peterson

MASTER STOP PROCESSOR™

Installation Instructions

Revised 6/03

For Software v. "W/SDP 3/18/02" and later

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TABLE OF CONTENTS

THE peterson
MASTER STOP PROCESSOR™ MSP-1000™

INSTALLATION INSTRUCTIONS

INTRODUCTION

The Peterson Master Stop Processor™ MSP-1000™ is a revolutionary product for the pipe organ that uses advanced microprocessor technology in a way that truly makes sense. We have placed great emphasis on making this system "comfortable" for organists to use, and allowing access to the greatest number of features possible through simple, intuitive procedures that do not take a long time to learn.

HOW TO USE THE PETERSON MASTER STOP PROCESSOR™

SUMMARY OF CONTROL PANEL FEATURES

Let's begin with a brief description of each of the controls and displays provided on the Main Control Panel of the MSP-1000™. This section is intended as a quick reference to help you understand the function of each control. More detailed information about how to use each of these controls is provided in the later sections.

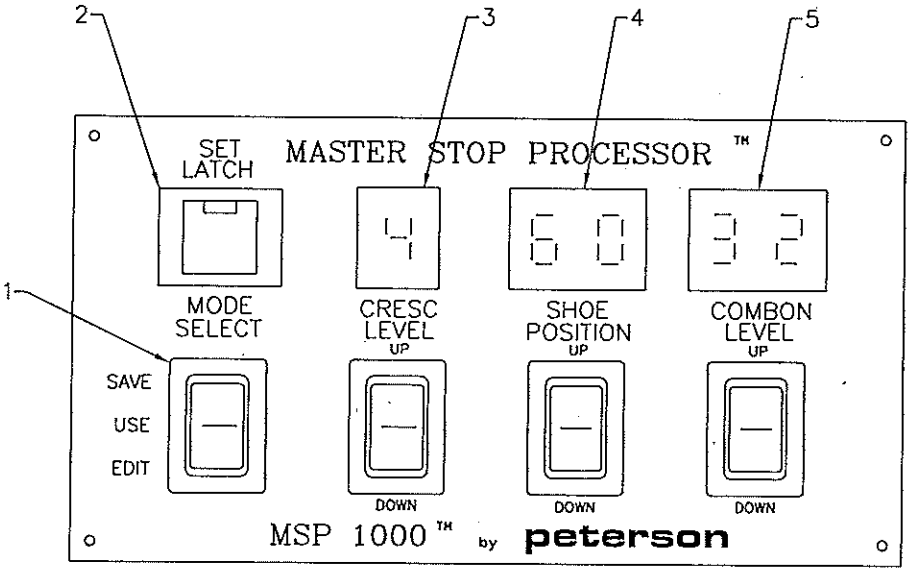


FIGURE 1

1- MODE SELECT ROCKER SWITCH AND INDICATOR LEDS

Pushing the top of this switch puts the system into the Save mode of operation. Pushing the bottom of the switch in will put the system into the Edit mode of operation. If the switch is in the center position, with neither the top nor the bottom pushed in, the system will be in the Use, or normal, mode of operation. An indicator LED will be illuminated whenever the organ power is on and the system is not in the Use mode. This switch should ***always*** be in the Use position unless you are setting memories or checking a crescendo or tutti memory.

2- SET LATCH MODE BUTTON

Pushing this button while holding in the "Set" thumb piston or toe stud will latch the system into the "Set Latch" mode of operation, providing the Mode Select rocker switch (#1) is in the Save position. The "Shoe Position" window (#4) must display a number before you engage the Set Latch Mode. The LED built into the button will come on and remain lit until the Set Latch mode button is pushed again, or until the Set Latch mode is automatically canceled. On consoles where no "Set" thumb or toe piston is provided, the Set Latch button serves as a "Set" piston. Please refer to the section on Setting the Crescendo for more details.

3- CRESCENDO LEVEL SELECTOR ROCKER SWITCH AND READOUT

The MSP-1000™ provides four (4) separate crescendo memory levels. Pushing the top of this rocker switch will advance the crescendo memory level number as indicated on the digital readout. Pushing the bottom of the switch will lower the crescendo memory level. A single push on the switch will change the crescendo level by one step, but if the switch is held in, the level will continually step until the switch is released. The count pattern is 1-2-3-4-1-2... when counting up, and 4-3-2-1-4-3... when counting down.

4- SHOE POSITION SELECTOR ROCKER SWITCH AND READOUT

Each crescendo memory level on the MSP-1000™ is divided into sixty (60) shoe positions, each of which may be programmed to turn on any combination of stops. The "shoe position number" digital readout will be lighted whenever the crescendo is active. When the Mode Selector rocker switch (#1) is in the Use position, this digital readout will indicate the actual position of the crescendo shoe. In effect this is the same as indicating how many contacts of a traditional sixty-contact crescendo roller are activated. When the Mode Select rocker switch (#1) is in the Save or Edit position, the shoe position number is usually determined by this Shoe Position Selector rocker switch. Pushing the top or bottom of this rocker switch will adjust the shoe position number up or down, respectively, and the numbers will begin to sequence automatically if the button is held in for more than about one second. The decimal points on this digital display will flash whenever the system is in the "set-enabled state". If the decimal points of this window (but not the combination action memory level window) are flashing, any changes to the positions of tabs or drawknobs will be set into memory for the current crescendo memory level and shoe position number instantly. If a "Crescendo Disable" control is activated, the shoe position number will indicate where the shoe is but the crescendo will not bring on stops.

5- COMBINATION ACTION MEMORY LEVEL SELECTOR SWITCH AND READOUT

Pushing the top or bottom of this rocker switch will adjust the combination action memory level up or down, respectively. The numbers will begin to sequence automatically if the button is held in for more than about one second. The decimal points on this digital display will flash whenever the combination action part of the MSP-1000™ is in the "set-enabled state". If the decimal points of this window (but not the shoe position number window) are flashing, any changes to the positions of tabs or drawknobs will be set into any pushed piston's memory instantly. Changing the combination action memory level will automatically change the optional American Programmable Piston Sequencer memory level. ***However, the memory level is prevented from changing unless the on/off switch on the Piston Sequencer Control Panel is in the off position.***

STEP-BY-STEP INSTRUCTIONS FOR USING EACH FUNCTION OF THE MASTER STOP PROCESSOR™ MSP-1000™

COMBINATION ACTION PISTONS

1- SELECTING A MEMORY LEVEL

The combination action memory level is indicated on the main control panel as shown in Figure 1. To select a different memory level, push the top of the select switch to go to a higher level, or push the bottom of the select switch to go to a lower level. Hold the switch in to automatically step through the levels. If the count reaches the maximum possible level, the counter will "wrap around" to level #1 automatically. Wrap-around will also occur when counting down. The combination action memory level may not be adjusted when the on/off switch on the optional Piston Sequencer Control Panel is turned on. The memory level of the American Programmable Piston Sequencer is automatically changed with the combination action memory level. NOTE: The organbuilder may choose to program the MSP to automatically change the combination action memory level when the American Programmable or European Piston Sequencer wraps around. This is covered in more detail in the sections on using the Piston Sequencer.

2- LOCKOUTS

One or more optional lockout keyswitches may be provided to allow an organist to prevent anyone else from tampering with his or her combinations. Each keyswitch may be allocated to a range of combination action, crescendo, and tutti memory levels by the organbuilder using the set-up terminal as described elsewhere in this manual. No setting will be permitted on the current memory level if that keyswitch is in the "locked" position. An automatic lockout feature is also incorporated into the Master Stop Processor™ which prevents setting of combination action pistons when a crescendo or tutti is active. This prevents accidental inclusion into a piston setting of stops that are not physically in the on position, but which are brought on because a crescendo shoe is advanced or a tutti is latched on. When setting is attempted, but prevented because of one of these lockout conditions, the letters "L.O." flash in the appropriate window on the control panel.

3- SETTING A PISTON

Combination action pistons may be set with the mode selector switch in the Save, Use, or Edit mode. Check to be sure that the "shoe position number" digital readout is not illuminated, and that no tutti is latched on. (If your MSP-1000™ is equipped with a tutti level select panel, it is normal for at least one level- number LED to be illuminated on this panel even though no tutti is latched on). Select the desired combination action memory level. Pistons may now be set in one of the following ways:

A- "Capture" or "set button" method

1- Move all tabs or knobs to the desired positions.
2- Push and hold the "set" piston. The decimal points on the combination action memory level display will flash to indicate that setting is now possible.
3- Push and release the desired piston.
4- Release the "set" piston.
5- Verify proper setting by pushing the general cancel piston, then the newly set piston to be sure that all desired stops come on.

B- "Tripper" or "hold and set" method

1- Push and hold the piston to be set. After a brief delay, the decimal point on the combination action memory level display will flash to indicate that setting is now possible.
2- Move all tabs or knobs to the desired positions.
3- Release the piston button.
4- Verify proper setting by pushing the general cancel piston, then the newly set piston to be sure that all desired stops come on.

Note that as part of a feature that prevents a mechanically stuck piston from disturbing the operation of the Master Stop Processor™, the decimal point will stop flashing after the "set" or other piston has been continuously held for about sixty seconds, and the positions of all tabs and knobs at this moment will be set into memory. Any further changes require that procedure A or B above be repeated.

Important: When all setting is complete, always move the mode selector switch on the main control panel back to the "Use" position.

4- OPERATING THE COMBINATION ACTION PISTONS

To use the combination action pistons normally, first be sure that the mode selector switch on the main control panel is in the Use position. It may also be necessary for the on/off switch on the optional American Programmable Piston Sequencer Control Panel to be in the off position. See the Piston Sequencer section if your Master Stop Processor™ has this option. Select the desired combination action memory level, and push pistons to recall preprogrammed stop settings. Pistons will be operational even if a crescendo and/or a tutti is engaged.

5- THE RESTORE PISTON

The Master Stop Processor™ has provisions for a "Restore" piston, which may be used at the organ builder's discretion. The primary use of the "Restore" piston is to give the organist the ability to quickly undo changes made in error, or the ability to make experimental changes knowing that there is a convenient way to "go back" if desired. If your system has such a piston, it may be used in the following ways:

A- In the Use Mode of Operation:

When the mode select switch on the main control panel is in the Use position, pushing the "Restore" button after any "regular" piston push will return the tabs and drawknobs to the positions they were in *immediately before* the regular piston was pushed.

B- In the Save or Edit Mode of Operation:

When the mode select switch on the main control panel is in the Save or Edit position, pushing the "Restore" button after *setting* any regular piston will return the *memory* for that piston back to the combination that was held for that piston before it was reset.

6- REVERSIBLE PISTONS

Three different types of reversible pistons may be provided when using the MSP-1000™. The operation of each type is described below.

A- "Regular" reversible pistons operate tablets or drawknobs and usually reverse the state of at least one tab or knob on alternate pushes of the reversible piston. This type of reversible is often used for inter-manual couplers at unison pitch. It is also common for the corresponding

16' and/or 4' couplers to be configured as "off only" reversibles, turning off whenever the same reversible piston push turns the unison pitch coupler off. Assignment of tablets, drawknobs, and pistons to "regular reversible" functions is handled by the organbuilder using the Set-Up Terminal. If no fully reversing stop is designated, stops designated as "off only" will turn off every time the reversible piston is pushed. This provision may be used for a function such as "All Reed Drawknobs Off".

B- "Blind" reversibles usually turn organ accessories or special features, such as a Zimbelstern or All Swells To Swell, on and off with alternate pushes of the reversible piston. A reversible is called blind if it does not operate a tablet or drawknob. Blind reversible pistons are assigned by the organ builder using the Set-Up Terminal, and a Special Functions Board must be included with the MSP-1000™ for this feature.

C- "Settable" reversible pistons may have one or more tablets and/or drawknobs assigned to them by the organist. This assignment may be conveniently changed at any time. These pistons then act as fully reversing "regular" reversibles affecting the assigned stop controls. The assignment of stops to a settable reversible will not change automatically when a new combination action memory level is selected. Assignment of stop controls to a settable reversible piston is made with the mode selector switch in Save, Use, or Edit position as follows:

1- Push and hold the settable reversible piston. The tabs or drawknobs currently assigned will move to the opposite states.
2- AFTER 1 SECOND, change the state of all tablets and/or drawknobs that should be controlled by the settable reversible piston. If a tab is on, turn it off; if it is off, turn it on. Remember to change the state of the stop controls that were already assigned to the settable reversible piston, if they are to be included in the new assignment. (Note: If no changes are to be made in the assignment of stop controls to the settable reversible piston, do not change the state of any tabs or knobs).
3- Release the settable reversible piston.
4- Verify that pushing the settable reversible piston changes the state of the desired stop controls.

7- PEDAL PISTON COUPLERS

The Master Stop Processor™ has provisions for "Pedal Piston Coupling", which allows pedal division tablets or drawknobs to be included in the registrations recalled by divisional pistons for one or more manuals when a switch is closed or a blind reversible piston is engaged. An indicator light should be provided to signal when this function is on. If this feature is to be utilized, the organ builder may use the Set-Up Terminal to indicate which of two configurations is desired.

A- The first configuration may be thought of as connecting each manual divisional piston to the pedal divisional piston with the same number. When the pedal piston coupler switch is activated, pushing a manual divisional piston such as Swell #2 will recall the registration set in that manual divisional piston's memory, and also the registration set in memory for the pedal divisional piston with the same number (Pedal #2). The same registration of Swell stops will be recalled from the Swell piston whether the pedal piston coupler switch is on or off. The same registration of Pedal stops will be recalled from the Pedal divisional piston and the Swell divisional piston when the pedal piston coupler switch is on. The pedal division registrations may only be set from the Pedal divisional pistons (Pedal #2 in our example). Note that the coupling only occurs in one direction- that is, pushing a pedal divisional piston will not recall the registration of a manual division's stops even though the pedal piston coupler is activated. If there are fewer Pedal divisional pistons than manual divisional pistons, the excess manual pistons will bring on only manual registrations even though the pedal piston coupler switch is on, since there will be no correspondingly numbered Pedal divisional piston.

B- In the second configuration, "New Pedal Memories" are called into use for each manual divisional piston. The registrations set into Pedal divisional pistons will remain totally independent from those of any manual divisional piston. When the pedal piston coupler switch is activated, the tablets and drawknobs of the Pedal division will join the tablets and drawknobs of a particular manual division to form a new "manual + pedal" division such as "Swell-Pedal". Registrations for this new division will be controlled by the manual's divisional pistons (Swell pistons in our example). The same memory will be used for the registrations of manual stops whether the pedal piston coupler switch is on or off. For example, registrations of Swell stops programmed into the "Swell-Pedal" divisional pistons when the pedal piston coupler switch is on will be recalled by the same pistons after the pedal piston coupler switch is turned off, but when the coupler switch is turned off, the Pedal tablets and drawknobs will no longer respond to the Swell divisional pistons.

A "Pedal-to-any-Division" option for Pedal Piston Couplers allows one stop control to be set "on" or "off" (by the organist) on every manual divisional piston, regardless of division. If a particular piston is set to turn this stop control on, then the pedal stops will also respond to the piston. Pedal stops will move to positions set for that specific manual divisional piston and will be unrelated to positions set in memory for pedal divisional pistons. If the piston is set to turn the "Pedal-to-any-Division" stop control off, the pedal stops will not respond.

8- MANUAL TRANSFER

The MSP-1000™ has provisions for a Manual Transfer stop tablet or blind reversible piston. This control may be wired to a Peterson OrgaPlex™ Master Coupler™ with an optional Manual Transfer Board to exchange or transfer the Great and Choir keyboards. This is useful when playing some European literature. When the Manual Transfer function is engaged, the Great and Choir divisional pistons will follow the transferred manuals. Intermanual coupler reversibles such as Great to Pedal and Choir to Pedal will also be transferred so they will stay with the appropriate manuals. When the Piston Sequencer is used, the organbuilder may use the Set-Up Terminal to specify whether any "Next" or "Previous" pistons under the Great and Choir manuals should transfer. Great and Choir divisional cancel thumb pistons should transfer, but if these divisional cancels are on toe studs they will ordinarily be configured by the organbuilder to not change function.

THE CRESCENDO SYSTEM

1- SELECTING A MEMORY LEVEL

The crescendo memory level is indicated on the main control panel as shown in Figure 1. To select a different memory level, push the top of the select switch to go to a higher level, and push the bottom of the select switch to go to a lower level. Hold the switch in to automatically step through the levels. The count will automatically "wrap around" from #4 to #1 when counting up, and from #1 to #4 when counting down.

2- LOCKOUTS

One or more optional lockout keyswitches may be provided to allow an organist to prevent anyone else from tampering with his or her memory settings. Each keyswitch may be assigned to a range of combination action memory levels, and one or more crescendo and tutti levels if desired. This is done by the organbuilder using the set-up terminal as explained elsewhere in the manual. No setting will be permitted when this keyswitch is in the "locked" position. When setting of a crescendo is attempted, but prevented because of this lockout circuit, the letters "L.O." are displayed in the "crescendo shoe position" window on the main control panel.

3- SETTING

Before setting a crescendo, check to be sure that no tutti is latched on, and that the lockout keyswitch for the current crescendo memory level, if included, is not in the "locked" position. Note, however, that if a tutti select

panel is provided, it is normal for at least one tutti-level LED to be on at all times, even though the tutti is not latched on. If a Crescendo Disable control has been provided, be sure it is not activated. Select the desired crescendo memory level. A crescendo may now be set in one of the following ways:

A- "Save Mode" method

1- Move the mode select switch to the Save position.
2- Use the "shoe position selector" switch to display the shoe position that you intend to set.
3- Put the tabs or drawknobs into the desired positions.
4- Push and release the "set" button to capture the setting into memory. If the console has no "set" button, the "Set Latch" mode button on the control panel may be used as a "set" button.
5- Verify proper setting by changing the shoe position number with the "shoe position selector" switch, and then changing it back and listening to be sure that all desired stops can be heard.

B- "Edit Mode" method

1- Move the mode select switch to the Edit position.
2- Use the "shoe position selector" switch to display the shoe position that you intend to set. If this switch does not change the displayed shoe position number, your Master Stop Processor™ has been configured by your organ technician to have this function controlled by the crescendo shoe. In this case, use the shoe to display the desired shoe position number. The tabs or knobs will move to the positions that have been previously set into each crescendo shoe position's memory. The decimal point after the shoe position number will flash, indicating that setting is now possible.
3- Move the tabs and knobs into the desired positions.
4- Repeat these steps for each crescendo shoe position that is to be set.

If you are listening to the organ as you set the crescendo using the Save mode method, keep in mind that until you push the set piston, you may be hearing some stops <u>previously</u> set into the crescendo memory of interest. These stops will stop sounding when the set piston is pushed, unless their tabs are physically in the on position at that moment. Although there are times when the Save mode method is useful, we recommend using the Edit mode method for setting the crescendo whenever possible to avoid confusion.

A special "set latched" function is provided on the Master Stop Processor™ to facilitate quickly and conveniently setting memory for each crescendo shoe position in an ascending order when any existing settings are to be ignored and overwritten. When using this "set latched" method, setting is achieved as in the Edit mode without pushing the "set" piston each time, but as in the Save mode the tabs do <u>not</u> move to "read out" previous memory settings. The procedure for using the "set latched" method is as follows:

C- "Set Latched" method

1- Move the mode select switch to the Save position.
2- Use the "shoe position selector" switch to display the first shoe position that you intend to set--usually Number 1.
3- Press and hold the "set" piston.
4- Momentarily press the "set latch" button on the control panel. A light on this button will latch on. If the console has no "set" piston, just press and hold the "set latch" button for about two seconds to latch it on. Disregard steps 3 and 5.
5- Release the "set" piston.
6- Move all tabs or drawknobs into the desired positions.
7- Advance the "shoe position number" to the next higher number, and then turn on or off tabs as required for this next shoe position.
8- Repeat these steps until all shoe positions are set.

9- "Unlatch" the set button by momentarily pushing the "set latch" button, by pushing the bottom of the "shoe position selector" switch to count down, or by advancing the shoe position number upward past position number 60 so as to "wrap around" to blank the display window.
10- Verify proper setting by blanking the shoe position number window with the "shoe position selector" switch, and then stepping through all positions and listening to be sure that all desired stops can be heard.

Important: When all setting is complete, always move the mode selector switch on the main control panel back to the Use position.

4- OPERATING THE CRESCENDO

To use the crescendo shoe normally, first be sure that the mode selector switch on the main control panel is in the Use position. Select the desired crescendo memory level, and move the crescendo shoe as desired to recall preprogrammed stop settings. The stop tabs/drawknobs will not move as the crescendo shoe position is changed. Additional stops may be turned on by hand or with a combination action or tutti piston. A piston push may move stop tabs or drawknobs to the off position, but those stops will continue to sound if the crescendo calls for them to be on. Activating a Crescendo Disable switch or reversible piston will prevent the crescendo system from bringing on stops, but will allow the shoe's position to be displayed on the LED readouts.

THE TUTTI (SFORZANDO) SYSTEM

1- SELECTING THE DESIRED TUTTI MEMORY LEVEL

On Master Stop Processor™ systems where multiple tutti capacity has been purchased, there are several possible configurations. The organ manufacturer or technician may select the configuration that is deemed most convenient for his or her client.

A- In some cases, up to four separate tutti pistons are provided on the keyslip and/or on toe studs. No separate memory level adjustments are provided for in this case.
B- A single tutti piston may be provided, along with a small tutti select control panel that has four push buttons, four tutti level indicator lights, and a "tutti active" indicator light on it. This control panel allows selection of which tutti memory level(s) are accessed by the single thumb piston and/or toe stud.
C- A single tutti piston may be provided, and the system configured to automatically select a separate tutti memory level as the combination action memory level is selected. Thus the total number of tutti levels provided will be the same as the total number of combination action memory levels.

When configuration A or B is selected, the organ builder may also choose to have "multiple levels active". If this is chosen, more than one tutti memory level may be "on" at once. Any stop that would be brought on by any active level will come on when the tutti thumb piston or toe stud is engaged. To avoid confusion when setting, only one tutti level may be active when the mode select switch is in the Save or Edit position.

2- LOCKOUTS

One or more optional lockout keyswitches may be provided to allow an organist to prevent anyone else from tampering with his or her memory settings. Each keyswitch may be assigned to a range of combination action memory levels, and one or more crescendo and tutti levels if desired. This is done by the organbuilder using the Set-Up Terminal as explained elsewhere in this manual. No setting of affected memory levels will be permitted when this keyswitch is in the "locked" position. When setting of a tutti is attempted, but prevented

because of the lockout keyswitch, the letters "L.O." are displayed on the control panel in both the crescendo shoe position number and combination action memory level windows.

3- SETTING A TUTTI PISTON

1. Check to be sure that the "shoe position number" digital readout (Fig.1, #4) is not illuminated.

2. Select the desired combination action/tutti memory level, if applicable (Fig.1, #5).

3. Tutti pistons may now be set in one of the following ways:

   A- If the existing tutti memory is to be modified--

      1. Move the mode selector rocker switch (Fig.1, #1) into the Edit position.

      2. Momentarily push the tutti level select button for the memory level that is to be set. If you do not have a tutti level select panel, momentarily push the tutti piston. Tabs/knobs will physically move to the positions previously set into memory.

      3. Move all tabs or knobs to the desired new positions.

      4. Press the tutti level select button or tutti piston to disengage the tutti.

   B- If the existing tutti memory setting is to be destroyed--

      1. Move the mode selector rocker switch (Fig. 1, #1) into the Save position.

      2. Momentarily push the tutti level select button or tutti piston to be set.

      3. Move all tabs or knobs to the desired positions.

      4. Momentarily push and hold the "set" piston. If the console has no set piston, use the "set latch" button (Fig.1, #2) on the control panel instead.

      5. Push the tutti level select button or tutti piston to disengage the tutti.

When the mode select switch (Fig.1, #1) is in the Save or Edit position, the tabs or knobs will move to "read out" the tutti memory whenever a tutti is activated. As part of a feature that prevents a mechanically stuck piston from disturbing the operation of the Master Stop Processor™, the decimal point will stop flashing after the "set" or tutti piston has been continuously held for about sixty seconds, and the positions of all tabs and drawknobs at this moment will be set into memory. Any further changes require that one of the setting procedures above be repeated.

Important: Always be sure to move the mode select switch back to the Use position when setting has been completed.

4- OPERATING THE TUTTI SYSTEM

To use the tutti pistons normally, first be sure that the mode select switch on the main control panel is in the Use position. It may also be necessary for the on/off switch on the optional American Programmable Piston Sequencer Control Panel to be in the off position. See the Piston Sequencer section if your Master Stop Processor™ has this option. Select the desired tutti memory level(s), if applicable, and push tutti pistons as desired to recall preprogrammed stop settings. Tutti pistons will be operational even if a crescendo is

engaged. To turn off a tutti, push the tutti piston a second time or push general cancel. If the Master Stop Processor™ is so configured, pushing one button on the tutti level select panel will cancel any other tutti level that is on. An alternate configuration allows more than one tutti level to be active at once, and in this case pushing one tutti select button a second time will not cancel other tutti levels on at the same time. Similarly, if the console has more than one Tutti piston instead of a tutti memory level select panel, pushing any tutti piston may cancel any other one that is active, or more than one may be active at once, depending on how the system is configured by your organ technician. Pushing general cancel will always turn off all tuttis but will not affect the tutti levels that have been selected.

THE PETERSON PISTON SEQUENCER

INTRODUCTION

A "Piston Sequencer" option may be provided with the Peterson MSP-1000™ . The purpose of a Piston Sequencer is to allow a series of combination action pistons to be activated, in order, by pushing a single thumb piston, or toe stud, or control panel button each time a registration change is required. A choice of two different configurations can be ordered from the Peterson factory and, if desired, changed by the organ technician by replacing the EPROM program chip: the American Programmable Piston Sequencer or the European Piston Sequencer. When the **American Programmable Piston Sequencer** is chosen, a list of pistons can be stored in memory in any order desired, and will be activated in order each time the "advancing" or "Next" button is pushed. Pistons of virtually any function at all may be included in this list. **The European Piston Sequencer** "remembers" the piston number of the most recently activated general piston, and will activate the next higher numbered general piston whenever the "Next" button is pushed. A "Previous" button on the control panel is provided for both American Programmable and European Piston Sequencer use so you may step backwards through the series of piston numbers.

Many organists find it much more convenient to use a Peterson Piston Sequencer than to worry about properly identifying and pushing thumb pistons at various locations on the console, especially when concentrating on the many other aspects of performing. This convenience may be enhanced by duplicating the "Next" and "Previous" buttons of the Piston Sequencer Control Panel on one or more thumb pistons. You may wish to have designated pistons engraved "Next" and "Previous" located in a convenient location. However, an exclusive feature of the Peterson system that we have found to be very popular with organists is our "Any Piston Previous/Next" provision, which allows *regular pistons to be automatically redesignated* as "Next" or "Previous" pistons whenever the Piston Sequencer is on. For example, the organ technician can designate all numbered pistons to serve as "Next" pistons instead of their regular functions any time the Piston Sequencer is on. This way the organist may push any numbered piston on the console to get the next piston in the programmed sequence (American Programmable) or the next General piston (European Piston Sequencer). ***To avoid confusion, pistons such as cancel, tutti, reversible, "Restore", and "Previous" may never be redesignated, and general pistons may not be redesignated when the Piston Sequencer is configured in the European mode.***

For clarity, the details of using the American Programmable and European Piston Sequencers are described separately below.

THE AMERICAN PROGRAMMABLE PISTON SEQUENCER

DETAILS OF OPERATION

As explained briefly above, the American Programmable Piston Sequencer is a feature of the Master Stop Processor™ which allows a sequence or list of standard combination action piston pushes to be stored in memory in any desired order. Any piston may be included in the sequence as many times as you wish. Each time a button labelled "Next" is pushed, the next combination action piston in the stored sequence is, in effect, "pushed". This causes the tabs and drawknobs to move just as they would if the piston was physically pushed by the organist.

The Peterson American Programmable Piston Sequencer allows you to program any combination of pistons into each sequence, including generals, divisionals, and specialty pistons such as reversibles, cancels, tuttis, and even the "Restore" piston. A special LED digital readout on the Piston Sequencer Control Panel displays the sequence position number, and also a five character description of the most recent "piston push". For example, if the display reads:

10 GRT 05

...then you will know that you have activated the tenth piston in the sequence, which is Great divisional piston number five. You may manually move tabs and drawknobs at any time. You may also operate the crescendo, and any pistons including tuttis at any time (except those "regular" pistons that are designated to act as "Next" or "Previous" buttons when the Piston Sequencer is on). Sequences of up to 99 piston pushes may be entered on each combination action memory level.

SUMMARY OF PISTON SEQUENCER CONTROL PANEL FEATURES

1-ON/OFF SWITCH

Push the bottom of this rocker switch to turn off the Piston Sequencer, and push the top of the switch to turn it on. This will automatically reset the sequence position number to zero; in other words, the system will be reset to the beginning of the sequence. The programmed sequence will be retained in memory even when this switch is turned off. If this switch is left in the "on" position, the current sequence position number will be retained even if the main organ power (rectifier) is turned off. The combination action memory level (and thus the Piston Sequencer memory level) may not be manually changed unless this switch is in the "off" position.

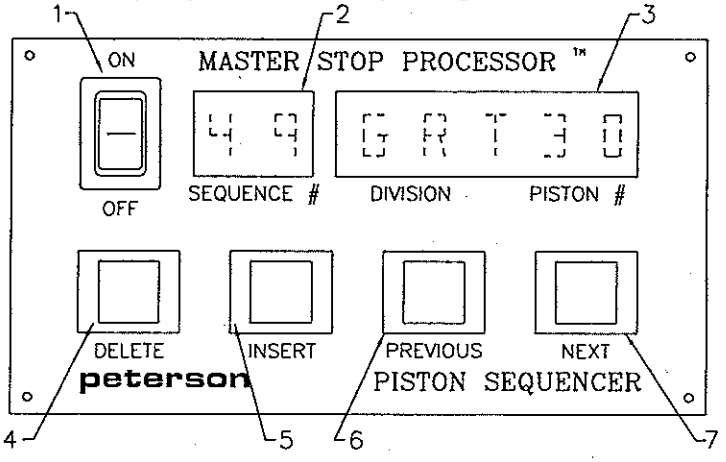


FIGURE 2

2- SEQUENCE POSITION NUMBER WINDOW

The number of the current position in the sequence is displayed here. This may be any number from 0 to 99, inclusive, since there are 99 possible "piston pushes" in each sequence. A zero digit or dashes displayed here indicates that the first piston push in the sequence has not yet been made. The digit(s) in this window will flash when the "set" button is held in, indicating that setting is possible.

3- PISTON NAME WINDOW

The five characters displayed in this window describe the piston that was most recently "pushed" by the Piston Sequencer. Lists of the abbreviations used are provided as Figures 4A and 4B in this manual.

4- DELETE BUTTON

Pushing this button will remove the currently displayed piston from the sequence, and adjust the sequence position numbers of all pistons later in the list. Note that this button will only work if the mode selector switch on the main control panel is in the Save or Edit position.

5- INSERT BUTTON

Momentarily pushing this button will prepare the Piston Sequencer for additional piston pushes to be inserted into the list before the currently displayed piston. The first new piston inserted will be given the sequence position number currently displayed, and the sequence position numbers of all pistons later in the list will be adjusted. After pushing the "insert" button, hold the "set" piston in while pushing the pistons to be inserted in order. Note that this button will only work if the mode selector switch on the main control panel is in the Save or Edit position. If the console does not have a "Set" piston, use the "Set Latch" button on the main MSP-1000™ control panel.

6- PREVIOUS BUTTON

In the American Programmable Piston Sequencer configuration, pushing this button will lower the sequence position number by one. If the mode selector switch is in the Use position, the piston assigned to this new position number will be activated. Otherwise, only the displays will change. This button may be duplicated with one or more piston buttons elsewhere on the console. The organbuilder may configure the system to automatically lower the Combination Action and Piston Sequencer memory level if the Previous button is pushed when the current position in the sequence is "1", causing the count to "wrap around" to position "99".

7- NEXT BUTTON

In the American Programmable Piston Sequencer configuration, pushing this button will raise the sequence position number by one. If the mode selector switch is in the Use position, the piston assigned to this new position number will be activated. Otherwise, only the displays will change. This button may be duplicated with one or more piston buttons elsewhere on the console. The organbuilder may configure the system to automatically raise the Combination Action and Piston Sequencer memory level if the Next button is pushed when the current position in the sequence is "99", causing the count to "wrap around" to position "1".

STEP-BY-STEP INSTRUCTIONS FOR USING THE PETERSON AMERICAN PROGRAMMABLE PISTON SEQUENCER

1- SELECTING A MEMORY LEVEL

The Piston Sequencer memory level is automatically adjusted with the combination action memory level. To select a different memory level, first turn off the on/off switch on the Piston Sequencer control panel. Then push the top of the combination action memory level select switch to go to a higher level, or push the bottom of the select switch to go to a lower level. Hold the switch in to automatically step through the levels. If the memory level reaches the maximum possible number, the counter will "wrap around" to level #1 automatically. Wrap-around will also occur automatically when counting down. When the desired memory level has been selected, you may turn on the on/off switch on the Piston Sequencer Control Panel. The sequence position number will automatically be reset to position 0.

2- LOCKOUTS

One or more optional lockout keyswitches may be provided to allow an organist to prevent anyone else from tampering with his or her memory settings. No setting will be permitted on the affected memory levels when this keyswitch is in the "locked" position. When setting of the Piston Sequencer is attempted, but prevented because of the lockout keyswitch, the letters "L.O." are displayed on the Piston Sequencer Control Panel.

3- SETTING A PISTON SEQUENCE

Before setting a piston sequence, move the mode selector rocker switch into the Save position. Select the desired Combination Action/ Piston Sequencer memory level, and then turn on the on/off switch on the Piston Sequencer Control Panel. Setting and modifying the piston sequence are then accomplished in the following ways:

A- Creating a Piston Sequence

1- Push and hold the "set" piston. The piston sequence position number will flash for as long as the set button is held in, indicating that setting is possible.
2- Push pistons in the desired order. Be sure to push the piston buttons firmly so the contacts make. After each piston push is "seen" by the system, the sequence position number that is displayed will advance.
3- When the complete sequence has been entered, release the "set" piston.
4- To check the newly entered sequence of pistons, turn the on/off switch on the Piston Sequencer control panel off and then back on to reset the sequence position number to zero, then advance through the sequence by pushing the "Next" button. For each sequence position number, the designated piston will be indicated in the large display window.

B- Inserting Steps into the Sequence

1- Use the "Next" or "Previous" buttons on the Piston Sequencer Control Panel to display the sequence position number that should be inserted. *For example, if you wish to add a new step as number 5, display sequence position number 5.*
2- Momentarily push the "insert" button on the Piston Sequencer Control Panel.
3- Push and hold the "set" piston.
4- Momentarily push the new piston(s) that should be inserted into the sequence, in order.
5- Release the "set" piston.
6- Check the new sequence pattern.

C- Deleting Steps from the Sequence

1- Use the "Next" or "Previous" buttons on the Piston Sequencer Control Panel to display the sequence position number that should be deleted.
2- Momentarily push the "delete" button on the Piston Sequencer Control Panel.
3- Check the new sequence pattern.

Important: Always be sure to move the mode select switch back to the Use position when setting has been completed.

4- OPERATING THE PISTON SEQUENCER

To use the American Programmable Piston Sequencer, first be sure that the mode selector switch on the main control panel is in the Use position. Remember that a separate piston sequence of up to 99 steps is provided for each combination action memory level. To reset the Piston Sequencer to start at the beginning of the sequence, turn the on/off switch on the Piston Sequencer Control Panel off and then back on again.

Note that if the main organ power switch is turned off, but the Piston Sequencer on/off switch is left in the "on" position, the sequence position number will not be reset. Thus, the organ can be turned off, and upon turning it back on the sequence position will be where it was left.

When the Piston Sequencer is on, the "Next" and "Previous" buttons on the Piston Sequencer Control Panel, and the piston(s) designated for use as "Next" and "Previous" pistons, may be pushed at any time to advance the Piston Sequencer and move the tabs or drawknobs to the positions stored in memory for the combination action pistons thus activated. The crescendo, tutti, and combination action will function normally when the Piston Sequencer is on, except that any pistons designated for use as "Next" or "Previous" buttons for the Piston Sequencer will not operate their primary functions while the Piston Sequencer is on.

THE EUROPEAN PISTON SEQUENCER

DETAILS OF OPERATION

The organbuilder may choose to configure the system as a "European Piston Sequencer" by installing a different program chip. When this arrangement is chosen, the piston number of the most recently pushed general piston is "remembered". Pushing the "Next" button will activate the next higher numbered general piston. Pushing the "Previous" button will activate the next lower numbered general piston. This series of general pistons will automatically "wrap around". For example, if you have sixteen general pistons and press general piston number 16, a subsequent push of the "Next" button will activate general piston number 1. The organ technician may optionally configure your European Piston Sequencer to automatically raise or lower the combination action memory level when wrapping up or down, respectively.

When the European Piston Sequencer option is chosen, the "sequence #" window will not light up. The "Division and Piston #" window will indicate the most recently activated general piston, whether activated by an actual piston push or through the Piston Sequencer. The Insert and Delete buttons on the Piston Sequencer Control Panel will not be functional when the European Piston Sequencer is chosen.

EUROPEAN PISTON SEQUENCER CONTROL PANEL FEATURES

1-ON/OFF SWITCH

Push the bottom of this rocker switch to turn off the Piston Sequencer, and push the top of the switch to turn it on. The combination action memory level may not be changed manually unless this switch is in the "off" position.

2- SEQUENCE POSITION NUMBER WINDOW

This window is used only in the "Programmable Piston Sequencer" configuration.

3- PISTON NAME WINDOW

The five characters displayed in this window describe the piston that was most recently activated either by actually pushing a piston or via the Piston Sequencer. The abbreviation "GEN", for general piston, will be followed by the appropriate piston number. If no general piston has yet been pushed, the word "READY" or a series of dashes will appear in this window.

4- DELETE BUTTON

This button is used only for editing the memory of the American Programmable Piston Sequencer, and thus is not operable when the European Piston Sequencer program chip is installed.

5- INSERT BUTTON

This button is not used when the European Piston Sequencer program chip is installed.

6- PREVIOUS BUTTON

In the European Piston Sequencer configuration, pushing this button will activate the next lower numbered general piston. This button may be duplicated with one or more piston buttons elsewhere on the console. The organbuilder may configure the system to automatically lower the Combination Action memory level if the Previous button is pushed when the piston name window displays "GEN 1", causing "wrap around" to the highest numbered General piston.

7- NEXT BUTTON

In the European Piston Sequencer configuration, pushing this button will activate the next higher numbered general piston. This button may be duplicated with one or more piston buttons elsewhere on the console. The organbuilder may configure the system to automatically raise the Combination Action memory level if the Next button is pushed when the piston name window displays the highest numbered General piston, causing "wrap around" to "GEN 1".

INSTRUCTIONS FOR USING THE PETERSON EUROPEAN PISTON SEQUENCER

1- SELECTING A MEMORY LEVEL

The European Piston Sequencer activates General pistons to provide the registrations that are set on the current combination action memory level. To select a different combination action memory level, use the combination action memory level select switch as described elsewhere in this instruction manual. Remember that it may be necessary to put the on/off switch on the Piston Sequencer control panel in the "off" position before the memory level may be changed. If the highest numbered general piston has been activated, and then the "Next" button is pushed, the combination action memory level may be automatically increased by one count as the Piston Sequencer "wraps around" to general piston number 1. Similarly, pressing the "Previous" button when general piston number 1 has been activated may automatically lower the combination action memory level by one count as the Piston Sequencer wraps around to the highest numbered general piston. (Whether or not the combination action memory level is automatically changed upon wrap-around is left to the discretion of the organ builder or service technician.)

2- OPERATING THE EUROPEAN PISTON SEQUENCER

To use the European Piston Sequencer, first be sure that the mode selector switch on the main control panel is in the Use position. ***Note that if the main organ power switch is turned off, the memory that holds the most recently activated General piston's number will be reset, and upon turning on the organ power and the Piston Sequencer, the word "READY" or a series of dashes will appear in the piston number window. However, if the Piston Sequencer Control Panel is turned off but the organ continues to be used, manual pushes of General pistons will be recorded into this memory, and the most recently pushed piston number will be displayed in the piston number window as soon as the Piston Sequencer Control Panel is turned on again.***

When the Piston Sequencer is on, the "Next" and "Previous" buttons on the Piston Sequencer Control Panel, and the piston(s) designated for use as "Next" and "Previous" pistons, may be pushed at any time to advance the Piston Sequencer and move the tabs or drawknobs to the positions stored in memory for the next higher

or next lower numbered general piston. The crescendo, tutti, and combination action will function normally when the Piston Sequencer is on, except that any pistons designated for use as "Next" or "Previous" buttons for the Piston Sequencer will not operate their primary functions while the Piston Sequencer is on.

INSTALLATION AND WIRING

Each Master Stop Processor consists of several circuit boards plugged onto one or more Mother Boards. Every system will have one Microprocessor Board, one or two Memory Boards, and one Control Board. One Piston Input Board is needed for every 32 pistons on the console, and one Stop I/O (Input/Output) Board is needed for every eight stops. As many Piston Input and Stop I/O Boards as you need may be plugged on, virtually without any limit, using Expansion Mother Board(s) if necessary. If "blind" reversibles, pedal piston couplers, or control of MIDI piston memory levels from the MSP-1000™ are called for, a Special Functions Board is needed and must be plugged on immediately after the last Stop I/O Board. If a bar graph crescendo readout is required, a Bar Graph Driver Board will be plugged onto the slot immediately after the Special Functions Board; or if there is no Special Functions Board, the Bar Graph Driver will be plugged onto the slot immediately after the last Stop I/O Board. Note that the first Stop I/O Board will be plugged into the first available Function Board slot following all Piston Input Boards. In special cases where lighted piston buttons are required, one Lighted Piston Board for every 32 lighted pistons must be installed after the last Piston Input Board and before the first Stop I/O Board. **PLEASE VERIFY THAT ALL BOARDS ARE IN THE CORRECT LOCATION BEFORE BEGINNING ANY WIRING!**

Most MSP-1000™ systems and other Peterson combination actions are now ordered "mounted and cabled". When specified this way we mount the circuitry down on a panel, run all wires necessary to interconnect separate modules of the combination action system, bring stop and piston lines out to a labelled plug-in junction, and provide a wiring harness that will plug onto the Peterson drawknobs and/or stop tablets. Because of the efficient wiring methods and fixturing that we have developed, and because the people who do this mounting and cabling have the experience gained by doing it every day, most organ builders find this an attractive alternative to doing their own cabling. If you do choose to wire the MSP-1000™ yourself, the following instructions should be followed.

NEVER apply power to an electronic system before completing all wiring and checking it carefully for correctness! Extensive engineering effort has been invested to make the MSP-1000™ as "fool-proof" as possible, but damage still may result from applying power to an incorrectly or incompletely wired system.

The wire sizes and related information recommended herein are based in part on our interpretation of the National Electrical Code®[1]. For more information, please refer to the booklet that we have prepared entitled "IMPORTANT INFORMATION ABOUT THE NATIONAL ELECTRICAL CODE ®" available at no charge from Peterson.

STEP 1- THE PISTONS (See Figure 5)

Wiring of the pistons to the Piston Input Board pins may be done in any convenient order, but it is advisable to wire the far left piston on the top keyslip to the pin labelled #1, the next piston to pin #2, etc., including all set, cancel, reversible, and other special pistons in the order they appear. Number 28 AWG or larger wire may be used. If there are more than 32 pistons, wire the 33rd one to the first pin of the second Piston Input Board, and so on. The assignment of pistons to their particular functions will be handled later using the Set-Up Terminal. *Note: If a toe stud and thumb piston duplicate each other (have the same function), wire the contacts of each to the SAME pin on the Piston Input Board.* The pin labelled Piston Common is a current-limited source of Organ Positive voltage which should be used for supplying the feed to the pistons. If lighted pistons are to be used, read Step 1A before wiring any Piston Input Boards.

STEP 1A - LIGHTED PISTON BOARDS

The MSP-1000™ has provisions to drive lighted pistons, and to latch their lights on after the piston has been activated. Each piston's light must return to Organ Negative. Lighted Piston Boards must be plugged into slots immediately after the last Piston Input Board. The first pin on the first Lighted Piston Board should be wired to the light in the piston whose contacts are wired to the first pin on the first Piston Input Board. If multiple Piston Input Boards are used but no more than 32 pistons are lighted, only one Lighted Piston Board is needed, and all lighted pistons should have their switch contacts wired to the first Piston Input Board. If the pistons use LEDs rather than incandescent bulbs, current limiting resistors must be provided. Typically, a 1.2 K Ohm, ½ Watt resistor is suitable.

STEP 2- THE ON COIL, OFF COIL, AND SENSE CONNECTIONS (Figs. 6,7,8)

After all pistons have been wired, you may wire the on, off, and sense connections to each stop tab or drawknob. You should use #26 AWG or larger wire for connections from the Stop I/O Board "on" and "off" coil pins to the tab coils, and #28 AWG or larger wires from the "stop (sense)" pins on the Mother Board to the switch contact on each tab.

It is important to match each stop (sense) pin on the Mother Board with the correct Stop I/O Board pins for on and off coils. Each "Function Board" slot on the Mother Board is designated "Board A", "Board B", and so on.

The Stop (Sense) pins on the Mother Board are arranged in eight pin groups also labelled "Board A", "Board B", etc. The position of the first Stop I/O Board depends on the total number of Piston Input Boards used on your MSP-1000™ system, and whether Lighted Piston Boards are used. If the total number of pistons on the console is not more than 64 and there are no lighted pistons, then the first Stop I/O Board will be plugged into the Function Board slot labelled "Board A". If the number of pistons to be accommodated is more than 64 but less than 97, then a third Piston Input Board is required and will be plugged into the slot labelled "Function Board--Board A". In this case the first Stop I/O Board will be plugged into the Function Board B slot. When wiring stop (sense), on coil, and off coil pins, be sure to match the pin number (one through eight) and the board letter designation, for each of the pins wired to a particular stop tab. For example, wire the pin on the mother board labelled "STOP (SENSE) BOARD B pin #1" to the same stop tab as the pins labelled "ON COIL #1" AND "OFF COIL #1" on the Stop I/O Board plugged into Function Board slot B.

Wire all stop tabs and/or drawknobs in any convenient and logical order. The allocation of each tab to a particular division, reversible function, etc. will be handled later using the Set-Up Terminal.

STEP 3- THE STOP CONTACT FEEDS (See Figures 7 & 8)

The stop contact feed polarity must be Organ Positive. If individual wires are run between each tablet and an Organ Positive terminal, wire as small as #28 AWG may be used for the stop contact feed if solid state switching rather than relay coils are used. For National Electrical Code® compliance, a fuse rated at 6 Amps or less should be provided in a line which then branches off to feed all stop contacts. When solid state switching is used, the total amount of current to turn on all stops of the organ is usually less than 1 Amp.

Wire the common or feed side of the stop contacts to one of the screw terminals labelled "ORG+" on the MSP-1000™ Mother Board, or to a Test and Power Junction, or directly to the Organ Positive rectifier terminal or buss bar. Note: we highly recommend that a Peterson Test and Power Junction be used between the organ rectifier and the solid state equipment in the organ. This will automatically be provided with any Peterson switching system or mounted combination action. A Test and Power Junction provides a convenient central location for connecting Organ Positive and Organ Negative wires, provides a current limited voltage and light for testing, and helps prevent damage to electronic equipment from nearby lightning strikes and related strong electrostatic fields.

STEP 4- THE ON COIL AND OFF COIL RETURNS (See Figure 6)

The on and off coil returns must be connected to the negative side of either a Peterson Pulse Power Supply, or to the Organ Negative terminals of an organ rectifier. If individual wires are run between each tablet and an Organ Negative or Pulse Supply Negative terminal, wire as small as #26 AWG may be used. If a single wire is used to carry return current from the coils of more than one tab/drawknob, heavier wire must be used. For National Electrical Code® compliance, "A main common return conductor in the electromagnetic supply shall not be less than 14 AWG". If the main common return conductor will carry more than 15 Amps or for runs longer than 25 feet, larger conductors may be needed.

If one or more Peterson Pulse Power Supplies are used, the tab/drawknob return wires will usually be grouped by division. Connect the wire(s) from the coil commons for each division to one of the screw terminals labelled "Division Negative" on a Pulse Power Supply. Refer to the instructions supplied with the Pulse Power Supply for complete wiring instructions. If the Organ Rectifier is used to supply the current to move the tabs/drawknobs, connect the coil common wires from all tabs/knobs to the Organ Negative terminal of a Peterson Test and Power Junction or directly to the rectifier.

STEP 5- THE FLYBACK RETURNS (See Figures 7 & 8)

When an electrical current flows through a coil, much of the electrical energy is converted into an electromagnetic energy field around the coil. This, of course, is the energy that causes the tab or drawknob to move. When the electrical current stops flowing through the coil, however, the electromagnetic field collapses and is converted back into electrical energy. If this is allowed to happen very suddenly, a very high voltage (perhaps several hundred volts) will instantaneously appear across the coil and induce a current that can damage driver transistors and other electronic components connected to the coil. This damage may be prevented by using flyback diodes, which in effect slow down the conversion of collapsing electromagnetic fields into electrical energy. Flyback diodes limit the voltage of the "flyback spike" to a level that will not damage transistors and other electronic parts. Flyback diodes are built into the Stop I/O Boards on the MSP-1000™ , but must be connected to the same voltage as the on coil and off coil returns.

If Pulse Power Supplies are used, this is accomplished by connecting the screw terminals labelled "FLYBACK RETURNS" on the Mother Board to the Division Negative terminals of the Pulse Power Supply. The designations "A&B", "C&D", etc. on the flyback return screw terminals should be matched to the Function Board slots labelled "BOARD A" & "BOARD B", and "BOARD C" & "BOARD D", respectively as in the following example. If the drawknobs wired to the Stop I/O Boards in slots A and B return to a particular Pulse Power Supply Division Negative screw terminal, then the Flyback Return screw terminal labelled A&B should be wired to that same Pulse Power Supply Division Negative screw terminal.

If the organ rectifier is used to move the knobs/tabs, then all of the flyback return screw terminals can be wired to the same Organ Negative terminal on a Test and Power Junction or another convenient source of Organ Negative. Please see Addendum B for information about Voltage specifications.

It is best to use a separate conductor of #18 AWG or larger for the connection from each flyback return screw terminal to the appropriate voltage source. Note that if the flyback return wire is not connected, a built in safety feature will prevent damage to the driver transistors by preventing the combination action from working. If this condition applies, a red LED labelled "F/B OPEN" on the Stop I/O Board will light up to indicate the problem each time a piston is pushed. ***HOWEVER, IF THE FLYBACK RETURN IS CONNECTED TO THE WRONG VOLTAGE, SEVERE DAMAGE CAN RESULT. DAMAGE DUE TO INCORRECT WIRING BY THE INSTALLER IS NOT COVERED BY WARRANTY!***

STEP 6- ORGAN RECTIFIER CONNECTIONS (See Figures 7 & 8)

Connect the "ORG +" screw terminal on the Mother Board to a convenient source of the positive rectifier voltage, such as the Test and Power Junction. This wire must carry about 4 Amps per STOP I/O Board, plus an additional 2 Amps total for the electronic circuitry, bar graph LEDs, and other indicators. If more than a few Stop I/O Boards are plugged onto the Mother Board, it is necessary to connect wires to both Organ + terminals of the Mother Board. The wires on both screw terminals should be the same wire size, the same length, and follow the same path. Multiple wires may be used to get the necessary current capacity. Note that a single #14 AWG wire is rated as suitable for carrying 15 Amps (for runs longer than about 25 feet, a larger size should be used). Please refer to our booklet entitled "Important Information about the National Electrical Code®" for information about wire sizes. Please see Addendum B for voltage specifications.

Next, connect the screw terminal labelled "ORG -" on the Mother Board to a convenient source of the negative rectifier voltage, such as the Test and Power Junction. A number 18 AWG wire will usually be suitable for this, since the total current carried by this wire will typically be only about 2 Amps.

STEP 7- CLASS 2 TRANSFORMER CONNECTIONS (See Figure 7)

Connect the screw terminals labelled AC1 and AC2 on the Mother Board to the Class 2 transformer that is supplied with the MSP-1000™. ***DO NOT plug in the Class 2 transformer at this time!*** Later, the Class 2 transformer must be plugged into a 117 Volt, 60 Hz outlet that is ***NOT*** switched with the rectifier, etc. You may use one of the unswitched outlets of a Peterson Console Control System. The supplied "lamp cord" wire should be used for this purpose. (Do not connect the terminals labelled "12 VAC FOR C/A BATTERY" on the Peterson Console AC Control System to an MSP-1000™). On larger systems which have more than four plug-in boards on an Expansion Mother Board #404564, an Auxiliary Power Supply Board #404571 will be plugged into a designated slot on the Expansion Mother Board. The Auxiliary Power Supply requires an additional Class 2 transformer, which should be wired to the Expansion Mother Board's AC1 and AC2 terminals.

STEP 8- MISCELLANEOUS MOTHER BOARD CONNECTIONS (See Figures 7 & 8)

If incandescent lamps are to be used for indicating when a Tutti is on, the lamps may be connected to the pins on the "INDICATORS" connector of the Mother Board labelled "ANY TU(tti)" or TU1, TU2, etc. Another pin on this same connector is labelled "ANY CR(escendo)". This pin can be used to light an indicator whenever the crescendo is on. The other side of these indicator lamps must be connected to Organ -. A pin labelled "ORG - LAMP COM(mon)" on this same connector may be used for this, or any other convenient source of rectifier negative voltage may be used. Indicator lamps properly rated for an Organ Rectifier voltage range and 100 mA maximum current should be used.

Note that the pins labelled "TU1", "TU2", "TU3", and "TU4" respond differently depending on the Tutti options chosen by the organbuilder with the Set-Up Terminal. If an optional "four button Tutti select panel" is used to select the memory level(s) of a single Tutti thumb piston, the TU1 - TU4 pins will provide a voltage to light the panel's LED indicator(s) to indicate the selected memory level. In this case, the "Any Tutti" pin will be used to indicate when the single Tutti piston has been activated. If more than one Tutti piston is provided, any of the pins TU1 - TU4 will have a voltage applied to them (from within the MSP-1000™ system) when the corresponding piston is activated.

A pin labelled "LOCKOUT DISABLE" on the Mother Board can be wired as a master unlock for all memory levels. Applying organ positive voltage to this pin will allow any memory to be set even if it would be locked out by a keyswitch in the lock position. Remember to disconnect organ positive from this pin when normal lockout key function is desired.

A pin labelled "LOCKOUT OUTPUT" will rarely be used and will ordinarily be left unwired. This pin will have a positive voltage applied to it internally whenever a crescendo or tutti is active, and may be used to lock out the setting of another Peterson combination action or signal the operation of some other similar function. This pin is not intended to supply enough current to operate an indicator light; be sure the total load on the "Lockout Output", "Any Tutti", and "Any Crescendo" terminals combined does not exceed 100 mA.

The "Expansion Mother Board" jumper cables are used to connect the Main Mother Board to the first Expansion Mother Board, and to connect the first Expansion Mother Board to the second, etc. These jumper cables are provided with the MSP-1000™ as required and have polarized connectors on the ends so they may only be plugged on the correct way.

Pins labelled "Out 1" and "Out 2" are provided for future expansion of the MSP-1000™ options. Do not connect anything to these pins.

STEP 9- THE MAIN CONTROL PANEL

The MSP-1000™ Main Control Panel is provided with a plug-in cable designed to be plugged onto the Control Board. The connectors are polarized so they can only plug on the correct way.

STEP 10- THE SET-UP TERMINAL

The Set-Up Terminal is provided with a cable designed to be plugged onto the Microprocessor Board. The connectors are polarized so they can only plug on the correct way. For the greatest protection against damage to the MSP in the event of severe lightning strikes, it is good practice to unplug the Set-Up Terminal from the Microprocessor Board when it is not in use. Also, watch the clearance between the Set-Up Terminal connector and any obstructions such as a roll top so as not to cause any damage. ***Never unplug or plug on the Set-Up Terminal cable with the organ rectifier power on!***

STEP 11- THE (OPTIONAL) PISTON SEQUENCER CONTROL PANEL

The Piston Sequencer Control Panel is provided with a cable designed to be plugged onto the Control Board, using pins labelled as such on this board. The connectors are polarized so they can only plug on the correct way.

STEP 12- THE SHOE ENCODER AND "A TO D" BOARD

The Crescendo function of the MSP-1000™ is controlled by a slide potentiometer attached to the organ's crescendo shoe. This slide pot is built into crescendo shoes available from Peterson. If you are using a crescendo shoe built by another manufacturer, our "Slide Pot Shoe Encoder Assembly" will be included with your MSP-1000™ and should be connected to your crescendo pedal using the instructions provided with it. A "modular" cable provided with the slide pot assembly must be plugged into the socket on the "Shoe Encoder A to D" (Analog to Digital) Board. A magnet wire cable is provided to plug between the A to D Board and the pins labelled accordingly on the Control Board. ***Control Boards manufactured after January 1, 1993 have the A to D converter built in and thus do not require a separate A to D Board or the magnet wire cable described above.*** These newer Control Boards may be identified by the modular phone jack in the upper left corner of the board and are illustrated in Figure 10B. The modular cable from the slide pot should be plugged directly into the modular phone jack on the Control Board in this case. Potentiometers labelled "0 Adjust" and "60 Adjust" on the A to D Board or the Control Board may be turned to set the exact position of the shoe where the number changes between crescendo off and stage 1, and between stages 59 and 60. These potentiometers eliminate the need for a very high level of precision in the adjustment of the mechanical linkage between the slide pot and the shoe.

STEP 13- THE MULTIPLE LOCKOUTS CONNECTOR

As shown in Figures 10A and 10B, the control board has a connector labelled the "Multiple Lockouts Connector" with pins numbered 1 through 8 and another pin labelled "+ COM(MON)". Each of these pins may be assigned to various memory levels for crescendo, tutti, and combination action by using the set-up terminal. An example of this assignment procedure is shown in the "DEFINE LOCKOUTS" section of the instructions for using the set-up terminal. These numbered pins may be wired to the "+ COM" pin through key lock contacts to prevent resetting of combinations except by authorized persons. The organ builder may also "hard wire" one or more of the numbered pins to the "+ COM" pin after setting a series of memory levels that will hold standardized registrations that may not be changed by the organist. Wire as small as #28 AWG may be used.

STEP 14- MIDI PISTON MEMORY SELECT *(bold italics indicates revised 3/14/02)*

When a Peterson MIDI Resource System™ is used on an organ that has a Master Stop Processor™, the Memory Select Up/Down Switch on the MSP-1000™ Main Control Panel may be used to select the memory level of MIDI preset pistons. This is made possible by wiring ***output pins #5 through 8*** of the MSP's Special Function Board to the MIDI System as explained in the MIDI Resource System™ Installation Instructions. Output pin #7 provides a pulse whenever the Memory Select Up or Down Switch is activated. Pin #8 provides a pulse whenever the MSP's memory level is changed to 1. This is used to reset the MIDI memory level to 1 in the event the MIDI and MSP should get out of sync with each other. **Output pins #5 and #6 indicate downward or upward counting, respectively.** The MIDI Resource System™ Installation Instructions include information about how to "tell" the MIDI System how many levels the MSP is set to have. Note that MSP-1000s manufactured before early 2002 use only Special Functions Board pins #7 and 8 for this purpose.

STEP 15- BLIND REVERSIBLE PISTONS

Blind reversible pistons (Reversibles that do not operate drawknobs or tablets) are wired to pins on the Piston Input Board along with all the others pistons as explained in Step 1. They are then assigned to output pins on a Special Functions Board by use of the Set-Up Terminal. This is shown by way of example in the Set-Up Terminal instructions. Each output pin may be wired to an inductive or resistive load, to activate accessories such as a Zimbelstern or an All Swells to Swell relay. Each output pin has a positive voltage on it when active. When Blind reversibles are used to operate Pedal Piston Couplers, follow the instructions in Step 16 below.

STEP 16- PEDAL PISTON COUPLERS

The MSP-1000™ has provisions for selectively coupling pedal division stops into the control of manual divisional pistons. The procedure for setting this up is shown by way of example in the Set-Up Terminal instructions section on Pedal Piston Couplers. This function is activated when a continuous positive common voltage, such as through a mechanical switch with contacts closed, is applied to one of the numbered input pins on the Special Functions Board. Indicator lamps to warn that this function is activated may be fed from the incandescent lamp output pin with the same number as the input pin used. The indicator lamp must return to Organ Negative. These pins are illustrated in Figure 11.

When Pedal Piston Couplers are to be operated by Blind reversible pistons, the following procedure is used. Define all necessary Blind reversible pistons and select appropriate names for them in the "define reversibles" section of the set-up procedure. Write down which Special Functions Board (SPF) output pin you assign to each of the Blind reversibles. Later in the set-up procedure, answer each prompt "turn on a PED PISTON Coupler" by carefully touching a test lead from Organ Positive to an unused Special Functions Board input pin. Write down the assignment of each of the Special Functions Board input pins. After the set-up procedure is completed and the set-up terminal's switch is turned off, remove all power from the MSP-1000™ and wire each of the Special Functions Board output pins that have been assigned as Pedal Piston Coupler blind Reversible outputs to the assigned Special Functions Board input pin that you assigned as a Pedal Piston Coupler switch input for the same manual.

In the special case of a "Pedal on any Divison" coupler tablet, this tablet must be wired in the same manner as the other stop controls. No Special Functions Board pins are used in this case.

After carefully checking your wiring, connect power to the MSP-1000™. Turn on the Class 2 transformer first, then the organ rectifier. Check for proper operation of the Pedal Piston Couplers.

STEP 17- CRESCENDO + TUTTI INDICATOR LAMPS

Pins are provided on the Main Mother Board for incandescent indicator lamps, as shown in Figure 7. The pins labelled "ANY TU" and "ANY CR" provide a positive voltage whenever a tutti or crescendo is on, respectively. The indicator lamps should be returned to the pin labelled "ORG - LAMP COM". The factory will usually provide a #18 AWG yellow wire that you may connect to the tutti indicator and a purple wire for the crescendo indicator.

NOTE: Do not use these pins to operate LED indicators unless you provide a current limiting series resistor. Typically a 1.2K Ohm, 1/2 Watt resistor is suitable for this.

STEP 18- TRIPPER MODE SELECTOR JUMPER

A small, three pin connector labelled "Tripper Mode" is provided on the MSP-1000™ Main Mother Board. The system is shipped with a plug-on jumper in a position to short pins #2 and 3 together, allowing the Combination Action to be set using either the tripper (hold and set) or the capture (set button) method. Moving this jumper to the position that shorts pins #1 and 2 together will disable the tripper method of setting. In this latter position, setting of the Combination Action requires that a set piston be used. Either method of setting may be used when the jumper is removed.

AFTER ALL OF THE ABOVE CABLING HAS BEEN COMPLETED AND CAREFULLY CHECKED, PLUG THE CLASS 2 TRANSFORMER INTO A 117 VOLT, 60 HZ OUTLET THAT IS NOT SWITCHED WITH THE RECTIFIER OR CHAMBER LIGHTS AND TURN ON THE ORGAN RECTIFIER POWER. THE MSP-1000™ IS READY TO PROGRAM USING THE SET-UP TERMINAL.

THE SET-UP TERMINAL

Every Peterson Master Stop Processor™ MSP-1000™ is provided with a small "set-up terminal". The set-up terminal is designed to be stored inside the console for use by the organ technician for defining the specification, options, and features of the system. We believe that the set-up terminal provides a very straightforward method of defining exactly how each Master Stop Processor™ will perform, because with this system no special computer programming skills are required of the organ technician, and there is no need for any part of the system to be sent to the factory for reprogramming.

After all wiring of the MSP-1000™ has been completed and thoroughly checked, and the AC and Organ Rectifier have been turned on, turn on the switch on the back of the Set-Up Terminal. The LCD display will now light up and some introductory words will appear on the terminal. Follow the instructions as they appear on the terminal's LCD display. You may find it useful to follow the sample set-up procedure to become familiar with the prompts (instructions that appear on the LCD screen) and the various options available.

Note: The first time the MSP-1000™ system is powered up after it is shipped from the factory, the LCD display on the Set-Up Terminal will likely display a flashing introductory message even before its switch is turned on. This is because the system must be programmed before it can be used. When you see this flashing display, turn on the Set-Up Terminal's switch and program the MSP-1000™. Note also that some options such as using previous data and backing up will be limited since no previous programming exists in the system's memory during this first programming cycle.

In the unlikely event that the Microprocessor should "lock up" during programming, as evidenced by random or undiscernible characters on the LCD display, you may reset the MSP by following this simple procedure. Turn off the switch on the Set-Up Terminal and the organ rectifier, and unplug the Class 2 transformer for the MSP. Wait 30 seconds, then plug in the transformer again. Finally, turn on the organ rectifier and re-enter the set-up mode by turning the Set-Up Terminal's switch on again.

The Set-Up Terminal is illustrated in Figure 3 below.

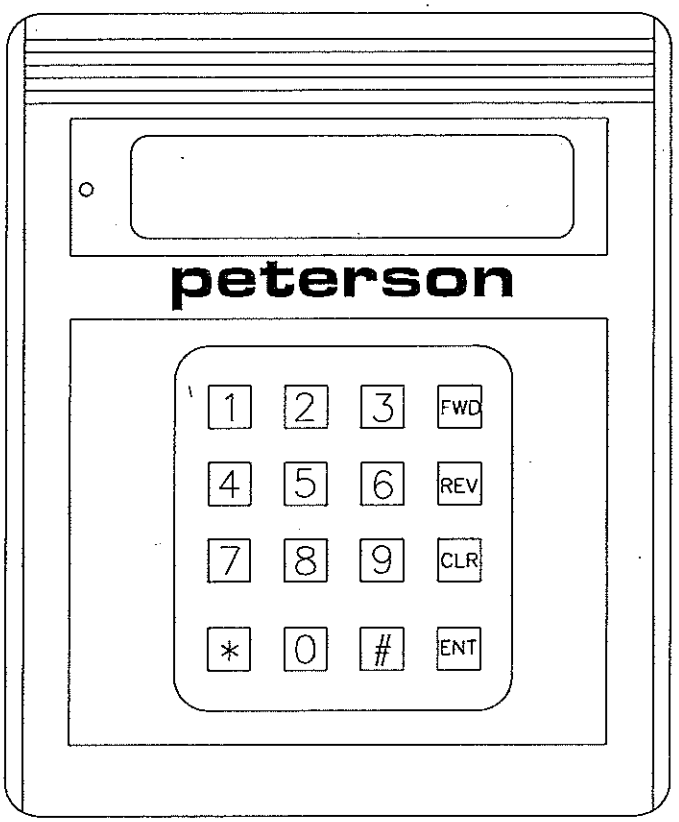


FIGURE 3

Beginning on the next page is a sample set-up procedure for the Master Stop Processor™ MSP-1000™ to illustrate how to use the set-up terminal. After installing the MSP-1000™, you may follow the step-by-step procedure shown to program your system. The examples show the order of prompts. The typical action to take for initially setting up a system is indicated in the "What to Enter" column. The comments column offers extra information to clarify the meaning of prompts or indicate what will happen if other responses are made.

If you should have any questions, please feel free to call us toll-free at 1(800) 341-3311.

FIGURE 4A
DIVISION NAME ABBREVIATIONS

GEN	Generals
GT	Great
CH	Choir
SW	Swell
PED	Pedal
POS	Positiv
SOL	Solo
ANT	Antiphonal
ECH	Echo
CEL	Celestial
CPL	Couplers
GGT	Gallery Great
GSW	Gallery Swell
GPD	Gallery Pedal
CGT	Chancel Great
CSW	Chancel Swell
CPD	Chancel Pedal
REC	Recit
BRU	Brustwerk
RPS	Ruckpositiv
ACC	Accompaniment
BOM	Bombarde
HWK	Hauptwerk
G2T	Great 2nd Touch
P2T	Pedal 2nd Touch
A2T	Accompaniment 2nd Touch
S2T	Swell 2nd Touch
FLT	Flutes
TRM	Trems

FIGURE 4B
PISTON NAME ABBREVIATIONS

BOUR	Bourdon
ZIMB	Zimbelstern
BOMB	Bombarde
PRI32	32' Principal
POS32	32' Posaunne
COR32	32' Cornet
POM32	32' Pommer
USATZ	Untersatz
C FAG	Contra Fagato
VIOL	Viole
TREM	Tremolo
TRAPS	Traps
RST	Restore
REV 1	Reversible #1
REV 2	Reversible #2
.	..
.	..
REV10	Reversible #10, etc.
SRV 1	Settable Reversible #1
SRV 2	Settable Reversible #2
PPCSW	Pedal Piston Coupler Swell
PPCGT	Pedal Piston Coupler Great
PPCCH	Pedal Piston Coupler Choir
PPCPO	Pedal Piston Coupler Positiv
PPC1	Pedal Piston Coupler 1
PPC2	Pedal Piston Coupler 2
PPC3	Pedal Piston Coupler 3
ALLSW	All Swells to Swell
ALLRS	All Reeds Off
ALLMX	All Mixtures Off
TUT	Tutti
NXT	Next
PRV	Previous
MANTR	Manual Transfer

PROMPTS	WHAT TO ENTER	COMMENTS
Cannot enter define from PROG/EDIT mode		Be sure that the mode select switch on the main MSP control panel is in the "use" position.
WELCOME to the PETERSON MSP-1000		
FWD = define organ ENT = UP/DOWN LOAD	FWD	Pressing the ENTR key allows you to copy the contents of the memory chips on one memory board into the chips on another memory board.
ready to define the organ parameters		
* = test for stuck sense line, FWD = skip	*	
make sure all stops are off & press FWD	FWD	
all stops should now be ON press FWD	FWD	
all stops should now be OFF press FWD	FWD	
* = define DIVISIONS FWD = skip, REV = exit	*	Pressing REV will end the set-up procedure. Pressing FWD will cause an advisory message to be displayed if the MSP-1000 does not already have a valid configuration, such as the first time it is programmed. If this is the case, just press * to go to the next step.
Number of divisions is 0 FWD = OK	CLR	If the desired number of divisions is not displayed, press CLR.
Punch in new value followed by ENTR:_____	3, *then* ENTR	
Number of divisions is 3 FWD = OK	FWD	Press FWD when the correct number of divisions is displayed. If you press anything other than FWD, the number on the screen will be blanked and you can enter the desired number to replace it.
* to reuse previous divn names, else FWD	FWD	If the organ has previously been defined and the number of divisions is the same, you may automatically reuse division names. This screen will not appear unless there are valid divisions already defined.
Ready for GENERALS -FWD to continue	FWD	
*To def GEN stops FWD to use previous.	*	The following procedure will define which tabs/knobs, cancels and pistons will operate as Generals. Each step can be skipped by pushing the FWD button if the controls defined in a previous set-up procedure are to be reused. Remember, however, that a previous set-up procedure will not have been "locked in" unless the prompt "FWD to commit all changes" was reached.
turn off stops not on GEN-ENTR when ready	(All stops will come on. Turn off any that should not be activated by general pistons) *then* ENTR	

PROMPTS	WHAT TO ENTER	COMMENTS
FWD to cancels REV to redo stops	FWD	You must press FWD to continue programming, even if there are no cancel pistons.
* to def GEN cancels FWD to use previous.	*	Press to define General Cancel pistons or if there is no Gen Cancel. Press FWD to preserve Gen Cancels as previously defined, if applicable.
Push GEN cancel 1 ENTR when done	(Press first general cancel piston)	
Push GEN cancel 2 press ENTR when done	ENTR	In this example there is only one general cancel piston.
FWD to pistons REV to redo cancels	FWD	
* To def GEN pistons FWD to use previous	*	These prompts are for defining numbered pistons but not reversibles. Pressing FWD will cause an advisory message to be displayed briefly if there is not already a valid configuration in memory.
Push GEN piston 1 press ENTR when done.	(Press the first general piston-- no ENTR yet)	
Push GEN piston 2 press ENTR when done. . . . . Push GEN piston 8 press ENTR when done	(Press the second general piston -no ENTR yet) (Press the last general piston) *then* ENTR	
FWD to continue REV to redo pistons	FWD	
REV to back up, CLR to redo, FWD to cont	FWD	Pressing REV returns you to where the # of divisions is defined. Pressing CLR returns you to "ready to define Generals".
ready for first divn-FWD to contin	FWD	
div name: 1=SW 2=GT 3=CH 4=PED FWD=more	1	Press FWD for more choices. These abbreviations will appear on the Piston Sequencer control panel when the sequencer is advanced. Figure 4 is a list of what each abbreviation stands for. In this example the Swell division has been chosen.
name is SW - press FWD=ok, REV = retry	FWD	
* to def SW stops FWD to use previous	*	
Turn on stops on SW prss ENTR when ready	(Turn on all stops and couplers you wish to include on Swell divisional pistons) *then* ENTR	
FWD to cancels REV to redo stops	FWD	
* to def SW cancels FWD to use previous	*	

PROMPTS	WHAT TO ENTER	COMMENTS
Push cancl 1 for SW press ENTR when done	(Push cancel piston for Swell division)	Push the ENTR key after the swell divisional cancel piston. If there is no divisional cancel, just push ENTR.
Push cancel 2 for SW press ENTR when done.	ENTR	
FWD to pistons REV to redo cancels	FWD	
* to def SW pistons FWD to use previous	*	Pressing FWD will briefly display an advisory message if there is no valid configuration for Swell pistons in memory.
Push pistn 1 for SW press ENTR when done. . . . . Push piston 4 for SW press ENTR when done	(Push all Swell divisional pistons in order)	Press the ENTR key only after the last Swell divisional piston. In this example we will define five Swell divisionals.
Piston already=SW C * = change, FWD = ignore	*	This example shows the error message that you get if you try to define a piston as Swell #4 when it has already been defined in this same set-up procedure as a Swell cancel. Pressing * will redefine the piston as SW #4. Pressing FWD will reprompt for a new choice.
Push piston 5 for SW press ENTR when done	(Push Swell divisional piston 5) *then* ENTR	
FWD to continue REV to redo pistons	FWD	
REV to back up, CLR to redo, FWD to cont	FWD	Pressing REV will return you to the beginning of defining Generals. Pressing CLR will return you to the beginning of defining the current division.
ready for second divn - FWD to contin	FWD	
(Repeat the same procedure as was used to define the first division, for all remaining divisions)		
* = define MIDI FWD = skip, REV = backup	*	Press * to tell the system whether or not a Peterson MIDI interface is used with the MSP-1000. If there is not a valid configuration in memory, pressing FWD will momentarily display an advisory message and you will be returned to this screen. Just press * to continue.
* = MIDI (uses SPF 5-8) # = no MIDI , FWD = prev	*	Press * if a Peterson MIDI system with multiple memory levels for piston presets will use the MSP control panel to determine its memory levels. Otherwise, press #.
* = define REVERSIBLES FWD = skip, REV = backup	*	Pressing REV returns you to the prompt " * = define Midi "

# reg + settable + blind 	
revrsbles = 0. FWD =
OK
	CLR	Press CLR if the total number of regular, organist settable, and blind reversibles shown is incorrect. (Tutti reversibles are handled separately and should not be included here).

PROMPTS	WHAT TO ENTER	COMMENTS
Punch in new value followed by ENTR:_____	3 *then* ENTR	
# reg + settable + blind revrsbles = 3. FWD = OK	FWD	
Press reversible piston number RV1.	(Press the first reversible piston)	
* = settable, # = blind, FWD = regular	FWD	
* if a coupler reversible, else #	*	In this example we define the first reversible piston (RV1) as a SW to PED coupler reversible. The names of all divisions defined previously are offered as "to" and "from" division names. If we pressed the # key we would have been asked to select a name such as ZIMB(elstern), BOUR(don), BOMB(arde), etc.
from div name: 1=SW 2=GT 3=PED FWD=more	1	
to div name 1=SW 2=GT 3=PED	3	
Turn on RV1 revrsing stops-ENT when ready.	(Turn on the stops that will be reversible from this piston) *then* ENTR	
Turn on RV1 off-only stops-ENT when ready.	(Turn on the stop tabs that will go off only with piston RV1) *then* ENTR	
REV to back up, CLR to redo, FWD to cont	FWD	Pushing REV will return you to the beginning of the reversibles section, and pushing CLR will allow you to redefine this reversible.
press reversible piston number RV2	(press the next reversible piston)	
* = settable, # = blind, FWD = to regular	#	In this example we define a "blind reversible" piston, name it, and assign an output pin on the Special Functions Board to it. Refer to Figure 4 for a list of abbreviations.
name:1=ZIMB 2=BOUR 3=BOMB FWD=more	1	
choose output pin # 1-8 on SF BOARD ____	(press a key numbered 1-8)	
any more output pins for BRV1? * =yes #=no	#	
REV to back up, CLR to redo, FWD to cont	FWD	
press reversible piston number RV3	(press the next reversible piston)	
* = settable, #=blind FWD = regular	*	Here we define an organist settable reversible piston.
REV to back up, CLR to redo, FWD to cont (Repeat for all reversibles)	FWD	

PROMPTS	WHAT TO ENTER	COMMENTS
* = defn TUTTI pistons FWD = skip, REV = backup	*	Pushing * allows you to define the Tutti (Sforzando) piston(s). Pushing the REV key will return you to the beginning of the reversible section.
press TUTTI 1-ENTR after last if < 4	(Push all tutti pistons in order) *then* ENTR	Push 1,2,3, or 4 tutti pistons. Press ENTR after the last one if there are less than four. Do not use ENTR if there are four tutti pistons. If a thumb piston is duplicated on a toe stud, just push one or the other, not both.
* = 1 tutti per CA level, else FWD	FWD	Press the * key if you want a separate Tutti memory for each combination action memory level.
* press to use panel 1 -4 select, else FWD	*	Press * if you have a four button control panel to select the Tutti memory level(s).
* = multiple tuttis active, else FWD	*	If you have more than one Tutti button, or a Tutti level select panel, you can have one Tutti cancel when another is activated, or you can have more than one level active at a time.
* = defn RESTORE pistn FWD = skip, REV = backup	*	This procedure is for defining a RESTORE button or telling the system that there are none. To use one that has been defined previously (when applicable) push FWD. Pressing the REV key returns you to defining Tuttis.
Press RESTORE piston FWD=prior, to ENTR=none.	(Press RESTORE piston if you have one).	Pressing FWD here will keep a restore piston that has previously been defined, but will momentarily display an advisory message if there is no valid configuration in memory.
* - define SEQUENCER FWD = skip, REV = backup	*	This section is used to define the piston sequencer or tell the system that there is none. Pressing the REV key returns you to defining the RESTORE piston.
prs * if there is a SEQUENCER, else FWD	*	If the Piston Sequencer option has been purchased and you have a Piston Sequencer Control Panel press *. If not, press FWD.
* = Wrap to next/prv memory level, FWD = no	FWD	Press the * key if you want the memory level to automatically change when "wrapping around". See the Piston Sequencer instructions.
* to control SEQ from panel only, else FWD	FWD	The Piston Sequencer NEXT and PREVIOUS controls on the control panel may be duplicated on piston buttons if desired - press FWD to define them.
* to define NEXT piston(s), FWD=prior	*	A separate piston may be used, or "regular" pistons may be used as NEXT and PREV pistons when the piston sequencer is on. Press the FWD key if NEXT pistons were defined previously and will not be altered. If you do not want any extra NEXT pistons, press * here, then immediately press ENTR at the next prompt.
Press NEXT piston 1 ENTR when done . . . Press NEXT piston 7 ENTR when done	(Press all pistons that will be used as NEXT buttons when the piston sequencer is on).	If you decide to change the assignment of "NEXT" or "PREVIOUS" pistons after they are defined and after you have answered the "* = keep changes" prompt, you may need to redefine all general and divisional pistons. See the troubleshooting guide for more information.

PROMPTS	WHAT TO ENTER	COMMENTS
Only regular pistons allowed-ENTR to cont	ENTR	If you press a cancel, reversible, set or other invalid piston, you will get an error message.
Press NEXT piston _8_ ENTR when done	(Press the final NEXT piston) *then* ENTR	
* to define PREV piston(s), FWD=prior	*	If you don't want to define any PREV pistons, press * here, then ENTR at the next prompt.
Press PREV piston _1_ ENTR when done . . . . Press PREV piston _7_ ENTR when done	(Press all pistons that will be used as PREVIOUS buttons when the piston sequencer is on. Don't press ENTR until after the last piston.)	
Can't be both NEXT & PREV-ENTR to change		If you press a piston that has already been defined as a NEXT button you will get an error message. Press ENTR to redefine as a PREV button, FWD to keep it as a NEXT button.
Press PREV piston _8_ ENTR when done	(Press the final PREVIOUS piston) *then* ENT	
*= define MAN TRANSFER FWD=skip, REV=backup	*	If you have a tablet, draw-knob, or blind reversible piston to operate a manual transfer press * Pressing the REV key returns you to defining the PISTON SEQUENCER. If you will have no Manual Transfer function, you can press * here, then FWD at the next prompt.
* = MANUAL TRANSFER function, else FWD	*	
* if NXT/PRV functn transfers, else FWD	*	By pushing * any NEXT or PREVIOUS pistons under a transferred manual will automatically follow when the manual transfer function is activated.
Press * if cancels transfer, else FWD	*	Choose whether divisional cancels transfer. This may not be desireable if they are provided on toe studs.
MAN TR - press BLIND REV or STOP+ENTR	(Turn on manual transfer tablet) *press* ENTR	If you have a tablet or drawknob for the manual transfer, turn it on and then press the ENTR key. If you have a blind reversible piston, press the piston but not the ENTR key. The piston must have been defined as a blind reversible in the reversible section previously. You may select other manuals to transfer by pushing FWD here and then choosing other division names.
* if GT/CH transfer FWD if other manuals	*	Press * if GREAT and CHOIR are the transferring manuals. If you press FWD, you will be given other choices.

PROMPTS	WHAT TO ENTER	COMMENTS
* = CRES DIS, ENTR=none FWD = skip, REV = backup	*	This section allows you to define "Crescendo Disable" piston or stop control.
* = activate by pist # = activate by stop	#	
turn on CRES DISABLE press ENTR FWD = none	Turn on stop control then press ENTR.	
* = define SET piston FWD = skip, REV =backup	*	If your console has no Set piston, you can press * here and then ENTR at the next prompt.
press SET piston or ENTR if none	(press set piston)	
* = keep changes REV = backup	*	***Until FWD is pressed at this point, any previous defining is not "locked in" so you have an opportunity to abort all changes you have made so far.*** Pressing FWD here will return you to the prompt for defining Manual Transfers.
* = define OPTIONS FWD = skip, REV = backup	*	Pressing FWD here skips over all option-defining prompts. If you press the REV key you will be returned to the beginning of the "define divisions" section.
* = pneumatic console option, else FWD	FWD	When the "pneumatic console option" is chosen, only the tabs that need to move are energized when a piston is pushed. Otherwise, tabs that need not move are energized to stay in the same position so the power supply load is constant.
* = use cres shoe in edit mode, else FWD	FWD	When the mode select switch on the main MSP control panel is in the "edit" position either the shoe or the control panel rocker switch can determine the "shoe position number". Press * for shoe, FWD for switch.
ready to define PEDAL PISTON couplers. FWD	FWD	When updating software on a system built before Feb. '94, see the troubleshooting guide section "Pedal Stops Won't Set".
* = piston or switch # = ped-to-any divsn	*	Press * if pedal piston coupler will be activated by a blind reversible piston or any switch that is not settable in combination action memory. Press # for the special feature wherein one "Pedal-to-any-Division" stop control is operated by all manual divisional pistons and may be programmed to include or exclude pedal stops on a piston-by-piston basis.
turn on a PED PISTON coupler. ENT to quit	(close the contacts of the switch wired to the Special Functions Board for this purpose)	See special instructions under *Wiring Instructions, Step 16.*
manual name: 1=SW 2=GT 3=CH FWD=more	1	Select the name of the manual division whose pistons will control pedal stops when the pedal piston coupler is on. Repeat for as many manual names as required.
* = new pedal memories # = pedal division mems	#	This prompt specifies whether existing pedal piston memory is used, or whether a new bank of memories is added for use with manual/pedal pistons.
turn on a PED PISTON coupler. ENT to quit	ENTR	

PROMPTS	WHAT TO ENTER	COMMENTS
ready to define # of CA levls,FWD to cont	FWD	This section is used to define the maximum number of combination action levels if you want fewer levels than the system's capacity. Press * to define a new limit, FWD to retain a limit defined previously, and ENTR if you want the maximum number of levels possible. In this example we define a limit of 64 memory levels.
* = define, FWD = prev ENTR = max, REV = backup	*	
limit = 98, capacity = 99. FWD if limit OK	CLR	
punch in new value followed by ENTR:_____	64 *then* ENTR	
limit = 64, capacity = 99. FWD if limit ok	FWD	
* =define LOCKOUTS FWD=skip, REV=backup	*	Press * to assign Crescendo, Tutti, and Combination Action memory levels to lockout pins 1-8 on the Control Module, or to tell the system that no lockouts will be used. Connecting Positive Common Voltage to these pins will then prevent setting of the assigned levels.
* to define LOCKOUTS FWD=prior, ENTR=none	*	
* =define CRES locks, FWD=skip, REV=backup	*	In this section you will allocate Crescendo memory levels one through four to the desired lockout keyswitches (pins on the control module) to allow "locking out" or preventing resetting. If the organbuilder desires to set combinations of stops into memory for one or more crescendos and then wire the MSP to prevent resetting by the organist, carefully connect a wire or clip lead from the "+ common" pin on the control module to the desired pin numbered 1-8 when the prompt asks for a keyswitch to be turned on. Remove the clip lead after pressing the ENTR key; an error message will result if you have more than one pin "locked" at a time during this set-up procedure.
turn key to LOCK for CRES 1 then ENTR	(turn key that will affect crescendo #1 to the "lock" position) *then* ENTR	
key 1 locks CRES 1 FWD = ok, CLR = redo	FWD	
..repeat for crescendo levels 2 and 3, then...		
turn key to LOCK for CRES 4 then ENTR	(in this example, assume there is no keyswitch #4, so just push the ENTR key)	
CRES 4 not lockable FWD=ok, CLR= redo	FWD	This message indicates that Crescendo #4 has not yet been configured to be lockable from any key. Press CLR to change that.
* =define TUTTI locks FWD=skip, REV=backup	*	This section allows you to allocate Tutti memory levels to lockout pins (or keyswitches), but these prompts will not come up if you have only one Tutti level or a separate Tutti on each combination action level. This section works exactly the same as allocating Crescendo lockouts.
turn key to LOCK for TUTTI1 then ENTR	(turn key that will affect tutti #1 to the "lock" position) *then* ENTR	
key #1 locks TUTTI 1 FWD = ok, CLR = redo .....repeat for tuttis 2 to 4, then.....	FWD	
* = define C/A locks FWD=skip, REV=backup	*	In this section you will allocate combination action memory levels to lockout pins (keys).
turn 1st key to LOCK then ENTR; FWD=exit	(turn key that will affect the first range of combination action memory levels to the lock position) *then* ENTR	A clip lead from Organ + to the desired lockout pin may also be used. A voltage must be applied to the pin when the ENTR key is pressed.
pin#1 doesnt lock CA FWD=ok, CLR to redo	CLR	This prompt appears when the pin is not yet allocated to any range of combination action levels. Press CLR to bring up the next prompt for designating the desired lock range.

PROMPTS	WHAT TO ENTER	COMMENTS
range for pin #1 LOW ENT HI ENT 0-	1; ENTR 8; ENTR	
pin#1 range is 1-8 FWD=ok, CLR to redo	FWD	
turn nxt key to LOCK then ENTR; FWD=exit	(turn key that will affect second range of combination action memory levels to the lock position) *then* ENTR	
pin#2 doesnt lock CA FWD=ok, CLR to redo	CLR	
range for pin #2 LOW ENT HI ENT 0-	7; ENTR 16; ENTR	
pin#2 range is 7-16 FWD=ok, CLR to redo	FWD	
keys 1 and 2 overlap range 7 to 8. FWD	FWD	If any memory levels are allocated to two different lockout pins (keys), you will get an error message indicating which keys (pins) are affected and which memory levels overlap. You will then be prompted to redefine the last range of memory levels.
turn nxt key to LOCK then ENTR; FWD=exit	turn key #2 *then* ENTR	
pin#2 range is 7-16 FWD=ok, CLR to redo	CLR	
range for pin # 2 LOW ENT HI ENT 0-	9; ENTR 16; ENTR	
pin#2 range is 9-16 FWD=ok, CLR to redo	FWD	
turn the next key to LOCK then ENTR; FWD=exit	FWD	Press the FWD key if you do not wish to assign any more memory levels to pins.
FWD = cont REV = backup CLR = redo ENTR = exit	FWD	
* = lght pstns, FWD = prv ENTR = none, REV = backup	*	This section is used to tell the system whether lighted piston boards are plugged into the system. If used, these must be plugged into Function Board slots immediately after the last Piston Input Board. Each pin on the Lighted Piston Board provides power to light the piston for the corresponding pin on the corresponding Piston Input Board.
numb of lghted pistn boards = 1 FWD = ok	CLR	
punch in new value followed by ENTR: 0	Key in the number of lighted piston boards the press ENTR	
numb of lghted pistn boards = 2 FWD = ok	FWD	
* = perform DIAGNOSIS FWD = skip, REV = backup	*	The diagnosis program checks for wiring errors, open coils, etc. Before starting the diagnosis, be sure to turn off all tabs and drawknobs.

PROMPTS	WHAT TO ENTER	COMMENTS
prss and hold CLR to terminate diagnosis	Tabs and drawknobs each will automatically turn on and off twice.	
sens lines Xed or stp not cncld-FWD or CLR	FWD	This error message means "Sense lines are crossed, or one of the stop tabs (or drawknobs) is not canceled". It could be caused by a bad or miswired off coil circuit or stop contact circuit.
on coil circt. open prss FWD to continue	FWD	This error message means "An on coil has an open circuit condition" (Open coil, wire broken, or wire nor properly soldered). However, the problem could also be a defective stop contact which prevents the MSP from sensing that the stop has moved to the On position.
off coil circt. open prss FWD to continue	FWD	This error message means "An off coil circuit has an open circuit condition". However, the problem could also be a defective stop contact which prevents the MSP from sensing that the stop has moved to the Off position.
don't forget to turn the terminal off		
PETERSON ELECTRO-MUSICAL PRODUCTS, INC.		

After verifying operation of the organ, always unplug the set-up terminal from the Microprocessor Board ***WITH THE ORGAN RECTIFIER POWER OFF.***

TROUBLESHOOTING GUIDE

This section describes the self-diagnostic features of the Peterson MSP-1000™ and other built in amenities which allow the organ service person to easily verify its proper operation or identify any faults that may develop. General troubleshooting techniques are also explained in this section. After installing an MSP-1000™ combination system, we recommend that you familiarize yourself with these techniques and features by reading this section while referring to your actual system.

GENERAL INFORMATION ABOUT TROUBLESHOOTING

Board Swapping- Because of the modular design of many Peterson electronic systems, including the MSP-1000™, circuit boards that you suspect may be damaged or defective may be "swapped" or exchanged with other boards that have the same part number. ***This circuit board swapping must ALWAYS be done with the organ power OFF!*** Plugging in a circuit board with the power on may cause damage to the board and/or other parts of the system, especially if the board is plugged on incorrectly.

Polarizing Keys- Wherever possible, Peterson circuit boards use a "polarizing key" to prevent the board from being plugged on incorrectly. This key is a tiny plug inserted into one receptacle of the board's bottom connector which must line up with the position where a pin is "missing" on the corresponding male connector.

Part Numbers- You may notice two different six-digit part numbers on Peterson circuit boards. The number on the front or component side of each board, beginning with "40....", should be referred to whenever ordering replacement boards or calling Peterson for assistance. This is the part number for the completed circuit board assembly. The number beginning with "30...." is Peterson's number for the "raw" printed circuit board before any parts are inserted.

Many six digit part numbers are followed by a version letter suffix. As a general rule, any board with a letter that comes later in the alphabet may be used to replace a board with an earlier letter or no letter suffix. Contact the factory if you have any questions about compatibility of circuit boards.

Replacing Integrated Circuits- In some cases you may wish to replace an integrated circuit chip instead of replacing an entire circuit board. Before beginning to do so, always free yourself of any static charge by touching a grounded metal surface such as the screw on an electrical outlet cover momentarily. Observe the location of any polarity-indicating notches or recessed dots on the surface of the old chip before carefully prying it out of its socket. Do Not use the orientation of printing on the chip to determine how the chip should be plugged in; this may vary. When selecting a replacement for an IC chip, only some of the numbers printed on the chips are relevant. These are usually the numbers beginning with a two or three letter prefix such as LM, MM, or UDN, and/or having two numbers followed by letters such as 74HC___. Other numbers are usually date codes that are not important when selecting a replacement chip. Some examples would be as follows:

MM74HC573, UDN2982, LM322 are identifying numbers.

P9124 and H.9101 are date codes that may be found on the same chips.

Soldering Technique For Replacing Electronic Parts- The modular design of Peterson systems allows easy replacement of complete circuit boards with spares that the organ technician may have on hand, or that Peterson can provide from stock via overnight delivery if necessary. However, should you decide to repair a circuit board by replacing an electronic part, the following techniques should be carefully followed.

Before removing the old part, observe any polarity markings and notice how the leads are formed and clipped on the bottom side of the board. Clip off the leads close to the body of the part. Use a small tipped, 15 Watt soldering iron to carefully heat the solder connection. While it is hot, remove the solder using a "solder sucker" tool or "Solder Wick™", available through the Peterson Miscellaneous Parts and Tools catalog. Be sure to use just enough heat to melt the solder, remembering that using too hot an iron, or applying heat for too long, can damage the delicate foils of the board. Remove the remaining pieces of component lead from the holes after all solder has been cleared away.

Insert the new part in the proper polarity, forming each lead in the same direction as the part being replaced. Use the tip of the soldering iron to apply heat to both the lead and the foil that it touches simultaneously. Apply a small amount of ROSIN CORE solder directly to the point where the lead meets the foil. Keep the soldering iron tip in place just long enough for the solder to flow, creating a shiny, smooth solder connection. Note that the MSP boards have foils on both sides, and the holes that the component leads pass through are plated with copper so as to form an eyelet-like channel. It is important that solder flow through this channel and be visible on the top (component) side of the circuit board.

DISCONNECTING THE MSP

One important design feature of the Peterson MSP-1000™ is that it does not intercept the connection between the organ's stop controls and switching equipment. This means that any malfunction of the MSP can never prevent the organ from being registered manually to turn stops on. In the unlikely event of stops becoming "stuck on" through the MSP's crescendo/tutti circuitry, the MSP may be quickly and easily disconnected by unplugging the sense (stop) connectors, as shown in Figure 7.

COLOR CODED INDICATOR LEDs

The Master Stop Processor™ is equipped with a system of LEDs (Light Emitting Diodes) which allow the organ technician to monitor all inputs and outputs as "seen" by the various circuit boards. These LEDs are each labelled as to their function via printing on each circuit board, and in Figures 5 to 13 in this manual. The LEDs each fall into one of three color-code groups as follows:

Green LEDs should always be illuminated during normal operation. An illuminated green LED on each plug-in board indicates that the board is being continuously monitored or scanned by the microprocessor whenever the organ power is on and the switch on the Set-Up Terminal is turned off. Although these LEDs are actually flashing at a very fast rate, they may appear to be on continuously. When the switch on the Set-Up Terminal is turned on, the green LEDs may appear to be flickering slowly, or may not be on at all.

Red LEDs will light momentarily to indicate the presence of a voltage on one or more input or output pins such as a piston input or an energized "on" or "off" coil. A red LED may also be illuminated to warn of an open connection in the flyback return for the coils. Any red LED that remains on continuously indicates a fault condition that should be checked.

Yellow LEDs are used where it is considered normal for the LED to be either on or off. The main use for yellow LEDs is on each Stop I/O Board, #404553, to indicate that at least one stop controlled by that board is on. Yellow LEDs also monitor each of the eight input or output pins on the Special Functions Board, #404568.

'CHECK SYSTEM' INDICATOR

When certain problems are detected by the MSP-1000's™ microprocessor, a "Check System" indication is given via an illuminated decimal point after the number in the Crescendo Memory Level Window on the Main Control Panel as shown in Figure 1. Depending on the problem detected, the system may work normally even though this LED is illuminated. No harm will be done by using the MSP while this light is on.

If the service person sees this decimal point illuminated when the organ rectifier power is on, you may use the Set-Up Terminal to display a diagnostic message. To do this, first turn off the organ rectifier power to the MSP-1000™. Carefully plug the connector on the Set-Up Terminal cable onto the pins at the top of the Microprocessor Board, part #404554 (See Figure 9). Turn on the rectifier power, then turn on the switch on the Set-Up Terminal. On the page following is a description of what you will see on the LCD display on the Set-Up Terminal, and what you should do.

YOU WILL SEE	YOU SHOULD....
Welcome to the Peterson MSP-1000	Wait
* = display error messages, else FWD	press the * key on the key pad
The error message will appear. For example:	
Piston stuck on - FWD	Press the FWD key
Don't Forget to turn the terminal off	Wait
That's all folks... Have a nice day!	Turn off the set-up terminal

After you turn off the switch on the Set-Up Terminal, the decimal point after the Crescendo Memory Level number on the main control panel should go out. If necessary, repair the problem before proceeding.

Following is a list of possible error messages.

ERROR MESSAGES

PISTON STUCK ON
This error message usually indicates that a piston contact is physically "making" or for some other reason there is a positive voltage applied continuously to a Piston Input Board pin. To verify this and locate the problem, check for an illuminated red LED corresponding to one of the groups of eight pins on the top of each Piston Input Board.

CONTROL STUCK ON
This message would ordinarily indicate that some control, such as a control panel button or switch or some other contact wired to the MSP, is shorted or continuously "making". Try resetting the Check System light as described above, but if it continues to turn on, it may be necessary to use a voltmeter to check for unwanted voltages or unplug various cables from the MSP base system and attempt the Check System light resetting procedure again with various groups of controls disconnected.

CHECK SUM ERROR
This error message usually occurs when the MSP's class 2 transformer is plugged into an outlet that is switched with the organ rectifier. This condition prevents normal shutdown "housekeeping", including the storage of the current memory level number. One way to verify this is to turn the organ rectifier on, observe the displayed MSP memory level, then change the memory level and turn the organ off. When you power up again, the control panel should display the most-recently-selected memory level.

NON-CONTIGUOUS MEMORIES
The main cause of this message is a missing or dislodged EEPROM memory chip on the Memory Board.

MEMORY LOST
This message is almost never seen but would indicate that the microprocessor has determined a loss of data from memory. Such an occurrance is extremely unlikely on systems containing operating system software with "Software Data Protect" (SDP), a safety feature incorporated in 2002.

LEAK ERROR- A COIL IS STUCK ON
This error message indicates that detection circuitry has determined there could be a continuous flow of current through at least one On or Off coil. To verify, check the red LEDs marked "On Coil" and "Off Coil" on the tops of the Stop I/O Boards. They should be illuminated only for about 1/4 second when a piston is pressed. If a stuck coil is confirmed, the related Stop I/O Board may be damaged and should be unplugged to prevent overheating of coils.

AUTOMATIC DIAGNOSTIC TEST

As a quick check of the order and continuity of all wiring between the MSP-1000™ and the organ's stop action magnets, you may instruct the MSP-1000™ to put itself through a self-diagnostic test wherein each stop action magnet is operated on and off twice, while the microprocessor checks for proper tracking of the sense (switch) input signal. This feature may be activated at the end of the Set-Up Procedure when you see the prompt "* to run diagnostics, FWD to skip". To begin the automatic diagnosis when this prompt is displayed, press the "* " key on the keypad of the Set-Up Terminal. See the sample Set-Up procedure section for more information.

CLEARING ALL MEMORY

Should you ever decide to completely "start over" with programming the organ's parameters and the piston, crescendo, tutti, and piston sequencer memory, the current memory can be randomized by carefully swapping memory chips, EEPROM1 and EEPROM2 on the Memory Board #404555 as shown in Fig. 13. Use extreme care that the EEPROM chips have all leads properly inserted into their sockets. Be sure to remove all AC and DC power to the system first!

CHANGING PISTON SEQUENCER "NEXT" AND "PREVIOUS" PISTON ASSIGNMENTS

Should you decide to change the assignment of the pistons that serve as "Next" or "Previous" buttons, you must first redefine all regular general and divisional pistons. To do this, turn on the switch on the back of the Set-up Terminal, and step through the various questions (prompts)by selecting "FWD to Use Previous" to answer all questions except where you are asked to press each piston. Skip over the other prompts, including the section for defining reversibibles, until you reach the piston sequencer questions. Be sure to press the * at the "* to Keep Changes" prompt..

SOLVING PROBLEMS

The following sections explain procedures for identifying problems with the operation of the MSP-1000™ system. We recommend following these steps in order to track down and correct the problem. Even if you do not experience any problems, reading and understanding these procedures will help you to become more familiar with the MSP-1000™.

One Dead Piston.

- Piston contacts stuck in the closed position. If this is the problem, you will see a red LED illuminated on a Piston Input Board #404552, even when the piston in question is not depressed. The microprocessor will automatically ignore a stuck piston, causing it to be dead while other pistons work normally. With the organ power off, unplug the connector on the piston button cable from the top of the Piston Input Board and then

turn the power back on. If a stuck piston contact is the problem, the red LED on the Piston Input Board will now be off. A piston that is stuck for more than about two minutes while the organ power is on will cause the "Check System" light (decimal point) to come on in the Crescendo Memory Level Window as an additional indicator of the problem (see " 'Check System' Indicator" section above). **This decimal point indication will NOT go off until it is reset or until after several on/off cycles of the organ power.** Repair or replace the defective piston.

- Defective input IC #74HC563 on the Piston Input Board #404552. If the 'Check System' indicator is on as described above, but removing the piston connector from the top of the Piston Input Board does not cause the red LED on the top of the Piston Input Board to go out, the problem is probably a defective input IC. Replace the IC or the Piston Input Board.

- Piston contacts don't make contact, or open connection to a pin on the Piston Input Board #404552. If this is the case, the corresponding red LED on the Piston Input Board will not light when the dead piston is pushed. Repair the defective piston, solder connection, or broken wire as necessary.

- Not programmed. Any piston that is not assigned to a function during the Set-Up procedure will be inoperative even though it is wired into a pin on the Piston Input Board. This problem may be corrected by re-entering the Set-Up mode as described elsewhere in this manual and reprogramming all of the divisions, or reversibles, or tutti pistons, or whatever group the dead piston belongs to. When assigning pistons, follow the prompts carefully on the Set-Up Terminal, paying special attention to the piston number that you are asked to push each time.

All pistons wired to a Piston Input Board are dead.

- Common Feed for the Pistons not connected to a source of Organ Positive. To quickly verify this, push a piston and check to see whether a red LED lights on the Piston Input Board #404552. If not, check the wiring connections carefully to trace the open connection. We recommend that the piston common wire be fed from the common pin on the Piston Input Board. If your system is wired this way, use a volt meter set on "DC Volts" in the range of about 15 to 30 Volts, to measure this pin with respect to the main Organ Positive screw terminal on the MSP Mother Board. You should measure close to 0 Volts DC.

- Piston Common feed pin on Piston Input Board #404552 used to feed circuits other than the pistons. This pin has a resistor in series with it to protect the circuit. If the pin is used to power other circuits such as feeding expression shoes, an excessive voltage drop may occur across the resistor, causing insufficient voltage to operate the piston circuits. Use the Organ Positive screw terminals or other "hard" voltage points instead of the piston common pin for these circuits.

- Defective Piston Input Board #404552. If this board is defective, the green LED will usually not be illuminated. On MSPs with more than one such board, check to see whether the other Piston Input Board(s) have their green LEDs on. If so, follow the board swapping procedure explained above to change the positions of two boards. If the board is defective, the problem will move so as to affect different pistons. Replace the defective Piston Input Board.

- None of the pistons wired to the Piston Input Board #404552 are programmed. If this is the case, the green LED will not be illuminated even though the organ power is on and the Set-Up Terminal switch is off. You must perform the set-up procedure as explained elsewhere in this instruction manual.

Single "on" or "off" coil won't activate to move drawknob or tab, but others wired to the same Stop I/O Board work correctly.

- Defective coil or open connection in the wiring from the output pin to the coil. To check this, touch a hot lead from the "Organ +" terminal on the Mother Board to the affected "On" or "Off" coil output pin on the Stop I/O Board #404553. If the drawknob or tab still doesn't respond, the problem is external to the MSP circuit boards. If Peterson PowerTabs™ or PowerKnobs™ are used, you can unplug the connector and swap it with an adjacent unit to verify a defective stop action magnet. Repair or replace as necessary.

- Output transistor 2SB1010 on the Stop I/O Board #404553 is damaged. Before replacing the transistor, be sure that the flyback return connection is made properly and securely as explained in the Wiring Instructions section, and that the red "F/B open" LED on the Stop I/O Board doesn't intermittently come on when pistons are pushed. Replace the transistor or the Stop I/O Board.

None of the "on" or "off" coils wired to a particular Stop I/O Board work.

- Fuse blown on Stop I/O Board #404553. Fuse F1 on this board protects the circuits that allow all eight stop controls to move. If the fuse is blown, determine the cause before replacing it. Suspect a shorted coil on one of the stop controls wired to the board, or a short in the wiring between one of the "On" or "Off" pins on this board and the stop action magnets.

- Flyback diode return connection is open. Check to see if the flyback-open ("F/B open") red LED on the Stop I/O Board #404553 comes on when a piston is pushed. If it does, an automatic protection feature is at work, preventing the coils from being energized, which in turn prevents any high voltage spikes from developing which could otherwise damage the driver transistors. See the wiring instructions section on flyback return connections for the proper wiring procedure.

- Stop I/O Board #404553 defective. If the green LED on the Stop I/O Board is not illuminated when the organ power is on and the switch on the Set-Up Terminal is off, follow the circuit board swapping procedure explained above to swap the suspect board with one that is working. If the board is defective or damaged, the problem will move with it. Replace the defective Stop I/O Board.

- None of the stops wired to that Stop I/O Board #404553 have been assigned to operate from generals or any divisional pistons. This must be done using the Set-Up Terminal as explained elsewhere in this instruction manual. If this is the problem, the green LED on that Stop I/O Board will not be illuminated. Follow the board swapping procedure explained above to carefully swap the affected Stop I/O Board with one that has its green LED illuminated. If the green LED on another card fails to light when the card is moved into the "suspect slot", reenter the Set-Up mode and follow the prompts to skip forward until you define all stops on generals and in all divisions. Then step forward until you reach the prompt " * = keep all changes". Press * , then step forward until you exit the set-up mode. Turn off the switch and check to be sure the green LED is now illuminated.

Many or all of the stops on the console won't move when pistons are pushed.

- Pulse Power Supply's automatic protection circuit has sensed continuous current flow for more than eighteen seconds and then shut itself down to prevent possible damage. When this happens, the green "Ready" LED on the pulse supply will not be on even though the organ rectifier is on. Also, many or all of the red LEDs on the Stop I/O boards may be on continuously when the rectifier power is on. This usually occurs when pistons are rapidly and continuously pushed for about eighteen seconds, or if a damaged driver transistor on the MSP-1000™ causes current to flow continuously through a coil for about this long. The Pulse Power Supply may be reset by simply turning off the rectifier for about thirty seconds, then turning it back on again. Identify the reason for "shut down" and correct any problem.

- Next, see the section entitled 'None of the "on" or "off" coils wired to a particular Stop I/O Board work', above.

None of the stops wired to the sense pins for a particular Stop I/O Board come on when the crescendo shoe is advanced or tutti is activated, even though the stops are programmed to be included in the crescendo or tutti.

- Fuse blown on Stop I/O Board #404553. Fuse F2 on this board protects the circuits that allow all eight stops to be brought on by the crescendo or tutti. If the fuse is blown, determine the cause before replacing it. Suspect a short somewhere in the wiring to the relay or in any relay coils that are wired to the board.

- Defective Stop I/O Board #404553. Where coils are wired to the sense pins on the MSP Mother Board, be sure that the coils are within the resistance ratings specified by Peterson. Early Stop I/O Boards use I.C. driver chips for this purpose, which must not be connected to a load resistance below 50 ohms. Later Stop I/O Boards use transistors that can handle resistances as low as 20 ohms. Special buffers, available

from Peterson, must be used for load resistances of less than 20 ohms. After assuring that all loads are high enough, repair or replace the damaged or defective board.

One stop won't set into the combination action, crescendo, or tutti memory, but others wired to the same board set properly.

- Bad contact on the stop control that won't set. Begin with all stop tablets off and the crescendo shoe and tutti(s) in their off positions. No yellow LEDs on the Stop I/O Boards #404553 should be illuminated. Turn on the affected stop tab or drawknob and see if a yellow LED comes on. If not, suspect a bad contact at the tab or drawknob, or a fault in the wiring for the stop. Check the wiring connections for continuity and repair or replace the stop control if necessary.

- Defective Stop I/O Board #404553. Follow the board swapping procedure to exchange the suspect board with one known to work. If the problem moves, the board is defective. Replace the defective board.

Stops sometimes won't set into memory as intended. On another try, they may set properly.

- Setting is prevented because of a lockout keyswitch in the locked position, or because the crescendo shoe or a tutti piston is activated. This locked mode is indicated by the letters "L.O." flashing in the Combination Action Memory Level Window on the Main Control Panel as shown in Figure 1.

- Set piston contacts are intermittent. If the problem only occurs when using the set piston and "capture" method of setting, the set piston contacts may not be making dependably. While pressing the set piston, two decimal points should flash in the Combination Action Memory Level Window on the Main Control Panel as shown in Figure 1. Try pushing the set piston repeatedly while watching these decimals. If they do not flash consistently or upon every push of the set piston, suspect intermittent contacts.

- Piston Common feed pin on Piston Input Board #404552 is used to feed circuits other than the pistons. This pin has a resistor in series with it to protect the circuit. If the pin is used to power other circuits such as feeding expression shoes, an excessive voltage drop may occur across the resistor, causing insufficient voltage to operate the piston circuits. Use the Organ Positive screw terminals or other "hard" voltage points instead of the piston common pin for these circuits.

Pedal Stops Won't Set

- If pedal stops will not set into memory for general or divisional pistons after updating the software on a system with software dated earlier than 2-94, turn on the set-up terminal's switch and use the FWD key to skip to the Pedal Piston Couplers section. At the prompt "ready to define PEDAL PISTN couplers. FWD" press the FWD key. At the prompt "* = pist cplrs, FWD=prv, ENTR=none, REV=backup, press the ENTR key. Skip over the other prompts, turn off the terminal's switch when directed to, and verify that the pedal stops will now set.

Pistons seem to be erratic and produce different combinations on each push.

- Piston Sequencer is turned on, and the affected pistons have been defined to serve as Next or Previous pistons. If this is the case, the LED characters on the Piston Sequencer Control Panel will change each time the affected pistons are pushed. The MSP is performing exactly as it should! Turn off the Piston Sequencer On/Off switch to return the pistons to their normal functions. If desired, use the Set-Up procedure as explained earlier in this manual to reprogram the Piston Sequencer's operation.

LEDs on MSP boards stay on when organ rectifier is turned off.

- Class 2 transformer wired to Expansion Mother Board is out of phase with the Class 2 transformer wired to the Main Mother Board. Unplug transformers and reverse the wires to AC1 and AC2 terminals from one of the transformers.

MAIN BLOCKS OF PROMPTS FOR THE MSP–1000™

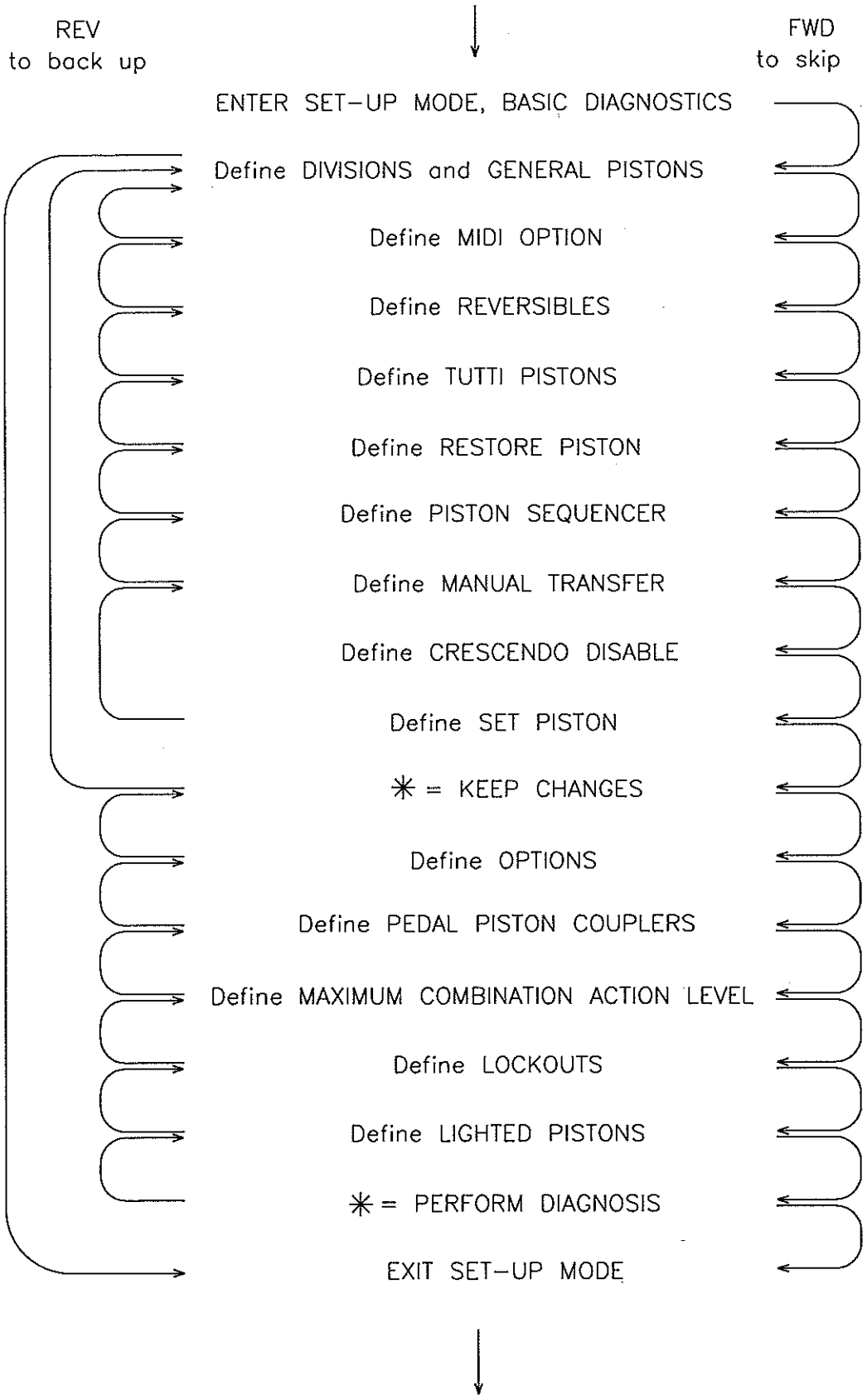
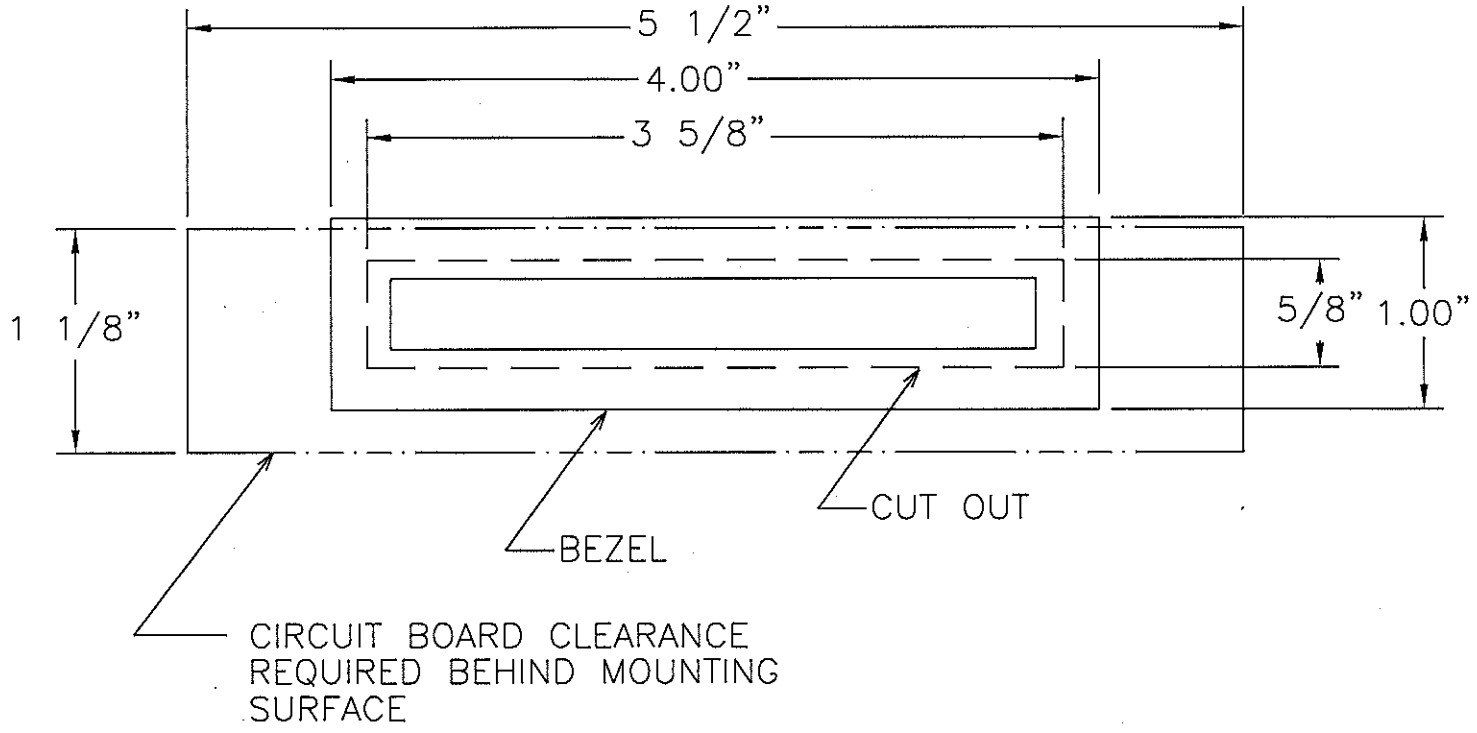
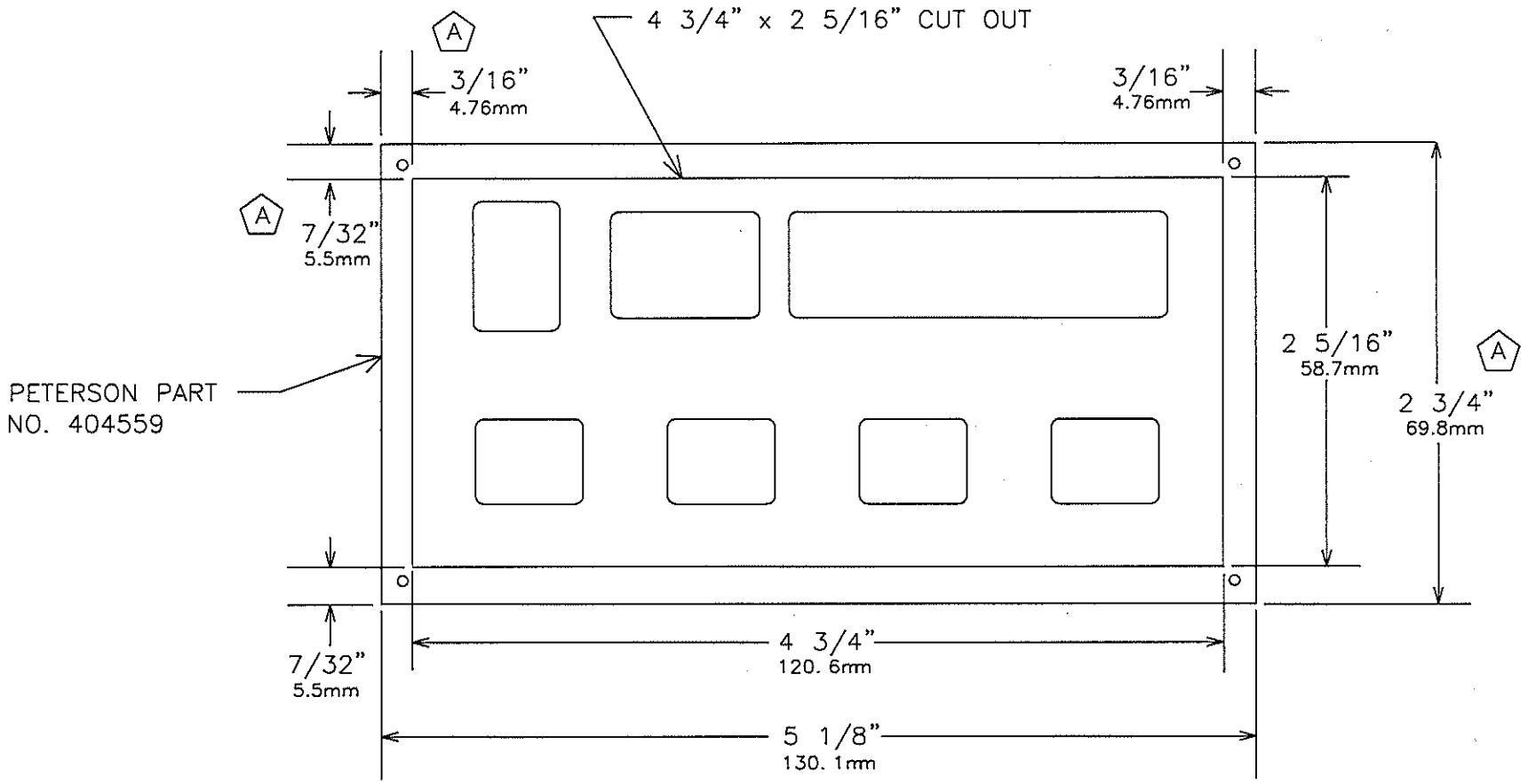


FIGURE 14



MOUNTING INFORMATION
BAR GRAPH READOUT

190156



UNLESS OTHERWISE SPECIFIED			BY	DATE
DIMENSIONS ARE IN INCHES – TOLERANCES		DRAWN	TJP	1/93
DECIMAL	FRACTIONAL	CHK'D		
.X=±.060 .XX=±.015 .XXX=±.005	±1/64	APP'D	SRP	8/93
	ANGULAR ±1°	ISSUE DATE		
DO NOT SCALE THIS DRAWING		MATERIAL		
FINISH				

REV.	DESRCIPTION	DATE/BY
A	CHANGE MTG. DIMENS.	7/23/97 KAL/SRP

REVISIONS

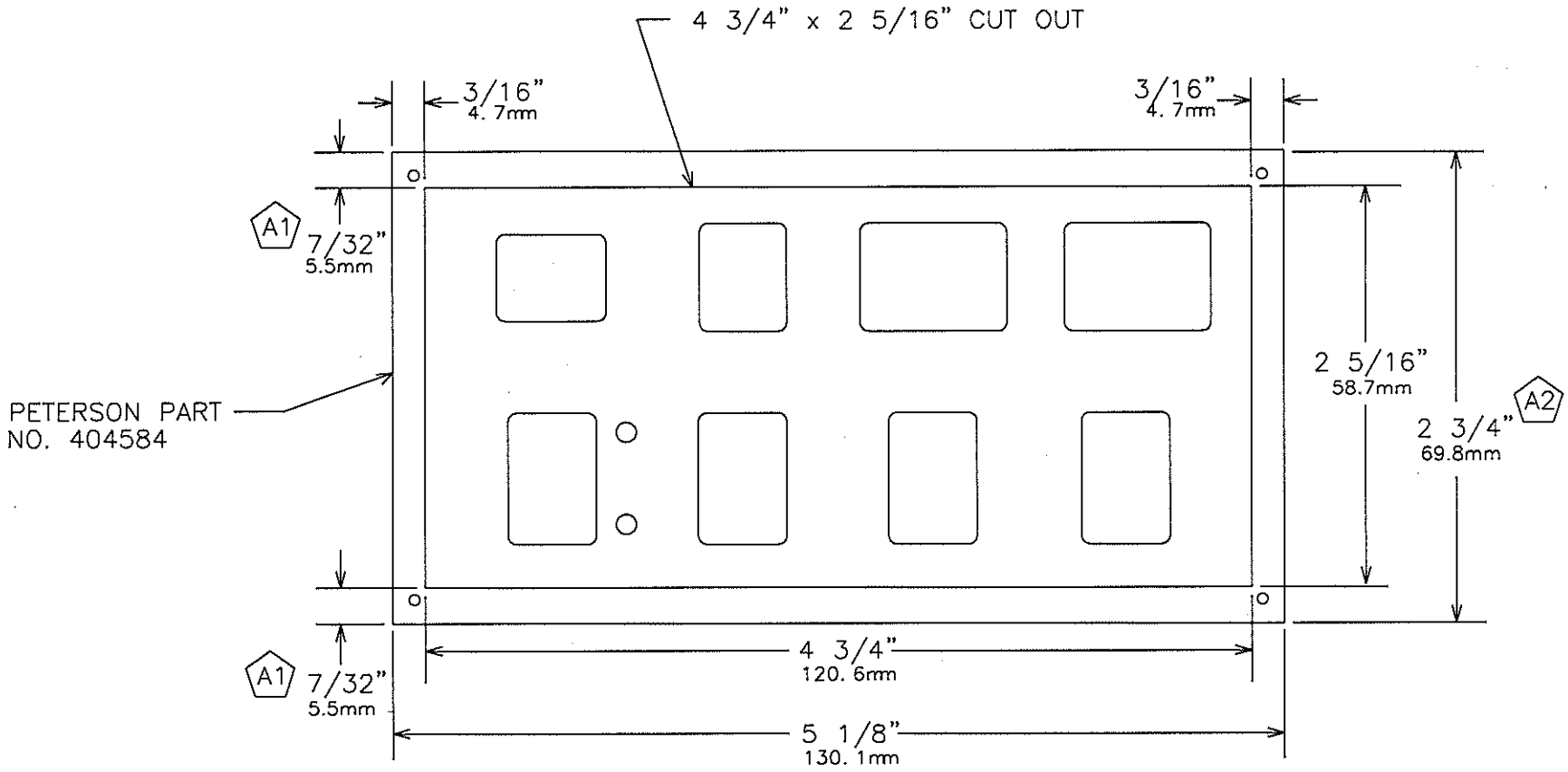
peterson

ELECTRO-MUSICAL PRODUCTS INC. / ALSIP, ILLINOIS 60803

MOUNTING INFORMATION
M.S.P. PISTON SEQUENCER PANEL

SIZE	NO.	REV.
A	190161	A

SCALE FULL SHEET 1 OF 1



UNLESS OTHERWISE SPECIFIED			BY	DATE
DIMENSIONS ARE IN INCHES – TOLERANCES		DRAWN	TJP	1/93
DECIMAL	FRACTIONAL	CHK'D		
.X=±.060 .XX=±.015 .XXX=±.005	±1/64 ANGULAR ±1°	APP'D	SRP	8/93
		ISSUE DATE		

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MOUNTING INFORMATION
M.S.P. MAIN CONTROL PANEL

REV.	DESCRIPTION	DATE/BY
A	A1) WAS .195" A2) WAS 2 45/64"	7/23/97 KAL/SRP

REVISIONS

DO NOT SCALE THIS DRAWING

FINISH

MATERIAL

SIZE	NO.	REV.
A	190162	A

SCALE FULL

SHEET 1 OF 1

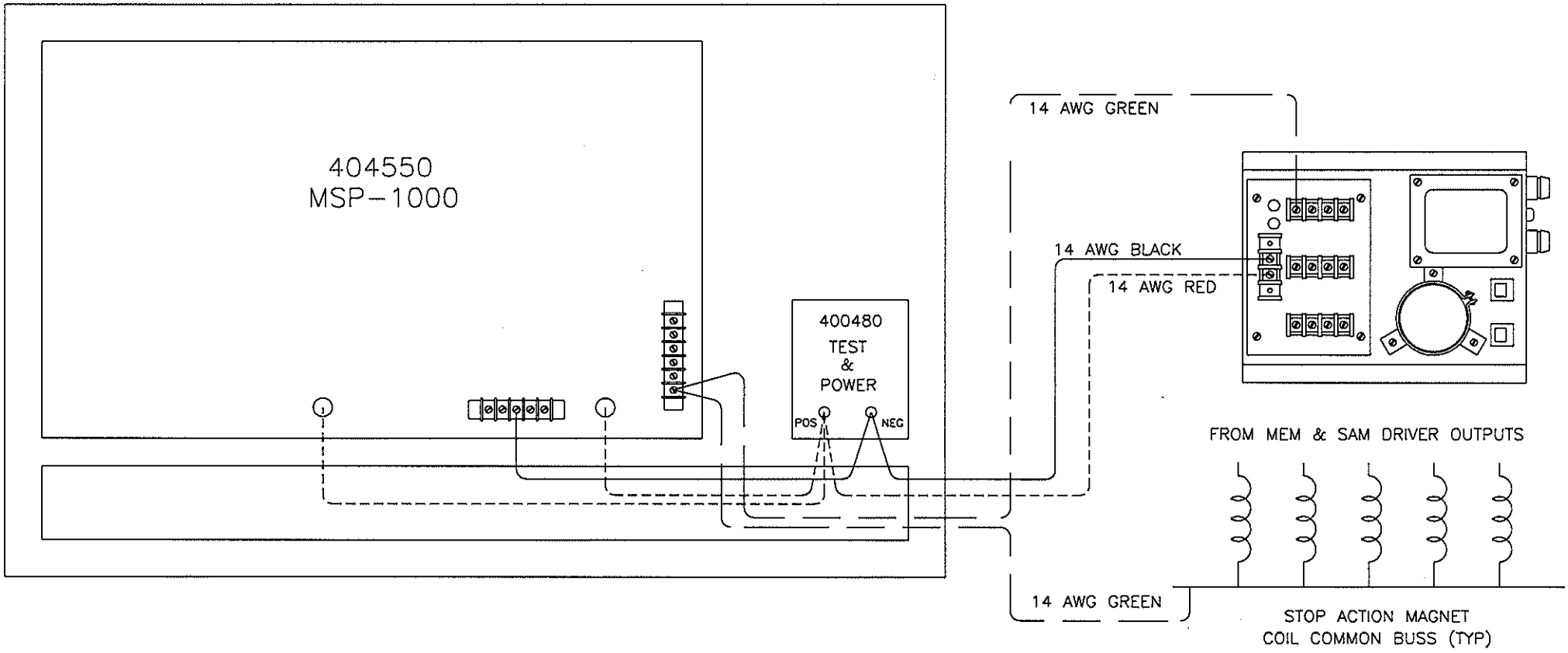
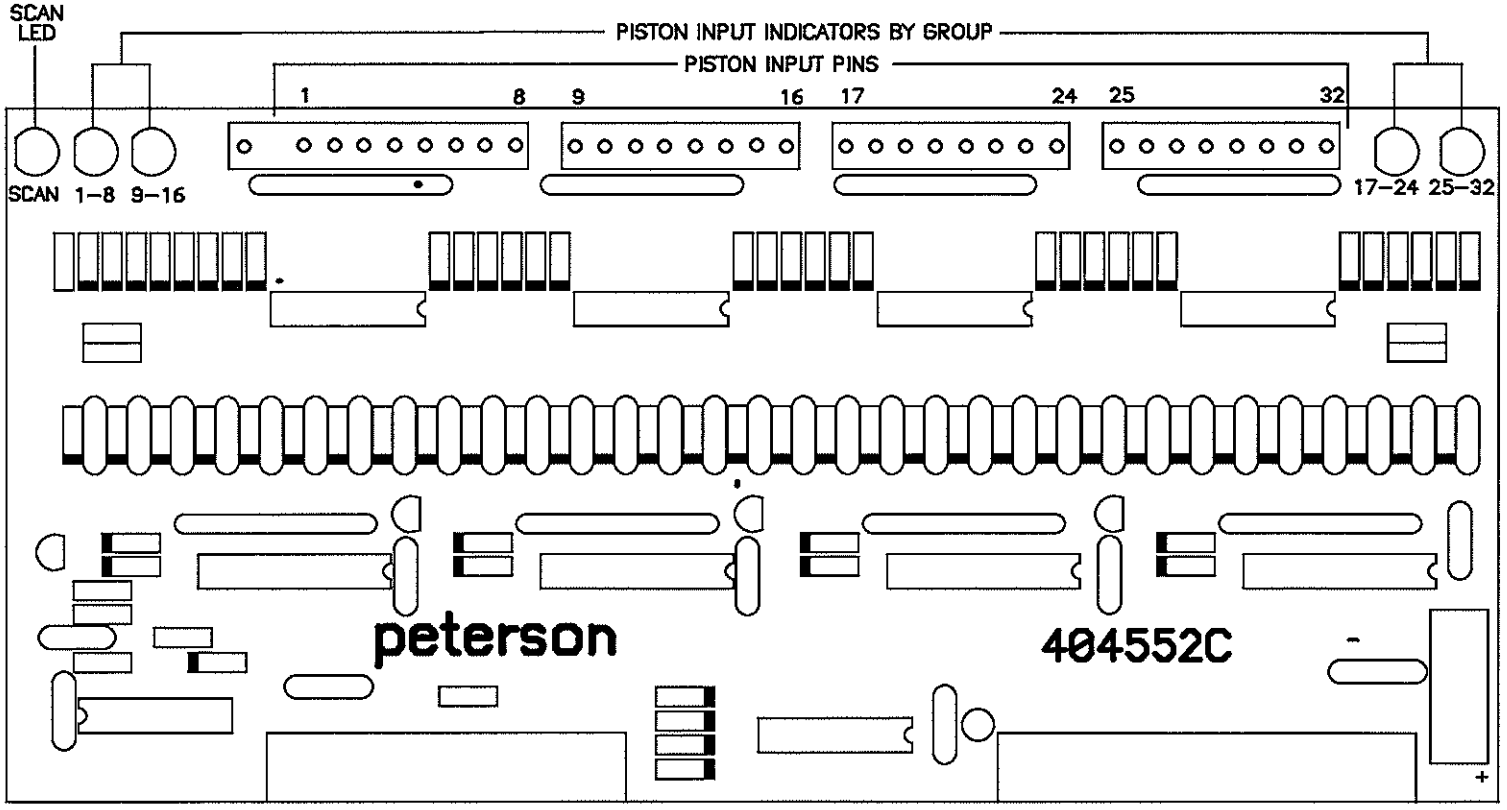


FIGURE 4
MASTER STOP PROCESSOR

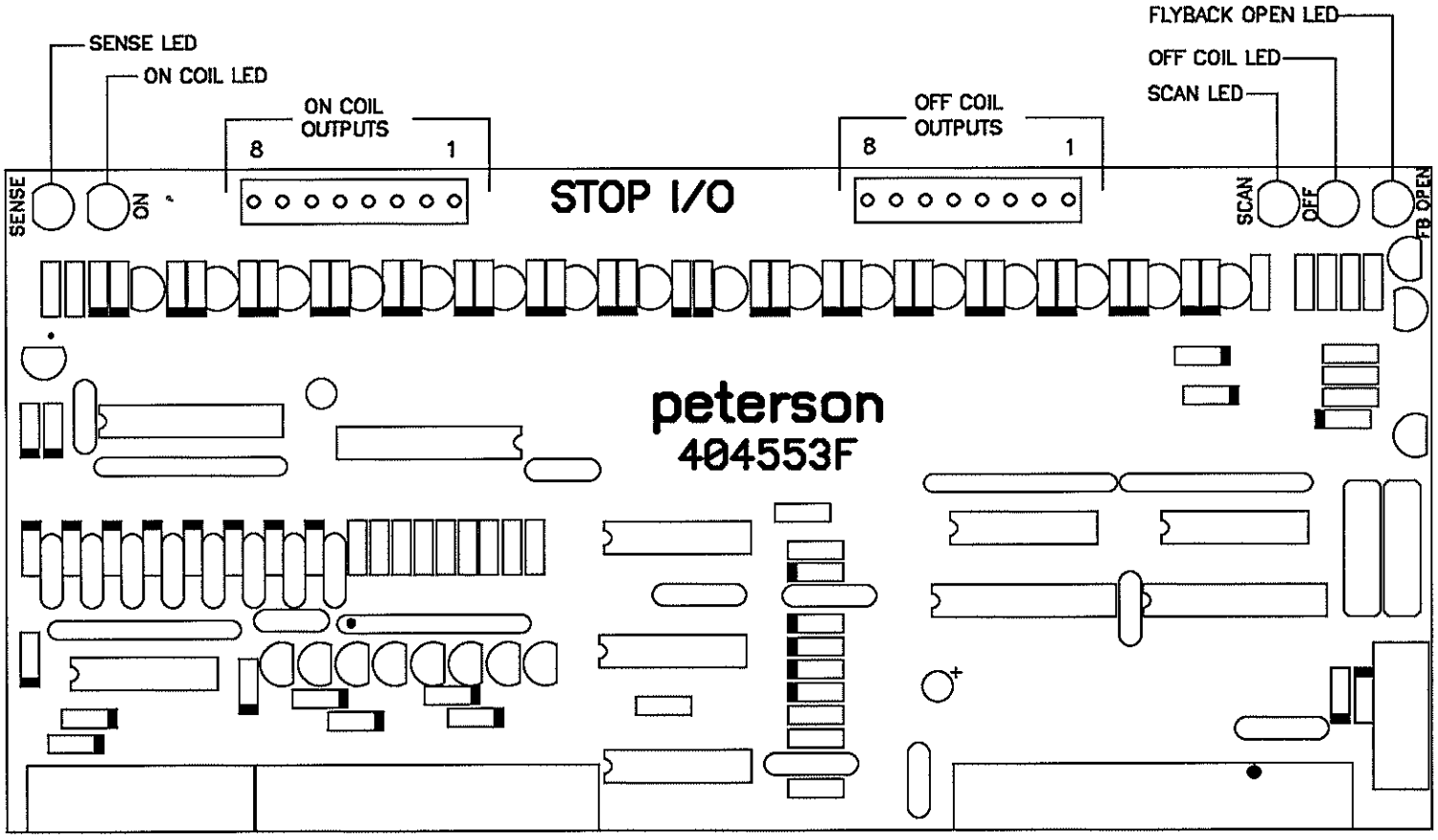
190418



PISTON INPUT BOARD

FIGURE 5

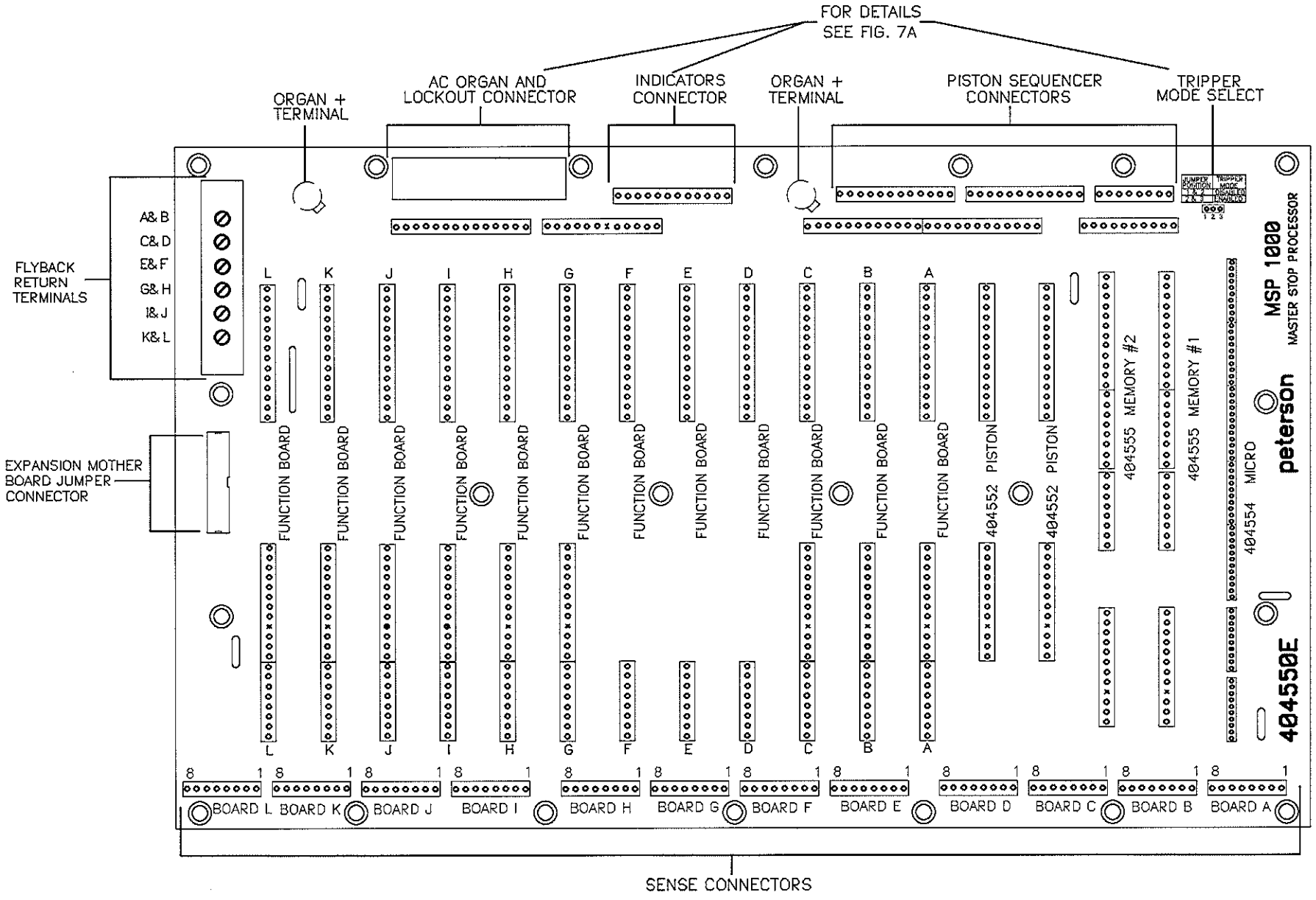
190419



STOP I/O BOARD

FIGURE 6

190420

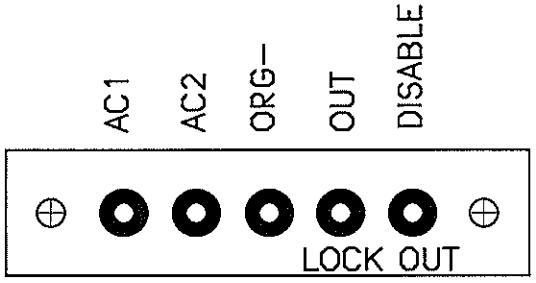


MAIN MOTHER BOARD

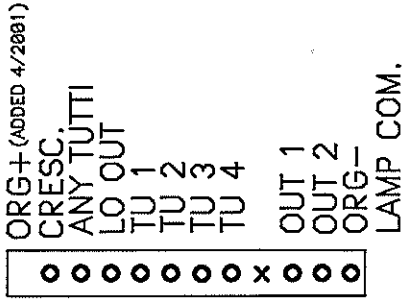
FIGURE 7

190421

AC ORGAN AND LOCKOUT CONNECTOR



INDICATORS CONNECTOR



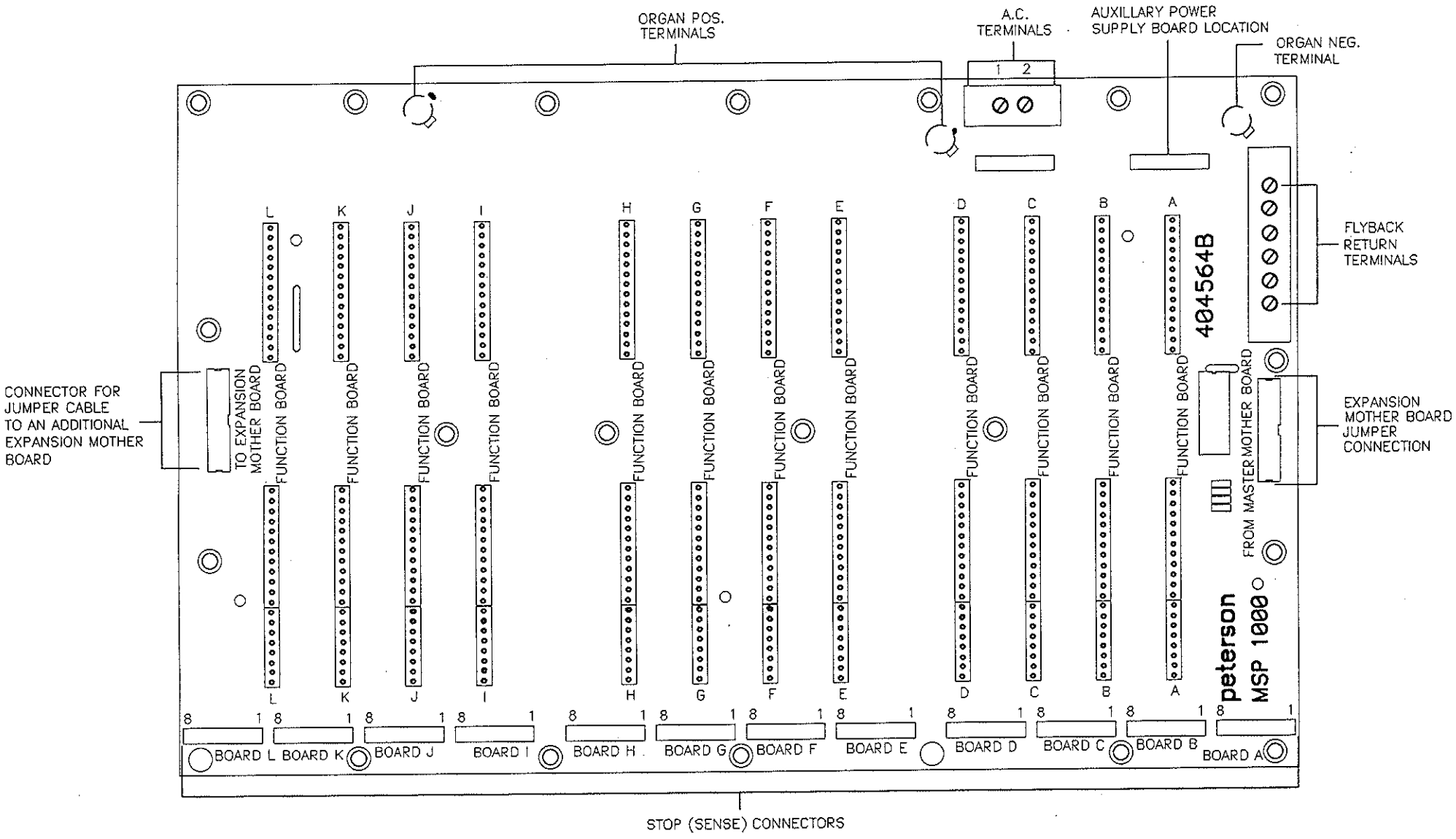
TRIPPER MODE SELECT

JUMPER POSITION	TRIPPER MODE
1 & 2	DISABLED
2 & 3	ENABLED

MAIN MOTHER BOARD DETAILS

FIGURE 7A

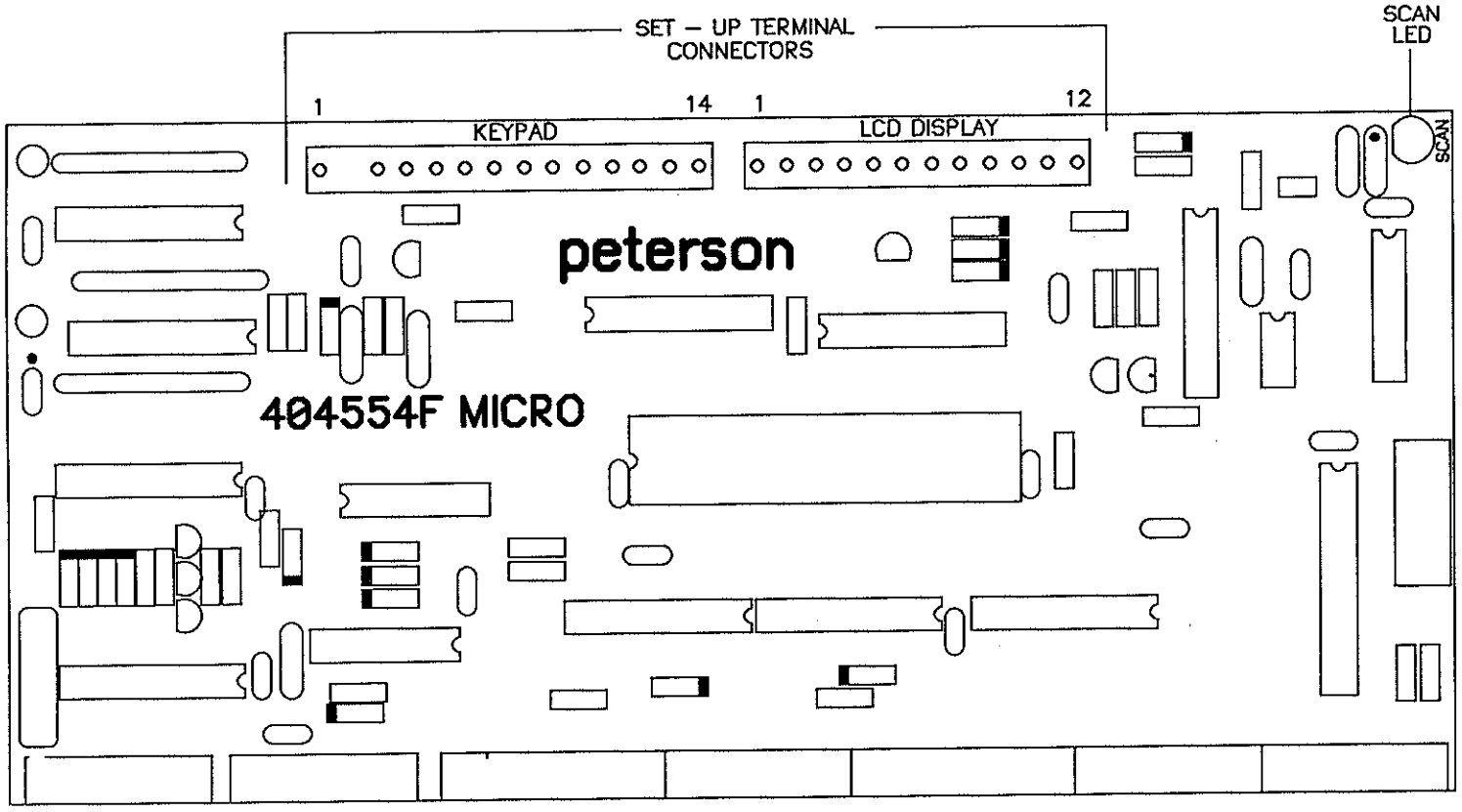
190422



EXPANSION MOTHER BOARD

FIGURE 8

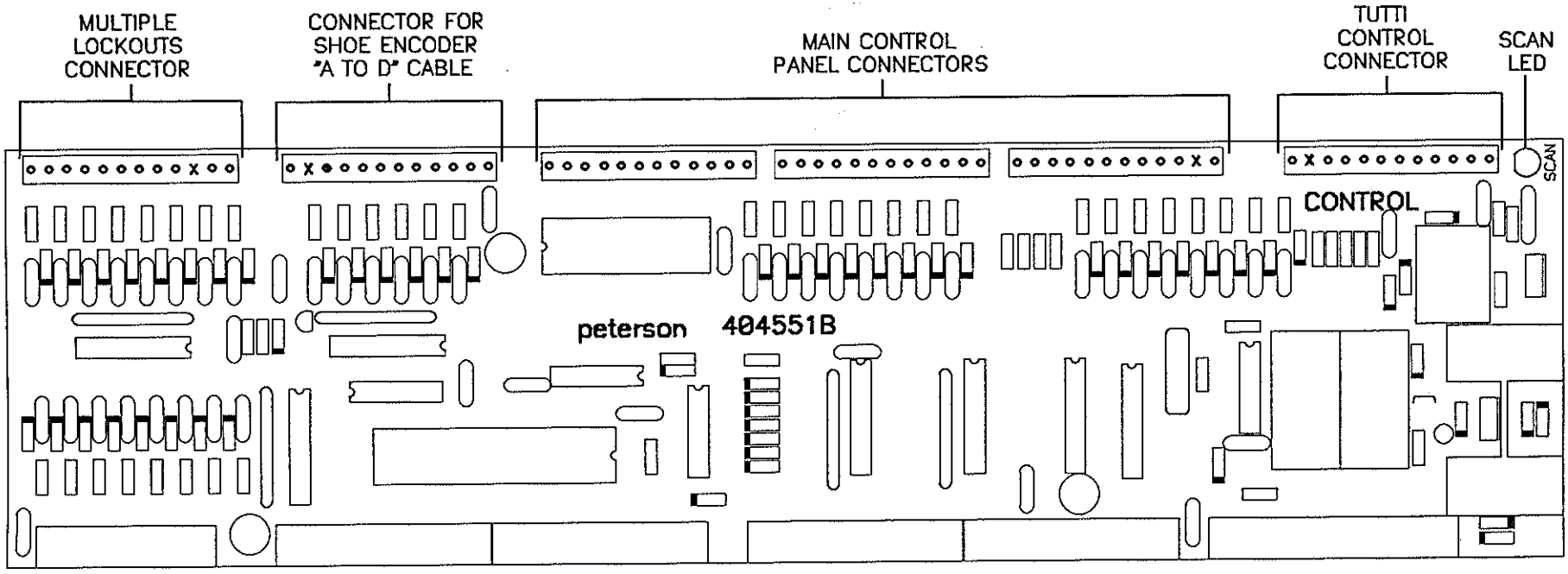
190423



MICROPROCESSOR BOARD

FIGURE 9

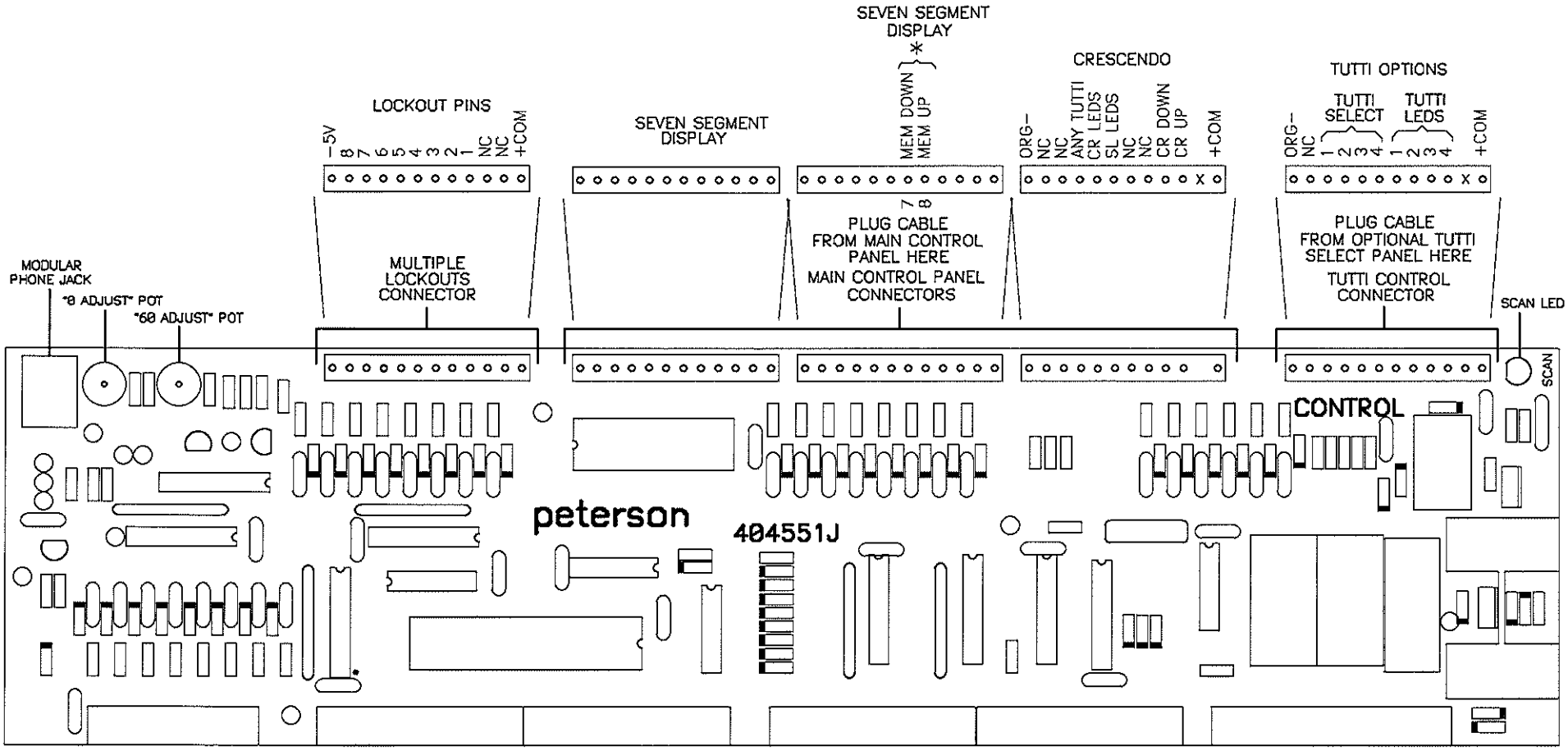
190424



CONTROL BOARD WITH NO A–TO–D

FIGURE 10A

190425

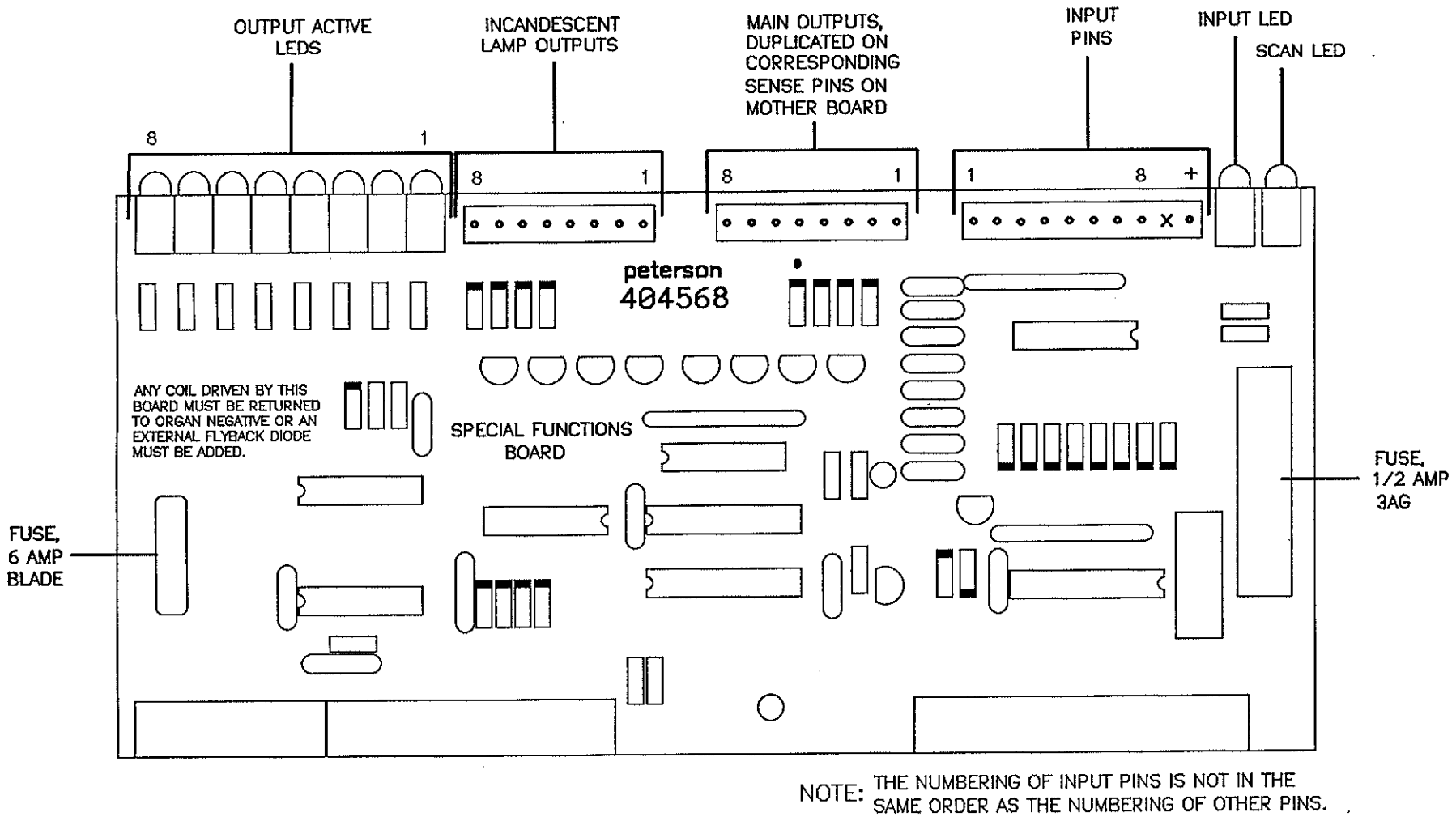


* TO CONTROL MIDI RESOURCE SYSTEM PISTON LEVELS FROM MSP MEMORY SELECT BUTTONS, WIRE "MEMORY LEVEL DOWN" PIN (#7) TO MINIMUM I/O BOARD PIN #2, AND "MEMORY LEVEL UP" PIN (#8) TO MIN. I/O PIN #1. SEE FIG #10B OF THE MIDI RESOURCE SYSTEM INSTALLATION MANUAL FOR FURTHER INSTRUCTIONS.

CONTROL BOARD WITH A–TO–D

FIGURE 10B

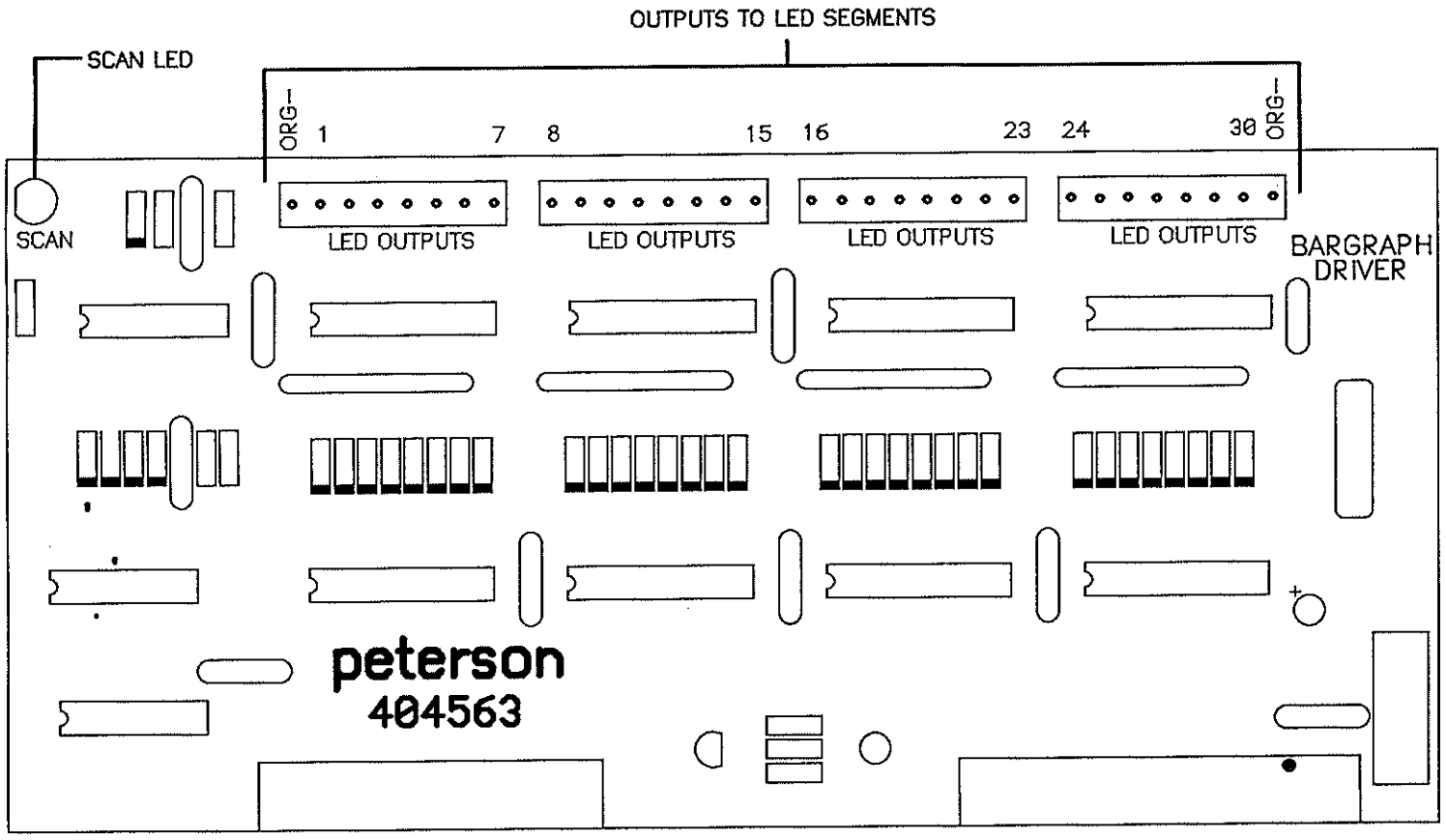
190426



SPECIAL FUNCTIONS BOARD

FIGURE 11

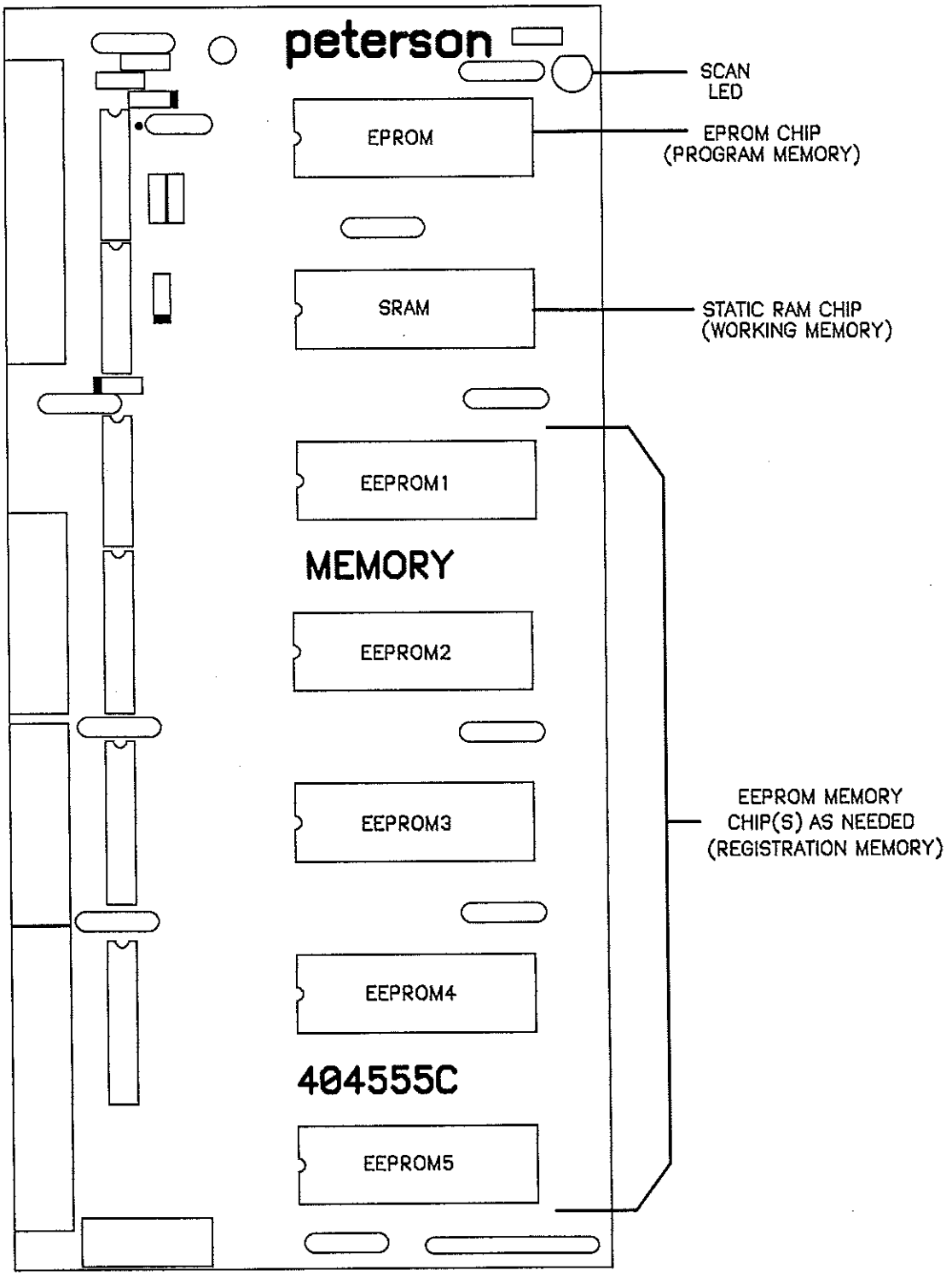
190427



BAR GRAPH DRIVER BOARD

FIGURE 12

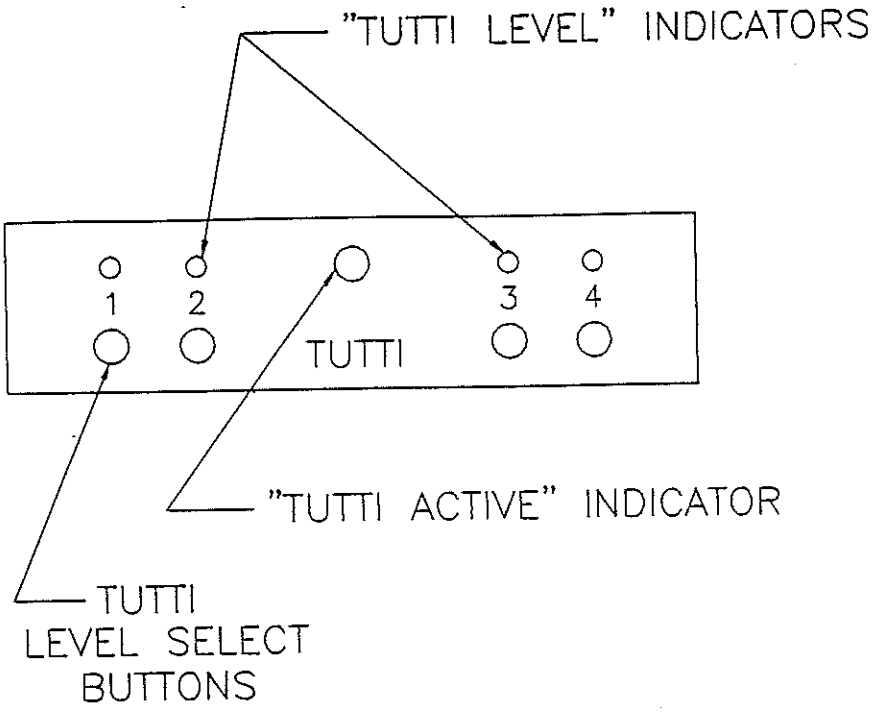
190428



MEMORY BOARD

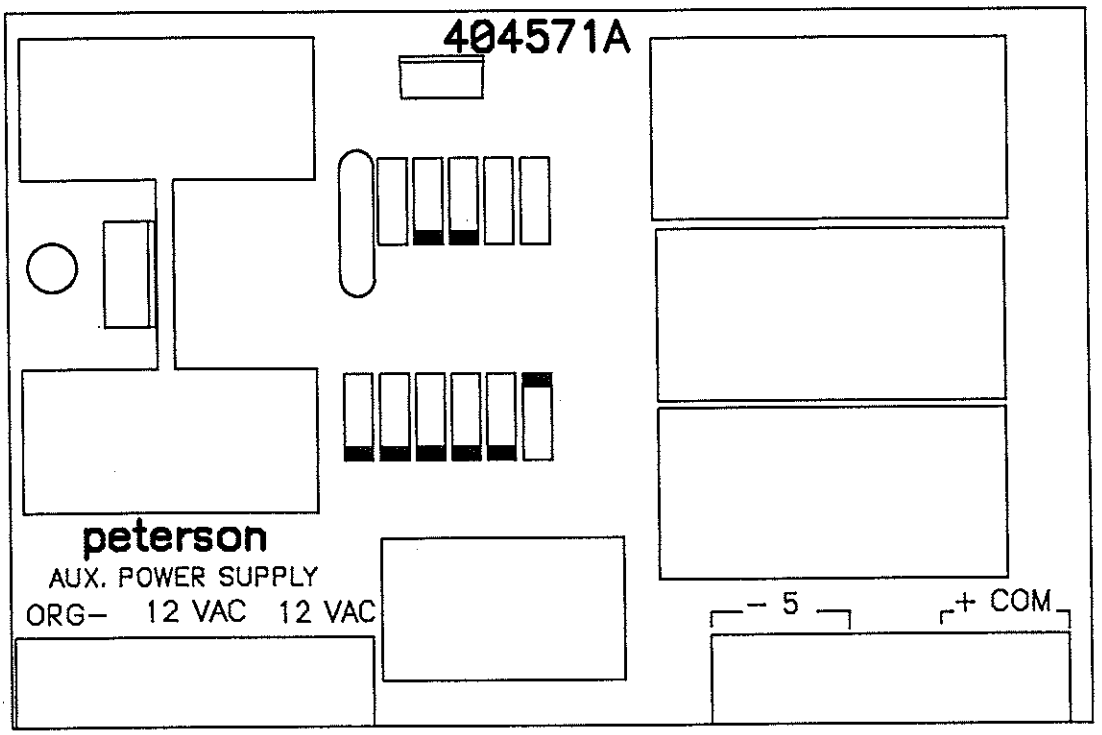
FIGURE 13

190429



TUTTI SELECT PANEL

FIGURE 15



AUXILIARY POWER SUPPLY

FIGURE 16

190432

CONTROLS THAT MAY BE DEFINED AND OPTIONS THAT MAY BE SELECTED USING THE MSP-1000™ SET-UP TERMINAL

- ❑ General stop controls, cancel pistons and numbered pistons.
- ❑ Each division's stop controls, cancels and numbered pistons by division name.
- ❑ All reversibles' pistons, fully reversing stop controls and "off only" stop controls by reversible name.
- ❑ "Blind" and "Organist-Assignable" reversible pistons.
- ❑ Tutti piston(s) and your choice of three formats for tutti memory levels:
  One piston with a separate memory for each combination actions level;
  Up to four separate pistons with one memory each;
  One piston with a separate control panel to select one or more of four memory levels;
- ❑ A "Restore" piston which brings stop controls back to the positions they were in before the most recent piston push. The restore piston will also return the memory for a particular piston to its original contents if it has been overwritten by mistake.
- ❑ For the Piston Sequencer, any number of desired pistons can be selected to act as "NEXT" or "PREVIOUS" pistons whenever the Piston Sequencer is on. (NEXT and PREVIOUS buttons are also provided on the Piston Sequencer control panel). Selection of "American Programmable" or "European" Piston Sequencer type is now handled by installing the appropriate program chip in the socket labelled "EPROM IC#1". Note: this is the leftmost socket on the Memory Board...don't confuse it with the one labelled "EEPROM 1"!
- ❑ Manual Transfer tablet or piston. You may define which two manuals are affected, and whether the piston sequencer's NEXT and PREVIOUS pistons under these manuals transfer accordingly (if applicable).
- ❑ Pneumatic or Electro-Mechanical Console option. With the pneumatic console option, a piston push will energize the coils of only the stop controls that must move. When the electro-mechanical option is chosen, one coil of each stop control is energized whenever a piston is pushed. This provides a uniform load on the power supply to prevent stop controls from slamming on "small" combinations.
- ❑ Maximum memory level for the combination action if a limit lower than the capacity is desired.
- ❑ Combination Action, Crescendo and Tutti memory levels that will be prevented from setting when any of up to eight keyswitches is in the "lock" position. This may also be used for hardwiring memory levels as unchangeable after the organbuilder determines a "standard" combination.
- ❑ Crescendo Disable switch or blind reversible piston.

MSP-1OOO™ SET-UP RECORD

Use this section to plan your set-up in advance. The organist's and/or organbuilder's preferences may be determined and indicated in this section. Once completed, this serves as a record of how the organ was configured.

1. Purpose of using set up terminal:

____ DEFINE ORGAN
____ DOWN LOAD MEMORY
(Copy contents of memory on front Memory Board to rear Memory Board)
____ UP LOAD MEMORY
(Copy contents of memory on rear Memory Board to front Memory Board)

2. Test Stop Controls: YES or NO

3. Define Divisions: YES or NO

DIVISION SPECIFICATIONS

NUMBER OF DIVISIONS _____

GENERALS: CANCEL? _____ # of PISTONS?_____

DIV. NAME	CANCEL?	# PISTONS?

Are Intermanual Couplers:
___ Operated by divisional pistons?
___ Operated by generals only?

Comments _____

4. Control MIDI piston memory level from MSP control panel? YES or NO

5. Define Reversibles: YES or NO

REVERSIBLE SPECIFICATIONS

TYPE (Reg, Reg Cplr, Settable, Blind)	NAME	NOTES

6. Define Tuttis: YES or NO

Quantity of tutti pistons 1 2 3 4

If one piston, choose.....

___Only one tutti memory level.
___One tutti memory per combination action memory level.
___Use 4 memory select panel
___ One at a time active
___ Multiple levels may be active

7. Restore Piston: YES or NO

8. Piston Sequencer: YES or NO

Automatic memory level wrap: YES or NO

Operate from control panel only: YES or NO

If no, list:

NEXT pistons _____
_____
PREVIOUS pistons _____
_____

9. Manual Transfer: YES or NO

Do NEXT/PREVIOUS functions transfer? YES or NO

Do Cancels transfer? YES or NO

Which divisions transfer? _____

10. Crescendo Disable: YES or NO

11. Set Piston: YES or NO

12. Options: YES or NO

Type of stop action operation: PNEUMATIC or ELECTRO-MECHANICAL

Control of shoe position in Edit Mode: SHOE or PANEL

13. Pedal Piston Couplers: YES or NO

Conventional (Piston or Switch) or "Pedal on Any Div"?

PEDAL PISTON COUPLER SPECIFICATIONS

PIN #	MANUAL NAME	TYPE (New ped memories or ped div memories)

14. Number of Combination Action Memory Levels _____

15. Lighted Pistons: YES or NO

Quantity _____

List Names _____

_____

16. Define Lockouts: YES or NO _____

_____

LOCKOUT PIN (key-switch) number	NONE	1	2	3	4	5	6	7	8
CRESCENDO #1									
CRESCENDO #2									
CRESCENDO #3									
CRESCENDO #4									
TUTTI #1									
TUTTI #2									
TUTTI #3									
TUTTI #4									
COMB. ACTION MEM. LEVEL RANGE									
_____ TO _____									
_____ TO _____									
_____ TO _____									
_____ TO _____									

RECORD OF SPECIAL FUNCTIONS BOARD PIN ASSIGNMENTS

	PIN #	ASSIGNMENT	Input or Output pin is used
	1		
	2		
	3		
	4		
These four output pins used for MIDI option if selected	5		
	6		
	7		
	8		

The output pins on the Special Functions Board may be wired to the Peterson MIDI Resource System™ so that the memory level for MIDI pistons is selected by the memory level switch on the MSP Main Control Panel. Output pins may also be configured to switch between Organ + and Organ - on alternate pushes of a blind reversible piston. Input pins may be wired to switches for the purpose of controlling Pedal Piston Couplers. For each pins number, ***either*** the input pin or the output pin may be used, but ***not both***.

ADDENDUM A: SAVING A BACKUP COPY OF MEMORIES

Once the MSP-1000 system is programmed and pistons, crescendos, tuttis, and any piston sequences are set, it is possible to copy the organ configuration, stops registration data, and piston sequencer patterns into a "backup" Memory Board #404555 for future use. Once the memories are copied, the backup Memory Board can be retained for use in restoring these settings in the unlikely event that memory should be lost for any reason.

The process of copying from the main Memory Board to a backup Memory Board is called "downloading". Restoring the memory from the backup Memory Board to the main Memory Board is called "uploading".

To download memory to a backup Memory Board, remove all power from the MSP-1000 and then insert the backup board into the third slot on the Main Mother Board, behind the Microprocessor Board and the main Memory Board. The backup Memory Board must have the same number of EEPROM memory chips in its sockets as the Memory Board to be copied from. Note that it is not necessary for the backup Memory Board to have chips in the first two sockets, which are labelled "EPROM" and "SRAM".

After the backup Memory Board is inserted and double-checked, plug the connectors of the Set Up Terminal cable onto the top of the Microprocessor Board as described elsewhere in this manual. Restore power to the MSP-1000, then turn on the Set Up Terminal switch. After the introductory messages, press the "ENTR" key on the Set Up Terminal to select "Upload/ Download" mode, then press the "FWD" key. Next press the "1" key on the Set Up Terminal to download (copy memory from Board 1 to Board 2). The display on the Set Up Terminal will not change while the memory is being copied, but the MSP Main Control Panel will show numbers counting down. The process will likely take several minutes. After the MSP Main Control Panel display returns to normal, exit the setup mode, turn off the Set Up Terminal switch, disconnect power to the MSP-1000, unplug the Set Up Terminal and remove the backup Memory Board for storage in a safe place.

To Upload the data from the Memory Board in the third slot of the Main Mother Board (Board 2) to the Memory Board in the second slot of the Main Mother Board (Board 1), repeat the steps above but select "reverse" instead of "Copy Board 1 to Board 2".

Be careful to copy memory in the intended direction, to avoid accidentally overwriting your good memory data with data from the unprogrammed "blank" chips! Also, keep in mind that the backup data from systems with a very early version of "EPROM" program chip may not be compatible with later revisions of this program chip. The EPROM is the chip in the first socket of the Memory Board, which has a date code, Peterson part number and revision suffix letter printed on it. If after updating from an old EPROM program chip to a new version for any reason you find that you need to set new registrations, it is a good idea to then make a new backup copy of your registrations.

Please note that on rare occasions a second memory board must be used in order to accomodate a very large number of stops, pistons, and memory levels. This will be an issue on only the largest console specifications. It is possible to download the contents of the (front) Memory Board in the Mother Board's second slot, but not the Memory Board in the Mother Board's third slot. The first Memory Board will contain all system configuration information and the registration memory for most of the memory levels. In this situation, remove the Memory Board from the third slot on the Main Mother Board and replace it with the backup Memory Board to be downloaded to. Perform the downloading procedure, then remove the backup Memory Board and reinsert the regular Memory Board.

ADDENDUM B: POWER SPECIFICATIONS

Organ Rectifier Voltage: 12-18 VDC nominal. Provisions for use with a 24 VDC nominal rectifier can be made upon request when an MSP-1000 is ordered.

Stop Action Power Supply: A separate DC Power Supply may be used to operate stop tablet and drawknob actions. Usually, this would be desireable if the rest of the organ's DC electrical system must be operated on a lower voltage than required for swift operation of the stop action magnets. The nominal voltage of a Stop Action Power Supply may be as high as 18 VDC continuous or 22 Volts during brief transients. Provisions for use with a 24 VDC supply can be made upon request when an MSP-1000 is ordered.

AC Voltage: The terminals marked "AC1" and "AC2" on all MSP-1000 Mother Boards must be connected to a 9 VAC, 20 VA Class 2 transformer supplied by Peterson, or the terminals marked "MSP" on a Peterson Console AC Control System. If a Class 2 transformer is used, it must be plugged into a 117 VAC, 60 Hz outlet that is always live (not switched with the organ rectifier, chamber lights, etc.)

Stop Lines: Each Stop pin on the MSP-1000 Mother Board may drive the stop input of an electronic switching system, or an electropneumatic or electromechanical stop coil with resistance of 20 Ohms or greater. A flyback diode is provided within the MSP for each Stop circuit. The MSP is designed for use with systems that require a positive voltage to turn the stop on.

On and Off Coils: Each On Coil Driver pin and Off Coil Driver pin is suitable for driving a coil with resistance of 20 Ohms or greater. A flyback diode is provided within the MSP for each circuit. On and Off Coil Driver pins deliver a positive voltage when active, so the stop action magnet coils must return to "SAM Negative".