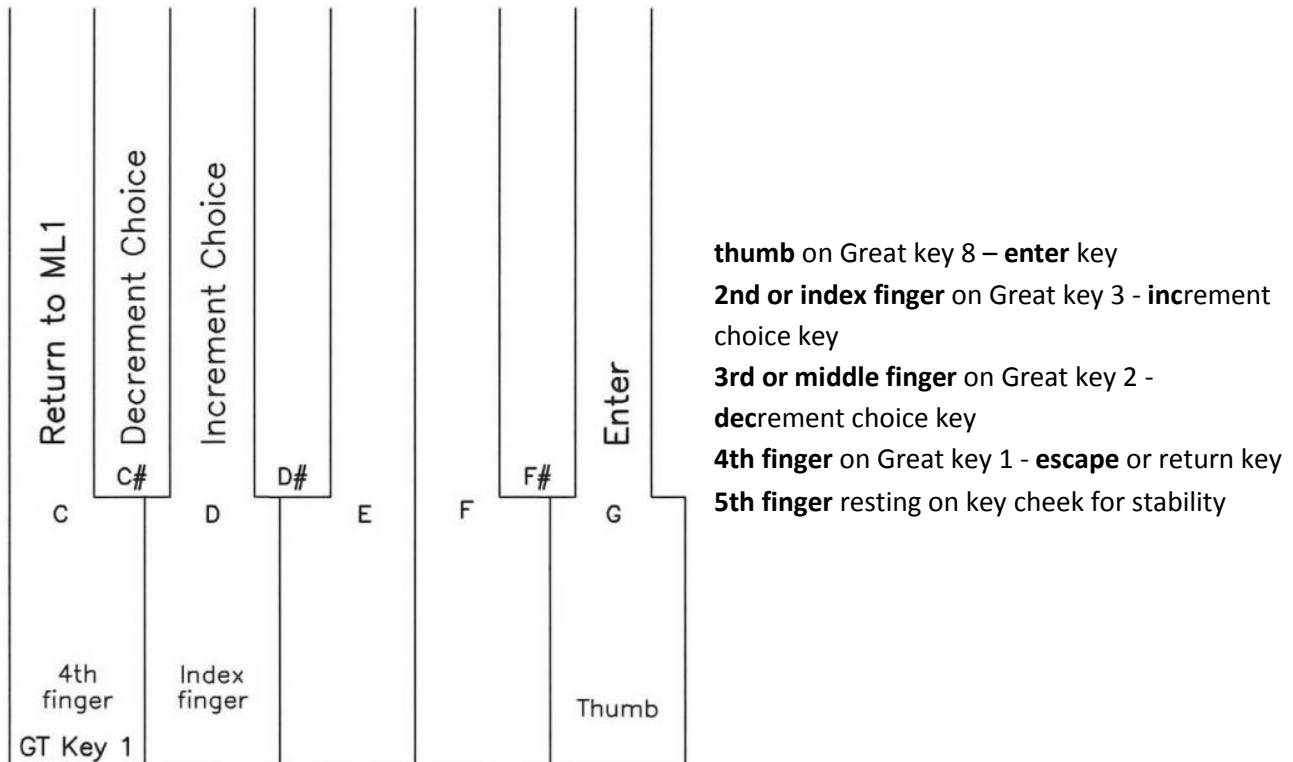


Power Up Programming Overview

After installation and wiring of the generic Input and Output cards, it is necessary to program the CPU card from the wiring pin lists to make each instrument 'unique'.

This programming is done by using Great keys 1-8 with the left hand. The key definitions are consistent throughout the programming sequences as follows:



To access this Power Up Programming sequence from a cold start: hold Great keys 1, 2, and 3, then turn on power.

To access this Power Up Programming sequence from ML1 on the LCD: hold SET piston and Great key 1, then depress the Player/Menu piston.

Please follow the Power Up Programming instructions in numeric sequence, completing each number before proceeding to the next.

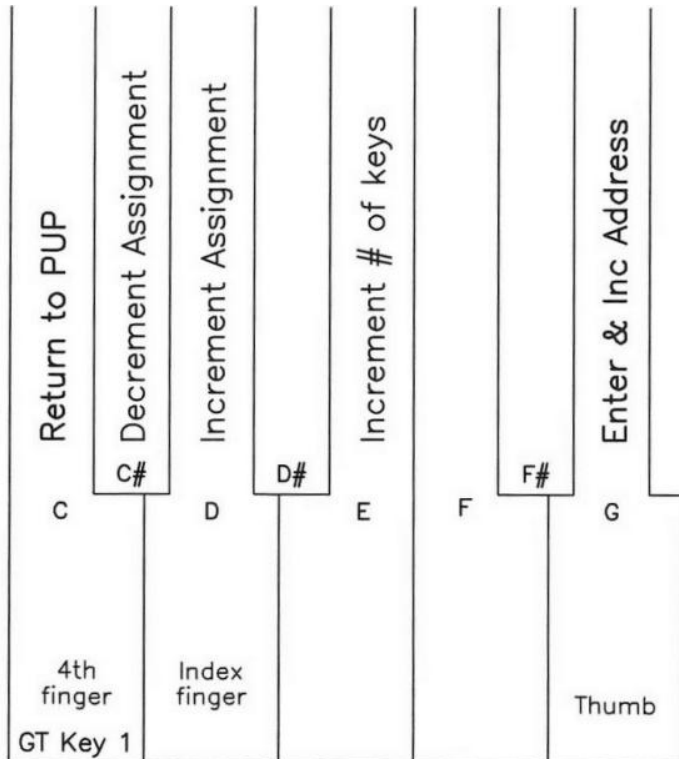
NOTE: When using the optical key contact rails, initial setup of on/off firing points for programming Great keys 1-8 must be done with only the Great keyboard – dip switch address 0 card in the fiber optic loop with the CPU card. To access the setup screen for these firing points, use the cold start holding or reflecting Great key 1 only.

1. Input Card Address Assignments

Each Input Card dipswitch address, from 0 to 15, needs to be assigned a definition as listed in the Wiring Outline-CPU System, IV. Inputs.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview.

Release keys and/or pistons. **1. Input Card Address Assignments** will now be displayed on the LCD.



Enter by depressing key 8 and the first address, 0, with Great/ Div1 will be displayed. By default address 0 is assigned to be the Great/Div1, this cannot be changed. The number of keys in Div 1, and Div 3-9, can be changed using key 5. When choices are correct, depress the 'enter' key 8 and the address will be assigned the definition as displayed on the LCD. When key 8 is released, the LCD will increment to the next address and display the assignment that is stored in memory. Use keys 2 & 3 to select the assignment. When all address assignments are completed, use the 'escape' key 1 to exit. The LCD will auto increment to 2. Inputs Test.

Any address that exists at the board level but does not have any wiring attached must say 'Not Used'.

All addresses that do not exist at the board level, hence not in the fiber optic loop, must say 'Not Used', except when utilizing a floating division. For this, skip a complete card address, that is base address and base+1 address, these being 'not used', then assign the floating division number.

All address assignments can be checked and read from memory by repeatedly depressing the 'enter' key 8.

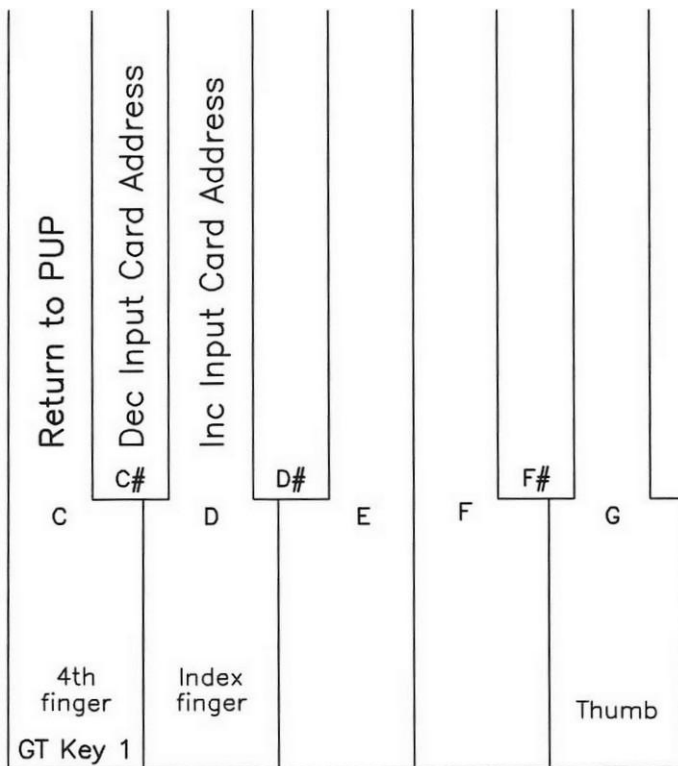
NOTE: When assigning for manual transfers, Div1(GT) and Div4 exchange, or Div5 and Div4 exchange.

2. Inputs Test

This is a read only sequence in Power Up Programming, that is, there is nothing to program into memory.

This sequence gives you a read out on the LCD of any Input that is currently on, a test and diagnostic tool for all of the wiring and programming that you have done to this point. An aid in setting firing points for keyboards, the LCD will read out the pin number at the point of turning on. If there are inputs stuck on, you will see them displayed on the LCD, a quick way to get the inside picture of the total number on and the first one to fix.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **2. Inputs Test** and 'enter' with key 8. The LCD will start with address 0.



Any key that you depress will be displayed at the moment of switch contact, For example if you hold Key 9 only, it will say: "total on: 1 and high pin: 9". The reason for saying high pin is that the LCD cannot display more than 1 pin, so the highest of any multiple of keys will be displayed. For example if you hold keys 9 and 10 down, the LCD will say: "total on: 2 and high pin: 10".

Use keys 2 & 3 to change the address number which equates with the dipswitch setting, and again holding any input that is wired to this dipswitch address will display on the LCD.

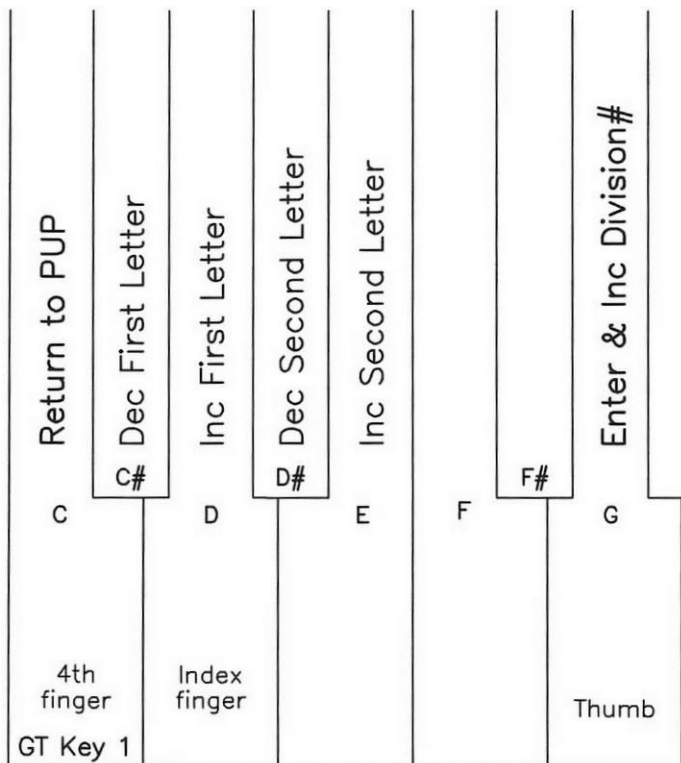
Use great key 1 to escape or exit. The LCD will auto increment to 3. Division Naming.

NOTE: By default address 0 is assigned to be the Great division. Since the first 8 keys of the Great keyboard are the programming keys, they are ignored in this test, but hitting any key from #9 on will give an LCD readout of which key you are holding and the total number on that are being held.

3. Division Naming

This sequence lets you name each keyboard division with a two letter abbreviation that makes sense in organ terminology, rather than using the numbers we assigned in 1. Input Card Address Assignments. By default, Division 1 is the Great division—GT and Division 2 is the Pedal division-PD. Divisions 3 – 9 can be named if they have been assigned in 1. Input Card Address Assignments.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. ‘Increment’ with key 3 to **3. Division Naming** and ‘enter’ with key 8. The LCD will display Division 1 GT.



With ‘enter’ key 8, accept this default and the LCD will increment to the next division number if assigned in 1. Input Card Address Assignments. If Division 2, then PD will be displayed, also a default name that cannot be changed. With key 8, enter this default and the LCD will increment to the next assigned division number. Displayed will be two upper case letters that are stored in memory for this division. If programming from scratch, “AA” will be displayed.

Use key 3 to increment the first letter, key 2 to decrement the first letter if you go too far.

Use key 5 to increment the second letter, key 4 to decrement the second letter if you go too far.

Use key 8 to enter this division name and the LCD will increment to the next assigned division number.

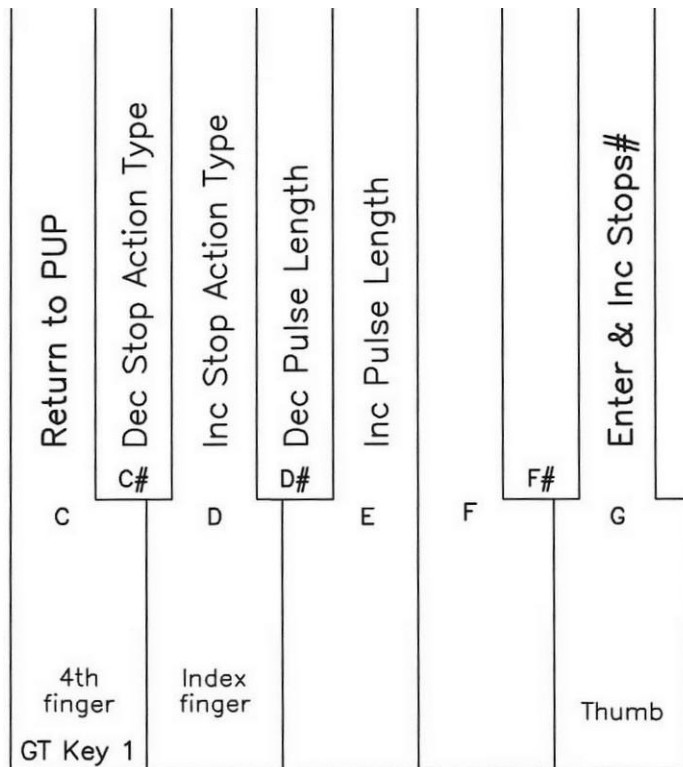
Repeatedly hitting key 8 will display the names of all of the divisions assigned and wrap from highest division to lowest division number.

Use great key 1 to escape or exit. The LCD will auto increment to 4. Stop/Coupler Switch Hardware.

4.Stop/Coupler Switch Hardware

Each StopsX address assignment has to have the type of stop action defined, either SAMs or LEDs. Positional switches that use on/off coils, these are displayed by the name SAMs and momentary switches with some sort of light indication, these are displayed by the name LED's. When defining SAMs, you are able to enter a pulse length, this being the amount of time that the on/off coils are energized to get this positional switch to change or reverse position.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **4. S/C Switch Hardware** and 'enter' with key 8. The LCD will display the settings for Stops1.



Use key 3 to toggle between SAMs and LEDs. If you have selected SAMs, use key 5 to select the pulse length, any number between 5 and 12 scan cycles, 8 being a good medium choice or starting point.

Use key 8 to accept this setting and the LCD will increment to the next Stops address assignment.

Use great key 1 to escape or exit. The LCD will auto increment to 5. Define Pistons.

NOTE: When setting the pulse length, you may want to come back to this programming sequence and experiment with the pulse length in conjunction with the voltage setting of the power supply to the magnet coils. Strive for the lowest voltage that is reliable for the quietest operation, balanced with the shortest pulse length for the least amount of duty cycle required by the power supply. This balance will consume the least amount of energy.

5. Define Pistons

Each Input pin that has been wired to a piston must be defined. The system scans all possible piston input pins as described in the wiring outline and when a piston is 'hit', the definition choice selected on the LCD will be written into memory or defined for this input pin. Every other pin that is not used for pistons must remain undefined.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **5. Define Pistons** and 'enter' with key 8. The LCD will display "Write to Memory" and "Piston 1".

C	Return to PUP	
C#	Dec Piston Definition	4th finger GT Key 1
D	Inc Piston Definition	Index finger
D#	Inc Div# for piston numbering	
E	Inc piston# for piston numbering	
F	Clear All Piston Definitions	
F#	On/Off Div & Piston Numbering	
G	Write/Read Piston Def.	Thumb

Use key 3 to increment the piston pin definition, and key 2 to decrement this definition. Hit the corresponding piston to program the selected definition into the input pin's memory. The LCD will go blank and increment to the next definition when the piston is released. Define general pistons first starting with Piston1, that is Piston 1 on General 1, Piston 2 on General 2, ... continuing with Divisional pistons after completing the Generals. Duplicate toe studs by the same name but wired to different input pins are defined by decrementing with key 2 to this same definition and hitting the toe stud. This will put the same definition with both the manual piston input pin and toe stud input pin.

After defining all Generals and Divisionals, use increment key 3 to skip the remaining piston numbers, up to 128. After piston 128, definitions are O. Rev 1-8 meaning organist programmable reversibles, P. Cancel 1-8 meaning programmable or divisional cancels, B. Rev 1-16 meaning builder reversibles such as Gt/Pd, Sw/Pd, etc., followed by the special function pistons. The final definition choice is "undefined", this means that you are defining the input to **not** be a piston. To be able to define any possible piston input as "Undefined" is necessary if a stop or coupler input pin has been mistakenly programmed as a piston.

If using manual interchanges or piston couplers, divisional pistons must be assigned to their corresponding division and number within the division. When the piston number is selected, toggle key 7 to turn on this div# and piston# within the division. Use key 4 to select the div# and key 5 to select the piston#, and then proceed

with hitting these divisional pistons in numeric increasing sequence. Toggle key 7 when finished with the division.

Toggle key 8 to change the LCD to from 'Write to Memory' to "Read from Memory". This allows the definition in memory to be displayed on the LCD when a piston is hit, thus checking that the definition in memory matches the engraving and defining.

Use great key 1 to escape or exit. The LCD will auto increment to 6. Define Couplers.

NOTE: For manual interchange of B. Rev#s(maximum 2/div): GT or Div1 - B.Rev 1&2, Div4 – B.Rev 7&8, and Div5 - B.Rev 9&10 respectively. For example, when exchanging the GT with the CH (div4), B.Rev1 will exchange with B.Rev7...

NOTE: For manual interchange of P.Can#s, GT or Div1 – P. Can1, Div4 – P. Can4, and Div5 – P.Can5.

NOTE: Check all stops and couplers when in "Read from Memory", they must say undefined.

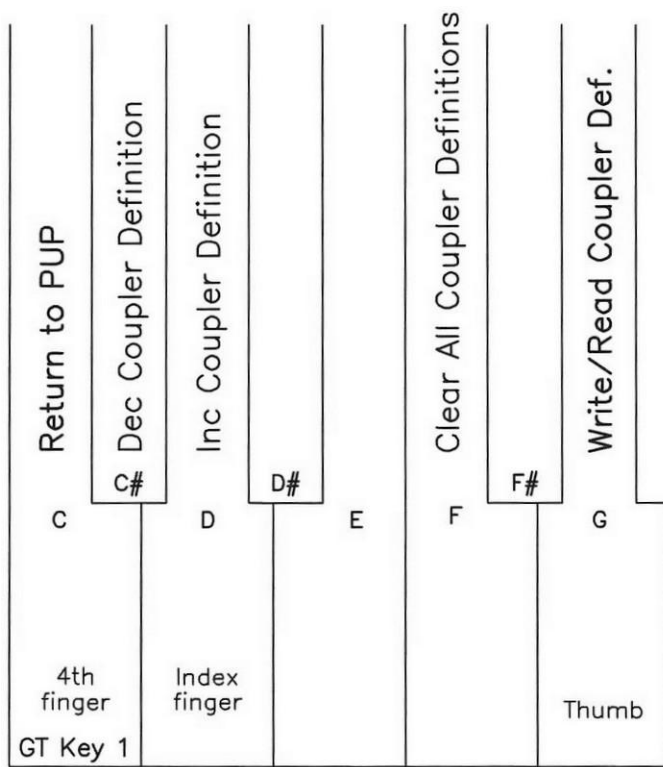
NOTE: If no piston number choice is displayed when entering #5. Define Pistons, this indicates that a possible piston input pin is on, thus blocking inadvertent defining of the pin.

NOTE: Key 6 will clear or erase or "undefine" all possible piston input pins.

6. Define Couplers

Each Input pin that has been wired to a coupler must be defined. The system scans all of the possible coupler input pins from Stops1 and Stops2 Input card address assignments, as described in the wiring outline. If turned on, the definition choice selected on the LCD will be written into memory or defined for this input pin. Every other pin that is not used for couplers must remain undefined.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. ‘Increment’ with key 3 to **6. Define Couplers** and ‘enter’ with key 8. The LCD will display “Write to Memory” and “D1/D1” “GT/GT 16”.



Use key 3 to increment the coupler definition, and key 2 to decrement this definition. Turn on the appropriate coupler to program this selected definition into the input pin’s memory. The LCD will go blank and increment to the next definition when the coupler is turned off.

Use key 3 to skip any definitions that are not needed.

Toggle key 8 to change the LCD from “Write to Memory” to “Read from Memory”. This allows the definition in memory to be displayed on the LCD when a coupler is turned on, thus checking that the definition in memory matches the engraving.

Use great key 1 to escape or exit. The LCD will auto increment to 7. Stop Programming.

NOTE: Check all stops, pistons, MIDI stops, and swell roller pins that are wired to Stops1 and Stops2 input card address assignments, they must say undefined.

NOTE: If no coupler choice is displayed when entering 6. Define Couplers, this indicates that a possible coupler input pin is on, thus blocking inadvertent programming of the pin.

NOTE: Key 6 will clear or erase or “undefined” all possible coupler input pins.

7. Stop Programming

Each stop and swell shoe must be mapped to magnets in the pipe chamber wired to pins on output cards with unique dip switch addresses.

This is done by use of levels, each level being a group of consecutive ascending keys or input pins mapped or programmed to a group of consecutive ascending output pins of the same number, aligned at the low pin of each group.

These levels are calculated from the Input and Output pin lists, and are to be documented on the Programming Levels pin lists before attempting to enter the numbers in this sequence.

Since this is a spreadsheet implementation where levels are rows, these levels can be manipulated by inserting, deleting, and clearing using key 6 for the choice, key 8 to enter, or key 1 to escape.

Any level that is not used must be cleared using the key 6 choice, and when clear, the word “clear” will be displayed next to the level number.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. ‘Increment’ with key 3 to **7. Stop Programming** and ‘enter’ with key 8. The LCD will display “Stop Programming” and “L1”.

C	Return to PUP	D	Dec Choice	E	Inc Choice	F	Dec division qualifier—Ext. SPLs	G	Inc division qualifier
	C#		D#		E#		F#		G#
4th finger GT Key 1		Index finger						Thumb	

Select the desired level with key 3 and ‘enter’ with key 8.

The LCD will display the stop number and move the stop wired to this pin number to the ‘on’ position by use of the combination action. If not the desired stop, then manually select the desired stop, and any other stop that is ‘on’ will go ‘off’ by use of the combination action off coils. Only one stop can be on at a time, the system will search and pulse to have only one ‘on’. Speaking stops are associated with keyboards by turning the stop ‘on’ and will be indicated on the LCD with a number Sx-xx indicating which Stops# from 1-5 followed by the input pin number from 1-64 where this stop is wired. Stop actions, tremolos, and zimmelsterns will be associated with pipe chamber magnets by leaving the stop in the ‘off’ position, which is displayed by S0-0. When correct, enter with key 8.

The LCD will display the division, or input card address assignment that this stop is to be associated with. Select the correct assignment with key 2 (dec) and key 3 (inc). Qualify with key 5 if applicable. All key divisions can be associated with chromatic (cr) or diatonic (c or c+). Key divisions 3-5 can be associated with non-coupling chromatic (crn) or diatonic (cn or c#n). Stops1 can be qualified with swell box (sb) - CPU version or chime volume (cv) - CPx update. AtoD is qualified with the channel number. When correct, enter with key 8.

Use keys 2 and 3 to choose the lkey (low key) or linp (low input) of the input group, and enter with key 8 when correct.

Use keys 2 and 3 to choose the hkey (high key) or hinp (high input) of the input group, and enter with key 8 when correct.

Use keys 2 and 3 to choose the ocaddr or dipswitch address of the output card to which the output group is wired low, and enter with key 8 when correct.

Use keys 2 and 3 to choose the lpin (low pin) of the output group that is to align with the low key or input of the input group, and enter with key 8 when correct. This will finish the level, cancel the selected stop if one was on, and increment to the next level number.

Use great key 1 to escape or exit. The LCD will auto increment to 8. MIDI.

NOTE: Two levels are required for straight chest stops, one level for the stop action (stop not turned on) and one level for the key primaries (stop turned on).

NOTE: Any level that is not used must be cleared using the key 6 choice, and when clear, the word "clear" will be displayed next to the level number.

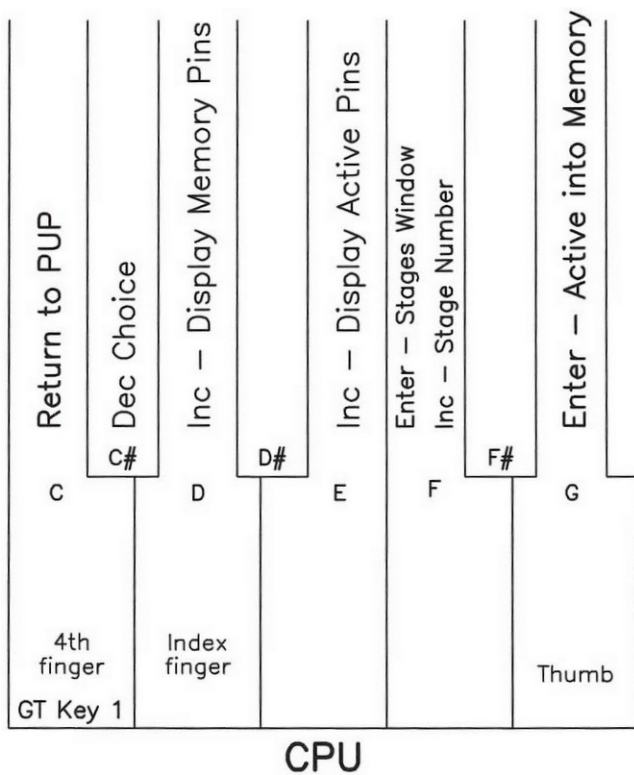
8. MIDI-CPU

Musical Instrument Digital Interface is embedded in the system in the form of MIDI stops and MIDI volume. These options, required to be wired to Stops1 Input card address assignment, have to be assigned and captured in this routine.

The Stops Mask Assignment is a group capture or snapshot (subset) of the 64 input pins assigned to Stops1 that are wired to MIDI stops.

The MIDI Volume is again this idea of a group capture or snapshot (subset) of the 64 input pins assigned to Stops1, group captured in every incremental contact roller position, that is, from no contacts made incrementing to all contacts made.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **8. MIDI** and 'enter' with key 8. The LCD will display "MIDI Setup" "Stops Mask".



Use key 3 to choose either Stops Mask or Volume and enter with key 8.

If Stops Mask, then the LCD will display a line for what has been stored in memory and an active line for what stop actions are physically on. This is done with a number for the total number of pins followed by a S1-xx number which indicates the lowest pin number of this mask assignment subset of Stops1(S1). To capture the MIDI stops mask assignment, physically turn on all MIDI stops at the same time. You will see the total number on followed by the S1-xx. To see all of the xx pin numbers that are part of this active total, use key 5. 'Enter' the active stops into memory by using key 8, this changes the memory line to look exactly like the active line. To see or verify all of the xx pin numbers that are part of this memory total, use key 3. When the memory line reads exactly as the active line, exit or escape with key 1.

If Volume, then the LCD will display the choice of AtoD, Swell box roller, or Disable(d). If you are not using the MIDI volume feature, this must say or be disabled. Choose with key 3 and enter with key 8. If AtoD or Disable, then the LCD will proceed to 9. C.A. Fields. If Swell Box Roller, then the LCD will display the memory and active lines to be used for the total number of contacts on the roller. Engage all contacts in the full open position and 'enter' with key 8, this changes the memory line to look exactly like the active line. Then select key 6 to proceed to the individual stages of the swell box roller, beginning with stage 1, and with repeated hits of key 6,

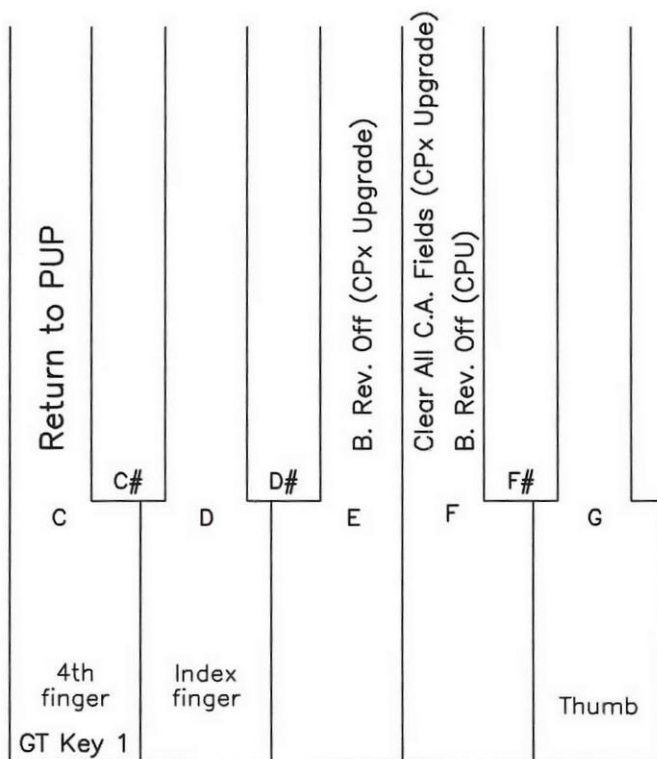
incrementing to the number of contacts + 1. At each stage number, activate the contacts desired to be on and 'enter' into memory with key 8. At any time keys 3 and 5 can be used to display the pin numbers that make up the total on. When completed for all stages, exit or escape with key 1.

9. C.A. Fields

Pistons can act on any or all of the input pins that have been programmed as couplers, stops, and/or MIDI stops in the previous PUP sequences, 6. Define Couplers, 7. Stop Programming, and 8. MIDI, respectively. The pistons now need to be told which of these inputs to act on. Some names for this process include: scope, range, mask, subset, or field. This is the process of defining a 'general' or 'divisional' piston (pistons 1-128) as well as what will reverse with a 'reversible' and what will cancel with a 'programmable cancel'.

In this routine the pistons and stop actions act just as they would in ML1 as a 'capture' combination action.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **9. C.A. Fields** and 'enter' with key 8. The LCD will display "C.A. Fields".



The LCD does not need to display anything. Hit any piston to physically display the field in memory, that is the stop actions will move. Capture a field by hand registering the field, hold the Set piston in and hit the desired piston. Cancel all stop actions with the General Cancel. When setting a reversible, there are two aspects to this process, setting the 'On' side and setting the 'Off' side. When the LCD is blank except for the C.A. Fields on the top line, setting a reversible is setting the 'On' side. By default, the 'Off' side is set at the same time as setting the 'On' side. If additional stops actions are desired on the 'Off' side, select key 5 (or 6, see note below) to access the B. Rev. Off side which is indicated on the LCD. Now 'capture' the 'Off' side, the 'On' side will not change. Key 5 (or 6, see note below) can be toggled at any time.

Key 1 will exit or escape and the LCD will return with 10. Memory Configuration.

NOTE: To access the B.Rev. Off in the CPx Upgrade, use key5, else use key 6.

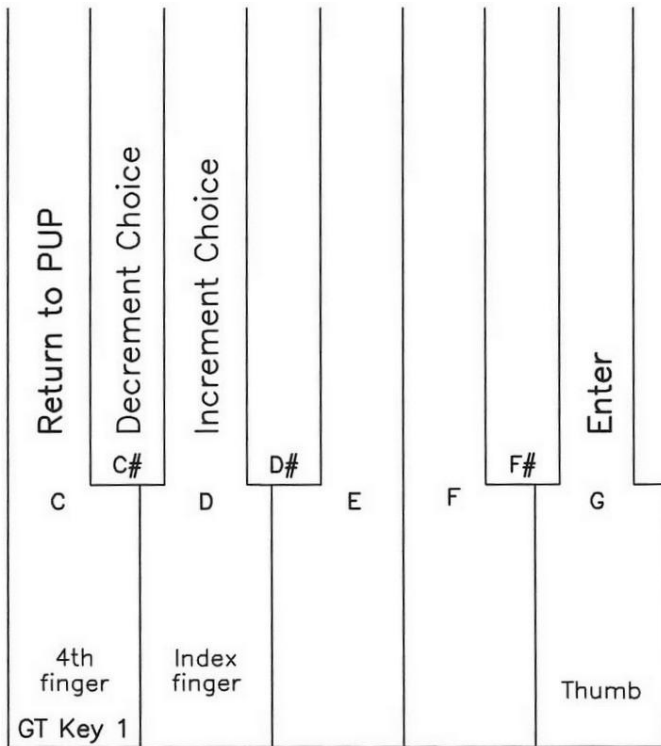
NOTE: Use key 6 to clear all combination action fields, this choice is only available in the CPx Upgrade.

NOTE: Reversibles to not reverse, they only show what will reverse when returning to ML1.

10. Memory Configuration

Various aspects of system memory and system configurations are set in this routine, if they apply, such as number of memory levels, LCD format, p/g split, allowing special function pistons to work with keys on or all off, FFF display word, access to extended programming levels, virtual MIDI address, and memory backup. What applies depends on CPU or CPx Upgrade software. All routines are self-explanatory.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **10. Memory Config** and 'enter' with key 8. The LCD will display "Memory Config" and either "Memory Levels" or "LCD Format".



Use keys 2&3 to select and key 8 to enter.

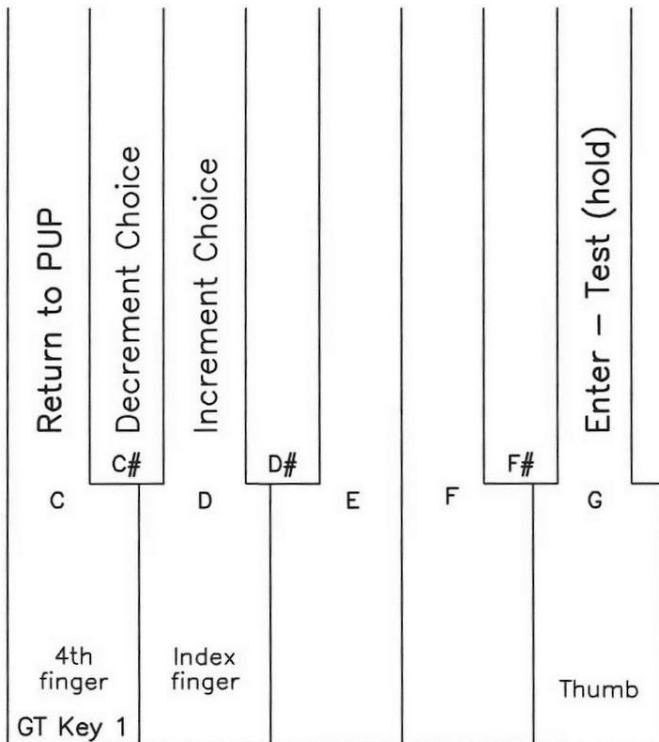
Then again use keys 2&3 to set the configuration and key 8 to enter this new configuration into memory. Version CPU will take you back to Memory Level selection and version CPx will take you to the next selection. Either way follow display and use keys 1, 2, 3, and 8 as directed.

Key 1 will exit or escape and the LCD will return with 11. Hardware Tests.

11. Hardware Tests

Various aspects of system memory and hardware interfaces can be tested here for system diagnosis and verification, such as LCD display, SRAM, and serial ports to console and pipe chamber. All routines are self-explanatory.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **11. Hardware Tests** and 'enter' with key 8. The LCD will display "Hardware Tests" and "LCD"



Use keys 2&3 to select and key 8 to enter.

If LCD test, a form of all blocks on and all blocks off should cycle for visual test.

If SRAM, hold key 8 until Pass/Fail appears.

If Clear SRAM, wait for memory to be erased at which time the display will go back to 1. Input Card Address Assignments to start the programming sequence from scratch. This is potentially a non-reversible condition in the CPU version.

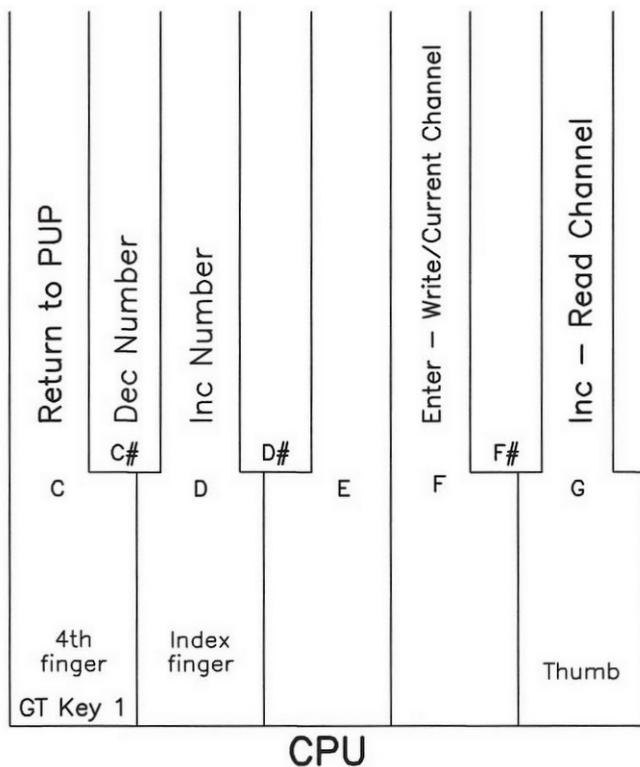
If Serial ports, then select console or chamber and hit and hold key 8 to start and run test. If console, hold key 8 until Pass/Fail is indicated on LCD. If chamber, hold key 8 until LCD changes back to serial port selection. If notes are heard from the pipe chamber circuit boards, then test failed, else test passed.

Key 1 will exit or escape and the LCD will return with 12. A to D.

12. A to D - CPU

Analog to Digital is the interface whereby a potentiometer is used to measure an expression pedal position (analog) so that this variable voltage reading can be converted to a number (digital) for communication to the CPU card. Each pedal is hooked to its own potentiometer, thus making for a unique channel number. This channel number has to be defined by use, low number (closed position), high number (open position), and number of contacts that are going to be mimicked if this was the old style discreet contact roller. When defined as the crescendo, each 'virtual' contact is treated as a general piston.

Enter the Power Up Programming Sequence as instructed in Power Up Programming Overview. 'Increment' with key 3 to **12. A to D** and 'enter' with key 8. The LCD will display "AtoD" and "enabled" or "disabled".



Follow the directions in the wiring outline to enable the AtoD option. Hit key 8 again to bring up the display for channel 1.

Use key 8 to increment and display the memory contents of each channel from ch1 to ch8.

To program the current channel, hit key 6 and a blinking block will appear at the first letter of the channel definition.

Choose definition with key 3 and enter with key 6. The blinking block will move over to the low position number.

Move pedal to closed or off position and enter with key 6. The blinking block will move over to the high position number.

Move pedal to open or maximum position and enter with key 6. The blinking block will move over to the # of contacts.

Use key 3 to select the number of contacts to mimic and enter with key 6. The blinking block will disappear and the channel number will increment and display the settings for this next channel.

Key 1 will exit or escape and the LCD will return with 1. Input Card Address Assignments.