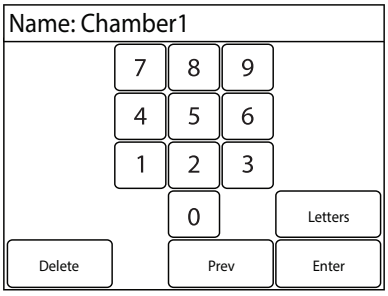
Step 1: Press the Power Config button on the System Configuration Menu.

Step 2: The screen will display the first MS8409 card located in the system. The MS8409 has four relays for power control and each have a configurable on and off delay timer of up to 60 seconds. Each of these outputs can be given a alphanumeric name to more easily identify what the relay is controlling.

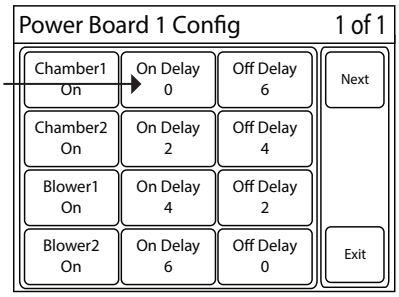
Step 3: To change the name, press the far left button of the desired output. The screen will display an alphanumeric keypad that is used to change the output name. When the name has been entered, press the Enter button to return to the Power Config screen.

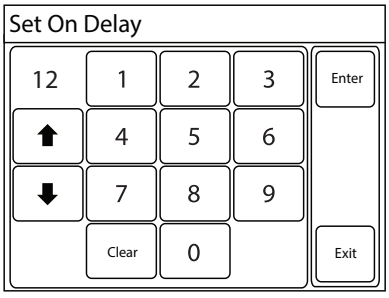




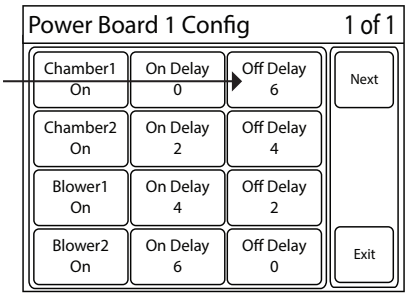


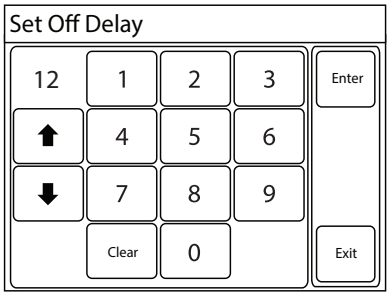
Step 4: To change the On time delay for an output, press the middle button for the desired output. The screen will display a numeric keypad to input the on delay time in seconds. When the on delay time has been entered, press the Enter button to return to the Power Config screen.



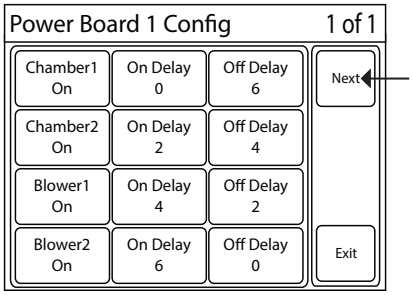


Step 5: To change the Off time delay for an output, press the middle button for the desired output. The screen will display a numeric keypad to input the on delay time in seconds. When the on delay time has been entered, press the Enter button to return to the Power Config screen.



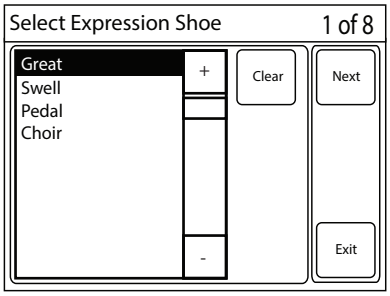


Step 6: If there are more then one MS8409 Power Boards in the system, press the Next button to save the settings and move on to the next MS8409 Power Board in the system. Repeat steps 3 through 5 until all MS8409 Power Boards have been configured. Once the last MS8409 Power Board in the system has been configured, press the Save button to save the settings and return to the System Configuration Menu.



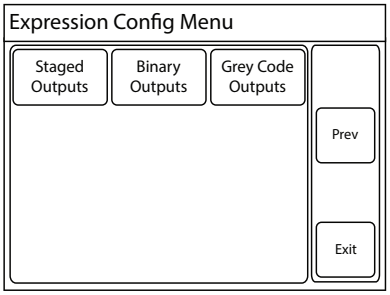
Expression Driver (Configuring How Expression Motors Are Driven)

Overview

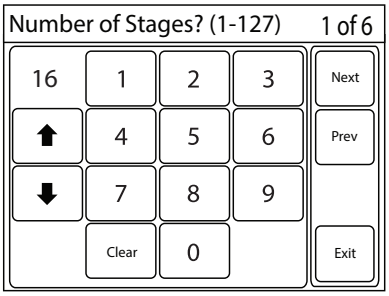


Any of the 80 outputs on the MS8406 Driver Cards can be configured to drive expression in the MS8400 system. The Expression Driver screen is where these outputs are configured to turn on with expression.

Each MS8404 Keying Input card has an input on it for a potentiometer that can be used to control expression for the corresponding division. Select the desired expression shoe from the list. Please note the Clear button on this screen which clears the current configuration data for the selected shoe. This is highly recommended when configuring expression to insure that no unwanted data remains. To clear the expression shoe configuration press the Clear Shoe button. A message will be displayed briefly that the shoe is being cleared. Once the correct expression shoe is selected and cleared, press the Next button to begin configuration.

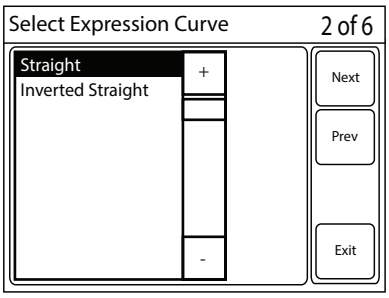


Three options are available for controlling expression: Staged Output mode, Binary Output mode, and Grey Code Output mode. Please read the configuration method for each mode in the rest of this section for more information on which of these three expression output modes is correct for the instrument. Press the desired mode to begin configuration of the selected expression shoe.



Staged Outputs

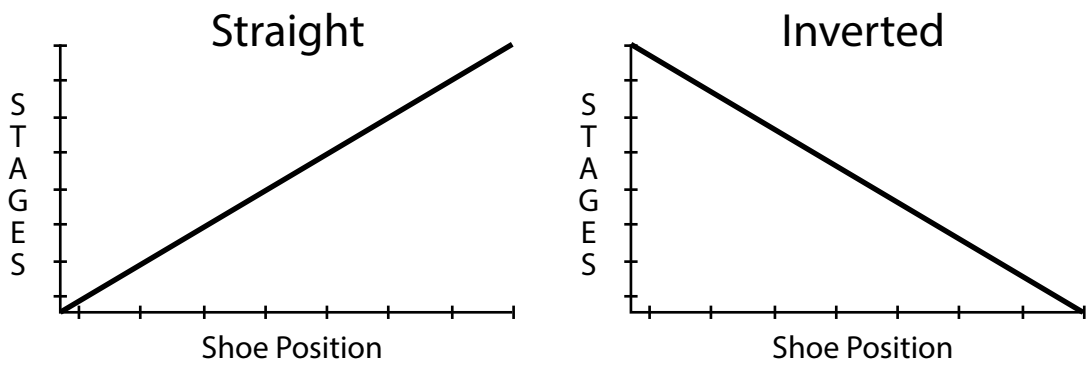
Step 1: Use the numeric keypad to input the total number of expression stages for the Swell engine. The MS8400 system can handle up to 127 stages of expression per shoe. Once the correct number of stages is entered, press the Next button.



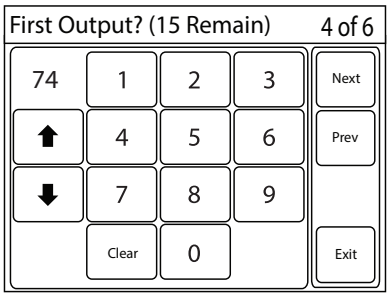
Step 2: Select the desired expression curve from the list box. The expression curve is used to control how the stages of expression correspond to the shoe position. Here is an explanation of the options and an example of how they operate.

Straight: The total number of stages are divided equally across all the positions on the potentiometer.

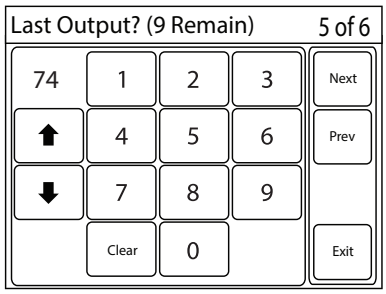
Straight Inverted: This is an inverted version of the straight selection. This selection is used where a Swell driver requires energized outputs to close the shades rather then to open them.



Step 3: Select the first driver card (MS8406) to configure from the list. Although any spare outputs on MS8406 Driver cards can be configured to turn on with expression stages, it is recommended to group outputs in order as much as possible to simplify configuration. Once the desired driver card has been selected, press the Next button.



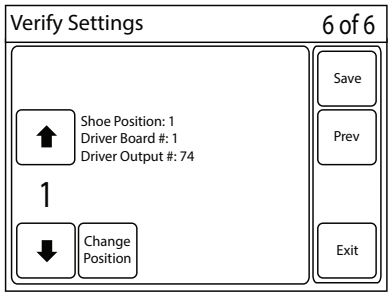
Step 4: Using the numeric keypad, enter the first output to turn on with expression stage one. Once the first output has been entered, press the Next button.



Step 5: Using the numeric keypad, enter the last output to turn on with its corresponding expression stage. Once the last output has been entered, press the Next button.

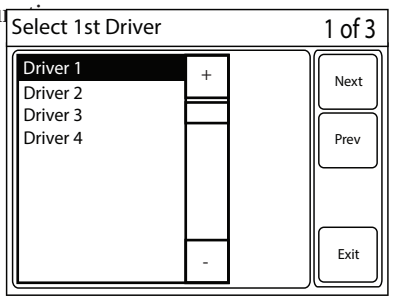
If the first and last output entered do not include enough outputs to cover all expression stages, the Next button will bring up the Select Next Driver screen (repeating step 5). This will allow the remaining expression stages to be assigned to another driver card. Note that the total number of unassigned expression stages is displayed in the title for easy reference. Repeat steps 5-7 until all outputs have been assigned. Once all the expression stages have been assigned to driver outputs, the Next button will bring up the Verify Settings screen.

Step 6: Verify that the correct Driver Cards and Outputs have been assigned to the correct expression stages. Use the up and down arrows to scroll through expression stages to see which shoe position, driver card, and output number is assigned to each expression stage. In cases where a custom expression curve is desired, the Change Position button can be used to enter a desired expression shoe position for each expression stage. This feature allows complete control over the relationship between shoe position and expression stage. Once the expression shoe has been configured correctly, press the Save button to save the changes and return to the System Configuration Menu.

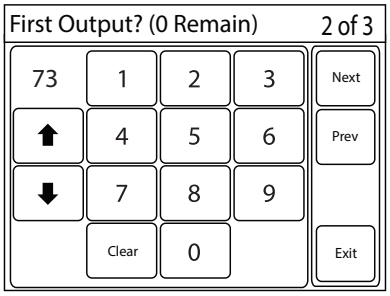


Binary Outputs or Gray Code Outputs

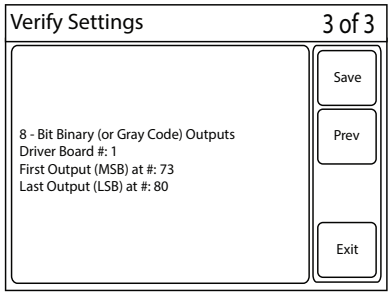
Binary Output and Gray Code Output modes uses eight pins on a single driver board to create a signal capable of controlling some expression motors. If an expression motor has a binary or gray code input, it is important to know how the these inputs work before attempting to wire and configure an MS8406 Chamber Driver board. The steps to configure binary or gray code outputs are the same, although the pins turn on in a different order. Please see the expression driver section of the Installation Manual for more information on how our binary and gray code outputs fu



Step 1: Select the MS8406 Chamber Driver card that is wired to the expression motor. Please note that all eight binary outputs must be connected on the same MS8406 Chamber Driver card. Once the correct driver is selected, press the Next button.



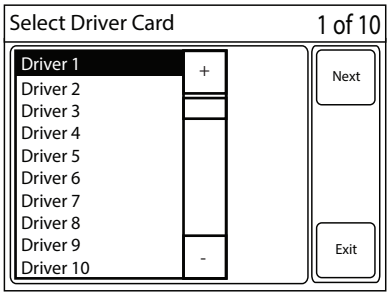
Step 2: Select the first output on the selected driver to be configured. This first (or lowest numbered) output pin is the most significant bit or MSB. All eight of the binary outputs must be located on a single driver card.



Step 3: Verify that the correct driver cards and outputs have been assigned to the correct expression stages. Note that with binary output and gray code modes, the MSB is the selected lowest numbered pin and the LSB is automatically calculated at the highest numbered pin. Once the expression shoe has been configured correctly, press the Save button to save the changes and return to the System Configuration Menu.

Driver Stop Configuration (Making Pipes Play on Chamber Drivers)

The Driver Stop Configuration screen is used to configure the MS8406 Driver cards to play pipes. Each MS8406 can be programmed with up to 7 different pitches per stop control. Each pitch is programmed directly from the console and can be configured to handle virtually any complex chest configuration. This multiple pitch feature can also be used to create custom synthetic mixtures and resultants.



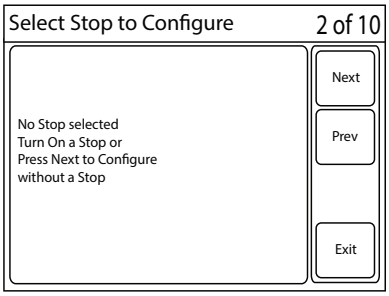
It is highly recommended that, before configuring, a list is made documenting all the MS8406 Driver cards in the system and how their outputs have been wired. Documenting is not only a good practice for staying organized, but it will help speed up installation and troubleshooting in the event any mistakes were made in the wiring process.

Step 1: Select the desired driver card from the list and press the Next button.

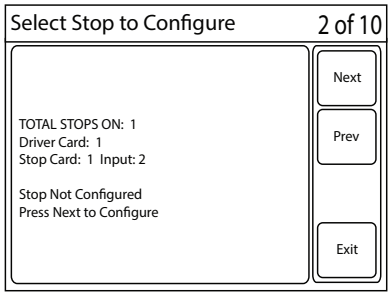
Step 2: The Select Stop to Configure screen is used to select which stop control will be configured to play the selected chamber driver. To complete this step, cancel all stop controls except the one stop control you are configuring and press the Next button or Edit button. At this time you may skip to step 3, however, we recommend reading all the information in this step for a better understanding of the Select Stop to Configure screen and its extensive features.

The screen displays different text and buttons depending on how many stop controls are active and what type of stop control is currently selected. If there is no stop control on, pressing the Next button will configure the selected chamber driver to play when no stop controls are turned on. If only one stop control is turned on, pressing the Next button will configure the selected chamber driver to play when the active stop control is turned on. If more than one stop control is turned on, pressing the Next button will configure the selected chamber driver to play on the currently selected stop only. When more than one stop control is on, a Next Stop button and a Prev Stop button become available allowing the builder to scroll through all active stop controls. Pressing the Next button with more than one stop control active will not configure multiple stop controls at one time. The following illustrations show how the screen changes depending on how many stops are on.

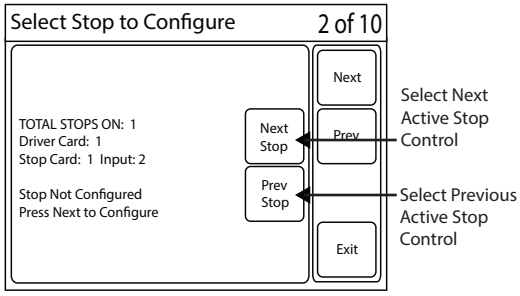
No Stop Controls On



A Single Stop Control On

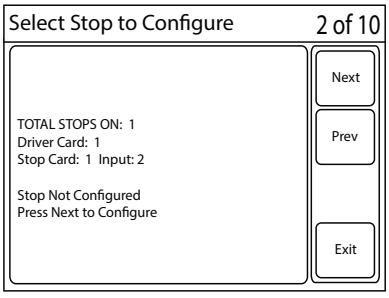


Multiple Stop Controls On at Once

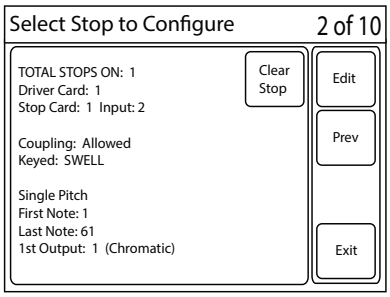


This screen also provides valuable information about any configuration data in the chamber driver that is currently set for the selected stop control. The screen changes the information and function buttons depending on whether the selected stop control is not yet configured, configured as a single pitch stop, or configured as a multi-pitch stop. The Clear Stop button appears when the current stop is configured as a single pitch or multi-pitch and will clear the configuration for that stop control on the selected chamber driver card. The following illustrations show how the screen changes depending on the selected stop control's current configuration.

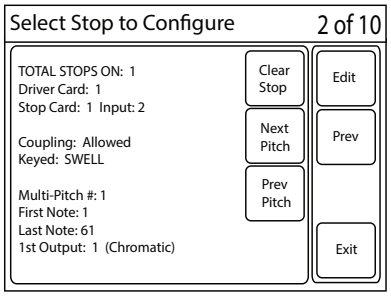
Stop Control Not Yet Configured



Single Pitch Configuration



Multi-Pitch Configuration



The configuration window changes depending on what stop control is selected, but the information is similar. Please see the following illustration explaining the configuration data in more detail.

A - Displays the total number of all active stop controls.

B - Displays the selected chamber driver card address number.

C - Displays the stop controller card number and input number for the currently selected stop control.

D - Displays whether the currently selected stop control is coupling or non-coupling.

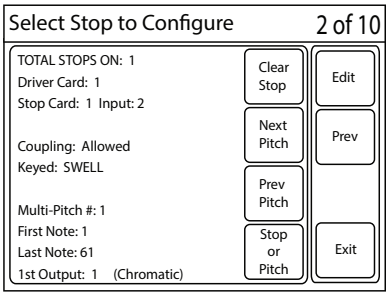
E - Displays which division keys the currently selected stop control.

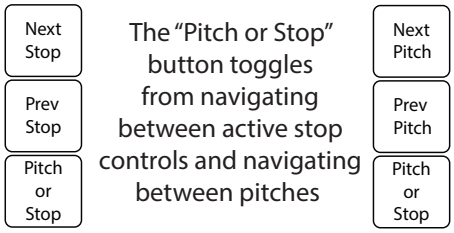
F - Displays whether the currently selected stop control is single or multi-pitch. If multi-pitch, the pitch number is displayed.

G&H - Displays the first and last note that plays on the configured division of keying.

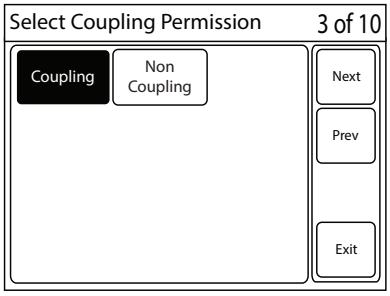
I - Displays the first output on the chamber driver to play when the first note (See G&H) is played on the configured division. It also shows that the notes play in chromatic order. There are options for A-Form and M-Form split chest wiring, but these SHOULD NOT be used.

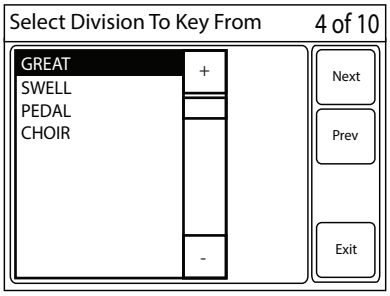
If the current stop control is configured as a multi-pitch stop, a Next Pitch button and Prev Pitch button appear to navigate through all seven available pitches. In a case where there is more than one stop control on, and the current stop control is configured as a multi-pitch stop, the Stop or Pitch button appears. The Stop or Pitch button toggles the navigation buttons from Next/Prev Stop buttons to Next/Prev Pitch buttons. This allows the builder to access any pitch configured on any active stop control. See the following illustration for more details.





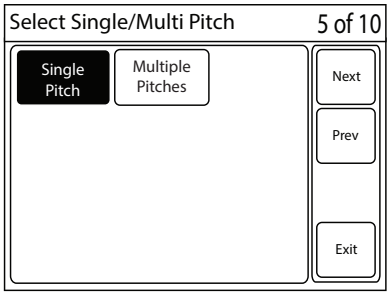
Step 3: Any stop on any driver card can be configured to be either coupling or non-coupling. Select whether this stop control will be coupling or non-coupling and press the Next button.



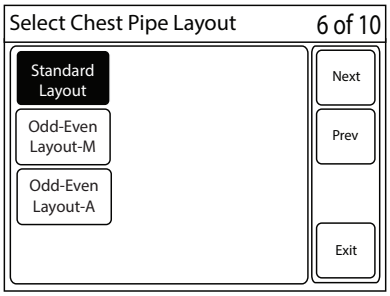


Step 4: Select the division of keying to play the selected stop control from the list box and press the Next button.

Step 5: Select whether the stop plays at one pitch, or at multiple pitches. Each stop can play at up to seven pitches per driver card. Once the correct pitch setting has been selected, press the Next button. At this point the manual will cover the steps for single pitch configuration separate from multi-pitch configuration.

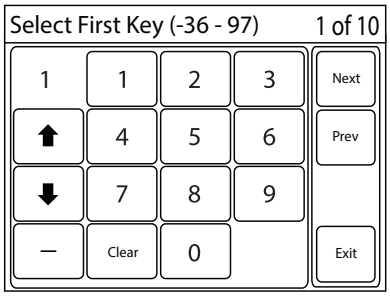


Single Pitch Configuration Steps

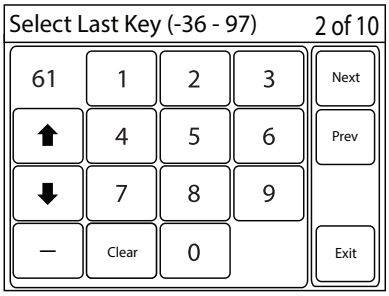


Step 6: Select how the pipes in the chest are wired. The standard layout is wired chromatically starting on the first defined output pin of the MS8406 in order from lowest note to highest note. The vast majority of chests should be wired in this way. We do not recommend using the Odd-Even Layout Form M or the Odd-Even Layout Form A options. These modes do not allow borrows and are extremely limited. Once the layout has been selected, press the Next button.

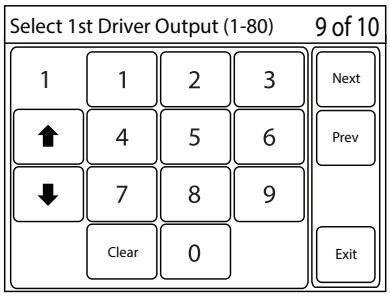
WE RECOMMEND AGAINST USING THE FORM M OR A OPTIONS AT THIS TIME



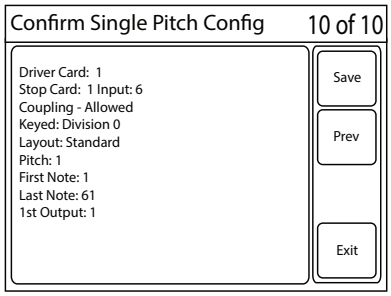
Step 7: Select the first key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the touchscreen keypad. For example, if the stop is supposed to play starting on Low C, press Low C and the number will automatically be changed to 1. If the stop is supposed to play starting at Tenor C, press Tenor C and the number will automatically change to 13. The first note can be set to a negative value in order to play any notes that would be coupled or transposed below note 1. For example, setting the first key to -12 will allow coupling or transposition down to an octave below the first note on the keyboard. Once the first key has been selected, press the Next button.



Step 8: Select the last key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the keypad. For example, if the stop is supposed to play up through the last note on the keyboard, press High C and the number will automatically be changed to 61. If the stop is supposed to play bottom octave only on this driver card, press Low B and the number will automatically be changed to 12. The last note can be set to a value higher then the end of traditional keyboards in order to play any notes that would be coupled or transposed above note 61. For example, setting the last note to 73 will allow coupling or transposition up to an octave above the last note on the keyboard. Once the last key has been selected, press the Next button.



Step 9: Select the first output to play on the selected MS8406 Driver Card. The first output selected will play when the first key on the selected division has been pressed. For example, if a 73-note chest is wired from Pin 1 through 73, and the selected stop is supposed to play starting at tenor C, enter Output Number 13. Once the first driver output has been selected, press the Next button.

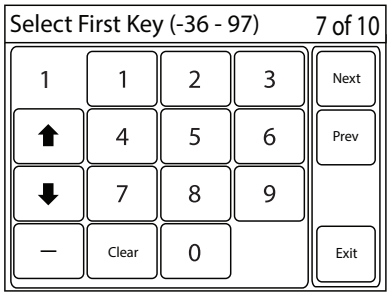


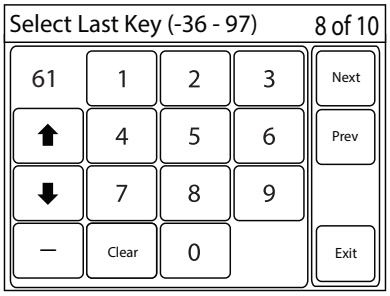
Step 10: The screen will now ask to confirm the settings to be configured before committing the configuration to memory. The Prev button can be used to move back through the screens to make changes. If the settings are correct, press the Save button to save the configuration and return to the System Configuration Menu.

Multi-Pitch Configuration Steps

Step 6: The Multi-Pitch Configuration screen is used to configure keying for multiple pitches on a single stop control. This is a powerful tool which can create resultants and custom synthetic mixtures at will. The screen displays information on a single pitch for the currently selected stop. All changes made on this screen are temporarily stored in memory and only saved into the system when the Save button is pressed. Pressing the Next Pitch button advances to the next pitch and displays its configuration. Pressing the Prev Pitch button goes back to the previous pitch and displays its configuration. The Clear Pitch button clears the configuration on the current pitch. The Edit/Config Pitch button configures the pitch using the same First Key, Last Key, First Output method described in the single pitch configuration mode. For each desired pitch to be configured, press the Edit/Config button and complete the following three sub steps.

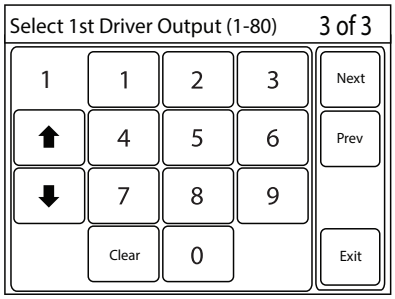
Sub-Step 1: Select the first key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the touchscreen keypad. For example, if the stop is supposed to play starting on Low C, press Low C and the number will automatically be changed to 1. If the stop is supposed to play starting at Tenor C, press Tenor C and the number will automatically change to 13. The first note can be set to a negative value in order to play any notes that would be coupled or transposed below note 1. For example, setting the first key to -12 will allow coupling or transposition down to an octave below the first note on the keyboard. Once the first key has been selected, press the Next button.





Sub-Step 2: Select the last key to play on the selected division. This can be done by pressing a key on the keyboard, or by entering the number through the keypad. For example, if the stop is supposed to play up through the last note on the keyboard, press High C and the number will automatically be changed to 61. If the stop is supposed to play bottom octave only on this driver card, press Low B and the number will automatically be changed to 12. The last note can be set to a value higher then the end of traditional keyboards in order to play any notes that would be coupled or transposed above note 61. For example, setting the last note to 73 will allow coupling or transposition up to an octave above the last note on the keyboard. Once the last key has been selected, press the Next button.

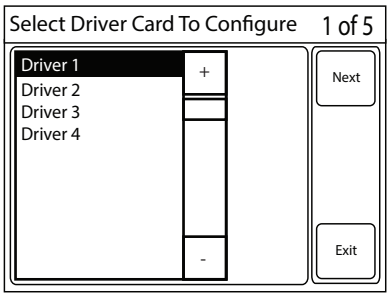
Sub-Step 3: Select the first output to play on the selected MS8406 Driver Card. The first output selected will play when the first key on the selected division has been pressed. For example, if a 73-note chest is wired from Pin 1 through 73, and the selected stop is supposed to play starting at tenor C, enter output number 13. Once the first driver output has been selected, press the Next button. This completes the configuration for the selected pitch and will return to the Multi-Pitch Configuration screen.



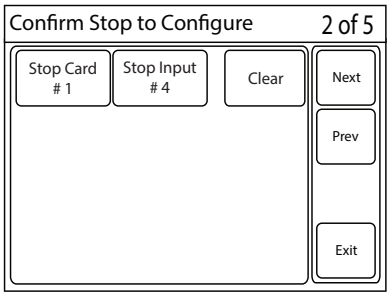
Once all the pitches have been configured properly, press the Save button to save the changes and return to the System Configuration Menu. The Prev button can be used to move back through the screens to make changes and the Exit button returns to the System Configuration Menu without saving any changes.

Stop / Trap Lines (Turning On/Off an Output with a Stop Control)

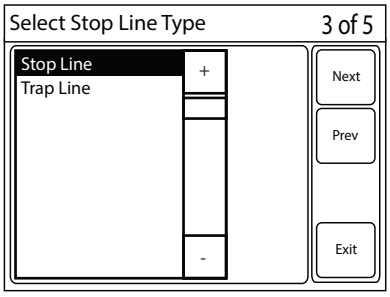
In the MS8400 system, any stop can be programmed to turn on any output on any MS8406 Driver Card. This can be configured as a stop line or a trap line.



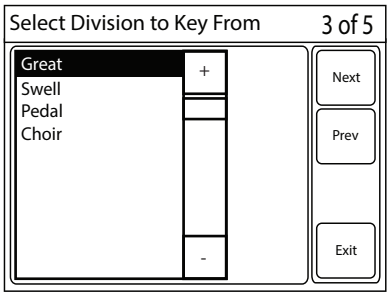
Step 1: Select the MS8406 Driver Card that is to be configured with the desired stop or trap line. Once the correct driver card has been selected, press the Next button.



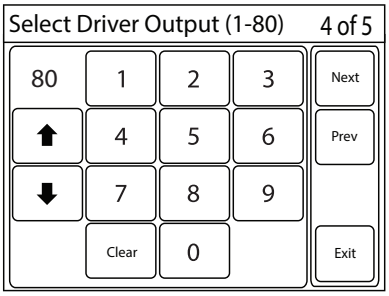
Step 2: Turn on the Stop Control that is to be configured with the desired stop or trap line. The Stop Controller Card number and the Stop Controller Card Input numbers will be displayed for reference. If the stop that is turned on is already configured as a stop or trap line, the Clear button can be used to remove the current configuration before continuing. Once the correct Stop Control has been turned on, press the Next button.



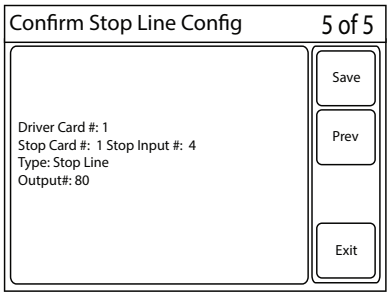
Step 3: Select whether the stop is to be configured as a Stop Line or a Trap Line. A stop line turns on an output on an MS8406 Driver Card when the configured Stop Control turns on, and turns off the output when the Stop Control turns off. A trap line turns on an output only when the Stop Control is on and a key from the selected division is being pressed. Trap lines do not activate if no keys are being pressed in the selected division or the Stop Control is turned off. Once the correct type has been selected, press the Next button.

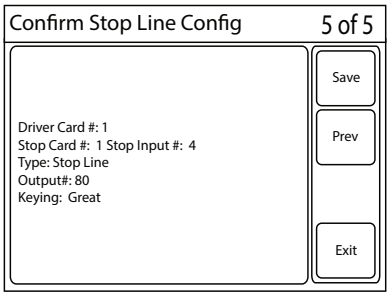


Step 3b (Trap Line): If trap line was selected, the screen will ask to select a Division. If the stop control is on and any key is pressed in the selected division, the trap line will activate. Once the correct division is selected, press the Next button.



Step 4: Select the output on the selected MS8406 Driver Card that will turn on when the stop or trap line is activated. Any of the available 80 outputs on the driver card can be selected.

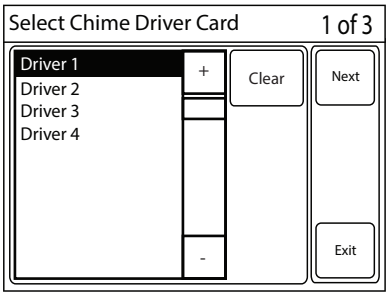




Step 6: Confirm that the configuration settings are correct. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the System Configuration Menu. Once the configuration settings are correct, press the Save button to commit the configuration to memory.

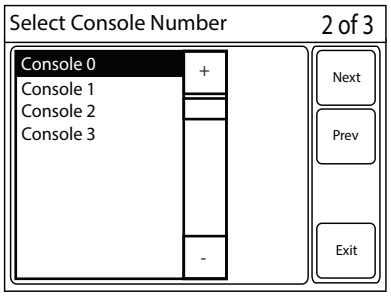
AC Chime Volume

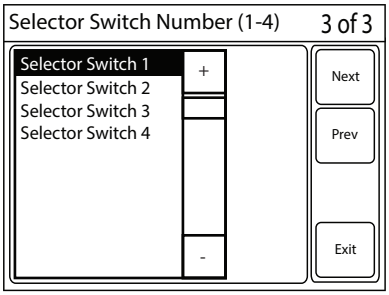
The MS8401 General controller has four rotary selector switch inputs. Any of these inputs can be configured to change AC Chime Volume using a Rotary Selector Switch.



Step 1: Select the Chime Driver Card to be configured. Pressing the Clear button will erase any previous configuration data saved in the selected Chime Driver. Once the desired Chime Driver is selected, press the Next button.

Step 2: Select the Console Number where the desired selector switch is located. The console number will be the same as the MS8401 General Controller card number. Once the desired console number is selected, press the Next button.

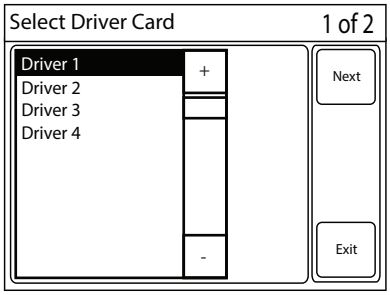




Step 3: Select the desired selector switch number located on the chosen console number. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the System Configuration Menu. Once the desired selector switch number is selected, press the Save button to commit the configuration to memory.

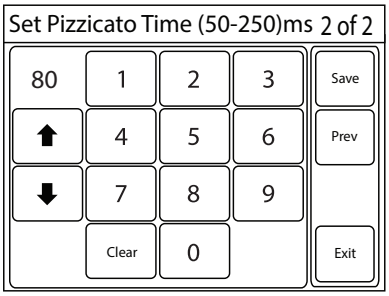
Pizzicato Set Time

Any stop in the MS8400 system can be configured as a Pizzicato coupler. Each MS8406 Driver Card can be configured with a different Pizzicato coupler time setting. This time setting is made in milliseconds.



Step 1: Select the Driver Card to be configured with a new Pizzicato time setting. Once the desired Driver is selected, press the Next button.

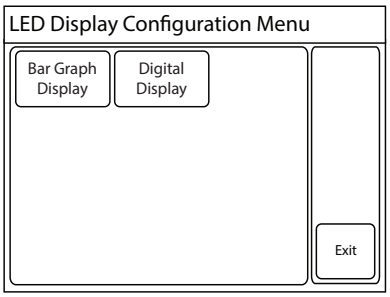
Step 2: Enter the Pizzicato time setting in milliseconds using the keypad. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the System Configuration Menu. Once the Pizzicato time setting is entered correctly, press the Save button to save the configuration to memory.

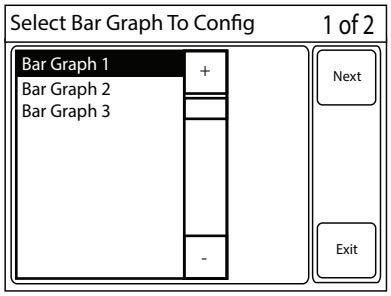


LED Displays (Optional External LED Readouts and Bar Graphs)

LED Display Configuration Menu

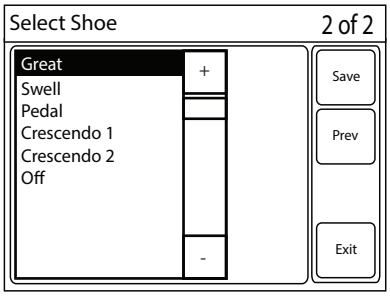
There are two external LED driving modules which are configurable from the MS8405 Touchscreen. The MS8415 is an external LED bar graph display that can be used to indicate position on any of the shoes in the MS8400 system. The MS8419 LED Driver System can be configured to display General Piston or Memory Level through micro LEDs. Please note there is a larger LED Memory Level Controller available (MS8418) which is not configurable.





Bar Graph Display

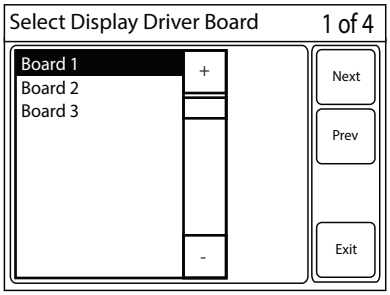
Step 1: Select the desired MS8415 External Bar Graph. Once the correct MS8415 is selected, press the Next button.

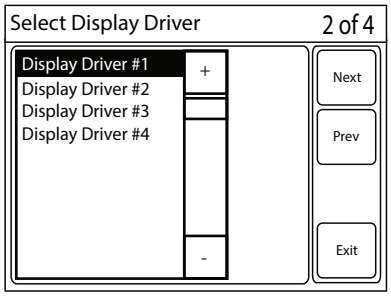


Step 2: Select the shoe whose position is indicated on the MS8415 External Bar Graph. Selecting "Off" from the list will remove the previous configuration data from the selected MS8415. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the System Configuration Menu. Press the Save button to save the configuration to memory.

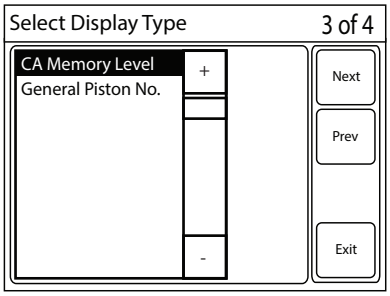
Digital Display

Step 1: The MS8400 system can have up to eight MS8419 Digital Display boards numbered using an onboard DIP switch. Please select the desired Digital Display board from the list box and press the Next button.

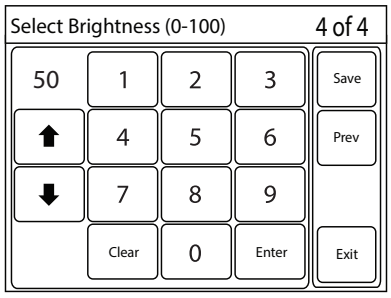




Step 2: Each MS8419 has four LED Display Driver connectors capable of driving a separate set of LEDs. These connectors are labeled Display 1, Display 2, Display 3, and Display 4 on the MS8419 board. Please select the Display Driver number from the list box that is attached to the desired set of LEDs and press the Next button.



Step 3: Select the desired display type for the selected Display Driver number from the list box and press the Next button. At this time, the only options available are CA Memory Level and General Piston Number.

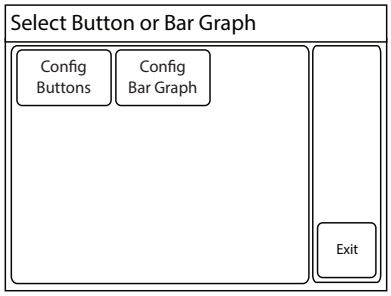


Step 4: Select the brightness at which to drive the LEDs. This is configurable between 0 and 100. It may take a few tries to find a brightness setting which works for the specific installation. Press the Save button to save the configuration to memory and return to the LED Display Configuration Menu.

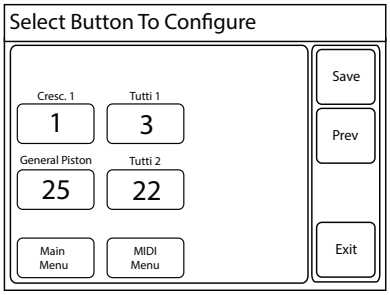
Performance Screen (Changing Configurable Buttons)

The performance screen is the primary display of the MS8405 Touch Screen Control Panel during the use of the organ. There are five configurable buttons on the performance screen that can be set up for a variety of functions.

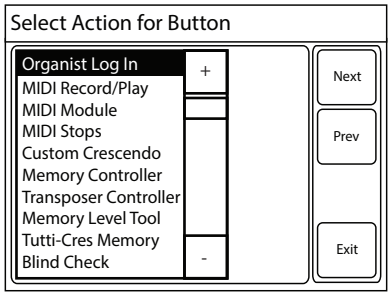
Step 1: From the System Configuration Menu, press the Performance Screen Configuration button. From the Performance Screen Configuration Menu, press the button labeled Config Buttons.



Step 2: The screen will display the six performance screen buttons in their actual layout. With the exception of the Main Menu, these buttons can be configured by pressing them. Press on any of the configurable buttons to set them to a new function.



Step 3: Select the desired function for the selected button from the list box. Once the desired function has been selected, press the Next button. This will return to the Button Configuration screen where other buttons can be configured. Changes are not saved to memory until the Save button has been pressed on the Button Configuration Screen.



Step 4: Once all the buttons have been changed to their desired functions, press the Save button to save the changes.

Function Button Options

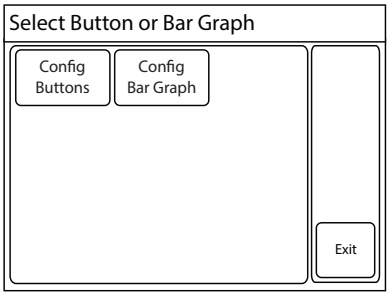
Crescendo 1/2: Displays and Changes the Crescendo Memory Level
Tutti 1/2: Displays and Changes the Tutti Memory Levels
SFZ1/2: Displays and Changes the Sforzando Memory Levels
General Piston: Show the active General Piston Number
Clock: Displays a Clock
Blank: Hides the selected button from the Performance Screen

Buttons for Quick Menu Access

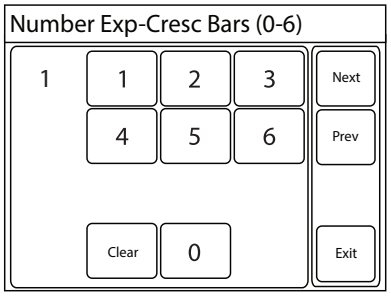
Organist Log In	Autopedal	Test and Diagnose
MIDI Record/Play	Organist Backup	System Config
MIDI Module	Organist Name	Cresc. 1
MIDI Stops	Change Access Code	Cresc. 2
Custom Crescendo	Add Organist	Tutti 1
Memory Controller	Delete Organist	Tutti 2
Chime Volume	Performance Screen	SFZ 1
Memory Level Tool	Screen Brightness	SFZ 2
Tutti-Cres Memory	Color Scheme	Gen Piston
Blind Check	Set Clock	Clock
Screen Sleep	Range Menu	Blank
Power Operation	Remote Tuner	

Performance Screen (Changing Expression/Crescendo Bar Graphs)

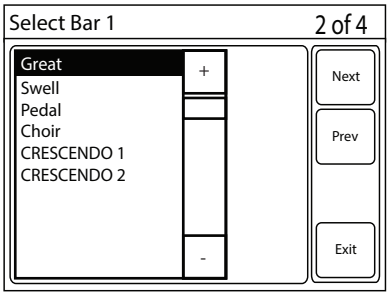
The performance screen is the primary display of the MS8405 Touch Screen Control Panel during the use of the organ. The performance screen can have up to six bar graphs to indicate different Crescendo or Swell shoe positions.



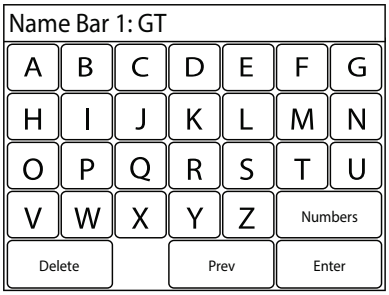
Step 1: From the System Configuration Menu, press the Performance Screen Configuration button. From the Performance Screen Configuration Menu, press the button labeled Config Bar Graphs.

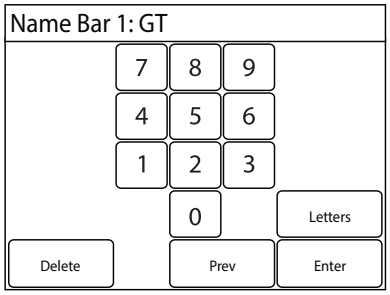


Step 1b: Select the number of bar graphs to be configured. The bar graphs will automatically resize themselves to fit the performance screen. Once the correct number of graphs has been entered, press the Next button.



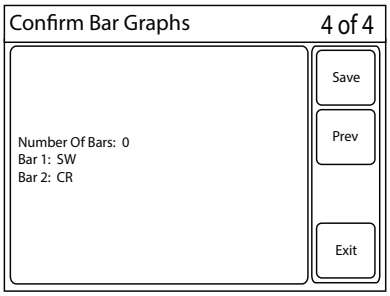
Step 2: Select which shoe the bar graph is supposed to indicate from the list box. The names of the shoes match the names entered in the Division Naming Screen. Once the shoe has been selected, press the Next button.





Step 3: Enter the bar indicator text using the alphanumeric keypad. The indicator text is displayed beneath the bar graph on the performance screen. The indicator text has a maximum of three characters. Once the correct bar indicator text has been entered, press the Next button.

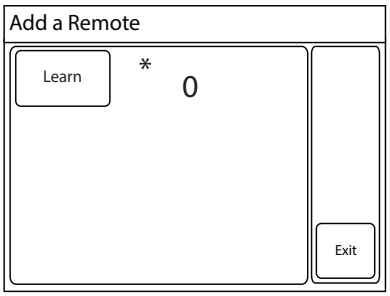
Step 3b: If more than one bar graph is being configured, repeat steps 3 and 4 for all of the desired bar graphs. Bars displays are placed on the screen in numeric order from left to right.



Step 4: Confirm the bar graph configuration settings displayed on the screen. The Previous button can be used to go back through the menus to make desired changes. The Exit button will return to the System Configuration Menu. Once the bar graph settings are entered correctly, press the Save button to save the configuration to memory.

Add a Remote

The MS8405 can be paired with a remote control for MIDI record and playback functionality as well as remote tuning. This screen is used to pair the remote with the MS8405.



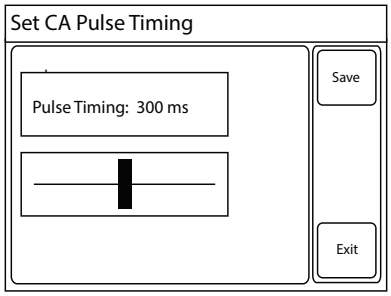
Step 1: Press the Learn button. An asterisk will begin flashing next to the number.

Step 2: Press any of the buttons on the remote control multiple times.

Step 3: Press the Learn button. The pairing is complete and pressing any button on the remote control will now cause the number on the screen to change to match the button being pressed.

CA Pulse Timing

The Combination Action has a configurable pulse time. The pulse time is the length of time that the on or off coils of a Stop Control are energized. A longer pulse time can be useful when older or less responsive stop controls require more power to move. The pulse time is configurable between 100ms and 600ms. 100ms is the factory default setting. Note that adjusting the pulse time will not compensate for a weak power supply.



Step 1: Slide the scroll bar to the left to decrease the pulse time or to the right to increase the pulse time. While the pulse timing screen is displayed, the MS8402 stop controller cards are switched to pulse timing mode. While in pulse timing mode, pressing any general or divisional piston will reverse the position of all stops in the system (if a stop is on, it will be turned off, if a stop is off, it will be turned on). General cancel will cancel all stops.

Step 2: Use any general or divisional piston to test out the pulse time setting. Continue the process of adjusting the scroll bar and pressing the pistons until all the stop controls are operating as desired.

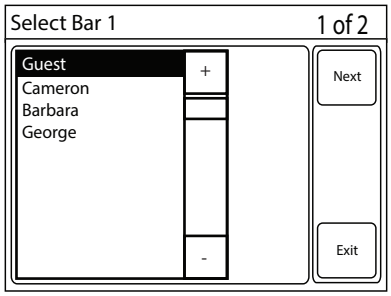
Step 3: Once the correct stop operation is achieved, press the Save button.

Set Screen Contrast

The screen contrast on the MS8405 Touch Screen Control Panel can be configured. Sliding the top bar and bottom bar to the left and right adjusts the screen contrast. Pressing the default button will return the slide bars to 50 (top) and 4 (bottom). Depending on the environmental conditions in which the screen resides, some experimentation with different settings may be required to find the correct settings. Once the correct settings have been discovered, press the Save button. Pressing the Exit button will return to the System Configuration Menu without saving any changes.

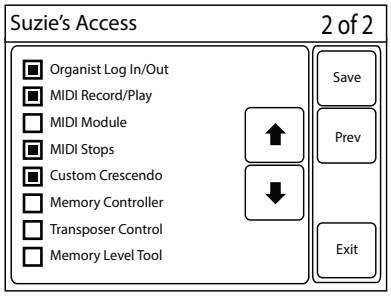
Organist Access

The MS8400 system can have up to 50 different organists. Each organist can be configured to have access to any buttons within the system using the organist access screen.



Step 1: Select the organist from the list to change their access settings. Once the correct organist has been selected, press the Next button. Note that the default "Builder" account cannot be selected, because they have access to all menus by default and cannot be limited. This prevents an accidental access lockout from occurring.

Step 2: Press on any menu item in the list to toggle it between checked and unchecked. The organist will have access to any menu item with a checked box and will be denied access to any menu item with an unchecked box. Denying access to a menu item will simply remove the button from the Main Menu or System Configuration Menu. The menu pages will automatically adjust so there are no gaps where missing buttons used to exist.



Step 3: Use the up or down arrows to scroll through all the available menu items. Continue checking and unchecking boxes on each screen until all desired menu items have been checked or unchecked.

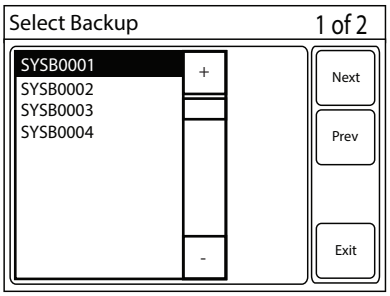
Step 4: Once all the correct menu items are configured, press the Save button. The Exit button returns to the System Configuration Menu and the Previous button returns to the organist selection list box.

System Backup / Restore / Firmware Overview

The MS8400 system can save and restore system backup files in order to prevent costly data loss and minimize system downtime in the case a board must be replaced. Firmware updates to the boards can also be achieved by loading firmware files from the MS8405 Touch Screen Controller through a USB jump drive. The different backup, restore, and firmware functions are described each in the following sections.

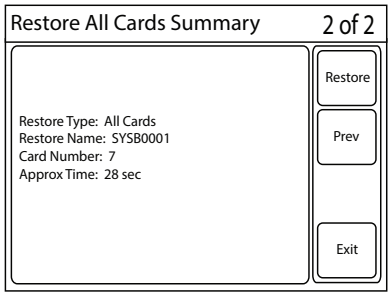
Restore All Cards

The MS8400 system can restore the configuration information for all cards in a system. If a system were damaged and had to be replaced, new boards could be put into the place of the old damaged boards. The correct board numbers would have to be assigned, for the restore to be done properly.



Step 1: Insert a USB drive with the desired system backup into the MS8400 System.

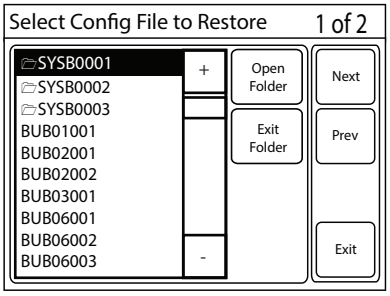
Step 2: Select the desired system backup from the list box. MS8400 "All Card" backups are actually folders that house a list of individual card backup files. The system looks in the root directory or "Home Folder" for any system backup folders and lists them to select from. Once the desired system backup is selected, press the Next button.



Step 3: Confirm the details of the backup to make sure that it matches the number of cards in the system. If the system backup details are correct, press the Restore button. This can take several minutes to complete and will exit to the System Configuration Menu when finished. The Exit button returns to the System Configuration Menu and the Previous button returns to the select backup screen.

Restore Single Card

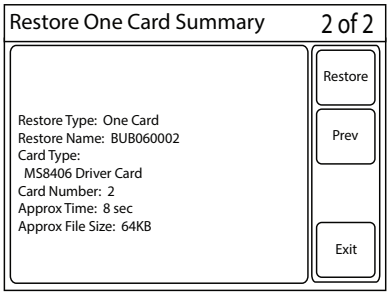
The MS8400 system can restore the configuration information of any single card in the system. If any particular board in a system is damaged and must be replaced, a new board could be put into the place of the old damaged board. The correct board number would have to be assigned, for the restore to be done properly. Also, single board files can be restored from inside an "All Card" backup. There is no need to save individual backups of each card separately.



Step 1: Insert a USB drive with the desired single card or system backup into the MS8400 system.

Step 2: Select the desired system backup from the list box. The list box shows available folders as well as single card backups. To navigate into a folder, select the folder from the list and press the Open Folder button. To navigate out of a folder, press the Exit Folder button. Once the correct single card backup has been located, select it from the list and press the Next button.

Step 3: Confirm the details of the backup to make sure that it matches the information for the replacement card. If the system backup details are correct, press the Restore button. This can take several minutes to complete and will exit to the System Configuration Menu when finished. The Exit button returns to the System Configuration Menu and the Previous button returns to the select backup screen.

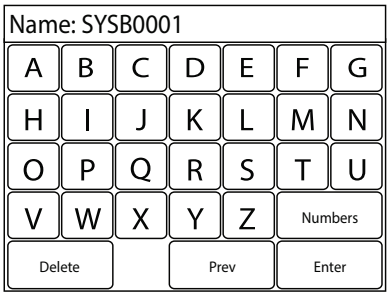


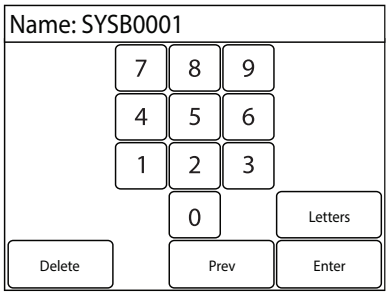
Backup All Cards

The MS8400 system can backup the configuration information for all cards in a system. If a system were damaged and had to be replaced, new boards could be put into the place of the old damaged boards. After setting the new card numbers to match their replacements, a system backup can be restored and any saved configuration data would be returned to the instrument.

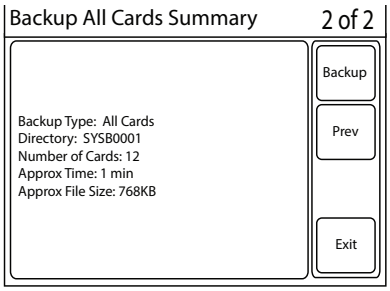
Step 1: Insert a USB drive into the MS8400 Systems USB Port.

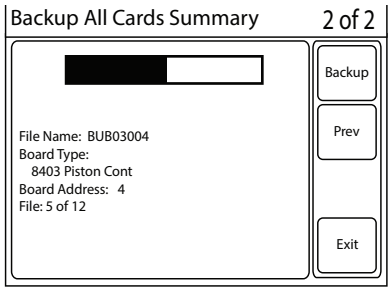
Step 2: Enter a name for the system backup. A suggested name will be automatically generated, but can be edited using the alphanumeric keypad. The backup process creates a folder on the USB drive with the system backup name. Then it fills this folder with all the individual card configuration backups from the entire system. Although this type of backup can be restored to the entire system, individual cards can also be restored from an "All Cards" backup.





Step 3: Confirm the details of the system backup to make sure that it matches the number of cards in the system and all other displayed information. If the system backup details are correct, press the Backup button. This can take several minutes to complete and will exit to the System Configuration Menu when finished. During the backup process the screen will display progress both through text as well as a progress bar. To abort the system backup, the Exit button is used to return to the System Configuration Menu and the Previous button returns to the name backup screen.

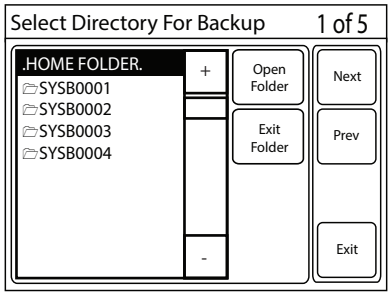




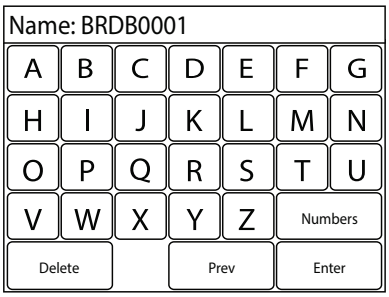
Backup Single Card

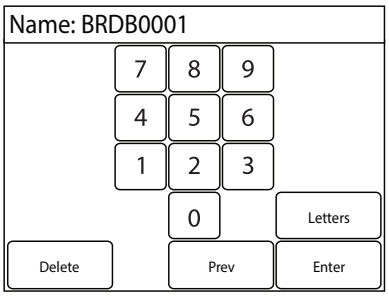
The MS8400 system can backup the configuration information of any single card in the system. It is important to note that doing an "All Card" backup still allows the builder to restore the configuration data from any single card within the system. The single card backup screen is available to speed up the process of backing up a single card when changes have been made. Backing up an entire system can take a long time, depending on the size of the instrument.

Step 1: With a USB drive plugged into the MS8400 USB Port, select the desired folder in which to save the single card backup. It is not recommended to save the backup into a folder that already contains a file of the same name. The list box shows available folders as well as lists the root directory or "Home Folder." Selecting the "Home Folder" option will save the backup to the root directory or "Home Folder" on the USB drive. To navigate into any folder, select the folder from the list and press the Open Folder button. To navigate out of a folder, press the Exit Folder button. Once the correct folder is selected, press the Next button.

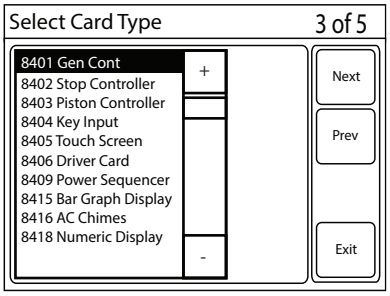


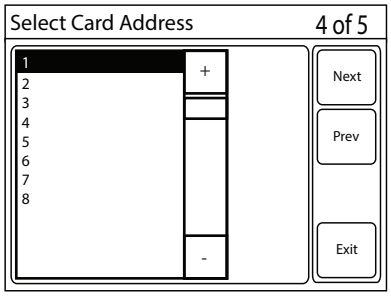
Step 2: Enter a name for the single card backup. A suggested name will be automatically generated, but can be edited using the alphanumeric keypad. The backup process creates a file in the selected folder named whatever is entered in the naming screen.





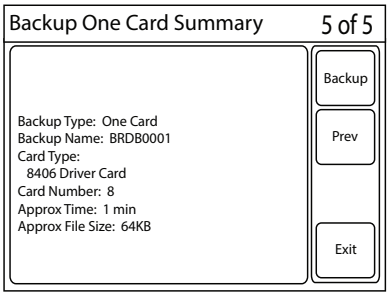
Step 3: There are several different types of cards in the system that can be backed up. The card type can be found listed on the title block located on the physical card. Once the correct card type has been selected, press the Next button.

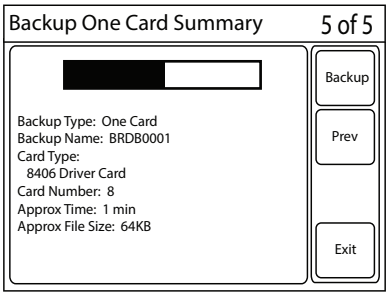




Step 4: The system will request card address numbers from all cards matching the selected card type. These card numbers are set using DIP Switches directly on the board. Once the desired card number has been selected from the list, press the Next button.

Step 5: Confirm the details of the single card backup to make sure that it matches correct card type and card number. If the card backup details are correct, press the Save button. This can take several minutes to complete and will exit to the System Configuration Menu when finished. During the backup process the screen will display progress both through text as well as a progress bar. The Exit button is used to return to the System Configuration Menu and the Previous button returns to the select card address screen.

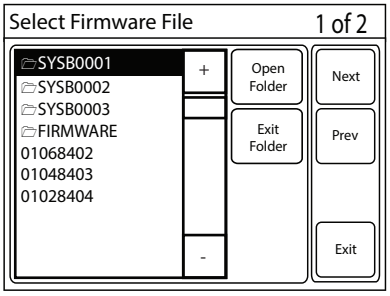


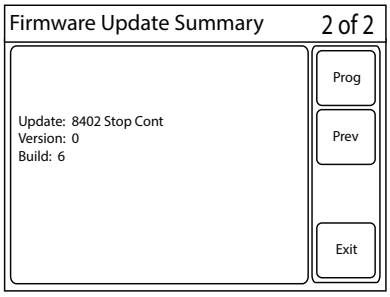


Firmware Update

The MS8400 system can be updated to the latest firmware using a USB Drive attached to the MS8400 USB Port. Due to the volatile nature of firmware updating, it is only recommended if there is a particular firmware bug or desired feature that is addressed in the update. Updating to the latest firmware simply to update is not recommended.

Step 1: With a USB drive plugged into the MS8400 USB Port, select the desired firmware file from the list box. The list box shows available folders as well as any firmware files in the root directory or "Home Folder." To navigate into any folder, select the folder from the list and press the Open Folder button. To navigate out of a folder, press the Exit Folder button. Note that the firmware name includes the four digit firmware revision and the four digit card type. For example, Revision 0105 of the MS8402 Stop Controller Card would be listed as 01058402. Once the correct firmware file is selected, press the Next button.

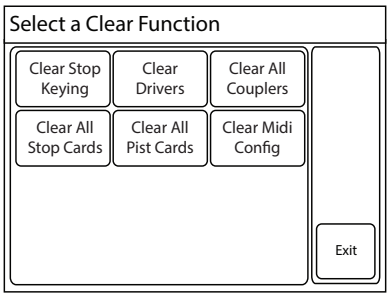




Step 3: Confirm the details of the firmware file to make sure that it matches the correct card type and revision. If the firmware details are correct, press the Program button. This will update all cards throughout the entire MS8400 system that match the selected card type. This process can take several minutes to complete and will exit to the System Configuration Menu when finished. To abort the update, the Exit button is used to return to the System Configuration Menu or the Previous button returns to the select firmware screen.

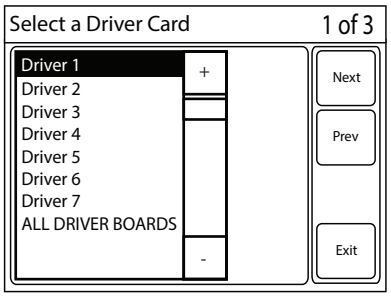
Clearing Cards Overview

The MS8400 system can clear cards in a variety of ways. It is important not to enter the Clearing Menu without a complete understanding of each button and a level of comfort with how each button operates. The next few sections cover the different buttons on the clearing menu. Note that at this time, Clear Drivers, Clear All Couplers, Clear All Stop Cards, and Clear All Piston Cards immediately clear all the cards in the system of the selected type. There is no warning message that asks to confirm whether the cards should be cleared. Be careful not to use these buttons unless absolutely sure.

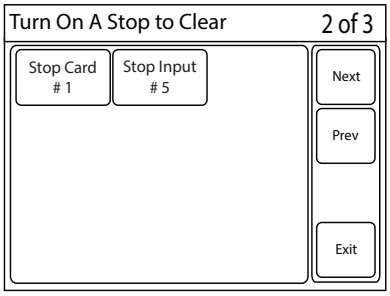


Clearing Keying For a Single Stop on Any or All Drivers

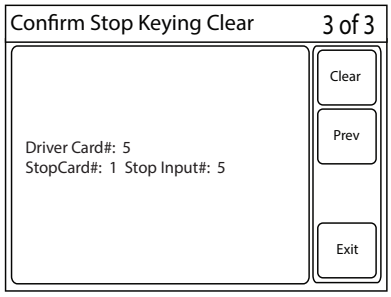
Clearing Stop Keying clears all the keying configuration for a selected stop in a specific or all MS8406 Driver Cards (depending on selection). To do a full clear of all driver configurations across all driver cards, see the Clear Drivers section.



Step 1: Select the MS8406 Driver Card from the list box. Selecting "ALL DRIVER CARDS" from the list will clear the keying configuration for the desired stop in all the MS8406 Driver Cards in the system. Once the correct card is selected, press the Next button.



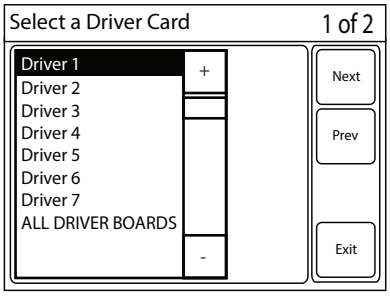
Step 2: Turn on a Stop Control to clear. Any keying in the selected MS8406 driver card(s) will be removed based on the selected stop control. Only one stop can be on at a time. If more than one stop is on, the screen will request to turn on only one stop. If no stops are on, the screen will display that all stops are off. Once the desired stop has been selected, press the Next button.



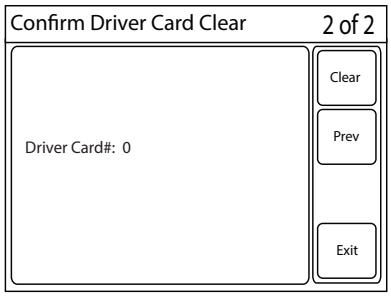
Step 3: Confirm that the clearing details match the desired Driver Card and Stop Control. If the clearing details are correct, press the Clear button. The Exit button returns to the System Configuration Menu and the Previous button returns to the Turn on a Stop to Clear screen.

Clearing Chamber Driver Cards

Clearing Driver Cards allows the builder to completely clear one or all chamber driver cards. All of their configuration data will be erased, allowing for fresh configuration. Press the Clear Drivers button to begin.



Step 1: Press the Clear Drivers button from the Clearing Cards menu. Select the desired Driver Card from the list box. Selecting ALL DRIVER BOARDS from the list box will allow the organ builder to erase all Driver Cards in the entire system.

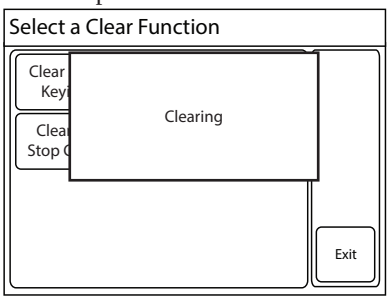


Step 2: Confirm that the clearing details match the desired Driver Card Number. If the clearing details are correct, press the Clear button. Once the button is pressed, the screen will display a clearing message while the drivers are clearing. Once the screen has returned to the Clearing Menu the drivers have been successfully cleared. The Exit button returns to the System Configuration Menu and the Previous button returns to the Driver Card Selection screen.

WARNING! THERE IS NO COMING BACK FROM THIS ACTION!

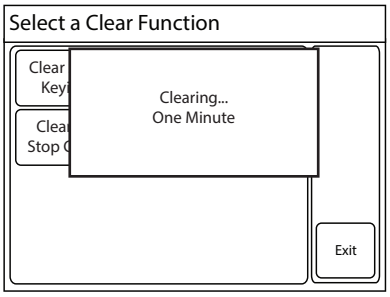
Clearing All Couplers

Pressing the Clear Couplers button clears all the coupler configuration data in each MS8402 Stop Controller Card. There is no coming back from this action without a saved configuration backup file. Once the button is pressed, all MS8402 Stop Controllers will be cleared of their coupler configuration data. The couplers will need to be reconfigured or a configuration backup file of the MS8402s must be restored. Before pressing this button, make sure that it will accomplish what you are expecting. Once the button is pressed, the screen will display a clearing message while the couplers are clearing. Once the screen has returned to the Clearing Menu the couplers have been successfully cleared.



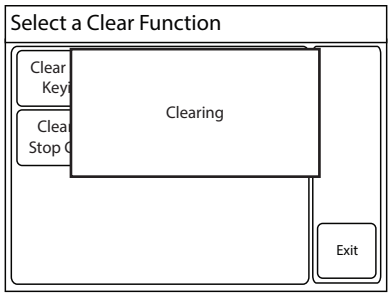
Clearing All Stop Controller Cards

Pressing the Clear All Stop Cards button clears all the configuration data in each MS8402 Stop Controller Card. There is no coming back from this action without a saved configuration backup file. Once the button is pressed, all MS8402 Stop Controllers will be cleared of their configuration data. The MS8402s will need to be reconfigured or a configuration backup file of the MS8402s must be restored. Before pressing this button, make sure that it will accomplish what you are expecting. Once the button is pressed, the screen will display a clearing warning message while the Stop Controllers are clearing. Once the screen has returned to the Clearing Menu the Stop Controllers have been successfully cleared.



Clearing All Piston Controller Cards

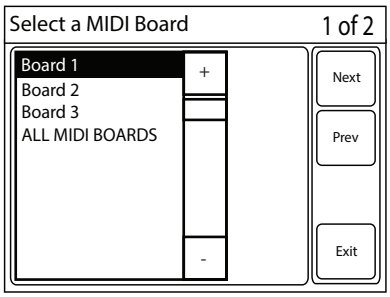
Pressing the Clear All Piston Cards button clears all the configuration data in the MS8403 Piston Controller Cards. There is no coming back from this action without a saved configuration backup file. Once the button is pressed, all MS8403 Piston Controllers will be cleared of their configuration data. The MS8403s will need to be reconfigured or a configuration backup file of the MS8403s must be restored. Before pressing this button, make sure that it will accomplish what you are expecting. Once the button is pressed, the screen will display a clearing message while the Piston Controllers are clearing. Once the screen has returned to the Clearing Menu the Piston Controllers have been successfully cleared.



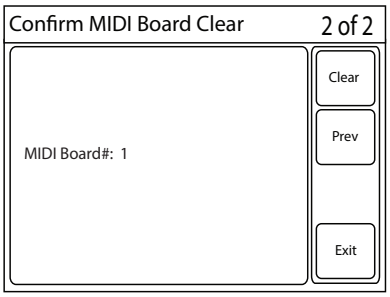
Clearing MIDI Config

Clearing MIDI Config clears all the configuration data on a single or all MS8410 MIDI Controller(s).

Step 1: Select the desired MS8410 MIDI Controller from the list box. Selecting the "ALL MIDI BOARDS" from the list will clear the configuration data from all the MS8410 MIDI Controllers in the system. Once the correct board is selected, press the Next button.



Step 3: Confirm that the Correct MS8410 is displayed in the confirmation screen. If the settings are correct, press the Clear button. To abort the MIDI Controller Clearing, the Exit button is used to return to the System Configuration Menu and the Previous button returns to the select a MIDI Controller screen.

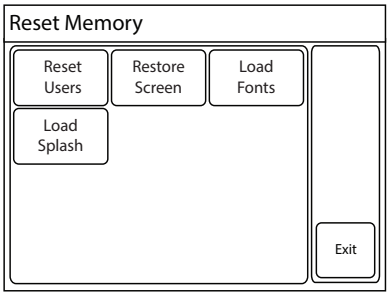


Clearing the MS8480

This will clear the MS8480 Two Manual Keying System board. Pressing this button will prompt an Are You Sure confirmation window. Pressing cancel on this screen will return to the Clearing Cards menu. Pressing continue on this screen will clear the MS8480 of all configuration data. There is no coming back from this action without a saved configuration backup file. Once the button is pressed, the MS8480 Keying System Card will be cleared of all configuration data. The MS8480 will need to be reconfigured or a configuration backup file of the MS8480 must be restored. Before pressing this button, make sure that it will accomplish what you are expecting. Once the button is pressed, the screen will display a clearing message while the MS8480 is cleared. Once the screen has returned to the Clearing Cards Menu and the MS8480 is successfully cleared.

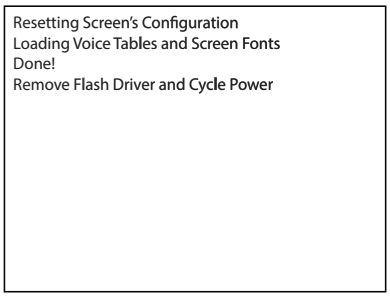
Reset Screen Flash (MS8405 Touchscreen)

The MS8405 Touchscreen Controller has built-in flash memory that may need to be cleared or changed. The Reset Screen Flash menu allows the builder to reset organists, restore the screen after an update, reload font tables, and load a custom splash screen. The following sections cover all available options on this menu.



Reset Users

The MS8405 Touch Screen Controller has built-in flash memory that can be cleared to return the screen to factory defaults. This button will erase all organists except the Builder and the Guest accounts. Also, the builder and organist passwords will be returned to factory defaults. All system specific configuration in the screen such as division names will be erased. This button will also load the font tables and splash bitmap into the screen if the font and/or bitmap files are present in the root directory on an attached USB Drive.



Step 1: Press the Screen Reset Button.

Step 2: During the screen reset, the screen will go blank. Text will be displayed to indicate the screen reset progress. Once the screen reset is complete, the screen should show the text, "Remove Flash Drive and Cycle Power."

Step 3: Turn the screen off and then back on again (power cycle).

Restore Screen

After updating an MS8405 Touchscreen to the latest firmware, all flash data is overwritten to factory defaults. The Restore Screen button allows the builder to restore some of this flash data. This button restores organists, added organist access codes, and division names. This does not restore the guest/builder access codes or the guest/builder's names (if changed) or any organist access levels.

During the screen restore, the following lines of text will be displayed as the process progresses:
Restoring Screen's Configuration
Loading Builder Defaults
Ok!
Cycle Power if Screen Does not Restart

Once all these lines of text are displayed, the screen should power itself off. Please turn the organ (or just the MS8405) off and on to continue.

We do not recommend pressing Restoring the Screen unless an MS8405 Touchscreen firmware update has just been performed.

Load Font Tables

Using this button is not common practice and should only be done if instructed by Syndyne. It is mostly included for future use. The Load Font table button looks at the USB driver for a font file. If a font file is found, the font is loaded into the system. Fonts are loaded into the system in cases where Syndyne has changed its flash memory structure in a system upgrade or loaded additional font characters.

Load Custom Splash Screen

The MS8405 Touchscreen is capable of displaying a custom splash screen at power-up. A builder can use this to display their logo, the churches logo, opus information, etc. This button searches an installed USB Flash Drive for a splash screen file in the root directory. If it finds a correctly formatted splash screen file, it will load the file to screen flash memory. If there is no file or the file is formatted incorrectly, the screen will power off and the organ must be turned off and on to continue.

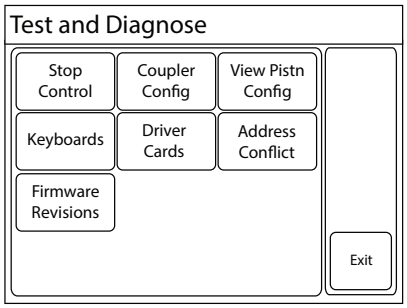
Requirements for a custom splash screen file:

- Bitmap file type
- 24 bit depth file
- 320 x 240 size
- Named splash01.bmp
- Located in the root directory

Test and Diagnose

MS8405 Test and Diagnose Menu

The Test and Diagnose menu has a variety of functions which help troubleshoot and verify an installation. We recommend builders restricting access to the Test and Diagnose menu for the majority of organists. However, the Test and Diagnose menu is located in the Main Menu in case a builder has an extremely long distance instrument and wants to allow an organist access. This would allow a technically savvy organist to help a builder troubleshoot potential problems over the phone prior to traveling to the instrument. Builders will have access to the Test and Diagnose menu.

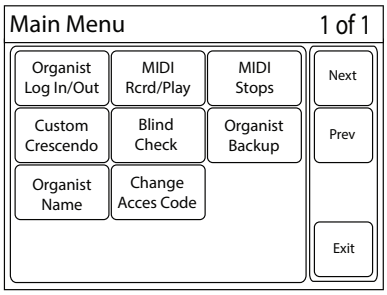


Accessing the Test and Diagnose Menu

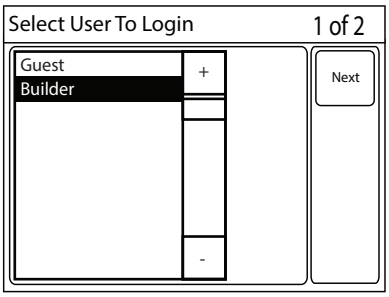
To access the Test and Diagnose menu, first power on the MS8405 Touchscreen. See section Powering On the MS8405 Touchscreen for more information. Once the MS8405 is powered on, log in to the touchscreen as the builder.

To log in as the Builder, enter the Main Menu by pressing the Main Menu button on the performance screen. Once on the Main Menu, press the Organist Log In/Out button. This brings up a list box containing all organists currently set up in the MS8405 Touchscreen. Select Builder from the list box and press the Next button. Enter the builder access code using the keypad and press the Login button. Once logged in as the builder, the Test and Diagnose button on the Main Menu is accessible.

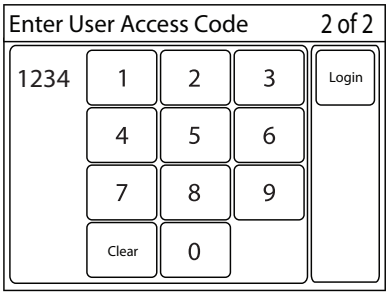
Press Organist In/Out



Select Builder



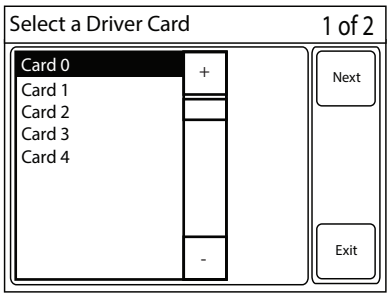
Enter Access Code

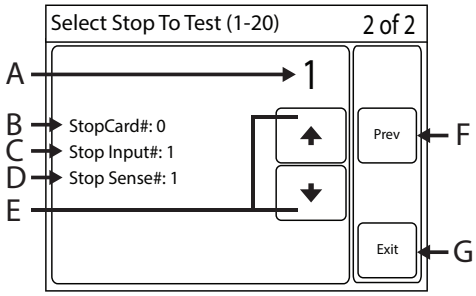


Test Stop Controls

In the MS8400 system, the Stop Controls are wired into MS8402 cards. Each MS8402 card is capable of driving 20 stop controls. Every MS8402 in the system requires its own unique address which is assigned by onboard DIP switches. The stop controls test is done on an MS8402 card by card basis. Only one stop can be on at a time for this test to function properly.

Step 1: Turn off all the organ's stop controls, then select the MS8402 stop control card to test from the list and press Next.





Step 2: Push the Up or Down arrow (E) to energize the next Stop Control's "On Coil." The last line of text (D) gives feedback of potential problems.

A: This displays the stop control number that the system attempted to turn on.

B: This displays the MS8402 card number that was selected in step 2 (for reference).

C: This number will match the number in "A" as the stop that the system turned on.

D: This gives feedback as to whether the stop control is functioning properly and/or wired properly. If the Stop Sense number matches the Stop Input number then the stop is functioning properly. If the stop sense number does not match the Stop Input number, then the Stop Control's sense line or on coil line is wired to the wrong location. The screen will also give an error if more then one stop sense is on at one time.

E: These arrows scroll through the Stop Controls on the selected MS8402 and energize their "On/Off Coils."

F: This exits to the Test and Diagnose menu.

G: This exits to the Main Menu screen.

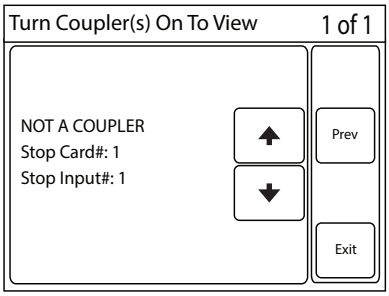
Test Couplers

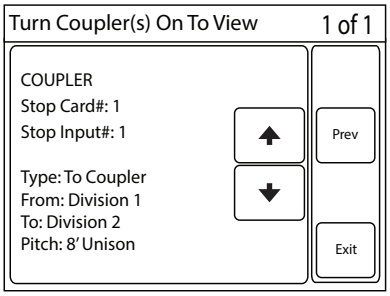
The coupler testing screen is useful for troubleshooting stop controls as well as viewing any coupler configuration that has been programmed on a stop control.

Step 1: Turn on the stop control(s) to test.

Step 2: If more than one stop is on, use the up and down arrows to select the desired stop control.

Step 3: The stop control's configuration information is displayed.





Coupler / Not a coupler: The first line indicates whether a stop control is a coupler or not.

Stop Card#: This indicates the MS8402 card number in which the stop is wired. Card Numbers are configured on each MS8402 card using the Card Number DIP switch. It is crucial that each MS8402 have a different card number.

Stop Input#: This indicates input number in which the Stop Control is wired.

Coupler Type: Couplers can be one of several different types. This line indicates what type of coupler that the stop control is configured to be. Some examples of coupler types include: To Coupler, On Coupler, Pizzicato, Low Note Melody, High Note Melody etc.

From: The division from which stops are being coupled.

To: The division to which stops are being coupled.

Pitch: The pitch at which stops are being coupled.

Some examples of pitches include: 64' 32', 16', 8', 4', 2', 1', etc.

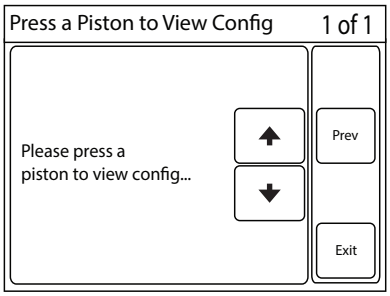
The Previous button returns to the Test and Diagnose menu and the Exit button returns to the Main Menu.

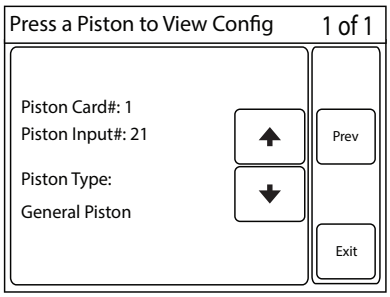
Test Pistons

The piston testing screen is useful for viewing the configuration of any piston in the system. To test a piston on the piston testing screen, simply press the desired piston and read its configuration data.

Piston Card#: This indicates the MS8403 Card Number to which the piston is wired. Card Numbers are configured on each MS8402 card using the Card Number DIP switch. It is crucial that each MS8402 have a different card number.

Piston Input#: This indicates the Input Number to which the piston is wired.





Piston Type: Pistons can be configured as one of many different types. Some examples of piston types include: Divisional, General, Set, General Cancel, Divisional Cancel, Reversible, Associated Reversible, SFZ, TUTTI, Memory Level Up/Down, Transposer Up/Down, Transposer On/Off, etc.

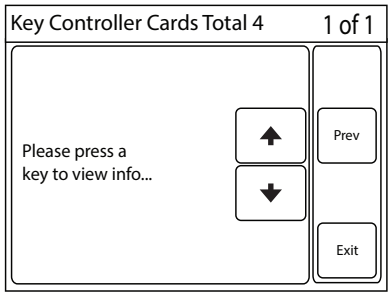
The Previous button returns to the Test and Diagnose menu and the Exit button returns to the Main Menu.

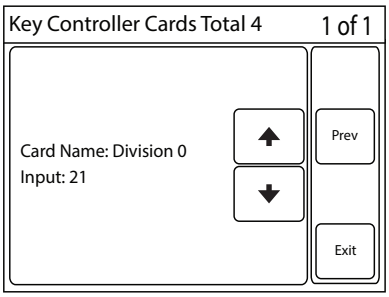
Test Keyboards

The keyboard testing screen is useful to see whether there were any mistakes made during the wiring process. Also, the top of the screen displays how many key input boards are in the system. This should match the total number of manual and pedal boards in the organ.

Step 1: Release all keys in the system and make sure that the system does not show that any keys are stuck on.

Step 2: Press down the lowest key on a desired keyboard. The screen will display the Card Name and the corresponding Input Number for this key.





Step 3: Slowly move up the keyboard one note at a time to make sure each note moves up sequentially by one Key Input Number.

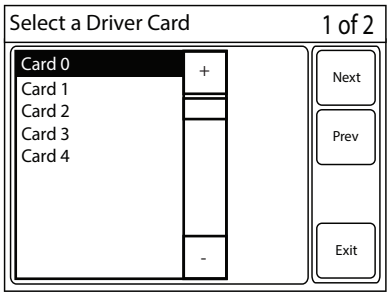
Card Name: Each keyboard is wired to an MS8404 Keying Input Card. These cards can be assigned a name such as "Great," "Swell," etc. If no name has been assigned to the card, it will have a default name. The default name is "Division" with the address of the card tagged on the end.

Input: The Input Number on the screen refers to the input pin on the MS8404 Card to which the key is wired. These pins are labeled on the MS8404 Card.

The Previous button returns to the Test and Diagnose menu and the Exit button returns to the Main Menu.

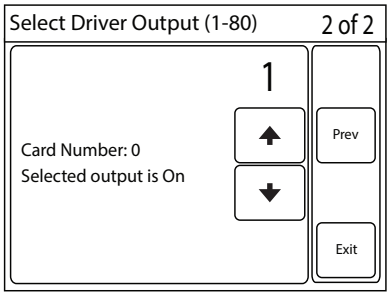
Test Driver Cards

The MS8406 Driver Card has 80 programmable outputs that can be used to play pipes, turn on stop lines, and much more. The driver card testing screen can sequentially turn on individual outputs of an MS8406 card. This is helpful in testing the functionality of what is wired to each output.



Step 1: Select a MS8406 from the list box and press the Next button.

Step 2: The first output on the selected driver will latch on. Use the up and down arrows to scroll through the outputs on the driver.

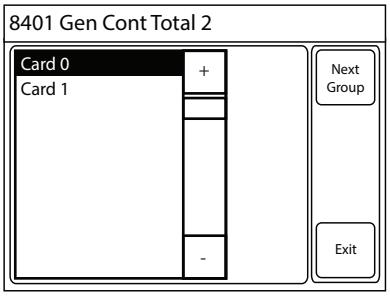


Card Number: Card Numbers are configured on each MS8406 card using the Card Number DIP switch. It is crucial that each MS8406 have a different Card Number.

The Previous button returns to the Test and Diagnose menu and the Exit button returns to the Main Menu.

Test for Address Conflicts

Each Card in the MS8400 system is given a unique address. The Address Conflict Test screen is used to determine whether any duplicate addresses have been assigned.



The address conflict test is done for each group of cards individually. The group of cards being tested and the total number of unique addresses found are at the top of the screen. Each address that is reported shows up in the list box. To determine whether there is a duplicate address, count the total number of boards in the organ console and/or chamber. If two boards have the same address, then only one of the addresses will appear in the list box and the total count will be less than expected.

Pressing the Next Group button will load the Next Group of boards and their addresses. Pressing the Previous Group button will load the previous group of boards and their addresses. Pressing Exit will return to the Main Menu.

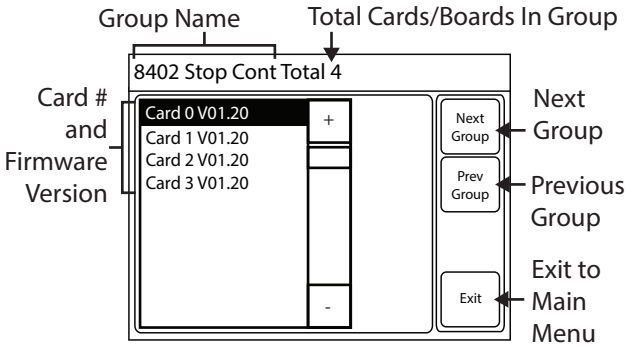
Firmware Revisions

In the MS8400 system, most cards have onsite boot loadable firmware. In cases where boot loading is required, the Firmware Revisions test displays each card in the system along with their current firmware revision.

The Firmware Revisions test screen shows the current card/board group name and the total number of cards/boards at the top of the screen. A list box shows all the cards/boards of the current group and their current firmware number. The Next Group button advances to the next group of cards/boards in the system. The Prev Group button returns to the previous group of cards/boards. The Exit button exits the Firmware Revisions test returning to the Main Menu.

Card/board groups are displayed in the following order:

MS8401 General Controllers
MS8402 Stop Control Cards
MS8403 Piston Control Cards
MS8404 Key Input Cards
MS8406 and MS8416 Chamber Driver Cards
MS8409 Power Sequencer Boards
MS8410 MIDI Sound Module Boards
MS8415 Bar Graph Boards
MS8418 Numeric Display Boards
MS8419 Digital Display Drivers
MS8460 2 Manual CA Boards
MS8480 2 Manual Keying Boards



If there are no cards/boards of the current group, the list box will be empty.

Appendix: Electrical Code Compliance (NEC)

Organ Systems and Conforming to Local/Regional Codes

Syndyne's Liability Disclaimer

It is critical to research, know, and adhere to local and regional codes. Any recommendations we give in this manual are general and should be ignored when in opposition to local and regional codes. If any local and/or regional codes differ from our recommendations, FOLLOW THE LOCAL AND REGIONAL CODES. Syndyne provides this information on code compliance from our limited experience without warranty of accuracy or completeness. Syndyne shall be held harmless of any liability for personal injury, damage to property, or damages of any nature whatsoever whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the use of this manual or reliance on this manual.

Why Comply with Local and Regional Codes?

Electricity is an incredibly useful tool, but if applied incorrectly, it can be extremely dangerous. Installing power systems incorrectly and/or without proper protection can start fires, electrocute people, and/or damage property. As an organ builder, the work you do will generate liability. This liability can be considerable when factoring in potential loss of life and property. Although an excellent business liability insurance policy is recommended, following local and regional codes provide additional liability protection. If a fire were to start in an organ that you have built or worked on, and you can prove that local/regional codes were followed, a costly and stressful lawsuit might be avoided. Safety is at the heart of most local/regional code requirements, even if they may seem overprotective. It is in the best interest of all organ builders to comply with code.

Important Information about the NEC®

The **NFPA 70®, National Electric Code®, (or NEC®)** is a set of electrical standards that is created and maintained by the **National Fire Protection Agency® or NFPA®** which is private organization. The **NEC** is used by many local and regional governmental authorities to determine the correct and safe method of installing, using, and connecting electrical systems. It is incredibly important to note that the **NEC** is not created or maintained by the government and therefore the **NEC** itself has no authority over a local or regional government unless that government agrees to adopt the **NEC**. This means that any local or regional government can override, replace, or ignore the **NEC** and utilize its own standards and code requirement within their jurisdiction. The good news is that the majority of governmental authorities stick to the **NEC** when writing their own code requirements. A copy of the **NEC** can be purchased from a variety of companies, and could be a useful tool for any organ builder that finds themselves dealing with electrical systems. For more information on the **NEC**, please visit www.nfpa.org.

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Our Summary Guidelines of NEC Article 650 (The Pipe Organ Section)

Many people, including some inspectors, do not know that the pipe organ has its own section in the **NEC**. This section is labeled article 650: Pipe Organs. The majority of the information in the **NEC** is directed to high voltage AC which is used on organs in limited doses. Applying the majority of the **NEC** to low voltage DC systems, such as with pipe organs, would be highly restrictive and unnecessary for general safety, which is the primary concern of the **NEC**. Article 650 takes the unique situation of the pipe organ into consideration and provides standards that help define and protect an organ electrical system installation.

We have studied the **NEC** article 650 and come up with some guidelines. It is critical to understand that these are only guidelines. Any code, including the **NEC**, is reliant on an inspector's interpretation of the code itself. We cannot guarantee that a local or regional agency will accept these guidelines as accurate or useful.

Guidelines to improve your chances of government compliance in relation to the **NEC**:

- Any wire used for a magnet or coil (Such as a stop control or pipe magnet) must be at least 26 AWG.
- Any wire used for an electronic signal (example: thumb piston reed switch, key/pedal mechanical switch, or a stop control switch) must be at least 28 AWG.
- Any wire used for a main common-return must be at least 14 AWG.
- All wires should be made of copper and have a thermoplastic or thermosetting insulation on the outside.
- In the past, organ installations may have used currently non-compliant wire such as cotton covered or even wax infused cotton covered wire. Our understanding of the NEC is that our system can connect to this existing wiring only if it has removable plugs, and the circuit is adequately protected with fusing or other over-current protection devices currently compliant with code. Our understanding is that modifications such as splicing, or soldering onto this existing non-compliant wiring is not acceptable.

NFPA70 NEC 2017 National Electrical Code Handbook Article 650

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ARTICLE
650 Pipe Organs

Contents

650.1 Scope
650.2 Definitions
650.3 Other Articles
(A) Electronic Organ Equipment
(B) Optical Fiber Cable
650.4 Source of Energy
650.5 Grounding or Double Insulation of the DC Power Supply
650.6 Conductors
(A) Size
(B) Insulation
(C) Conductors to Be Cabled
(D) Cable Covering
650.7 Installation of Conductors
650.8 Overcurrent Protection
650.9 Protection from Accidental Contact

650.1 Scope. This article covers those electrical circuits and parts of electrically operated pipe organs that are employed for the control of the keyboards and of the sounding apparatus, typically organ pipes.

Informational Note: The typical pipe organ is a very large musical instrument that is built as part of a building or structure.

650.2 Definitions.

Electronic Organ. A musical instrument that imitates the sound of a pipe organ by producing sound electronically.

Informational Note: Most new electronic organs produce sound digitally and are called digital organs.

Pipe Organ. A musical instrument that produces sound by driving pressurized air (called wind) through pipes selected via a keyboard.

Sounding Apparatus. The sound-producing part of a pipe organ, including, but not limited to, pipes, chimes, bells, the pressurized air (wind)-producing equipment (blower), associated controls, and power equipment.

Informational Note: The sounding apparatus is also referred to as the "pipe organ chamber."

controls, and power equipment.

Informational Note: The sounding apparatus is also referred to as the "pipe organ chamber."

650.3 Other Articles. Installations of circuits and equipment shall comply with 650.3(A) and (B) as applicable. Wherever the requirements of other articles in Chapters 1 through 7 of this *Code* and Article 650 differ, the requirements of Article 650 shall apply.

(A) Electronic Organ Equipment. Installations of digital/analog–sampled sound production technology and associated audio signal processing, amplification, reproduction equipment, and wiring installed as part of a pipe organ shall be in accordance with Article 640.

Some pipe organ installations incorporate digital/analog–sampled sound technology. The requirements in Article 640 are necessary for electronic sound production, amplification, signal processing, and other sound reproduction circuits and equipment installed as part of a pipe organ.

(B) Optical Fiber Cable. Installations of optical fiber cables shall be in accordance with Parts I and V of Article 770.

650.4 Source of Energy. DC power shall be supplied by a listed dc power supply with a maximum output of 30 volts.

Informational Note: Class 1 power-limited power supplies are often utilized in pipe organ applications.

650.5 Grounding or Double Insulation of the DC Power Supply. The installation of the dc power supply shall comply with either of the following:

(1) The dc power supply shall be double insulated.
(2) The metallic case of the dc power supply shall be bonded to the input equipment grounding conductor.

650.6 Conductors. Conductors shall comply with 650.6(A) through (D).

(A) Size. The minimum conductor size shall be not less than 28 AWG for electronic signal circuits and not less than 26 AWG for electromagnetic valve supply and the like. The minimum conductor size of a main common-return conductor in the electromagnetic supply shall not be less than 14 AWG.

(B) Insulation. Conductors shall have thermoplastic or thermosetting insulation.

(C) Conductors to Be Cabled. Except for the common-return conductor and conductors inside the organ proper, the organ sections and the organ console conductors shall be cabled. The common-return conductors shall be permitted under an additional covering enclosing both cable and return conductor, or they shall be permitted as a separate conductor and shall be permitted to be in contact with the cable.

(D) Cable Covering. Each cable shall be provided with an outer covering, either overall or on each of any subassemblies of grouped conductors. Tape shall be permitted in place of a covering. Where not installed in metal raceway, the covering shall be resistant to flame spread, or the cable or each cable subassembly shall be covered with a closely wound listed fireproof tape.

Informational Note: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-2011, *Reference Standard for Electrical Wires, Cables and Flexible Cords*.

650.7 Installation of Conductors. Cables shall be securely fastened in place and shall be permitted to be attached directly to the organ structure without insulating supports. Splices shall not be required to be enclosed in boxes or other enclosures. Control equipment and busbars connecting common-return conductors shall be permitted to be attached directly to the organ structure without insulation supports. Abandoned cables that are not terminated at equipment shall be identified with a tag of sufficient durability to withstand the environment involved.

650.8 Overcurrent Protection. Circuits shall be so arranged that 20 AWG through 28 AWG conductors shall be protected by an overcurrent device rated at not more than 6 amperes. Other conductor sizes shall be protected in accordance with their ampacity. A common return conductor shall not require overcurrent protection.

650.9 Protection from Accidental Contact. The wiring of the sounding apparatus shall be within the lockable enclosure (organ chamber) where the exterior pipes shall be permitted to form part of the enclosure.

Informational Note: Access to the sounding apparatus and the associated circuitry is restricted by an enclosure. In most pipe organ installations, exterior pipes form part of the enclosure. In other installations, the pipes are covered by millwork that permits the passage of sound.

Appendix: Wire Size Recommendations

Wire Gauge and Voltage Drop Considerations

Local and/or regional governmental authorities have jurisdiction over an installation meeting code standards. Any information we have included requires an understanding of how electricity works and how to properly wire an installation. We cannot be held responsible for misapplication of this information, or be held responsible for an installation not meeting local and/or regional codes.

Using the proper wire gauge is important for an installation to function correctly. Wire gauge calculations are based on several factors. The voltage of the power supply, the magnet load, the length of the wire run, the acceptable voltage loss, and **NEC** standards are all part of the calculations which go into wire gauge selection.

NEC *NOTE: The* NEC *states that any wires in an electro-magnetic circuit must be a minimum of 26 AWG and any Main common-return wires in an electro-magnetic circuit must be a minimum of 14 AWG.*

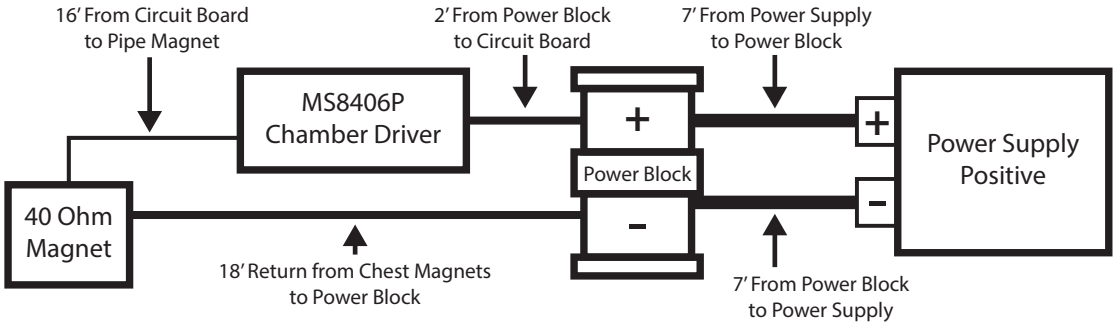
Before we can determine wire gauge, we must define and calculate potential voltage drop. Voltage drop is the principle that a wire increases in resistance, the longer it is run. For example, the resistance of a 14 AWG copper wire at five feet is 0.04 Ohms while a 14 AWG copper wire at twenty feet is 0.161 Ohms. As the resistance of the wire increases, the voltage begins to drop to maintain the power required by a load (such as a pipe magnet). If the voltage drops enough, bad things happen. Drops in voltage can make magnets unresponsive, cause wires to overheat, and/or cause system boards to lose power to the point of a reset.

Syndyne recommends limiting total voltage drop from wire runs to 1 Volt or less. This is not the only important calculation in determining wiring gauge, but it cannot be ignored.

With the maximum acceptable voltage drop defined, the next step is to work out the current and distance required for each run of power wiring. This process involves determining the power supply voltage, the total length of each run of wire, and the load current for each run of wire. It is not necessary to run calculations for every magnet circuit in the entire system when the majority of the variables are the same. For example, with a chest containing 61 pipe valve magnets, do not calculate voltage drop for each separate pipe valve magnet. Simply run the voltage drop calculation for the pipe valve magnet with the longest run and for the pipe valve magnet with the largest load. As long as these circuits are within the voltage drop limit, the runs which are shorter and less Amps will also be within voltage drop limit. The exception to this is in instances where a builder wants to use as little gauges of wire possible for each individual load in the system to cut wire costs. We do not recommend this as it makes the entire process much more complicated. Our recommendation is to use a gauge of wire for similar types of runs that accommodates every circuit in the organ wherever is practical. So if 24 AWG is sufficient for the heaviest and longest magnet runs, use 24 AWG throughout the system even if some loads could get away with 26 AWG wire.

The first step in this process is to get the length of each run of wire by measuring out distances between power supplies, distribution blocks, magnets, and any other component in each magnetic circuit. It is a good idea to draw out a simple block diagram of each of the parts in the magnetic circuit and then record the length of wire required to connect each component together.

Determine the layout of each component and the distance between components



The next step is to determine the circuit voltage. It is important to note the difference between power supply voltage and circuit voltage. Circuit voltage is the current after accounting for potential voltage drop. If this is not accounted for, the current on the circuit will increase because the voltage will have decreased. To calculate current voltage, simply take the power supply's output voltage and subtract 1.0 Volt for maximum line voltage drop, and 0.8 Volts for voltage drop across the system circuit board. For our included examples, we use a 60 AMP power supply with a 13.8 Volt output, so our circuit voltage is 13.8 Volts - 1.8 Volts, which equals 12 Volts.

With the circuit voltage determined, the next step is to determine the current for each run in the circuit. Each run will likely have a different current depending on how many magnetic loads are connected, however, the formula is still the same. To calculate current, divide the circuit voltage by the resistance of the magnetic load or loads. Lets take our example from above and calculate each wire run.

Formula for Current

$$I = \frac{V}{R}$$

V = Voltage in Volts
I = Current in Amps
R = Resistance in Ohms

Run from the chamber driver to the pipe valve magnet: This run is calculated as 12 Volts / 40 Ohms, which equals 0.3 Amps. This wire is simple because there is only one connected pipe magnet.

Chest return wire from the chest magnets to the power block: Chest manufacturers say a good rule of thumb is 1.6 Amps for a electro-pneumatic rank and 3.0 Amps for a direct electric rank. These recommendations are equivalent to 12 magnets at 90 Ohms at 12 Volts for an electro-pneumatic rank (per stop) and 12 magnets at a 48 Ohm average at 12 Volts for a direct electric rank. However, this only works if chests have typical magnet sizes. If a chest has many larger magnets or requires more power than is typical, additional calculations will be required. The most important thing is that the Amps estimated is larger than the Amps going through the wire. For our example, we are being more conservative and assuming the driver is wired to a chest with an average magnet size of 36 Ohms, and the standard max of 12 notes held on at one time. This means we calculate current for this wire as (12 Volts / 36 Ohms) * 12 Magnets, which equals 4 Amps.

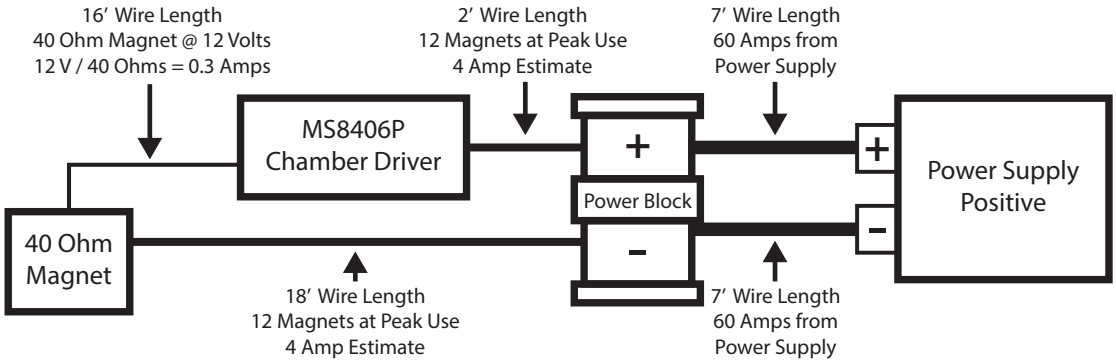
Do not assume these recommendations are correct without a good knowledge of how organ power works. Running too much current through an improperly gauged wire can cause fire, injury, and death.

Wire feeding the chamber driver circuit board from the power distribution block: This wire may require more AMPS than the chest return since our chamber drivers are programmable to operate many DC outputs stop lines, Swell engines, slider motors, or other outputs in addition to the pipe magnet circuit. For simplicity, our example chamber driver is only wired to the one 61-note rank of chest magnets estimated previously at 4 Amps.

Main lines from the power supply to the power distribution block: This is simply the max output current of the power supply. If there are multiple mains going to multiple power distribution blocks, the wire for each set of mains would all need to be capable of handling the max power supply current. Remember, we recommend limiting the distance of main wire runs between system circuit boards and a power supply in order to better regulate voltage. Please see the section labeled Power Supply Sizing for more details.

The following illustration shows our example with the recorded distances and currents.

Determine the current at each individual wire run



With all the wire run distances and currents recorded, it is time to determine the correct wire gauge. We cannot recommend a safe wire gauge to use in an installation because this is dictated by local and/or regional codes. **LOCAL AND/OR REGIONAL CODES MUST BE FOLLOWED**. Ampacity charts can be found online, and in the **NEC** Code Book, however, we do not have permission to print these here, and there is no guarantee that these resources meet local and/or regional codes.

Once the minimum wire gauge required to safely carry the current for each run of wire is determined, fill in the following worksheet to determine if the wires may need to be a larger gauge to stay under the voltage drop limit. The work sheet helps a builder make the necessary calculations on a run-by-run basis and add them together to get a total voltage drop. Simply write in the length of wire in feet and the current in AMPS, then solve the formula for each run. We have filled in an example worksheet below which can be used for easy reference.

EXAMPLE WORKSHEET FOR CALCULATING VOLTAGE DROP									
	Ohms per 1000 Feet		Length of Cable in Feet		Divide by 1000 to Convert		Circuit Current (Amps)		Solve for Voltage Drop per Run in Volts
WIRE RUN FROM DRIVER BOARD TO MAGNET									
26 AWG	40.81	x		/	1000	x		=	
24 AWG	25.67	x	16	/	1000	x	0.3	=	0.1232
WIRE FROM MAGNET TO COMMON-RETURN (for SAMS and SDKS)									
26 AWG	40.81	x		/	1000	x		=	
24 AWG	25.67	x		/	1000	x		=	
COMMON-RETURN FROM MAGNET TO POWER BLOCK									
14 AWG	2.525	x	18	/	1000	x	4	=	0.1818
12 AWG	1.588	x		/	1000	x		=	
10 AWG	0.9989	x		/	1000	x		=	
8 AWG	0.6282	x		/	1000	x		=	
MAIN FROM POWER SUPPLY TO POWER BLOCK									
14 AWG	2.525	x	2	/	1000	x	4	=	0.0202
12 AWG	1.588	x		/	1000	x		=	
10 AWG	0.9989	x		/	1000	x		=	
8 AWG	0.6282	x	14	/	1000	x	60	=	0.5277
6 AWG	0.3951	x		/	1000	x		=	
4 AWG	0.2485	x		/	1000	x		=	
2 AWG	0.1563	x		/	1000	x		=	
1 AWG	0.1239	x		/	1000	x		=	
TOTAL THE RIGHT COLUMN AND ENTER HERE - >									0.8327

For each run of wire, we selected a conservative wire gauge and calculated its voltage drop. We calculated the resistance of the each run by multiplying the Ohms per 1000 feet by the cable length in feet and dividing by 1000 to convert to Ohms per foot. Then we multiplied the resistance by the current to get the total voltage drop for each run. Finally, we totaled the voltage drop for each run of wire. This was less than 1 Volt, so this will work well. It is not a good idea to push the limits by getting as close to 1 Volt as possible. Having extra buffer is not a bad idea when calculating power requirements. Now fill in the information for your installation by following our example above. If the voltage drop is over 1 Volt, simply increase the gauge of wire of different runs until the total voltage is less than 1 Volt.

WORKSHEET FOR CALCULATING VOLTAGE DROP									
	Ohms per 1000 Feet		Length of Cable in Feet		Divide by 1000 to Convert		Circuit Current (Amps)		Multiply
WIRE RUN FROM CHAMBER DRIVER TO MAGNET									
26 AWG	40.81	x		/	1000	x		=	
24 AWG	25.67	x		/	1000	x		=	
WIRE RUN FROM CHAMBER DRIVER TO MAGNET									
26 AWG	40.81	x		/	1000	x		=	
24 AWG	25.67	x		/	1000	x		=	
WIRE RUN FROM CHAMBER DRIVER TO MAGNET									
14 AWG	2.525	x		/	1000	x		=	
12 AWG	1.588	x		/	1000	x		=	
10 AWG	0.9989	x		/	1000	x		=	
8 AWG	0.6282	x		/	1000	x		=	
WIRE RUN FROM CHAMBER DRIVER TO MAGNET									
14 AWG	2.525	x		/	1000	x		=	
12 AWG	1.588	x		/	1000	x		=	
10 AWG	0.9989	x		/	1000	x		=	
8 AWG	0.6282	x		/	1000	x		=	
6 AWG	0.3951	x		/	1000	x		=	
4 AWG	0.2485	x		/	1000	x		=	
2 AWG	0.1563	x		/	1000	x		=	
1 AWG	0.1239	x		/	1000	x		=	
TOTAL THE RIGHT COLUMN AND ENTER HERE - >									

Other Power Reference Tables and Formulas

Load Side Distance in feet to drop 0.25 Volts (Assuming 13.8 Volt Power Supply)								
Wire Gauge	Typical magnet loads found in a pipe organ							
	21 Ohms	28 Ohms	40 Ohms	45 Ohms	50 Ohms	60 Ohms	90 Ohms	125 Ohms
24 AWG	17.04'	22.72'	32.46'	36.52'	40.57'	48.69'	73.04'	101.44'
26 AWG	10.72'	14.29'	20.41'	22.97'	25.52'	30.62'	45.94'	63.81'

Load Side Distance in feet to drop 0.5 Volt (Assuming 13.8 Volt Power Supply)								
Wire Gauge	Typical magnet loads found in a pipe organ							
	21 Ohms	28 Ohms	40 Ohms	45 Ohms	50 Ohms	60 Ohms	90 Ohms	125 Ohms
24 AWG	34.08'	45.44'	64.92'	73.04'	81.15'	97.38'	146.08'	202.89'
26 AWG	21.44'	28.58'	40.83'	45.94'	51.04'	61.25'	91.88'	127.62'

How many feet does is take to drop 0.25 Volts using common wire gauges and loads (Example: 40 Amps through a single 8 AWG wire drops 0.25 Volts in 9 feet)											
		Wire Gauges (AWG) Commonly Used for Organ Mains									
		14	12	10	8	6	5	4	3	2	1
Power Supply (Amps)	30	3.30'	5.24'	8.34'	13.26'	21.09'	26.59'	33.53'	42.30'	53.31'	67.20'
	40	2.47'	3.93'	6.25'	9.94'	15.81'	19.94'	25.15'	31.72'	39.98'	50.40'
	60	1.65'	2.62'	4.17'	6.63'	10.54'	13.29'	16.76'	21.15'	26.65'	33.60'
	70	1.41'	2.24'	3.57'	5.68'	9.03'	11.39'	14.37'	18.12'	22.84'	28.80'
	90	1.10'	1.74'	2.78'	4.42'	7.03'	8.86'	11.17'	14.10'	17.77'	22.40'
	120	0.82'	1.31'	2.08'	3.31'	5.27'	6.64'	8.38'	10.57'	13.32'	16.80'

How many feet does is take to drop 0.5 Volts using common wire gauges and loads (Example: 60 Amps through a single 10 AWG wire drops 0.5 Volts in 13 feet)											
		Wire Gauges (AWG) Commonly Used for Organ Mains									
		14	12	10	8	6	5	4	3	2	1
Power Supply (Amps)	30	6.60'	10.49'	16.68'	26.53'	42.18'	53.19'	67.06'	84.60'	106.63'	134.40'
	40	4.95'	7.87'	12.51'	19.89'	31.63'	39.89'	50.30'	63.45'	79.97'	100.80'
	60	3.30'	5.24'	8.34'	13.26'	21.09'	26.59'	33.53'	42.30'	53.31'	67.20'
	70	2.82'	4.49'	7.15'	11.37'	18.07'	22.79'	28.74'	36.25'	45.69'	57.60'
	90	2.20'	3.49'	5.56'	8.84'	14.06'	17.73'	22.35'	28.20'	35.54'	44.80'
	120	1.65'	2.62'	4.17'	6.63'	10.54'	13.29'	16.76'	21.15'	26.65'	33.60'

How many feet to drop 0.25 Volts using common wire gauges and loads (Example: 4 Amps through a single 14 AWG wire drops 0.25 Volts in 24.75 feet)					
		Wire Gauges (AWG) for Magnet Commons/Returns			
		14	12	10	8
Power Supply (Amps)	1	99.00'	157.43'	250.27'	397.96'
	2	49.50'	78.71'	125.13'	198.98'
	3	33.00'	52.47'	83.42'	132.65'
	4	24.75'	39.35'	62.56'	99.49'
	5	19.80'	31.48'	50.05'	79.59'
	6	16.50'	26.23'	41.71'	66.32'
	7	14.14'	22.49'	35.75'	56.85'
	8	12.37'	19.67'	31.28'	49.74'
	9	11.00'	17.49'	27.80'	44.21'
	10	9.90'	15.74'	25.02'	39.79'

How many feet to drop 0.5 Volts using common wire gauges and loads (Example: 4 Amps through a single 14 AWG wire drops 0.5 Volts in 24.75 feet)					
		Wire Gauges (AWG) for Magnet Commons/Returns			
		14	12	10	8
Power Supply (Amps)	1	198.01'	314.86'	500.55'	795.92'
	2	99.00'	157.43'	250.27'	397.96'
	3	66.00'	104.95'	166.85'	265.30'
	4	49.50'	78.71'	125.13'	198.98'
	5	39.60'	62.97'	100.11'	159.18'
	6	33.00'	52.47'	83.42'	132.65'
	7	28.28'	44.98'	71.50'	113.70'
	8	24.75'	39.35'	62.56'	99.49'
	9	22.00'	34.98'	55.61'	88.43'
	10	19.80'	31.48'	50.05'	79.59'

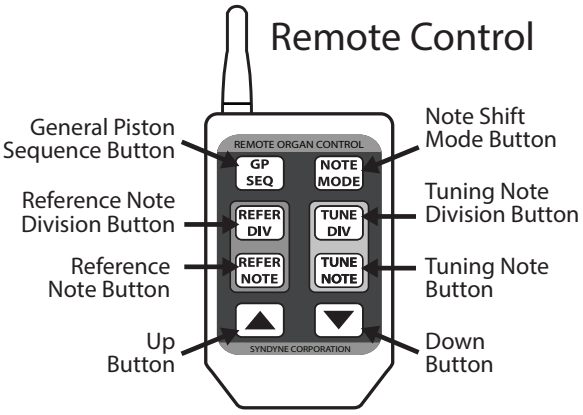
Loads for Common Pipe Organ Magnets	
Syndyne Drawknob	28 Ohm
Synydne SAM	28 Ohm
*OSI Coupler Rail (1 Switch)	28 Ohm
*Harris Drawknob	32 Ohm
*Peterson Power Knob	21 Ohm

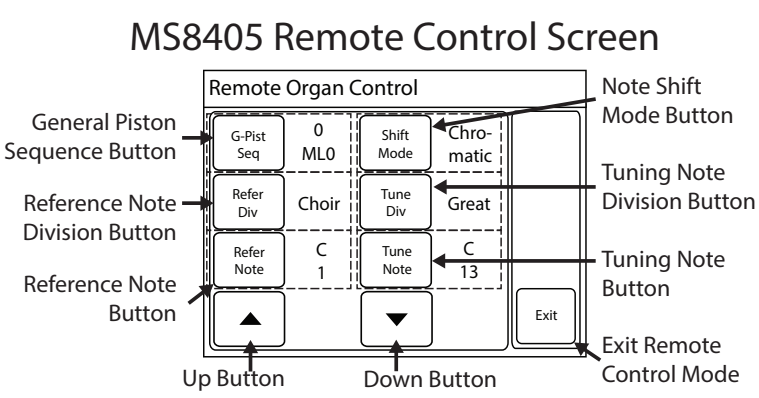
* This information was given to us by other companies via online documentation, word of mouth, or industry publication. We recommend checking the switches before relying on this.

Appendix: Remote Control

Overview

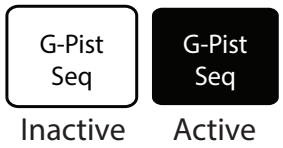
The MS8400 has an optional remote organ control function that allows the builder to remote operate the console. Builders can use this feature to tune or voice an instrument without needing someone at the console controlling stops and keys. Using a hand-held remote, two different notes can be turned on and off, each with their own separately controlled division. Stops are controlled by sequencing through general pistons. The remote organ control function is accessed from the Main Menu.

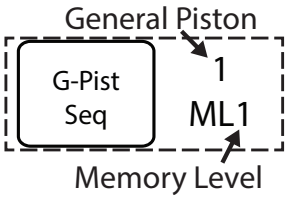




Controlling the general piston sequencer

The General Piston Sequence button allows the user to scroll through general pistons and memory levels when activated. This can be used to change an organ's stop registration throughout the tuning or voicing process. To activate, press the General Piston Sequence button on the touch screen or the remote control. This will cause the touch screen button to invert its colors showing that it is active. Pressing it again will turn the General Piston Sequence button off and change the screen button back to its original colors.





The current piston number and memory level are displayed to the right of the General Piston Sequence button. The general piston number is on top and the memory level is listed on the bottom marked with ML.

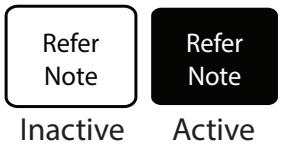
While General Piston Sequence Control is activated, use the up or down arrow buttons to scroll up or down through general pistons and memory levels. Pressing the up button will increase the current general piston by 1 step while pressing the down button will decrease the current general piston by 1 step. When the highest general piston is on, pressing the up button again will increase the memory level by 1 and change the general piston back to 1. When the lowest general piston is on, pressing the down button will decrease the memory level by 1 and change the general piston to the highest general piston in the system. Memory levels wrap up or down in the same method when on the highest memory level or when on memory level 1.

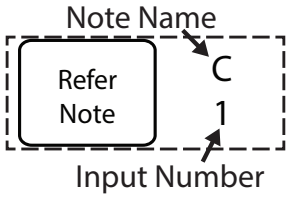
Pressing and holding the General Piston Sequence button for 2 seconds will reset the general piston and memory level to 1.

Controlling the Tuning and Reference Notes

When using the MS8400 Remote Control function, two notes can be controlled together or separately. One note is called the Reference Note and one is called the Tuning Note. These notes are controlled by the Reference (or Tuning) Note buttons on the touch screen or the remote control.

Pressing the Reference (or Tuning) note button will latch the note on and invert the color of the button on the touch screen to indicate that the note is on and controllable. Pressing the button again will turn the note off and return the touch screen button back to normal.





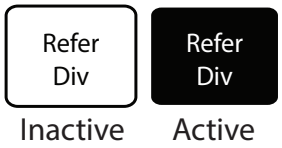
The Reference (or Tuning) Note Name and Number are listed to the right of the button on the touch screen. While a note is latched on, pressing the up button will increase it and the down button will decrease it. If both the Reference and Tuning notes are latched on, they will be controlled simultaneously. The number of steps the notes increase or decrease each time the up or down arrows are pressed is affected by the Note Shift Mode Control. See the section on setting the Shift Control Mode for more details.

Pressing and holding either the Reference (or Tuning) Note button will reset the note back to Low C and turn the note on

Controlling the Tuning and Reference Note Divisions

The Reference Note and Tuning Note play in an assigned division. This division can be changed using the Reference (or Tuning) Note Division button on the screen or the remote control.

Pressing the Reference (or Tuning) Division Control button on the touch screen or the remote control, will activate the Reference (or Tuning) Division Control Mode and invert the button's color on the touch screen showing that it is active. Pressing the button again will deactivate the mode and return the button to its original color.



With the Reference (or Tuning) Division Control Mode activated, pressing the up or down arrows will change the division on which the Reference (or Tuning) Note plays.

The scrolling order for divisions is tied to the numerical address of each MS8404 Keying System Board in the MS8400 system. Divisions can be named for convenience, but they do not affect the scrolling order. For more information on changing division names, see the "Name a Division" section in this manual.

Pressing and holding the Reference (or Tuning) Note Division button will activate it and reset the division control back to the lowest numbered division in the system

Changing the Note Shift Mode (Number of Steps)

The number of steps that the Reference (or Tuning) Notes change each time the up or down buttons are pressed is controlled by the Shift Mode button. Pressing the Shift Mode button, or the Shift Note Mode button on the remote control, will scroll through four different note shifting modes. Each mode was designed to fit different tuning preferences as well as different chest styles by changing the number of notes moved per press of the Up or Down arrows in Tuning or Reference Note Mode. Chromatic mode moves one step (C to C# for example) per press of the Up or Down button. Diatonic mode moves one whole step (C to D for example) per press of the Up or Down button. Tierce mode moves five steps per press of the Up or Down button. Octave mode moves 1 full octave per press of the Up or Down button.

Pressing and holding the Shift Mode button on the screen or the remote control will reset the Shift Note Mode back to Chromatic.