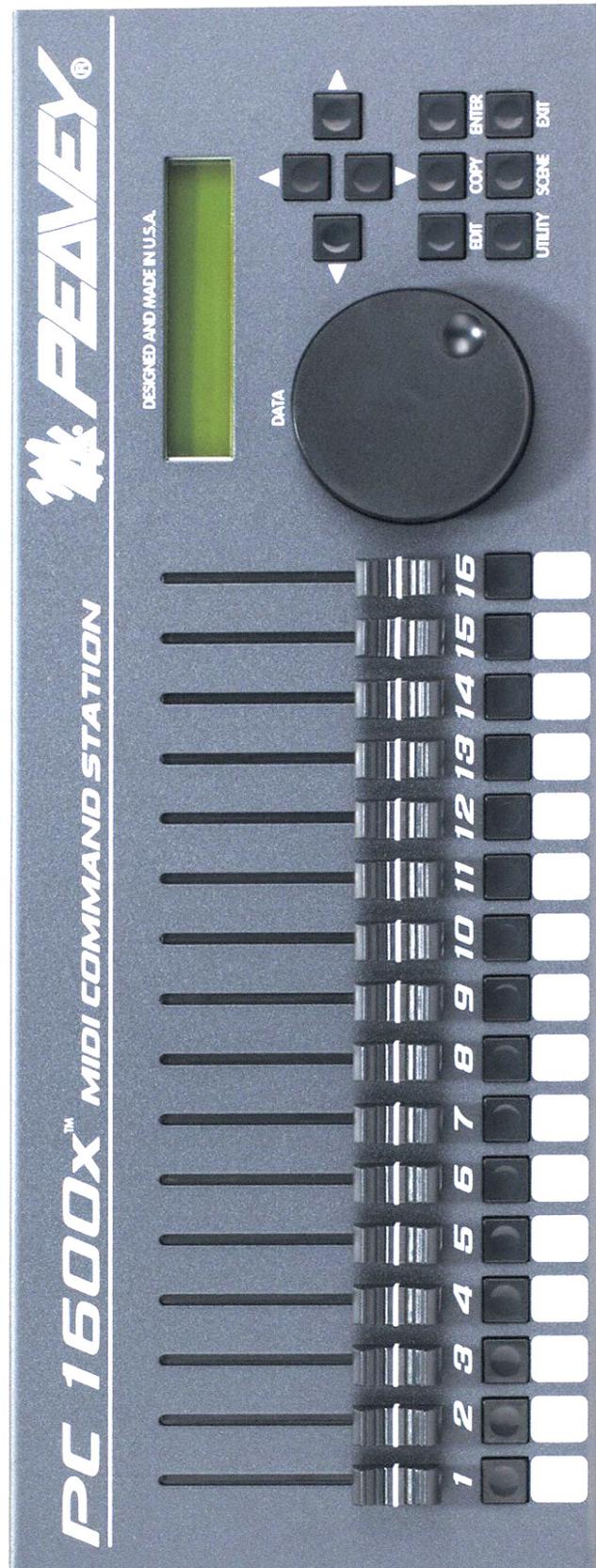


Peavey



PC1600X



CAUTION: Risk of electrical shock DO NOT OPEN!

CAUTION: To reduce the risk of electric shock. Do NOT REMOVE COVER.

No user serviceable parts inside.

Refer servicing to classified service personnel.

WARNING: To prevent electrical shock or fire hazard, do not expose this appliance to rain or moisture.

Before using this appliance read the operating guide for further warnings.

PC1600X Firmware Versions

Version		
2.1	Had some small fixes over 2.0	Not documented as well as latter ones, so you might want to update if you have 2.0
2.2	Yamaha-style checksums supported in SysEx strings	Not just Roland checksums
2.3	Added a version request message so computer editors could "ask" the unit which software version it has	Fixed the scene receive MIDI message to take all 100 scenes, not just the first 50. It also fixed the MIDI maps to be able to point to all the scenes.

NOTE: most users don't need anything past 2.1

Introduction

Congratulation on your purchase of the PC1600X MIDI Control Station This is THE MIDI command station for digital workstations, sequencer control or remote MIDI editing. As a matter of fact the PC1600x will edit and control just about ANY MIDI device. Fifty factory presets give a good representation of its power and all fifty are completely user-programmable MIDI data is transmitted using the following controllers:

1. Sixteen programmable 60mm faders: Which can be assigned to transmit continuous controller data like, volume, pan or any MIDI String (i.e. Channel System Messages). Also any fader can be the master over any of the other faders. To simplify operation each fader can be individually named.

2. Sixteen programmable buttons: which can be assigned as: fader mute, fader solo, program change, note on/off, MIDI string, MIDI string with button press & release (2 messages), MIDI string toggle (2 messages), fader send, scene send and fader identify. Like the faders each button can be named. Also buttons can be accessed remotely via Note or Program Change messages.

3. Data wheel: The "Data Wheel" can be linked to a fader or Control Voltage input and duplicate it's Programming. It can also transmit the value of the last fader moved.

4. Two Control Voltage Pedal Inputs: The 1600x allows you to plug in and assign CV pedals. These are assigned like the faders. The CV 2 jack can also sub as a dual footswitch input.

The PC1600x has even more "under the hood!"

100 scenes: Just in case there comes a time when you would like to save your fader's physical position. (like when mixing). the PC1600x offers 100 scenes that can be saved and recalled as needed. This feature is extremely useful for MIDI light controllers, MIDI mixing, MIDI controllers, etc.

Three Merge Modes: When MIDI connections place the PC1600x between the source of data (sequencer, etc), and the destination (tone modules. etc) it can merge with controller data coming into it in a variety of ways.

Three modes are available:

1... Merge - Fader movements are merged with incoming data.

2... Replace - Same as above, except that when the fader is moved, incoming data is filtered and replaced by data generated by the fader. Fader position determines the value transmitted

3... Update - When the fader is moved. its data matches the last value of the incoming data regardless of fader position. This allows seamless modification of the incoming data.

MIDI Filtering: The PC1600x contains an extensive MIDI filtering section.

Programmable Set-up string: Along with all of the faders, buttons settings a MIDI Set-up string can be transmitted when a preset is selected. This string can send Bank select, Program Change and Volume settings for ALL 16 channels. In addition a scene and a MIDI string of up to 80 bytes can be sent.

Easy Synth Programming: The PC1600x will accept presets Pre-programmed for editing. We've made this as "Painless as possible, by designing specific presets for the PC1600x that are stored in the Spectrum Synth, Spectrum Organ and Spectrum Bass LL. You simply transfer them to the PC1600x. and you instantly have fader and button control over all the parameters. Now, without ever having to deal with hexadecimal SysEx messages you can edit presets quickly and spend more time getting work done.

The PC1600x will revolutionize your MIDI set-up Hook it up to your computer keyboard or other MIDI device and take your music to another level.

Contents

What's New With The "X"	9
Front Panel Description	12
Back Panel Description	14
<hr/>	
Fast Start	15
Connection	
Overview	
Changing Presets sending Current Values	
Resetting Replace/Update Mode	
Interface 101	
Utility Menu	18
Navigation	
View angle and MIDI Channel	
MIDI Filter	
Preset Mapping	
Program Change Enable and Current map Status	
Dumping Internal Data	
Footswitch Assignments	
Device Number and Note recording Receive Channel	
MIDI Transmission delay	
Remote Button Set-up	
Individual Preset Initialization	
Memory usage	
Scenes	24
About Scenes	
Sending A Scene storing A Scene	
Scene Reset/initialization	
Preset setup string Scene editing	
About Presets and Editing	26
Initialization/Reset	
Unit	
Preset	
Edit Introduction	
Naming and Saving A Preset	
Exiting Edit Mode Accessing Global setting with Special MIDI messages	

Editing The Faders	29
Defining and Naming	
No Message	
Continuous Controller	
Master Fader/CV	
MIDI strings	
Dealing with Checksum Values	
Assigning String Device IDS and MIDI Channels to Global settings	
Learn Mode	
Saving Your Edits	
Editing The Buttons	34
Defining and Naming	
Off/Fader ID (No message)	
Mute/Solo Fader	
Program Change	
Note On/Off	
MIDI Strings	
String Prs/Rls	
String Toggle	
Assigning String Device IDs And MIDI Channels To Global Settings	
Responding To Remote Velocity Messages	
Learn Mode	
Send Fader	
Note Stream Recording	
Send Scene	
Saving Your Edits	
Editing The CV Pedals, Footswitches and Data Wheel	42
CV 1 & CV 2	
What Type Of Control Voltage Pedal	
Footswitch (see Utility section for more information)	
Data Wheel	
Defining The Preset Setup String	43
Bank/Program Change/Volume	
About Bank Select	
Scene Recall	
MIDI String	
Learn Mode	

Contents

Copy Menu	45
Copying From The Main Menu	
Copying From The Edit Menu	
Appendix A: System Exclusive Messages	46
Appendix B: Parameter Formats	47
Appendix C: MIDI Implementation Chart	49
Appendix D: MIDI Controller Listing	50
Appendix E: Taking The Vex Out OF HEX	51
Appendix F: MIDI 101	54
Appendix G: Schematic	56

What's New With The X?

The “X” stands for expanded! We've started with the modular PC1600 and added extensive new features along with a NEW look!

Expanded SysEx Control

Checksum

Now it is possible to designate a byte as “cs” for checksum calculations.

Global Channel Bytes

Many MIDI products use SysEx messages that include a MIDI channel and/or device ID. This is of course handy for differentiating among multiple units of the same type. Normally changing this byte would require editing of each fader/button individually. Now a new byte can be a part of the string that specifies the global MIDI setting or Global device ID. By simple changing the Global Setting all messages are changed.

Expanded Button Facilities

Send Fader

This feature provides an easy way to send specific fader values, when a button is set to “send faders it must be pressed to enable a fader value to be transmitted. Fader movement is used to select a specific value and the button is pressed to send it. By the way continuing to hold the button down will enable the fader to work as usual.

Send Scene

This new button function allows any scene to be sent from any of the 16 buttons.

Fader ID

With a button programmed to “Off/Fader ID.” Dressing the button displays the fader name.

Remote Control

All 16 buttons can now be triggered externally via MIDI notes or program change messages. This is particularly handy for control from a foot pedal.

Note Capture

This makes it easy to capture clusters of notes (cords) and assign them to a button.

Left Arrow (Mute) Button

When the Left Arrow button is pressed, the PC1600X will not generate any MIDI messages. (Only non-filtered messages arriving at the MIDI In will be echoed).

Preset Initialization

This new utility feature allows a preset to be returned to an initialized state. This is handy for programming from “scratch” or freeing up more dynamically allocated preset memory.

Enhanced Scene Features

Preset Identity

The scene display now indicates the associated preset number.

Scene Initialization

This new scene function allows an existing scene to be initialized, which dissociates it with any preset.

Setup String Additions

Scenes

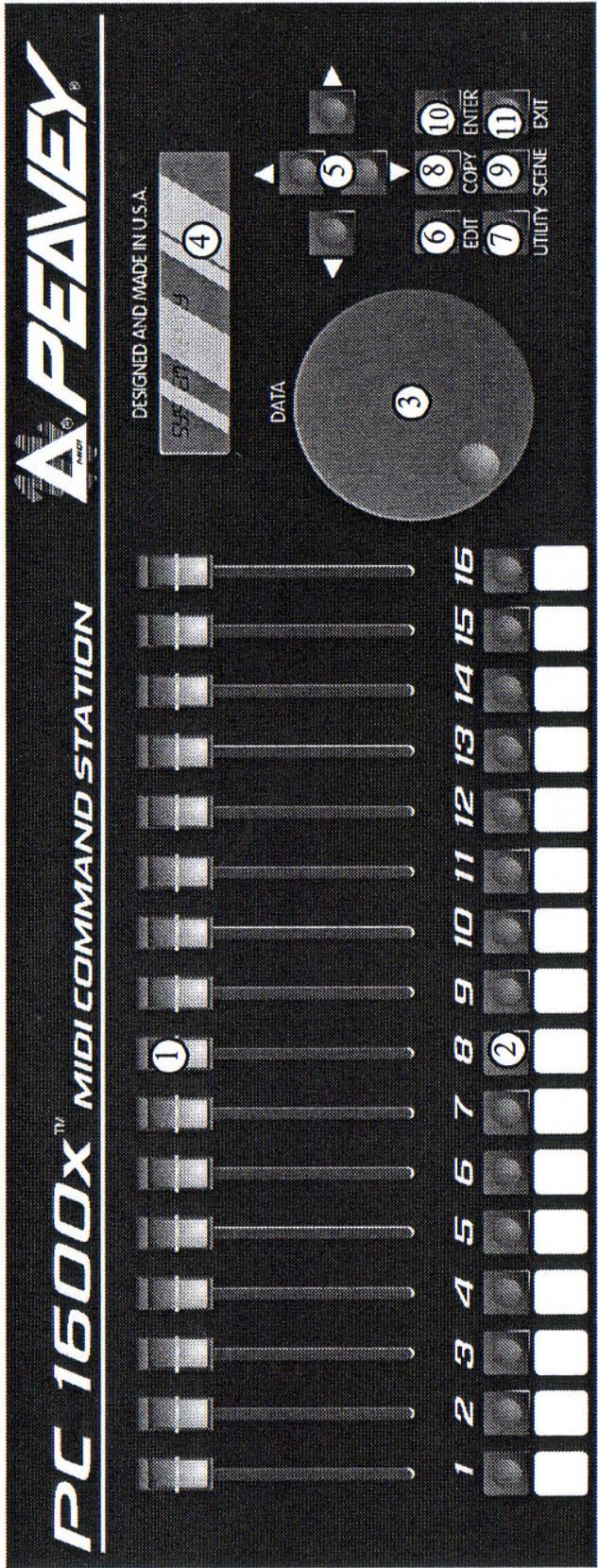
A scene can now be assigned to each preset. Any time the preset is recalled, the scene will be transmitted.

Flexible Bank Select

Bank Select editing is now expanded to include MSB or LSB programming.

New factory Presets

Fifty presets are available that present a wide range of applications.



Front Panel

1. 16 Faders:

Each of the programmable faders can be assigned the following functions: No Message, Continuous Controller, Master fader, MIDI string.

2. 16 Buttons:

Each of the programmable buttons can be assigned the following functions: Fader ID, Fader Mute, Fader Solo, Program Change, Note-on/Note-off, MIDI String, MIDI String, Press and Release, MIDI String Toggle, Send Fader, Send Scene.

3. Data Wheel:

This is a high-resolution device, which allows fine adjustment of any fader or control voltage value. The data wheel can be linked to a fader or Control Voltage input and duplicate its programming. It can also transmit the value of the last fader moved.

4. Display Window:

This is a 20 character by 2 line, Liquid Crystal Display (LCD) with adjustable contrast.

5. Direction Buttons:

The Up, Down, Left, Right direction buttons are used to navigate through the user interface. The Up/Down buttons also serve as increment and decrement buttons to edit parameter values and chance presets. The left arrow button also doubles as a MIDI mute button.

6. Edit Button:

This button accesses all parameters stored within a preset.

7. Utility Button:

This accesses all global functions of the PC1600X.

8. Copy Button:

The Copy button is used to copy from one preset or scene to another. It is also used to copy individual messages.

9. Scene Button:

Scenes are “snapshots” of the current fader and CV values. in addition to the current preset number. This button is used to save, store and initialize.

10. Enter button:

This button is used to execute functions whenever “Enter” appears in the Upper or Lower right hand corner of the display. When the main page is displayed, pressing this button sends the current message for each fader and CV input. The display will read “Sending Faders/CV’s.”

11. Exit button:

This button is used to escape from any menu. Pressing Exit several times will always return you to the main page. Pressing Exit from the main menu page can reset the controller filtering of the update/replace merge modes. The display will read “Replace/update reset.”

PC 1600x™
MIDI COMMAND
STATION

1 16 VAC LAMP

2 POWER

3 CV1 FISH TAIL

4 CV1

5 MIDI OUT

6 MIDI IN

WARNING
 ⚠️ **TRISK ELECTRONICS STOCK**
DO NOT USE!
 WARNING: TO PREVENT THE
 POSSIBILITY OF FIRE OR
 TO HARM OR VIOLENCE
 ALWAYS DISCONNECT THE POWER
 THROUGH THE MAIN POWER

A PEAVEY®
 A PRODUCT OF PEAVEY ELECTRONICS CORP.
 MERIDIAN, MS. MADE IN U.S.A.

THIS UNIT COMPLIES WITH THE LIMITS FOR A CLASS B COMPUTING DEVICE
 PLUS QUANT TO SUBPART 15 OF FCC RULES

Back Panel

1. Power Supply Input:

Use only the 16 (VAC) 1000ma adapter provided. (Peavey part#: 709006601)

Caution: Use only the 16VAC Power Supply provided with this product. If the original Power Supply must be replaced, consult your Peavey dealer or the factor for the correct replacement. Failure to use the correct Power Supply could result in fire, shock hazard, extensive circuit damage, decreased performance, non-operation loss of gigs, frustration, cursing, marital problems and an all-around bad day.

2. Power Switch:

Turns the PC1600X On and Off.

3. CV 2 / Footswitch 1 & 2:

This input accepts a control voltage foot pedal in addition to a single or dual footswitch. The foot pedal is programmable per-preset and functions the same as a fader. Each footswitch can be assigned to one of the following functions: up (Inc.), down (Dec.), “Enter” or duplication of a button (1-16) Polarity is automatically detected at Power-On.

4. CV 1:

This input accepts a control voltage foot pedal and is programmable to function the same as a fader.

5. MIDI OUT:

This transmits all data generated internally. This also acts as a MIDI THRU for all unfiltered messages received by the PC1600X.

6. MIDI IN:

This accepts commands to be interpreted by the PC1600x. It also accepts data to be echoed to the MIDI OUT back.

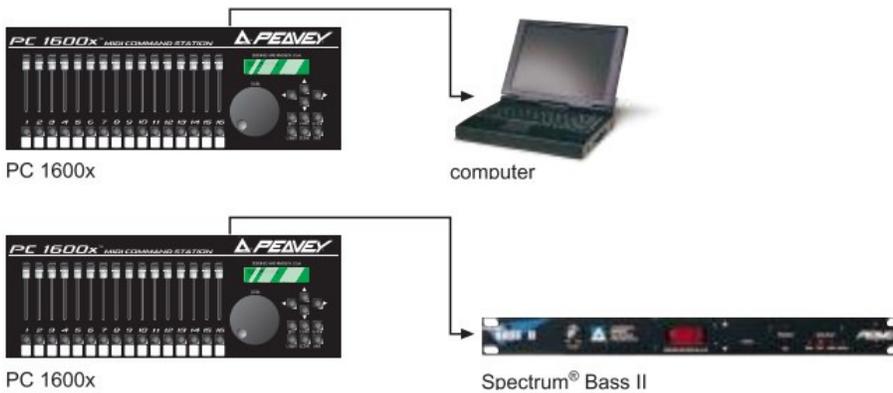
This section is designed to set you up and running quickly.

Connection:

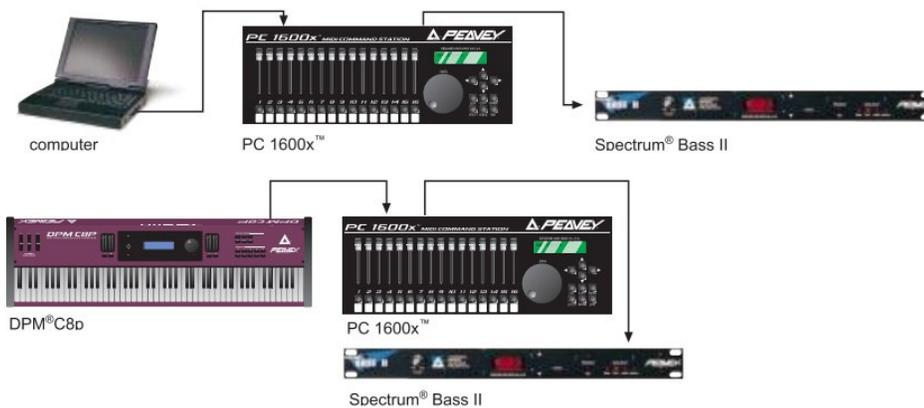
The PC1600X MIDI command station is ideal for digital workstations, sequencer control or remote MIDI editing. Your specific application will dictate the proper MIDI connection.

The PC1600x is connected one of three ways:

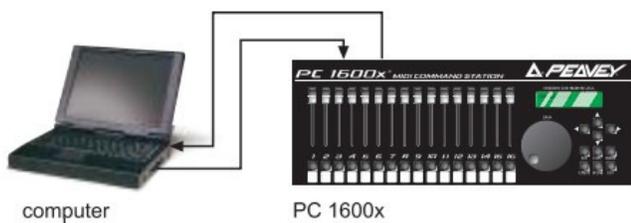
Directly to a Device



Between Devices



Two-Way



Overview

The display shown below is an example of the main display of the PC1600X. Pressing the EXIT button several times will return to this page from any menu. Information shown on this page includes the current preset number. Current preset name and information about the last fader or button moved.

00 Volume with mute Fdr01=C1

Changing presets:

The PC1600x has 50 presets numbered 0-49. The current preset can be changed using the Up/Down buttons or by an incoming program change when a MIDI map is enabled. A footswitch assigned to duplicate the Up/Down buttons can also be used to change presets while on this page. Lastly a system exclusive message can be used to change presets (see Appendix A).

Sending current values:

Pressing the “Enter” button while on the main page will send the current message for each fader and CV input. The display will read “Sending Faders/CVs”. This allows the PC1600X to cancel a soloed fader or update external devices.

An Example:

Suppose the current preset is programmed to send MIDI volumes on each channel and the PC1600X is connected to a sequencer. Pressing “Enter” from the main page at the start of a sequence allows all initial volumes of the sequence to be recorded. Simply set the position of all defined faders start the sequencer recording, then press “Enter” All following fader movements will track smoothly from this initial setting.

Resetting Replace or Update more with the EXIT button:

A fader defined as a continuous controller can be out in a mode that allows it to replace or update a matching controller message passing through the PC1600x. As soon as the fader moves and sends its message, the PC1600X begins filtering matching incoming messages. Press the Exit button from the main display page to cancel this filtering allowing the incoming message to pass through the PC1600X. The display will confirm this operation with “Replace/Update Reset” See page 21 for more information on this feature.

INTERFACE 101

The user interface is based around the 20 x 2 display and the four navigation/arrow buttons. Like most devices the PC1600X is very easy to use as soon as you learn how. Fortunately with the PC1600X the interface is both straightforward and simple to learn. Most features of the PC1600X can be programmed by understanding only a few basic concepts.

The **Edit, Utility, Scene and Copy** buttons are used to access various menus.

The **Up/Down** direction buttons serve three major functions:

1. When no parameters are flashing these buttons select different Data within a menu.
2. When a parameter is flashing on a particular page the Up/Down buttons set the parameter's value. On all pages except the main page the **Data Wheel** has the same function as the Up/Down buttons.
3. They are used to change presets when on the main page.

The **Left/Right** direction buttons select the parameter to be adjusted for a given Page. If other pages are available within the menu scrolling past the left-most or right-most parameter causes all parameters to stop flashing.

Note:

The **Up/Down** and **Left/Right** buttons are auto-scrolling, they will repeat at a fixed rate if you hold one down. To speed up the scrolling, press the opposite direction button after pressing the first (i.e. press and hold the down button. Then press the Up button to decrement much faster.)

Pressing the **Exit** button while a parameter is flashing will always stop that parameter from flashing. Pressing the Exit button when no parameter is flashing will always leave the current menu. Several presses of the Exit button will return you to the main page.

The **“Enter”** button is used in several places to cause a function to be executed. Except for the main page, “Enter” appears in the Upper or Lower right corner of the display if it is to be used.

The programmable **Faders, Buttons** and attached **CV Pedals** are all used to transmit MIDI messages. In addition, the **Data Wheel** can duplicate the action of a fader or CV input.

NAVIGATION

1. Press the Utility button to access the utility pages.
2. Use the Up/Down direction buttons or the data wheel to scroll through the different utility pages.
3. When the correct utility page is displayed, use the Left/Right direction buttons to activate the desired parameter on this page. A parameter is active when the field blinks.
4. Use the Up/Down direction buttons or data wheel to edit the value of the parameter while the parameter is blinking.
5. Press the Exit button once or use the Left/Right direction buttons to de-select (stop all fields from blinking). Now return to step 2 to edit a different parameter or press the Exit button a second time to return to the main page.

VIEW ANGLE & MIDI CHANNEL

The VIEW parameter adjusts the contrast of the display to allow for different lighting conditions or viewing angles, to adjust the view angle:

1. Press the Utility button.
2. If not displayed, use the Up/Down buttons or Data Wheel to access the following page:

UTIL: View	ChIn	ChOut
0	01	01

3. Cursor right once to activate the “View” field and use the Up/Down direction buttons or data wheel to edit the view angle.

Separate MIDI channels can be set for incoming MIDI messages and transmitted MIDI messages. The “ChIn” parameter is used to set the receiving MIDI channel of the unit. The PC1600X will only respond to incoming messages received on this channel. The “ChOut” parameter is used to set the transmitting channel of the unit. Any messages set to transmit on the main channel use this parameter. Use the same procedures listed above to access the MIDI parameters.

Note: For the PC1600X to receive the SysEx messages as listed in Appendix A, the ChIn value set on this screen must match the channel byte in the message.

Many devices use SysEx command strings that include a MIDI channel or device number as one of the bytes. This practice is beneficial to the user since it allows separate SysEx control when differentiating one unit from an identical unit on the same MIDI stream.

Instead of hard coding these values into the strings a “gc” (global channel) or “dv” (device number) byte can be designated that references the global setting. By altering this Utility setting all strings can be altered simultaneously. When the PC1600X sees a “gc” in the string, it will transmit the ChOut setting. When it sees a “dv” in the string, it will transmit the DevNum variable (see the “Device Number...” section in this chapter).

MIDI FILTER

Selecting which MIDI messages will pass from MIDI IN to MIDI OUT is handled by the MIDI filter utility. Individual messages or all MIDI messages can be filtered allowing only certain incoming messages to pass to the MIDI OUT. The following messages can be filtered:

- All MIDI (overrides all others when set to filter)
- All Notes
- Mod Wheel
- Foot Pedal
- Volume
- Sustain
- Reset Controllers
- ALL Notes Off
- Program Change
- Polyphonic Aftertouch
- Channel Aftertouch
- Pitch Bend
- System Exclusive
- System Common
- System Real-time

To set the status of a filter:

1. Press the Utility button.
2. Use the Up/Down buttons or data wheel to access the following page:

UTIL: Midi-Filter Notes=Pass

3. Press the right direction button once to edit the filter tulle. Use the Up/Down buttons or data wheel to display the different filter types. The field on the right displays whether the data is filtered or passed to the MIDI OUT jack.
4. To toggle between “pass” and “filter.” simply press the right direction button while the filter type field is active. The filter type field remains active until the left direction or Exit button is pressed.

PRESET MAPPING

In its default state, the PC1600x will echo Program Changes, but not respond to them. To make it respond, you must go to the “MAP: Curr Midi map” screen and switch on one of the three map’s (instead of “Off”). Then the PC1600X will respond to Program Changes on its MIDI IN channel (“ChIn” parameter on the first utility screen) according to the mar). Mapping allows each of the 128 MIDI program change messages (0-127) to recall any preset or send any scene. Follow the stems below to select which preset is recalled or which scene is sent in response to a received program chance message:

1. Press the Utility button.
2. Use the Up/Down buttons or data wheel to access the following page:

MAP1: Prog 000->prs000 Preset Name Here
--

3. First cursor right to the digit after “MAP” Editing this value selects which MIDI map will be edited. This

should not be confused with the current MIDI map described below.

4. Cursor right again to the third field which displays a preset or scene number, this is the preset number recalled or scene sent when the program change value in the second field is received. If a preset is selected, the bottom line will display the preset name. When a scene is selected, the associated preset number will be displayed.

Note:

Program Change Map1 and Map2 default to recall presets 0-49 with received Program changes 0-49. Program Change Map3 defaults to send Scenes 0-99 with received Program changes 0-99.

PROGRAM CHANGE ENABLE AND CURRENT MAP STATUS

The current MIDI MAP parameter selects which map incoming program changes will use. Incoming program changes can be ignored completely by setting the current map number to “Off”.

To set the current map number:

1. Press the Utility button.
2. Use the no/down buttons or data wheel to access the following Dace:

MAP1: Curr MIDI map Off

3. Cursor right once to activate the field and use the Up/Down direction buttons or data wheel to edit the map number.
4. To ignore all incoming program changes, decrease the current map number until “off” is displayed.

DUMPING INTERNAL DATA

ALL internal data can be transmitted over MIDI to be saved on an external device. The MIDI Dump page allows the following data to be transmitted:

- ALL presets
- All scenes
- All global variables
- The current preset
- Everything

To transmit this information:

1. Press the Utility button.
2. Use the Up/Down buttons or data wheel to access the following page:

UTIL: dump [Enter] Everything

3. Cursor right once to activate the field and use the Up/Down direction buttons or data wheel to edit the type of data to be transmitted.
4. Press the “Enter” button to transmit the data.

Note:

Data dumps can also be requested remotely using the appropriate SysEx message (see Appendix A)

ASSIGNING FOOTSWITCHES

A footswitch can be assigned globally to duplicate most of the front panel buttons

1. on the PC1600x. Examples of footswitch uses include:
2. Changing presets on the PC1600x by assigning the footswitches to “Inc.” or “Dec.”
3. Saving and sending scenes by assigning a footswitch to copy the “Enter” button.
4. Starting and stopping a sequencer by assigning a button to toggle between Start and Stop messages and assigning the footswitch to copy that button.
5. Sending note messages to drum machines allows drum Darts to be played with a footswitch. Assign a button to send a note message and assign a footswitch to copy that button.
6. Muting an effect by duplicating a button message that mutes a fader.

To assign a footswitch:

1. Press the Utility button.
2. Use the Up/Down buttons or Data Wheel to access the following page:

UTIL: Ftsw1	Ftsw2
Off	Off

3. Select the correct footswitch field using the left and right direction buttons.
4. Use the Up/Down buttons or the data wheel to select which button the footswitch will emulate.

The polarity of the footswitch is automatically determined on power-up. If a footswitch is installed after the PC1600X is powered up, or if the footswitch is depressed during power-up, the polarity of the footswitch may be incorrect. Simply switch the power off, wait a few seconds and turn the power back on with the footswitch installed but not pressed. This will correct the polarity.

Note: Assigning a footswitch will automatically disable the CV 2 input.

DEVICE NUMBER - NOTE RECORDING/RECEIVE CHANNEL

UTIL: DevNum	RecChn
000	001

This screen allows the assignment of a global device ID. Many MIDI products use system exclusive command strings that have a device number as one of the bytes. These numbers are used to differentiate the unit from an identical unit on the same MIDI stream. Being able to change these numbers globally allows you to use one set of PC1600X presets for multiple units of the same product. Instead of hard coding these values into the strings, it is possible to designate a “dv” (device numbers byte in the strings. then adjust this parameter to function as the Global setting.

The RecChn parameter is used when recording note messages into button strings. The Note Recording Receive Channel parameter simple determines which channel notes will be accepted on. For more information, check out the Note Stream Recording section on page 28.

MIDI TRANSMISSION DELAY

Sometimes a device can't handle MIDI data as fast as the PC1600x can generate it. This can happen when sending scenes, dumping presets or during any other operation that sends large amounts of data. There are two types of MIDI delay available to you. They both default to zero and shouldn't be set otherwise unless a problem is occurring with a receiving unit.

UTIL: DevNum	RecChn
000	001

The first is a PER - SysEx message delay, which is inserted after the PC1600X sends an EOX byte (F7h). This puts delays in between SysEx messages. The delay can be set from 0 to 100 ms, Try raising this number in 5 ms steps if a unit chokes on SysEx data from sending scenes. (By “choking” we mean that the unit got a MIDI receive error got hung, or just didn't do everything that it should have.) Don't set this number higher than needed. The maximum value of 100 ms will make a scene with 16 SysEx messages take almost 2 seconds to send.

The other type of delay is a Per-byte delay, which is inserted after every byte that the PC1600x sends. This delay can be set from 0 to 1000 us (1 ms) in 10 us steps. If a computer or MIDI librarian is letting a buffer overflow when you're backing up your PC1600x data. try setting this delay between 100 and 500 as needed. (A value of 320 will essentially split the MIDI speed in half. You'll probably want to lower the delay when you're done and only raise it when needed.

The Delay screen is displayed as follows:

MIDI: PerMsg	PerByte
Delay 000ms	000ms

Note:

These delays only affect MIDI data that the PC1600X generates internally. Data that is received from MIDI IN to MIDI OUT is not delayed.

REMOTE BUTTON SET-UP

The 16 programmable buttons are useful for sending any type of message to just about any MIDI device. You can access the button messages remotely by sending simple messages into the PC1600X. All you need is a MIDI keyboard, pedal board. or any other MIDI controller that sends Program Change commands or MIDI Note On/ Note 0 messages (i.e. “MIDI-fied” foot pedals). For example use your note pedals to play chords instead of single notes (With preprogrammed velocity or the velocity from the pedals). Reserve keys on your keyboard for sending SysEx messages. Or use your Program Change pedal board to send more complex MIDI messages (like SysEx or multiple Program Changes). The possibilities are virtually unlimited.

Move to the utility screen displayed below. Pick the emulation cache (Off, Notes, PrgCh) the MIDI channel you are sending these messages on (1-16) and the starting value (0-127). The starting value is the base note number or base program number depending on the emulation type. The base value will emulate button #1 while the next 15 values will emulate buttons #2-#15. The incoming message will not be echoed, even if the button is “Off” (NOTE: Middle C on a MIDI keyboard is note number 60 (3Ch1.)

BUTN:	Type	CH	Start
REMT	Off	01	000

When the type is set to “Notes” Note On messages will emulate a button press, while Note Off messages (including Note On with velocity = 0, of course) will emulate a button release. In “PrgCh” mode, . Program Chance messages will emulate a button press immediately followed by the release, (You probably won't find much use for a Prs/Rls string when emulating in PrgCh mode - use normal or toggled strings instead.)

INDIVIDUAL PRESET INITIALIZATION

When creating new presets, it is perfectly fine to edit existing presets. However if you prefer to start with a “Clean Slate” a preset initialization function is available in the utility menu:

1. Press the Utility button
2. Use the Up/Down buttons to move to the following screen:

UTIL:	Init a Preset
00	Volume with mute

3. Select the Preset number you wish to re-initialize.
4. Press “ENTER”, then you will be asked. “ARE YOU SURE”
5. Press “ENTER” again to confirm initialization. The preset will be renamed “--initialized--”

Note:

All presets share the same block of memory, which gets divided among the available presets. This utility is very handy for freeing up memory since you can reinitialize presets that are not needed.

MEMORY USAGE

PC1600x presets are dynamically allocated, allowing a single preset to be very large when necessary. If too many larvae presets are created, the PC1600x will run out of preset memory. When this occurs, some memory must be freed by removing (reinitializing) or re-defining presets. The memory usage display help determine which presets to modify. To use the memory usage display:

1. Press the Utility button.
2. Use the Up/Down buttons or data wheel to access the following page:

UTIL:	Memory
	Free: 6324

4. Use the Up/Down buttons or the data wheel to view the amount of free memory and the amount of memory used by each preset.

Note:

The names of faders, CV inputs and buttons only use memory per character. Therefore shortening the names frees up memory. Preset names however have a fixed length so this wouldn't apply.

ABOUT SCENES

A scene allows a “snapshot” to be taken of the current preset number, fader positions & CV settings. These are saved in one of the 100 scene locations. Sending a scene will transmit the information for each fader/CV Pedal just as it was saved. The scene will be sent referencing the preset that was active when the scene was saved, not the preset active when the scene is sent.

Example:

If the current preset is configured to control digital tracks, each fader can be used to adjust the mix on a specific track. When all faders are set to a desired setting, save this as a scene, continue to adjust the faders and save scenes as necessary. During a performance, the scenes saved can easily be sent to the mixer, recorder or sequencer system even if a different PC1600x preset is being used.

Repeatedly pressing the Scene button will toggle between the SCENE Send, Store and INITIALIZE pages.

Note:

The original preset that was active when the scene was saved must still be in the same preset location within the PC1600X for the correct messages to be transmitted.

SENDING A SCENE

1. Press the Scene button until the following clave is displaced:

SCENE: Send [Enter] [p:---] 00

2. Use the Up/Down direction buttons or the data wheel to select a scene. Note: The associated preset is indicated in the lower left corner in parentheses.

3. Press the “Enter” button to send the scene. The scene will be sent using the preset which was current when the scene was saved. The scene number will automatically increment to the next scene, allowing several scenes to be sent quickly.

STORING A SCENE

1. Recall the desired preset to be used.
2. Set all faders and CV inputs to the correct positions.
3. Press the SCENE button until the following page is displaced:

SCENE: Store [Enter] [p:---] 00

4. Use the Up/Down direction buttons or the data wheel to select the scene number to save.

Note: The associated preset is indicated in parentheses in the lower left corner.

5. Press the “Enter” button to save the scene. The scene number will automatically increment to the next scene, allowing several scenes to be stored quickly.

Note:

A scene saves the current position of each fader and CV input. Data wheel movements and soloing/muting a fader have no effect on the data stored in a scene or sent by a scene.

SCENE INITIALIZE

Allows an existing scene to be initialized which disassociates it with any preset, therefore making it send nothing.

This screen is displayed as follows:

1. Press the Scene button until the following page is displaced:

SCENE: INITIALIZED!!!
[p:---] 00 [Enter]

2. Use the Up/Down direction buttons or the data wheel to select a scene, Note: The associated preset is indicated in parentheses in the lower left corner.

3. Press the “Enter” button to initialize the scene. The scene number will automatically increment to the next scene, allowing several scenes to be initialized quickly.

Pressing “ENTER” will clear any values recorded by a stored scene. After initialization, the preset link will change to: “[p:---]” Of course, if at first you see “[p:---]” the scene is already initialized.

PRESET SET-UP STRING SCENE EDITING

A scene can be assigned to each preset, when this condition exists, any time the preset is recalled, the scene data will be transmitted. Since the memory area for scene storage is fixed and separate from the preset memory, this function provides an efficient way to transmit data. For more information, see the preset set-up string info on page 32.

About Presets & Editing

Each preset contains a variety of information:

- *16 fader messages
- *16 button messages
- *2 CV messages
- *A group of “set-up” messages that are transmitted each time a preset is selected (recalled).
- *Data Wheel Link

Fifty unique presets are available for editing, however we have pre-programmed each of them with a variety of sample presets to give you application examples.

UNIT INITIALIZATION:

Initialization restores all 50 factor presets (and erases any settings you might have made), resets the global settings and deletes any programmed scene settings. If you're sure you want to do this, use the following procedure:

1. Turn Power Off.
2. Hold down the **Utility** and **Enter** buttons while turning the Power On.
3. “**Memory initialized**” is displayed.

Note: It is not possible to undo the initialization procedure.

INDIVIDUAL PRESET INITIALIZATION

When creating new presets, it is perfectly fine to edit existing presets. However, if you prefer to start with a “Clean Slate” a preset initialization function is available in the utility menu.

1. Press the Utility button.
2. Use the Up/Down buttons to move to the following screen:

UTIL: Init a Preset? 00 Volume with mute

3. Select the preset number you wish to reinitialize.
4. Press “ENTER” then you will be asked. “ARE YOU SURE ?”
5. Press “ENTER” again to confirm initialization. The preset will be renamed “--initialized--”.

Note: ALL presets share the same block of memory, which gets divided among the available presets. This utility is very handy for freeing up memory since you can reinitialize presets that are not needed. The Memory Usage page is also in the Utility Menu.

EDIT INTRODUCTION

Access the main edit maple at any time by pressing the Edit button. The field on this page selects the item to be edited. The following choices are available:

- Fader 01 - Fader 16
- CV 1 & CV 2
- Button 01 - Button 16
- Data wheel
- Set-up string
- Name/save preset

The up and down direction buttons or the data wheel can be used to scroll through the above choices. Moving any Fader, CV input or Button will cause that item to be displayed, when the desired item is displayed, press the “Enter” button to access the parameters specific to that item.

Shortcut: For a time-saving shortcut, try moving a fader, CV input button or the Data Wheel while holding the edit button. Releasing the edit button will immediately access the selected item. “Sideways/Navigation” is possible when switching to a device that is set to the same function. This will allow you to jump to a different device and be at the same screen as the previous device.

NAMING & SAVING A PRESET

Go to the Edit menu. Use the Data Wheel or Up/Down arrow keys to move to the “Name/save Prs” page, Press “ENTER”, Use the Left/Right direction buttons to select the character in the name and the Up/Down buttons or data wheel to edit the character. To make editing faster, each fader edits a different character of the name. Pressing “ENTER” from this page accesses the “SAVE TO” page. The bottom line of this page displays the number and name of the destination preset to be overwritten, The data wheel and Up/Down buttons maybe used to change the storage destination. Pressing the “Enter” button from this page will save the preset and return to the main page, by pressing the Exit button, you will be returned to the “Edit name” page.

EXITING EDIT MODE

To return to the main page at any time, Press Exit several times until the main page is reached. If changes were made to the preset, the preset number will be replaced with “***” This is an indication that the preset in the edit buffer has been modified but not saved. Press Edit to return to the Edit mode if the chances are to be saved.

Changing presets results in the following display:

[Enter] Exit without saving?

Press “ENTER” to confirm that you don't want to save your edits. Press Up/Down from the main page to leave this preset. This will cause any chances that were made to be discarded. However, if you don't edit another preset, recovery is possible. Edits which were discarded can be recovered from the main page. Increment the preset number above preset 49 and the preset number is replaced by “***” Pressing Edit returns to the Edit mode with the edit buffer exactly as it was last time the Edit mode was exited (even if the unit had been Dowered down. Amazing!)

ACCESSING GLOBAL SETTINGS WITH SPECIAL MIDI MESSAGES

Many MIDI products use system exclusive command strings that have a MIDI channel or device number as one of the bytes. These numbers are used to differentiate the unit from an identical unit on the same MIDI stream. Being able to change these numbers allows you to use one set of PC1600X presets for multitude units of the same product.

Instead of hard coding these values into the strings, you can designate a “gc” (global channel) byte or a “dv” (device number) byte in the strings. then just go to UTILITY and change the ChOut (1st screen) and DevNum (7th screen) parameters.

Whenever the PC1600x sees a “gc” in a string, it will transmit the ChOut parameter minus 1 (0-15h). When it sees a “dv” it will transmit the DevNum parameter (0-127 / 00h-7Fh)

Additionally, the “gc” designation can be placed after a channel status byte (80h through EFh). In this case, the “gc” will channelize the status bite, as opposed to it being sent as a separate byte. The status and “gc” bytes will be connected by a hyphen to show that they are being combined into a single byte upon transmission. The following screen would program fader //1 to send Program Changes on the global out channel. The zero after the C will get replaced by ChOut -1 (0 - F), therefore making it meaningless (A CF would make no difference to the fader function).

FDR01: String C0-gc pr

To program one of these values in a string (fader, CV, button or set-up, edit the byte value up to FD or FE, at which point you will see “dv” or “ac” on the display, respectively (instead of “FD” or “FE”)

NOTE: In button and setting strings, the first byte of the string cannot be a “dv” or “gc” This allows the user to send the raw values add (undefined) and few (active sensing) over MIDI. if desired. by programming them as the first byte.

Editing The Faders

DEFINING AND NAMING

When a fader is selected to be edited, the first page displayed selects the function of the fader. A fader can be assigned to the following functions:

No Message
Continuous Controller
Master Fader
MIDI string

To set the function of a fader:

1. Access the following fader function display by pressing Edit from the main page, then moving fader 01 Next, press "ENTER".

FDR01: Function No Message

2. Cursor right to select the function for the fader (it will blink). Press the Up/Down buttons to access any of the four choices: No message, Controller, Master fader or String.

3. Press EXIT to deselect the item. Except when "No messages is selected, access to additional parameters and naming for this fader is available by pressing the up direction button (when the function field is not blinking).

After assigning a function to the fader, the fader can be named. To name the fader:

1. With no parameters flashing, press the up direction button until the following page is displayed.

FDR01: Name <Name>

2. Use the left/right direction buttons to select the character in the fader name. Next, press the Up/Down direction buttons, data wheel, and/or the current fader to change (edit) the character.

NO MESSAGE

A fader can have its function set to "No message's with this option, moving the fader will (of course) have no action.

CONTINUOUS CONTROLLER

A fader can be programmed to send a continuous controller message whenever the fader moves. The MIDI channel can be set to any specific channel, or to the main transmit channel set in the Utility section. The controller number can be set to any value from 0 to 120.

The **”Min”** parameter determines the value sent when the fader is in its lower-most position next to the button.

The **”Max”** parameter determines the value sent when the fader is in its upper-most position. Simply exchange the values in these two parameters to reverse the polarity of a fader.

The **“Mode”** parameter determines how matching incoming controller messages will be handled. The three modes are as follows:

Merge:

Incoming controller messages that match a fader are always passed through the PC1600x. The MIDI data generated from fader movement is merged with the data passing through the unit.

Replace:

Incoming controller messages that match a fader are passed through the PC1600x until the fader is moved. The matching incoming controller messages are filtered until the Exit button is Pressed while on the Main Page. This mode allows direct replacement of data in an existing stream of controller messages.

Update:

Incoming controller messages that match a fader are passed through the PC1600x until the fader is moved. The data sent when the fader first moves will always match the last value that passed through the PC1600x, regardless of the position of the fader. The matching incoming controller messages are filtered until the Exit button is pressed while on the main page. This mode allows seamless modification of data in an existing stream of controller messages.

To define a fader as a continuous controller:

1. First, set the function to “Controller” press the left/right, or Exit button to deselect the edit field, then press the up button to move to the following page:

FDR01:	Chnl	Num
	16	007

2. Cursor over to the “Chnl” field and set the MIDI channel for the controller message. Incrementing the channel number above 16 will display “ChOut.” When “ChOut” is selected, the controller message will be transmitted on the global MIDI transmit channel from the Utility menu.

3. Cursor over to the “Num’ field to set the controller number to be transmitted. See Appendix C for a list of MIDI Controller numbers.

4. With no parameters flashing, press the up direction button to access the following page:

FDR01:	Min	Max
	000	127

5. Cursor left or right to the Min or Max field and edit the value as necessary (range=0-127).

6. With no parameter flashing, press the up direction button to access the mode page:

FDR01: Mode Merge

7. Cursor rig or left to access the “Mode” parameter, select either Merge, Replace or Update.

Master Fader/CV

Several faders can be aroused together and controlled by another fader. This is done by defining a single fader or CV pedal as the master fader as shown:

1. Set the function to “Mater Fader” next press the up direction button when the function field is not blinking, the following page will be displayed:

FDR01: Master of Fader01= No

2. Cursor right once to activate the “Master of” field. Set this field using the Up/Down direction buttons, the data wheel or the current fader. Moving any fader will select the fader moved.

3. The “Yes” or “No” on the right shows whether the fader in the “Master of’ field is being controlled by the current master fader. To toggle between “Yes” and “No.” simply press the right direction button. The “Master of’ field will remain active.

MIDI STRINGS

Any MIDI message can be assigned to a fader by “Entering the message as a hexadecimal string. A legible “parameter format” allows the current fader position to be inserted into the message in one of many different formats. A programmable minimum and maximum parameter value allows the parameter to span practically any range. To define a MIDI message string: 1. Select the function “String”. Next, press the up direction button when the function field is not blinking. The following page will be displayed:

FDR01: String F0 00 F7

2. To edit the string, use the four direction buttons, the data wheel and the current fader. The left/right direction buttons are used to select a specific byte, while the Up/Down direction buttons, the data wheel and the current fader are used to edit a digit of the string. Pressing the “Up” button when “**Between Bytes**” inserts a byte and pressing the “Down” button deletes the byte to the right of the cursor.

3. Replace with “pr” any byte that will be determined by the fader position. This is done by incrementing the byte until “pr” is displaced. When the string is finished, press Exit.

4. Access the minimum and maximum parameters by pressing the up direction button when the underscore cursor is not displayed.

FDR01: Min Max 0 127

5. Cursor over to either parameter and edit the value. Use the fader to set the parameter to the approximate value necessary. Use the data wheel or the Up/Down buttons to “Enter” the exact value.

6. When neither field is flashing, press the up direction button to access the parameter format page:

FDR01: Param format Single Byte

7. The value selected here determines how the “pr” bytes will be filled with the parameter value. Refer to your unit's owner's manual to determine which format to use. For a detailed description of the parameter formats, see Appendix-B.

DEALING WITH CHECKSUM VALUES

Some products call for checksum bytes in their SysEx implementation in order to specify a byte as checksum, A “cs” can be added to the string. To program, just edit the byte up to what would normally be “FC”, displayed in its place will be “cs” Here is an example string with an extended display to show you the entire string:

FDR01: String F0 41 10 70 12 00 00 01 PR CS F7

The PC1600x will compute the checksum as follows:

Adds up all bytes from byte #5 or higher, see below, when FO is byte #0b to the last byte before the “cs.”
Note: byte #5 is typically the start of the data portion of the SysEx.

Takes the 2's complement (flips all the bits, then adds 1).

Uses the least significant 7 bits of the result as the checksum byte, The 8th byte is always zero.

With some SysEx messages, the unit ID (byte #3 and command ID byte #4) could be extended beyond a single byte by using leading zeroes before the non-zero bite, In this case, the PC1600x's checksum calculation will start later in the string accordingly: at byte #(5 + number of leading zeroes). Note: The “cs” computation is unavailable in button and set-up strings. In these cases, the checksum must be calculated and inserted into the string as a constant by the programmer. Be sure and refer to your product owner's manual for the necessary values/massages.

ASSIGNING STRING DEVICE IDS AND MIDI CHANNELS TO GLOBAL SETTINGS

Many devices use SysEx command strings that include a MIDI channel or device number as one of the bytes. This practice is beneficial to the user since it allows separate SysEx control when differentiating one unit from an identical unit on the same MIDI stream.

Instead of hard coding these values into the strings, a “gc” (global channel) or “dv” (device number) byte can be designated that references the Global settings in the Utility section. When the PC1600x sees a “gc” in the string, it will transmit the Utility menu's ChOut setting. When it sees a ”dv” in the string, it will transmit the DevNum variable:

FDR01: String F0 00 00 1B gc F7

Additionally, the “gc” designation can be used with MIDI Channel messages. In this case, the “gc” will channelize the preceding byte, as opposed to being sent as a separate byte. For display, the status and “gc” bytes are connected by a hyphen to show that they are being combined into a single byte. The following example is how this would be displayed:

FDR01: String C0-gc pr

The zero after the C will get replaced by the ChOut setting in the Utility menu.

LEARN MODE

If a system exclusive message is received while a fader string is being edited (the underline cursor must be presents. the PC1600x will automatically replace the existing fader string with the system exclusive message received.

SAVING YOUR EDITS

Use the following steps to save your edits:

1. Press the Edit button.
 2. Use the data wheel or no/down buttons to scroll to the last option: Name/save preset.
 3. Press “Enter”.
 4. To rename, use the left/right buttons to select character positions and the Up/Down buttons to edit the character. Note: Faders also can be used to select character positions.
 5. Press “Enter”.
 6. Choose the destination for the save with the Up/Down buttons or the data wheel.
 7. Press “Enter” to save to the location displaced at the bottom of the display.
- To return to the main page at any time, press Exit several times until the main page is reached. If changes were made to the preset, the preset number will be replaced with “***” This is an indication that the preset in the edit buffer has been modified but not saved. Press Edit to return to the Edit mode if the changes are to be saved.
- Press up or down from the main page to leave this preset. This will cause any changes that were made to be discarded.

Note: Edits which were discarded can be recovered from the main page if no other preset has been edited seven after a Dower down). Increment the preset number above preset 49 and the preset number is replaced by “***” Pressing Edit returns to the Edit mode with the edit buffer exactly as it was last time the Edit mode was exited.

Editing The Buttons

DEFINING AND NAMING

When a button is selected to be edited, the first page displayed selects the function of the button. A button can be assigned to the following functions:

- Off/Fader ID
- Mute fader
- Solo fader
- Program chance message
- Note on/off message
- MIDI string MIDI string with button Dress. MIDI string with button release
- Toggle between two MIDI strings
- Send Fader
- Send Scene

To set the function of a button:

1. Press EDIT, then press a button to select it (in this example. button 16. Press “Enter” to access the following dated

BTN16: Function Off / Fader ID

2. Press the right direction button to select the function (it will blink. then use the Up/Down buttons or data wheel to select the desired function.

3. Use the up direction button when the function field is not blinking to access other parameters. Press either of the left/right direction arrows (or exit) to de-select (stop the blinking).

After assigning a function to the button, the button can be named.

To Name the button:

1. With no parameter selected and a function other than “Off / Fader ID” selected, press the up direction button until the following page is displayed:

BTN16: Name
<Name>

2. Use the left/right direction buttons to select the character in the button name and the Up/Down direction buttons, Data Wheel and/or the fader above the button to edit the character.

OFF/FADER ID (NO MESSAGE)

Whenever one of the 16 programmable buttons is programmed as “Off/Fader ID” it will identify its associated fader when on the top of the preset screen, For example, pressing button 16 would cause the PC1600x to display “Fdr16 : <fader name>”. This allows you to see what the fader is going to do (if it is named) before moving it, without having to look at the edit screens.

MUTE/SOLO FADER

A button can be assigned to mute the associated fader. Pressing the button will mute the fader by sending the minimum value for the fader, and then disable the fader. When muted, moving the fader will have no effect. When the button is pressed again, the current fader message is sent, and the fader is enabled. To program a button to mute the associated fader, simply select “Mute fader” for the button function.

A button can be programmed to Solo the associated fader by simply selecting “Solo Fader” function for the button. With this function, pressing the button will send the minimum value for each fader except the button’s associated fader. To restore any fader, simply move the desired fader. To cancel the Solo entirely, simply press “Enter” button with the “main” page displayed.

PROGRAM CHANGE

A button can be assigned to send a program change message each time it is pressed. The MIDI channel can be set to any MIDI channel, or to the main transmit channel set in the Utility section. The program number can be any value from 000 to 127.

To set these two parameters:

1. From the button function page, select “Program Chng”. Next, deselect then press the up direction button. The following page will be displayed:

BTN16: Chn1	Program
01	000

2. Cursor over to the “Chn1” field and set the MIDI channel for the program change message. Incrementing the channel number above 16 will display “ChOut.” When “ChOut” is selected, the program change message will be transmitted on the Global MIDI channel set in the Utility menu.

3. Cursor over to the “Program” field to set the program number.

NOTE ON/OFF

A button can be assigned to send a note-on message when the button is pressed, and a note-off message when the button is released. The MIDI channel can be set to any specific channel, or to the main transmit channel set in the Utility section. The note number can be set to any note from C-1 to G9. The velocity can be set to any specific value (1-127), determined by the current fader position (fair), or determined by incoming MIDI velocity (Rem) when button remote is used.

To set the parameters:

1. From the button function page, select “Note-on/off.” Next, deselect then press the up direction button. The following page will be displayed:

BTN16: Chn1	Note	Vel
01	C4	127

2. Cursor over to the “ChIn” field and set the MIDI channel. Incrementing the channel number above 16 will display “ChOut”, which references the global MIDI channel.

3. Cursor over to the “Note” field to set the note number.

4. Cursor over to the “Vel” field to set the velocity value. Incrementing the velocity value above 127 will

display “Fdr”. This option allows the current position of the fader to set the note-on velocity. Pressing the up button again will display “Rem”. This substitutes the incoming MIDI velocity when the button is activated via a MIDI “note on” message. When pressed locally, “Rem” will act like the “Fdr” setting and velocity will be determined by fader position.

MIDI STRINGS

A button can be assigned to transmit just about any MIDI message when pressed. These messages are “Entered in hexadecimal form or captured via MIDI (see “Learn Mode” on page 24.

To define a button MIDI string:

1. From the button function page, select “String”. Next deselect and press the up direction button. The following page will be displayed:

BTN16:	String
F0 00 F7	

2. Use the left and right direction buttons to select a byte to be edited. When the cursor is on a digit, the up/down direction buttons, data wheel and/or associated fader will edit the digit. Pressing the up button when between bytes insets a byte and pressing the down button between bytes deletes a byte.

STRING PRS/RLS

A button can be assigned to transmit any MIDI messages when Dressed and any other MIDI message when released. These messages are “Entered in hexadecimal form.

To program the Press and Release String:

1. From the button function page, select “String Prs/Rls.” Next, deselect, then press the up direction button. The following clave will be displayed:

BTN16:	Press String
F0 00 F7	

2. “Enter” the MIDI string.

3. After editing the “Press string's” press Exit. Press the up direction button to move to the release string displayed as follows:

BTN16:	Rls String
F0 00 F7	

4. “Enter” the “Rls’ String.

STRING TOGGLE

A button can be assigned to toggle between any two MIDI message strings. These messages are “Entered in hexadecimal form.

To program the two strings:

1. From the button function pace, select “String toggle”. Next, deselect then press the up direction button. The following page will be displayed:

BTN16:	String 1
F0 00 F7	

2. “Enter” the first string.

3. Exit from editing the first string then Press the up direction button to edit the second string displayed as follows:

```
BTN16: String 2
F0 00 F7
```

4. Edit the second string as necessary.

ASSIGNING STRING DEVICE IDS AND MIDI CHANNELS TO GLOBAL SETTINGS

Many devices use SysEx command strings that include a MIDI channel or device number as one of the bytes. This practice is beneficial to the user since it allows separate SysEx control when differentiating one unit from an identical unit on the same MIDI stream.

Instead of hard coding these values into the strings, a “gc” (global channel) or “dv” (device number) byte can be designated that references the Global settings in the Utility section. When the PC1600x sees a “gc” in the string, it will transmit the Utility menu's “ChOut” setting. When it sees a “dv” in the string it will transmit the “DevNum” variable.

```
FDR01: String
F0 00 00 1B gcF7
```

Additionally, the “gc” designation can be used with MIDI Channel messages. In this case, the “gc” will channelize the preceding byte, as opposed to being sent as a separate byte. For display, the status and “gc” bytes are connected by a hyphen to show that they are being combined into a single byte.

The following example is how this would be displayed:

```
FDR01: String
C0-gc pr
```

The zero after the C will get replaced by the “ChOut” setting in the Utility menu.

RESPONDING TO REMOTE VELOCITY MESSAGES

When using “Note” mode (the Button Remote page in the Utility menu is set to Type=Notes). To play MIDI notes or chords the PC1600x (per note) can be programmed use a fixed velocity, or to use the velocity that comes in via MIDI (e.g. from velocity sensitive note pedals or keyboards. If the button is programmed as a single note, set the velocity variable to “rv” for Remote.

This is one example:

```
BTN16: String
90 60 rv
```

If playing a chord (a button is programmed to transmit several notes via a MIDI string). edit the string and set the velocity bytes up to FF. which accesses “rv” (remote velocity) in the string instead of the FF. Whenever the PC1600x sees an 'rv' in a button string and the most recent status byte in the string was a Note On (9x for attack velocity) or Note Off (8x for release velocity). it will substitute the incoming velocity.

If the button is programmed to transmit a single note on message using the button “Note On” function (vs. a MIDI string) the screen would be displayed similar to this:

BTN16: Chnl	Note	Vel
01	C4	Rem

As mentioned earlier the “Rem” designation indicates that velocity will be determined from remote MIDI input, if a button is pressed locally (on the PC1600x itself) or a Program Change is received, the “rv” byte value (or “Rem” setting) will be determined by the position of the fader above the button, even if it did not follow a “9x” or an “8x”. The fader position number will always be ranged from 0-127 (or 1-127 if within a note streams. It will not be affected by the fader's Min and Max parameters.

NOTE:

Since the “rv” velocity will use the fader position when the button is pressed on the PC1600x it is useful to use “rv” even when not using the remote feature. It gives you a method of inserting the fader position (0-127 only) into any button string. Use it for program number, note number etc. If the fader is not being used for something else, however it is probably better to program the message into the fader, then set the button to “Send Fader”.

LEARN MODE

If a system exclusive message is received while a button string is being edited (the cursor must be visible), the PC1600x will automatically replace the existing button string with the system exclusive message received. Note recording is also possible with this function. See below for more information.

NOTE STREAM RECORDING

To make chord programming easier, the PC1600x can now record note streams into button strings. This allows you to play a chord into the PC1600x to program a button instead of inserting all of the numbers in manually. To set up note recording, you must first enable the feature by telling the PC1600x which MIDI channel you will be sending the note data over. This parameter/screen is located in the Utility menu (along with the MIDI Device Numbers):

MIDI; DevNum	RecChn
000	000

After setting the channel, go to any button's string editing screen (String, Prs/Rls or toggle) and hit the left or right arrow button to put the underline cursor on the screen:

BTN01: String
90 3C 7F

The recording will be triggered by any Note On received on the specified channel. Any Note Off received on that channel will erase the string, allowing you to experiment until you find the right group of notes. Any other MIDI commands will not affect the recording. When finished, press the “ENTER” button while continuing to hold the chord. (if you're using 2-handed chords you can plug a footswitch into the PC16000x and set it to emulate the “ENTER” button - see the 6th screen under UTILITY.)

NOTE:

Any Note Off will erase the whole chord, even though the other notes may still be sounding. If you play 3 notes, release 1 of them, then add another (still 3 soundings, then press “ENTER”, the last note will be the only one recorded.

Therefore whenever you are going to release any notes (because the chord is not yet complete) release all the notes and retrigger the whole chord.

You will not see the note stream on the screen until after you press the “ENTER” button. The string will start with a “9x” (where the x is the note record channel – 1) followed by the first note number, then the first note velocity, etc.

(Only one status byte - we're using running status here.) The velocity bytes can be changed to ‘rv’ so that the incoming MIDI velocity (or fader position) gets substituted allowing “Dynamic” remote button playing.

The following screen shows a “dynamic” C major triad on Channel 1 (starting with Middle C):

```
BTN01:  String
90 3C rv 40 rv 43 rv
```

So now that we know how to trigger chords remotely, how do we turn them off? There are two ways to do it. The easy and memory-efficient method is to use the MIDI ALL Notes of command. This is a channelized command that tells a Synth/MIDI device to release all of the notes that were triggered on that channel. The command is defined as continuous controller #123 (7Bh) with a data value of zero:

All Notes Off command for:

```
channel 1: B0 7B 00
channel 2: B1 7B 00
```

You can use Prs/Rls strings with the chord on the press and the All Notes Off message (same channel of course) on the release. This will act like a normal “Gated” triggering system (like a keyboard). You could also insert the All Notes Off command in regular “Press Only” strings ahead of the chord so pressing any button will release the previous chord before slaving its own chord before playing its own cord also letting you release the button without releasing the chords. Just remember to program one of the buttons as an “All Notes Off” only, so you can silence the sound source when needed.

You may find that the ALL Notes Off command doesn't work correctly in your system. There are some Synths/MIDI devices out there that do not respond to the All Notes Off message and even some that respond to it incorrectly.

Some units will “Kill” the notes abruptly instead of releasing them (as a Note Off would) and some others will apply the message to all notes in the unit not just the ones that were generated on the same MIDI channel as the ALL Notes Off message itself. If your Synth/devices respond correctly great! If not. You'll have to send matching Note Off commands after the Note On commands.

The PC1600x won't record Note Off streams but there is a fairly easy way to handle this for the “Gated” mode.

After recording the chord into the press string, record the same chord into the release string and then either change the “9X” at the start of the string to an “8x” (Which will give you control over release velocity) or change all the velocity bytes to zero which will convert the Note On's to Off's.

SEND FADER

This feature allows you to send single messages (as opposed to “sweeps” of messages) from the faders. This is desirable in many cases like when sending very precise control chances into a sequencer.

When a fader's button is programmed as “Send Fader” moving the fader will not cause a MIDI transmission. You will however see the data value on the top preset screen as you would normally except that there will be an “M” in the lower right corner of the LCD telling you that the fader is temporarily muted. After you move the fader to the desired position press the button to send the message (you will see the “M” disappear signaling that the message was sent).

You can also use the Data Wheel to change the value before it is actually sent, if I is linked to the fader (either directly or with “Last Fader”). Pressing a “Send Fader” button will switch to the “Last Fader Moved” (even if the fader itself was not moved).

You can also set a normal “Sweep” from the fader by holding the button while moving the fader (or data wheel). In this case the “M” will not be on the LCD signaling that the message is being transmitted.

BTN01: Function Send Fader

NOTE: When using faders to send continuous controller messages the replace and update modes will be unaffected by fader movements when the button is not pressed, In other words the incoming controller won't get filtered until the local controller is REALLY transmitted.

SEND SCENE

You can send any scene from one of the 16 buttons. This is useful when you know that you're going to transmit particular scenes from a preset. It saves you from having to go to the SCENE page, choose the scene and then send it with the “ENTER” button.

Choose “Send Scene” as the button function and the next screen will allow you to nick the desired scene.

BTN01: Function Send Scene

BTN01: Scene [p:32] 02

SAVING YOUR EDITS

Use the following steps to save your edits:

1. Press the Edit button.
2. Use the data wheel, Up/Down buttons or press button 16 to scroll to the last option: Name/save preset.
3. Press “Enter”.
4. To re-name use the left/right buttons to select character positions and the Up/Down buttons to edit the character. Note: Faders also can be used to select character positions.
5. Press “Enter”.
6. Choose the destination preset (will be overwritten).

7. Press “Enter” again to save to the location displaced at the bottom of the display.

To return to the main page at any time press Exit several times until the main page is reached. If changes were made to the preset, the preset number will be replaced with “**” this is an indication that the preset in the edit buffer has been modified but not saved. Press Edit to return to the Edit mode if the changes are to be saved.

Press up or down from the main page to leave this preset. This will cause any changes that were made to be discarded.

Note: Edits which were discarded can be recovered from the main page if no other preset has been edited - even after power-down. Increment the preset number above preset 49 and the preset number is replaced by “**” Pressing Edit returns to the Edit mode with the edit buffer exactly as it was the last time the Edit mode was exited.

CV Pedals, Footswitch & Data Wheel

EDITING CV 1 & CV 2

The CV 1 and CV 2 inputs will accept a Control Voltage foot pedal. Press EDIT, then select CV 1 or CV 2. Press “ENTER” to move to the function edits page:

CV 1: function No Message

Control voltage inputs are programmed like the faders. Refer to the “Editing the Faders” chapter describing how to define a fader.

Note: The dual footswitch parameters must be disabled (turned off) for CV 2 to work correctly.

WHAT TYPE OF CONTROL VOLTAGE PEDAL IS REQUIRED

Any 0-10 volt control voltage pedal or 10K potentiometer pedal (unpowered) should work. As of this writing, both Roland (EV-5, EV-10) and Ensoniq (CVPI) offer control voltage pedals that will work with the PC1600x.

DUAL FOOTSWITCH EDITING

The dual footswitch is set up globally in the Utilities menu, each pedal can be programmed to control:

Up/Down

“Enter”

Button functions

EDITING THE DATA WHEEL

The data wheel is programmed by linking it to a fader or CV input. When the data wheel is linked to a Fader, CV input, it will adjust that parameter using the current Fader, CV position as a starting point. The data wheel can also be set to link to the last Fader/CV moved instead of a specific fader.

1. Press EDIT, then select “Data Wheel, Press “Enter” to move to the following page:

Wheel; Link None

2. Use the Up/Down buttons or the data wheel to select a fader or CV input. Also, moving a fader or CV input will cause them to be selected.

3. Increment until “Last moved is displayed to make the data wheel always edit the last fader or CV input that was moved.

Defining The Preset Set-Up String

When a preset is selected/recalled, each MIDI channel can send out an associated bank select message, Program change message and volume message. The preset string can also be linked to a scene in addition to an 80- byte programmable string.

BANK/PROGRAM/VOLUME

To program these options:

1. Press Edit, then select "Setup string". Next, press "Enter" to access one of the three set-up pages. The bank select, program change and volume for each channel are available on the first page:

Setup;	Bank	Prog	Vol
Ch01	Off	Off	Off

2. Cursor right to the "Ch" field. Changing this field causes the bank, program and volume fields to display the information for the selected channel.

3. Cursor right to the "Bank" field. This field displays the bank number to be sent for this channel. Decrementing this field below zero (off) causes no bank message to be sent. When the Bank parameter is set to 0-127, the full Bank Select message is transmitted with a zeroed MSB and the Bank number in the LSB. Some products use the MSB directly to chance bands ignoring the LSB. Because of this the PC1600Xs Bank parameter can be incremented further past 127. This new range is shown as 001m - 127m. When one of these values is used the Bank will be sent as the MSB and the LSB won't be sent. For example, bank 002n on Channel 1 would be transmitted as follows:

Hex	B0	00	02
Description	Status	CC#	MSB

NOTE: There is no "000m" choice in the list.

To switch an "MSB" unit to bank #0, use the 000 (LSB) selection since that will send a zeroed MSB along with the zeroed LSB.

More About Bank Select

MIDI specifies the Bank Select message as a full 14-bit controller message, (Two 7-bit controllers combined into a 14-bit number). The MSB (Most Significant Byte) is controller #0, while the LSB (Least Significant Byte) is controller #32 (#20h). The bank number is computed as (MSB * 128) + LSB, hence, to switch to bank #2 on Channel 5, the MIDI message would look like this:

Hex	B4	00	00	20	02
Description	Status	CC#0	MSB	CC#32	LSB

4. Cursor right to the "Prog" field. This field displays the program number to be sent for this channel. Decrementing this field below zero (off) causes no program message to be sent.
5. Cursor right to the "Vol" field. This field displays the volume to be sent for this channel. Decrementing this field below zero(0) causes no volume message to be sent.

6. Repeat the above steps as necessary for each channel.
7. With parameters deselected (press exit) press the up direction button to access the screen recall screen.

SCENE RECALL

Setup:	Scene
[P;--]	Off

A scene can be part of the set-up string. When this condition exists, any time the preset is recalled the scene data will be transmitted. Since the memory area for scene storage is fixed and separate from the preset memory, this function provides an efficient way to transmit data. Previously this information would have been stored in the set-up MIDI string which would have been both tie and memory intensive. Note that when a scene is selected for the result scene, its associated preset is indicated in the lower left corner.

MIDI STRING

1. With parameters deselected (press EXIT). Press the up direction button to access the string on the following page:

Setup:	String
--------	--------

2. Edit the MIDI string just like a button string. The left/right direction buttons are used to select a specific byte while the Up/Down direction buttons and the data wheel are used to edit a digit of the string. Pressing the up button when between bytes inserts a new byte and pressing the down button deletes a byte. If no bytes are displaced, no string will be sent.

LEARN MODE

If a system exclusive message is received while a set-up string is being edited (the cursor must be visible) the PC1600X will automatically replace the existing set-up string with the system exclusive message received.

Copy Functions

The Copy functions can be accessed by pressing the COPY button. When pressing COPY from the main screen, the Copy area is used to copy presets and scenes only. When accessing it from the EDIT menu, a wide variety of source types can be copied. This includes a fader, CV input, button, data wheel, set-up string or preset name.

COPYING FROM THE MAIN MENU

The Copy function is used to copy from one preset to another or from one scene to another. To perform a copy:

1. Press the Copy button from the main page to access the following page:

Copy: Prs00->00 [Enter] <Preset Name>
--

2. Cursor left or right until the first field is active.
3. Use the Up/Down direction buttons or the data wheel to select the source preset or scene. When this field is active the bottom line displays a preset name if a preset is selected.
4. Cursor right to select the destination preset or scene. If a preset is selected the preset name will appear on the bottom line when this field is active.
5. Press the “Enter” button to perform the copy.

COPYING FROM THE EDIT MENU

When in the Edit mode, any copy of the edit buffer can be defined by copying FROM any existing preset or the current edit buffer, In other words you start from a destination preset and copy items to its edit buffer.

To perform a copy:

1. Select the destination preset. Move to any area in the Edit mode.
2. Press the Copy button to access the following type of page:

Copy: [Enter]

3. Cursor left or right until the first field is active. Use the Up/Down direction buttons or the data wheel to set the source cache. This can be a fader, CV input, button, data wheel, set-up string or preset name. Moving any fader or button selects that device.
4. Cursor right to the second field. This selects the destination for the copy. Any preset or the current edit buffer can be used as a source preset.
5. Cursor right to the third field. This field selects the destination within the current edit buffer.
6. Press the “Enter” button to perform the copy.

Remember - Copied messages must be saved to become a permanent part of the preset. For more information review the “Saving Your Edits” section of the “Editing” the Buttons” chapter.

PC1600x System Exclusive Messages

Recall Preset: F0 00 00 IB OB ch 00 pp F7

When this is received the PC1600x will switch to the preset specified by “pp” regardless of the current MIDI mapping.

Send/Recv All presets: FO 00 00 IB OB ch 01 {data} F7

This message is sent and received by the PC1600x. It contains all preset data including the current edit buffer.

Send/Recv All scenes: FO 00 00 IB OB ch 02 {data} F7

This message is sent and received by the PC1600x. It contains all scene data.

Send/Recv All globals: FO 00 00 IB OB ch 03 {data} F7

This message is sent and received by the PC1600x. It contains all MIDI maps and all other global variables.

Send/Recv Current edit buffer: FO 00 00 IB OB ch 04 {data} F7

This message is sent and received by the PC1600x. It contains only the current edit buffer. This combined with the Recall preset SysEx command will allow any preset to be obtained from an outside source.

Request everything: FO 00 00 IB OB ch 10 F7

The PC1600x will respond to this message with:

Send/Recv All presets

Send/Recv All scenes

Send/Recv All globals

Request All presets: FO 00 00 1B 0B ch 11 F7

The PC1600x will respond to this message with: Send/Recv ALL presets

Request ALL scenes: FO 00 00 IB OB ch 12 F7

The PC1600x will respond to this message with:

Send/Recv All scenes

Request All Globals: FO 00 00 IB OB ch 13 F7

The PC1600x will respond to this message with:

Send/Recv All Globals

Request edit buffer: FO 00 00 IB OB ch 14 F7

The PC1600x will respond to this message with:

Send/Recv Current edit buffer

Write edit buffer : FO 00 00 IB OB ch 20 DD F7

When the PC1600x receives this message, it saves the current edit buffer to the preset specified by pp.

ABOUT PARAMETER FORMATS

Parameter formats determine how the variable “pr” bytes in a fader string are computed by the PC1600x. The single byte format is the most basic. It allows for 128 distinct values, usually 0 to 127 (0-7Fh in hex).

Remember a MIDI data “Byte” is essentially only 7 bits, since the eighth bit can't be set - that would make it a MIDI “Status” byte. When this range isn't large enough, the data must be represented with more than one byte (the PC1600x supports up to 4h. After these bytes are sent to a MIDI device, that device must translate all the bytes into a single value.

There is no industry standard for this translation so the PC1600x is able to send the data in several formats to support the most popular translation methods. The choice of parameter format will tell the PC1600x three important things:

1. The number of bytes that make up the data value (1-4).
2. The size and weighting of each byte
 - 4-Bit binary (Nibs or nibbleized).
 - 7-Bit Binary
 - 4-Bit BCD (Binary Coded Decimal).
3. The order of numerical significance (high to low or low to high).

To determine the proper parameter format for your receiving device. Consult your owner's manual or SysEx documentation.

Remember to make sure that the number of “pr” bytes in your MIDI string matches the number in the parameter format. For example, if you choose “2 Byte, Nibs Hi->lo)” you must have at least two “pr” bytes in the string. If you choose to put more than two in the string, the 2-byte data value will repeat as necessary. This is useful if you want to use a single fader to program two different parameters simultaneously (as long as they have the same format and range, of course).

Single byte:

This format requires only one “pr” byte and is used for numbers ranging from 0-127 (or -64 to +63). This is the format used for most MIDI commands.

2 byte, 7 bits, hi to lo

This format requires two “pr” bytes. The first byte contains bits 7-13 of the parameter and the second byte contains bits 0-6 of the parameter.

2 byte, 7 bits, lo to hi

This format requires two “pr” bytes. The first byte contains bits 0-6 of the parameter and the second byte contains bits 7-13 of the parameter. This is the format used for a MIDI pitch bend command. The MIDI sample dump standard also specifies parameters in this format.

3 byte, 7 bits, hi to lo

This format requires three “pr” bytes. It is similar to the format “2-Byte,7-bits, hi to lo” except extended to three bytes. This is a rarely used format.

3 byte, 7 bits lo to hi ---

This format requires three “pr” bytes. It is similar to the format “2-Byte,7-bits, lo to hi” except extended to three bytes. This is a rarely used format.

2 bytes, Nibs, hi to lo

This format requires two “pr” bytes. The first byte contains bits 4-7 of the parameter and the second byte contains bits 0-3 of the parameter. This is a common format used to send parameters ranging from 0-255 or -128 to 127.

2 bytes, Nibs, lo to hi

This format requires two “pr” bytes. The first byte contains bits 0-3 of the parameter and the second byte contains bits 4-7 of the parameter. This is a common format used to send parameters ranging from 0-255 or -128 to 127.

3 byte, Nibs, hi to lo

This format requires three “pr” bytes. The first byte contains bits 8-11, the second byte contains bits 4-7 and the third byte contains bits 0-3 of the parameter. This is a rarely used format.

3 bytes, Nibs, lo to hi

This format requires three “pr” bytes. The first byte contains bits 0-3, the second byte contains bits 4-7 and the third byte contains bits 8-11 of the parameter. This is a rarely used format.

4 bytes, Nibs, hi to lo

This format requires four “pr” bytes. The first byte contains bits 12-15, the second byte contains bits 8-11, the third byte contains bits 4-7 and the fourth byte contains bits 0-3 of the parameter.

4 bytes, Nibs, lo to hi

This format requires four “pr” bytes. The first byte contains bits 0-3, the second byte contains bits 4-7, the third byte contains bits 8-11 and the fourth byte contains bits 12-15 of the parameter.

2 byte, BCD Nibs, hi to lo

This format requires two “pr” bytes. The first byte contains the value of the tens digit parameter while the second byte contains the ones digit of the parameter. This is sometimes used for parameters ranging from 0-99 or 0.0-9.9. This is a rarely used format.

2 byte, BCD Nibs, lo to hi

This format requires two “pr” bytes. The first byte contains the value of the ones digit parameter while the second byte contains the tens digit of the parameter. This is sometimes used for parameters ranging from 0-99 or 0.0-9.9. This is a rarely used format.

NOTE: If a string has more “pr” bytes than a format requires the extra “pr” bytes will cause the parameter to be repeated. This allows the parameter to appear several times in a single string.

MIDI Implementation

Model: PC1600X

Date: 6/97 Version: 2.0

Function		Transmitted	Recognized	Remarks
Basic Channel	Default Changed	1 1 -16	1 1 -16	Memorized
Mode	Default Messages Altered	X	X	
	Messages Altered	O	X	
Note Number	True Voice	1 - 127	X X	
Velocity	Note On	O	O	Recognized for button emulation
	Note Off	O-x		O-x can be with a String
After Touch	Key's Channels	O O	X X	
Pitch Bender		O	X	
Control Change		0 & 32 Bank Select 1 -120 Fader Assignable	X X	
Program Change	True Number	0 - 127	0 - 127	Mappable
System Exclusive		O	O	
System Common	Song Position Song Select Tune	O O O	X O X	Song Select Sends A Scene
System Real Time	Clock Command	X O	X X	
Aux Messages	Local: On/Off All Notes Off Active Sense Reset	O O X O	X X X	

Mode 1: OMNI ON. POLY
Mode 3: OMNI OFF. POLY

Mode 2: OMNI ON. MONO
Mode 4: OMNI OFF. MONO

O : Yes
X : No

Controller Number Listing

Controller	Number	Control Function
Decimal	HEX	
0	0	Bank Select
1	1	Modulation Wheel
2	2	Breath Controller
3	3	Undefined
4	4	Foot Controller
5	5	Portamento Time
6	6	Data entry MSB
7	7	Main Volume
8	8	Balance
9	9	Undefined
10	0A	Pan
11	0B	Expression Controller
12	0C	Effect Control 1
13	0D	Effect Control 2
14-15	0E-0F	Undefined
16-19	10-13	General Purpose Controllers #1 - #4
20-31	14-1F	Undefined
32-63	20-3F	LSB for Controller 0
64	40	Damper Pedal (Sustain)
65	41	Portamento On/Off
66	42	Sostenuto
67	43	Soft Pedal
68	44	Legato Footswitch (0-3F=Normal, 40-7F=Legato)
69	45	Hold 2
70	46	Sound Control 1 (default: Sound variation)
71	47	Sound Control 2 (default: Timbre Content)
72	48	Sound Control 3 (default: Release Time)
73	49	Sound Control 4 (default: Attack Time)
74	4A	Sound Control 5 (default: Brightness)
75-79	4B-4F	Sound Control 6-10 (no defaults)
80-83	50-53	General Purpose Controller #5 - #8
84	54	Portamento Control
85-90	55-5A	Undefined
91	5B	Effect 1 Depth
92	5C	Effect 2 Depth
93	5D	Effect 3 Depth
94	5E	Effect 4 Depth
95	5F	Effect 5 Depth
96	60	Data Increment
97	61	Data Decrement
98	62	Non-Registered Parameter Number LSB
99	63	Non-Registered Parameter Number MSB
100	64	Registered Parameter Number LSB
101	65	Registered Parameter Number MSB
102-120	66-78	Undefined
121-127	79-7F	Reserved For Channel Messages

Taking The Vex Out Of Hex, When Working With MIDI Messages.

MIDI, of course is an acronym for “Musical Instrument Digital Interface”. Contrary to the opinion of some, MIDI was not created to complicate matters, but to allow musicians to do what was once thought to be impossible. Never the less the “Digital” part of MIDI means the actual messages are digits (numbers).

Fortunately, MIDI numbers often refer to aspects of musical performance. As a matter of fact, MIDI is not too different from music notation. For example, each symbol represents something done musically. To play written music, you actually translate what’s on the page into a musical performance. With MIDI, the computers inside MIDI devices actually translate your playing into “MIDI Speak” which is then forwarded to connected devices. This “MIDI Speak’ includes messages such as what note you played, How hard it was played, how long it was played, Held etc. Most of the time, this is of little concern since MIDI software and instruments often allow plug & play operation. However, occasionally, an understanding of MIDI messages can be very handy.

The Numbers...

MIDI messages can he described in any of three numbering systems below:

- * **Binary**
- * **Decimal**
- * **Hexadecimal**

Computers, and therefore the processors inside MIDI devices, use the binary system where data consists of zeros and ones.

128	64	32	16	8	4	2	1
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1 or 0							

With binary, the value is either “On” (1) or “Off (0). These values are known as “bits” (short for binary digits). Typically, bits come in groups of eight, which are referred to as “bytes”.

They Look Like This:

1111 1111
0000 0000
0011 1010
1010 1011

But how is the value of binary numbers determined? Check out the chart above, and then look at the sample below:

0000 0000 = 0
0000 0001 = 1
0000 0010 = 2
0000 0100 = 4
0000 1000 = 8
0000 1111 = 15
1111 1111 = 256 (128 + 64 + 32 + 16 + 8 + 4 + 2 + 1)

You might have noticed that there are 256 possible values from a byte (all “On” = 256, all “Off” = 0). By the way, 4 bits or half a byte is known as a “nibble” (see, computer folks have a sense of humor). How many values are possible with a nibble: you got it 16! (all “On” = 15, all “Off” = 0).

simply adding or subtracting them is problematic. Converting decimal to binary isn't much fun either.

Quick...

what's the binary letter for 148 see what I mean? (BTW.. **1001 0100 (128+16+4)**).

Fortunately there is a number system that makes dealing with binary much easier:

Hexadecimal

With hexadecimal, you can work with one nibble at a time, which greatly simplifies conversion. Instead of the ten values used in decimal notation, hexadecimal uses sixteen. Hmm, That should ring a bell... yes, a nibble can represent up to 16 values. After the familiar 0 thru 9, hexadecimal uses the letters A thru F to represent 10 thru 15, Check out the chart featuring hex and decimal equivalents.

Hexadecimal:

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Decimal:

Hexadecimal:

10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Decimal:

So...

20 (TWENTY) IN DECIMAL IS EQUIVALENT TO 14 (ONE-FOUR) IN HEX! Keep in mind that the largest hex number available from two digits is FF (255). Note: it is common to use symbols to identify hexadecimal numbers.

Examples:

7F include:

7Fh, 7FH, \$7F, 0x7F

UGH...

Why go to this much trouble?

- a. We love confusion
- b. We're techno wiz bangs
- c. We're rocket scientists
- d. It's the best Way

Take a byte

Actually, it really is the best way. When a byte is "sliced" in half (two nibbles) a maximum of 16 values (per nibble) are possible. This obviously translates well into a hex number. An eight-bit number, therefore, easily translates into TWO hex digits.

Since eight-bit binary numbers are referred to as a byte, the two-digit hex representation is also called a byte. A nibble translates nicely into one hex value. Just "cut" the byte into two nibbles, then assign a hex value to each. You end up with hex numbers like these:

Note: h signifies hexadecimal number)

Those Familiar Hex Numbers

You've probably noticed many decimal numbers used by synthesizers that reveal hexadecimal "activity." All the way from present numbering systems to polyphony, these hex numbers "pop up" in a variety of places.

Now, we have a basic understanding of hex numbers, so what do we do with them?

Hexadecimal messages create a variety of different types of MIDI messages. This gives you the ability to "talk" to your synthesizer directly. Check out the MIDI 101 article for specific hex messages that you can use. Also, next month, we'll be looking at Status, and Data bytes. Don't miss it!

MIDI 101:

When most of us use MIDI, the actual messages that move through the MIDI cable are often of little concern. After all, we are too busy making music to be bothered with such technical things. However, occasionally, it becomes necessary to work with MIDI messages and, therefore, it is handy to understand how they work and how to use them.

Let's look at four types of MIDI messages:

Channel Messages

System Exclusive Messages

System Common Messages

System Real-Time Messages

But first . . .

MIDI messages are displayed using hexadecimal notation (see Hex article on page 30). Getting a basic handle on this numbering system is half the trick in working with MIDI messages.

Channel Messages

Let's take a look at channel messages. These are so-named due to the fact that the MIDI channel is imbedded into the message itself. The receiving MIDI device must be set to the same channel or the message will be ignored. Channel messages are either two or three bytes in length with the first byte being the **status byte**. This signifies the message type and MIDI channel. The bytes that follow are known as **data bytes** and contain the actual value of the message. Let's take a look at channel messages (*n-MIDI channel, x=value*)

System Exclusive Messages

SysEx (System Exclusive) messages "speak" to specific synthesizers, sound modules, or other MIDI devices. That is why they are referred to as "exclusive" messages. For example, if SysEx messages for the Spectrum Synth are sent to the Spectrum Organ, the module will ignore the messages. Only the Spectrum Synth will respond to Spectrum Synth SysEx messages.

All SysEx messages start with F0 ("Start of SysEx" message), and end with F7 ("End of SysEx" message). The anatomy of a typical message is as follows:

SysEx messages are used to edit parameters on a MIDI device, remotely, yet in real time. Devices such as the PC 1600 can be programmed to transmit SysEx (and other) MIDI messages using faders, buttons, pedals, and a data wheel.

System Common Messages

System common messages are important, but, not that common (I had to say it). The system common messages are:

System Real-Time Messages

System real-time messages are important for applications such as sequencing. They are unique in such that they can occur anywhere in a MIDI stream – even in the middle of other messages.

These one-byte messages include:

These messages make up the majority of MIDI messages involving synthesizers, samplers, sequencers, etc. Don't hesitate in using these messages to make real-time changes in your musical performance.

Schematic: PC1600/PC1600X

What is the difference between the original PC1600 and the PC1600x?

- Expanded SysEx Control
- Checksum-- Now it is possible to designate a byte as "cs" for checksum calculations.
- Global Channel Bytes-- Many MIDI products use SysEx messages that include a MIDI channel and/or device ID. This is, of course, handy for differentiating among multiple units of the same type. Normally, changing this byte would require editing of each fader/button individually. Now, a new byte can be a part of the string that specifies the global MIDI setting or global device ID. By simply changing the global setting, all messages are changed.
- Improved SysEx Transfers-- New MIDI delay parameters to slow down the MIDI stream if you have a unit that "chokes" on the data at full speed.
- Expanded Button Facilities
- Send Fader-- This feature provides an easy way to send specific fader values. When a button is set to "send fader," it must be pressed to enable a fader value to be transmitted. Fader movement is used to select a specific value and the button is pressed to send it. BTW, continuing to hold the button down will enable the fader to work as usual.
- Send Scene-- This new button function allows any scene to be sent from any of the 16 buttons.
- Fader ID-- With a button programmed to "Off/Fader ID," pressing the button displays the fader name.
- Remote Control-- All 16 buttons can now be triggered externally via MIDI notes or program change messages. This is particularly handy for control from a footpedal.
- Note Capture-- This makes it easy to capture clusters of notes (chords) and assign them to a button.
- Left Arrow(Mute) Button-- When the left arrow button is pressed, the PC 1600 will not generate any MIDI messages.
- Preset Initialization-- This new utility feature allows a preset to be returned to an initialized state. This is handy for programming from "scratch" or freeing up more dynamically allocated preset memory.
- Enhanced Scene Features
- Preset Identity-- The scene display now indicates the associated preset number.
- Scene Initialization-- This new scene function allows an existing scene to be initialized which disassociates it with any preset.
- Setup String Additions
- Scenes-- A scene can now be assigned to each preset. Anytime the preset is recalled, the scene will be transmitted.
- Flexible Bank Select-- Bank Select editing is now expanded to include MSB or LSB programming.
- New Factory Presets-- New factory presets present a wide range of applications.

The only “Physical” change is a larger “Encoder Wheel”

Notes:

1... PC1600 Front Panel, Sheet 1 of 1, Left edge of page cut off.

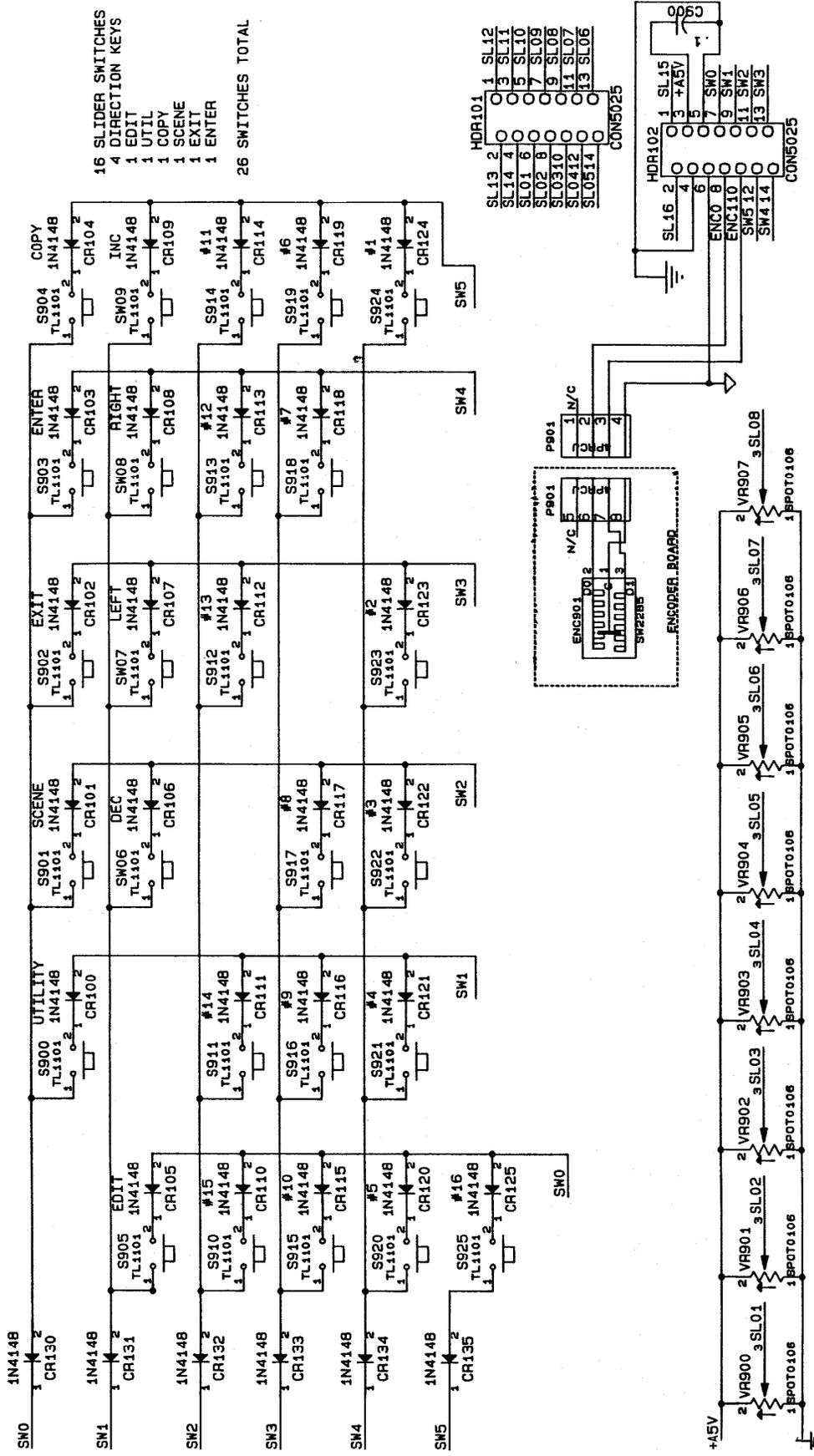
W0@CR130, W1@CR131, W2@CR132, W3@CR133, W4@CR134, W5@CR135

Should read: SW0, SW1, SW2, SW3, SW4, SW5

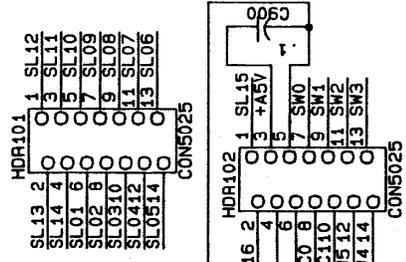
These are the same designators at the bottom of the switch array.

Just in reverse order, they do not connect to themselves.

Resulting in the “Step” formation through the middle of the switch array.



- 16 SLIDER SWITCHES
- 4 DIRECTION KEYS
- 1 EDIT
- 1 UTIL
- 1 COPY
- 1 SCENE
- 1 EXIT
- 1 ENTER
- 26 SWITCHES TOTAL

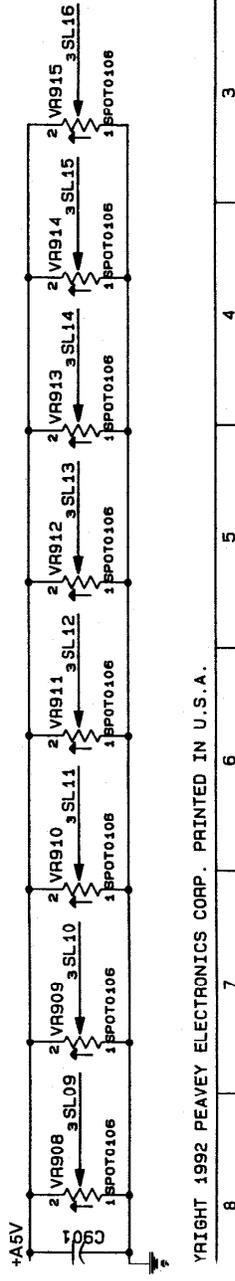


PEAVEY ELECTRONICS CORP.
711 A STREET
MERIDIAN, MS 39301

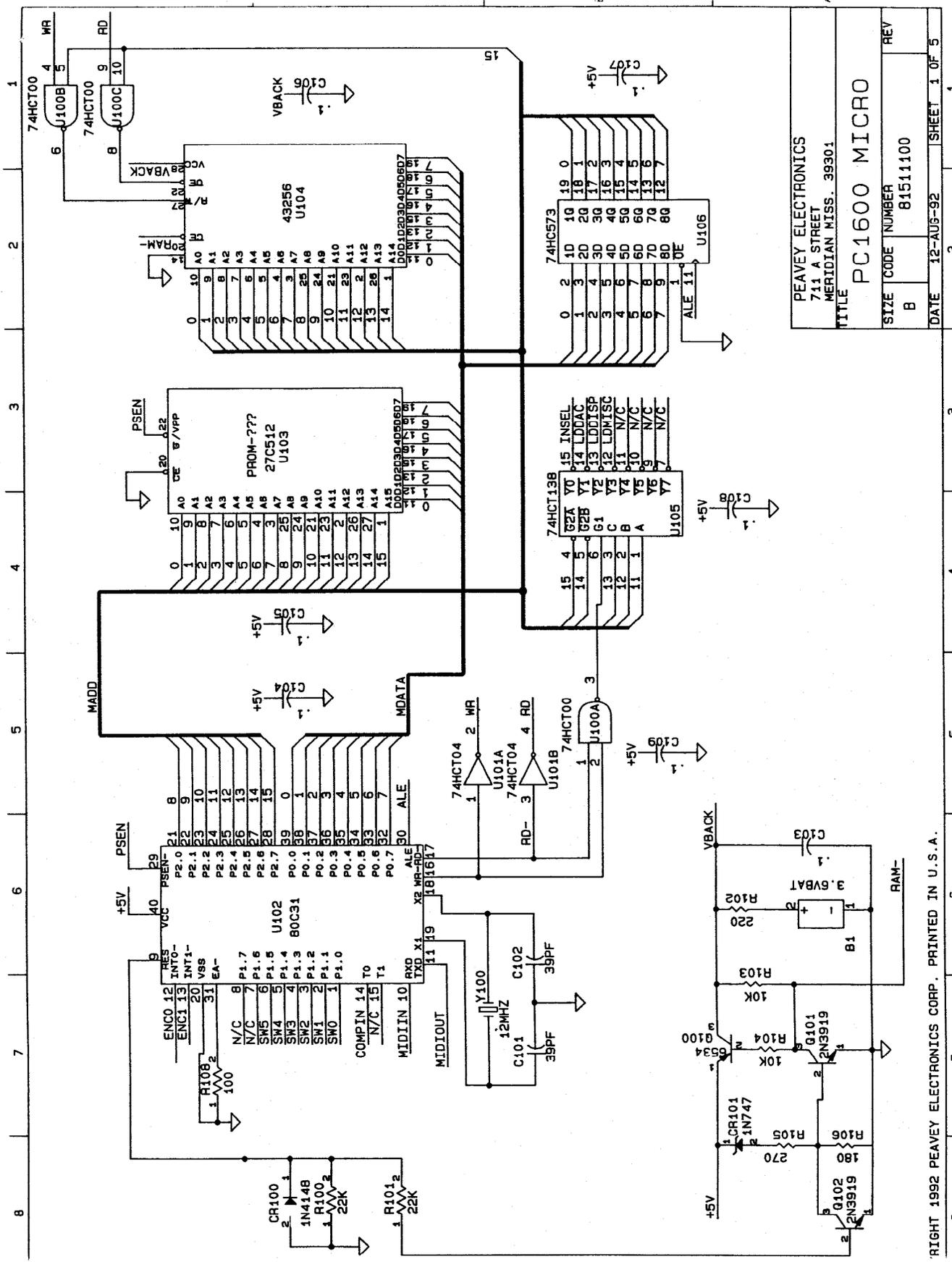
TITLE
PC1600 FRONT PANEL

SIZE CODE NUMBER
B 81511100

DATE 12-AUG-92 SHEET 1 OF 1



RIGHT 1992 PEAVEY ELECTRONICS CORP. PRINTED IN U.S.A.



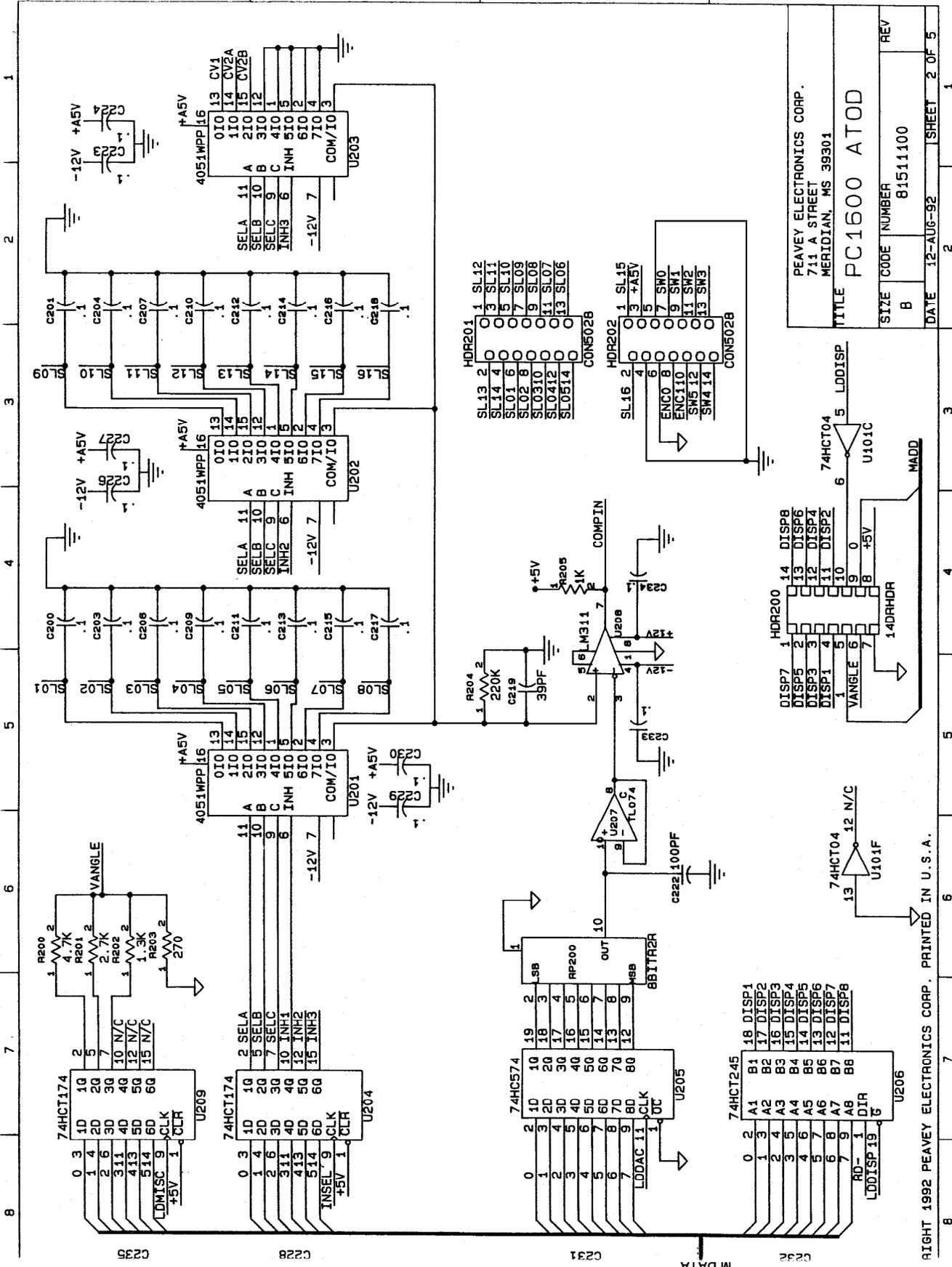
PEAVEY ELECTRONICS
 711 A STREET
 MERIDIAN MISS. 39301

TITLE
PC1600 MICRO

SIZE CODE NUMBER
 B 81511100

DATE 12-AUG-92 SHEET 1 OF 5

RIGHT 1992 PEAVEY ELECTRONICS CORP. PRINTED IN U.S.A.



PEAVEY ELECTRONICS CORP.
711 A STREET
MERIDIAN, MS 39301

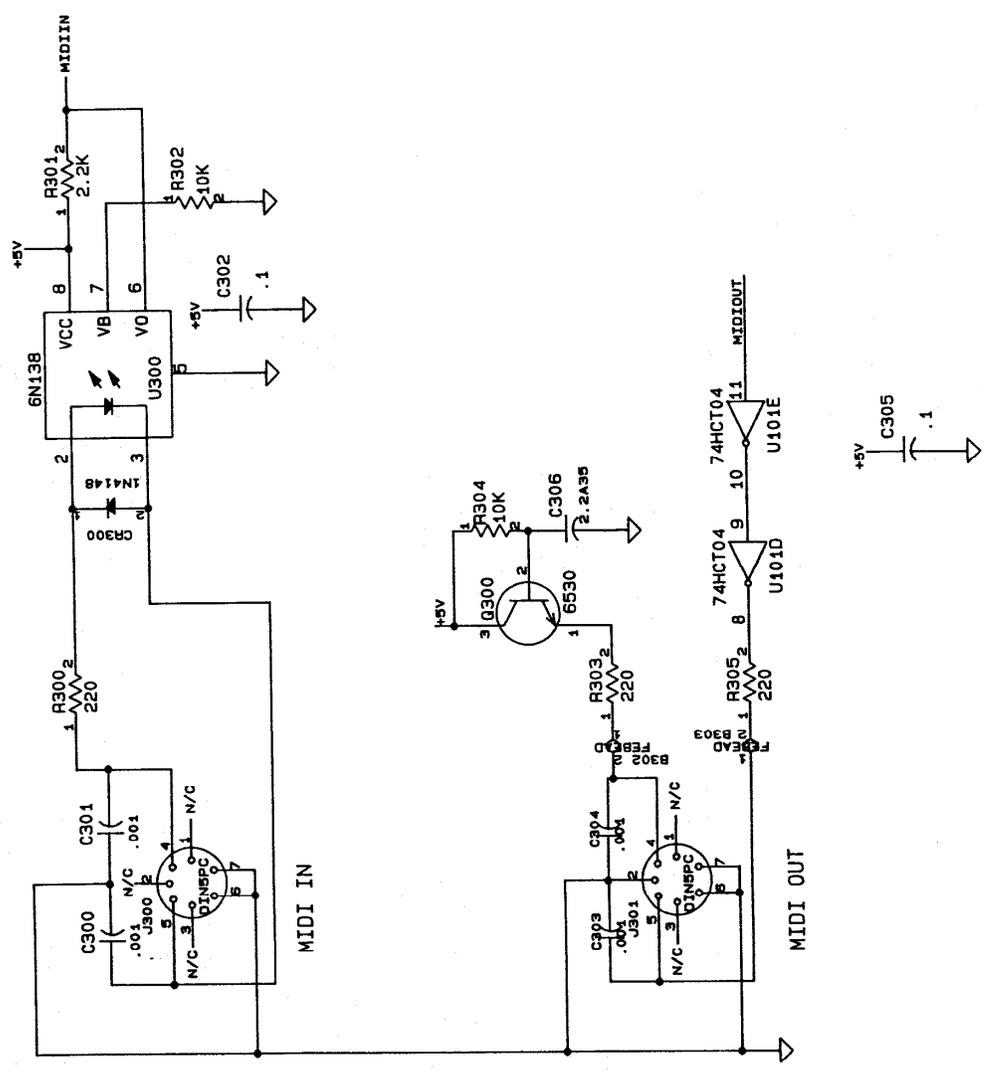
TITLE PC1600 ATOD

SIZE CODE NUMBER B 81511100

DATE 12-AUG-92 SHEET 2 OF 5

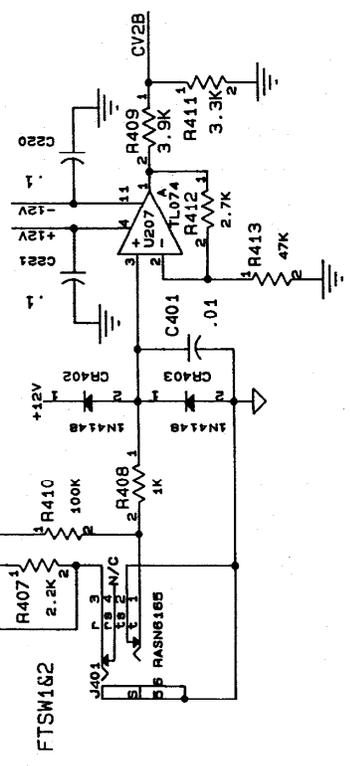
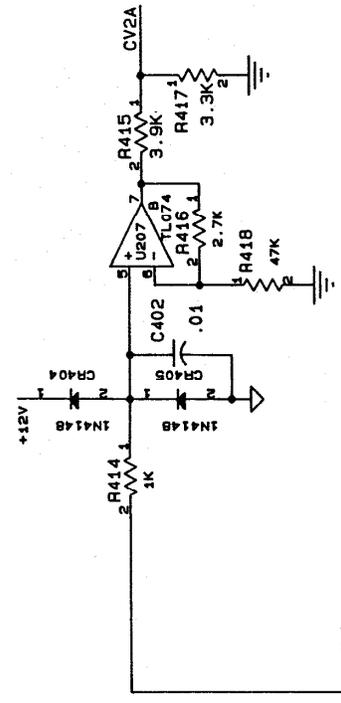
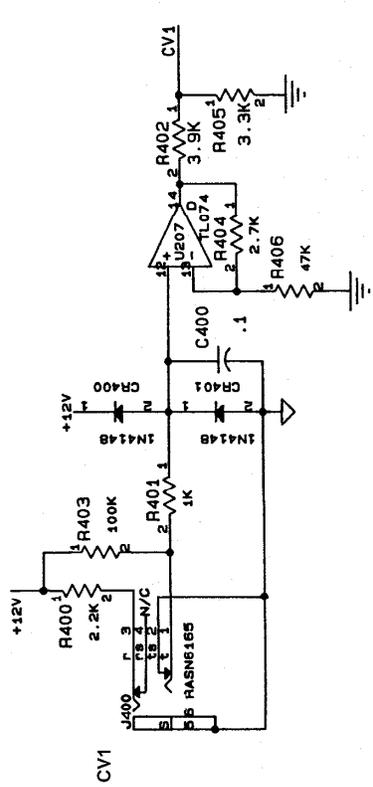
RIGHT 1992 PEAVEY ELECTRONICS CORP. PRINTED IN U.S.A.

1 2 3 4 5 6 7 8

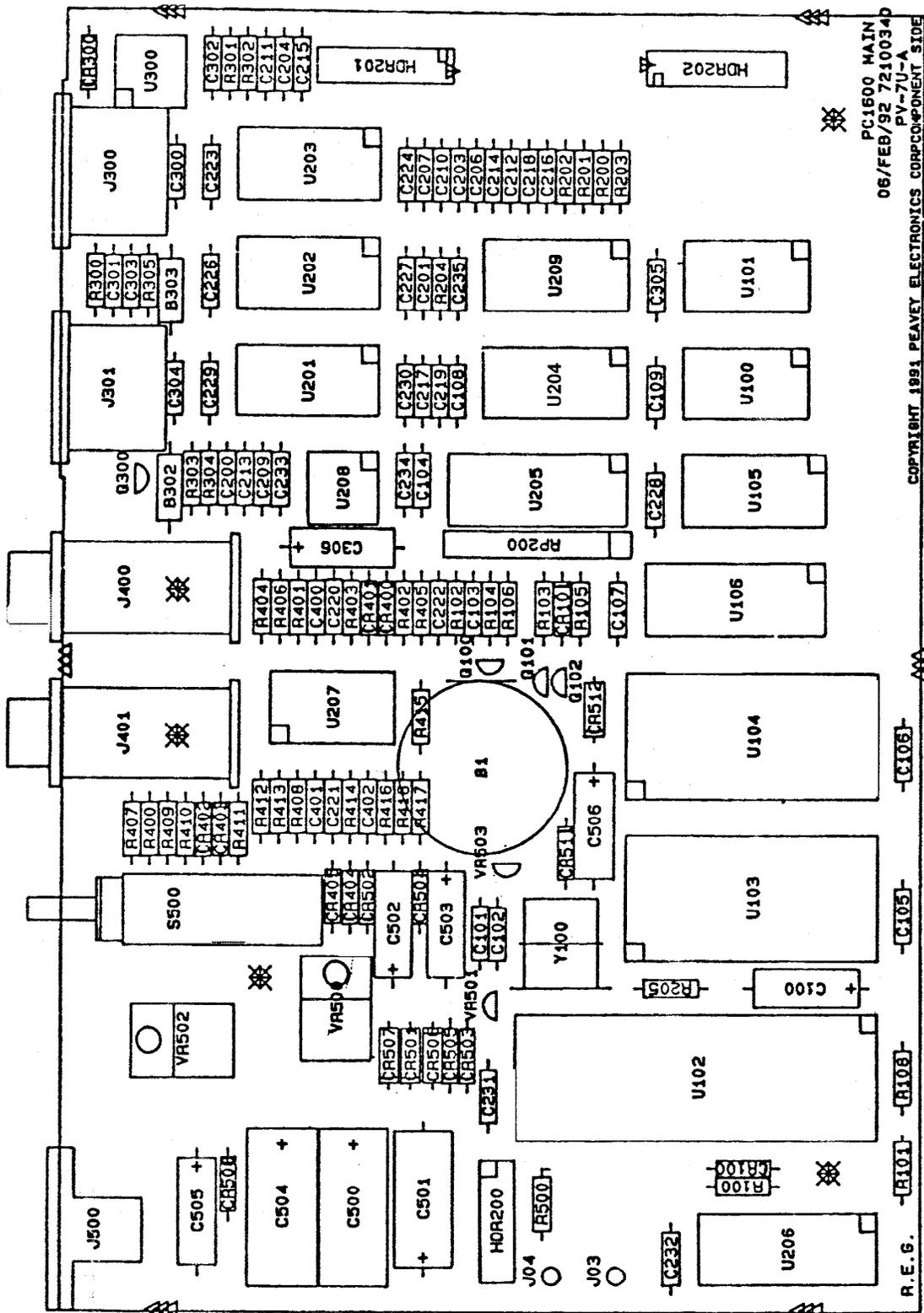


PEAVEY ELECTRONICS CORP. 711 A STREET MERIDIAN, MS 39301	
TITLE PC1600 MIDI I/O	
SIZE B	CODE NUMBER 81511100
DATE 12-AUG-92	REV 3 OF 5

RIGHT 1992 PEAVEY ELECTRONICS CORP. PRINTED IN U.S.A.



PEAVEY ELECTRONICS CORP. 711 A STREET MERIDIAN, MS 39301	
TITLE PC1600 CV INPUTS	
SIZE B	CODE NUMBER 8151100
DATE 12-AUG-92	SHEET 4 OF 5



PC1600 MAIN
06/FEB/92 7210034D
PV-7U-A

COPYRIGHT 1991 PEAVEY ELECTRONICS CORPORATION SIDE

R. E. G.





