

Chapter 4

Control Sources

Control sources are assigned as values for control source parameters, like Src1 and Src2, Depth Control for Src2, and LFO rate control. Assigning a control source to one of these parameters is like connecting control source outputs to various inputs on early modular synthesizers. You can think of each control source parameter as the input to a synthesizer module, and the values for those parameters as the outputs of modules generating control signals.

For the control sources to have an effect, two things have to happen. First, the control source must be assigned as the value for (patched to) a control source parameter like Src1. In other words, for a control source parameter to have an effect, it must be programmed to respond to a particular control message. Second, the control source must generate a signal. The level of the control source's signal determines how much effect it has on the control source parameter to which it's assigned.

In terms of generating signals, there are two types of control sources. The first, which might be called hardware control sources, require some physical movement to transmit them. The control source called MWheel (MIDI 01) is probably the most prominent example of this type of control source. When you move your MIDI controller's Mod Wheel, it sends a Modulation message (MIDI 01), unless you've programmed it to send something else. By default, when the K2600 receives a MIDI 01 message, it responds by sending a control signal to whatever control source is assigned as the value for the MWhl parameter on the MIDI-mode RECEIVE page. Of course, you can program the MWhl parameter to send any available control source signal in response to MIDI 01 messages.

Some of these hardware control sources have physical controls "hard-wired" to transmit them. That is, there are certain physical controls that *always* generate these control signals. Every time you strike one of your MIDI source's keys (or pluck a string, or whatever), for example, a Note On message is generated, along with an Attack Velocity message. So any time you strike a key, any control source parameter that has AttVel assigned as its value will be affected by the Attack Velocity message. Similarly, every time you move the physical Pitch Wheel, a PWheel message is generated. Whether this affects anything depends on whether you have assigned any control source parameters to respond to the PWheel message (in other words, whether any control source parameter has PWheel assigned as its value).

In the Setup Editor you'll find several parameters that correspond to the standard physical controllers found on many keyboards. These parameters and their default values are listed in Table C-1 on page C-2. The values you assign for these parameters determine which control messages will be transmitted to the K2600 and to its MIDI Out port when you move the corresponding controls on your MIDI source. If you look at the WHEEL page in the Setup Editor, you'll see that the parameter called MWhl has a default value of **MWheel**. You can interpret this as follows: "Moving the Mod Wheel on my MIDI source sends the MWheel (Modulation, MIDI 01) message to the K2600's sound engine, and, if the K2600's LocalKbdCh parameter matches my controller's transmit channel, also sends it to the K2600's MIDI Out port."

If you change the value of the MWhl parameter, the Mod Wheel will no longer send the MWheel message, and any control source parameter with **MWheel** assigned as its value will no longer respond to movement of the Mod Wheel. All of the control assignment parameters in the Setup Editor can be programmed to send any of the MIDI controller numbers. For example, if you assign **Foot** (MIDI 04) as the value for the Press parameter, then generating mono pressure messages from your MIDI source will send a Foot (MIDI 04) message to the K2600's sound

engine, and will affect any control source parameter that has **Foot** assigned as its value. If the value for the K2600's LocalKbdCh parameter matches your MIDI controller's transmit channel, then in this case the Foot message will be sent to the K2600's MIDI Out port as well, when you generate mono pressure messages from your MIDI controller.

The other type of control source is independent of the movement of physical controls. These control sources generate their control signals internally, and might be called software control sources. They either run automatically (like A Clock and RandV1), or they're programmed to generate their signals according to parameters of their own (as with the LFOs and FUNs). The software control sources must have some nonzero value set for one or more of their parameters before they'll generate control signals.

To summarize, there are two different cases in which you'll assign control sources. One, the transmit case, determines what control message will be sent by a particular physical control. For example, MWheel is set by default to be transmitted by the Mod Wheel. The other case, the receive case, determines which control message will activate a particular control source parameter. For example, if you assign **MPress** as the value for the Src1 parameter on the PITCH page in the Program Editor, then that layer's pitch will be affected whenever an MPress message is generated by any physical controller.

Control Source Lists

There's one long list of control sources stored in the K2600's memory, although not all control sources are available for all control source parameters. With time you'll become familiar with the types of control sources available for various control source parameters.

The available list of control sources varies depending on the type of control source parameter you're programming. There are four basic types: MIDI control sources, local control sources, global control sources, and FUNs.

When you're setting the control assignment parameters in the Setup Editor, you'll see only the portion of the Control Source list that has values appropriate to MIDI controller messages. Consequently we refer to this subset of the Main Control Source list as the MIDI Control Source list.

You'll see variations on the Main Control Source list as you program the other control source parameters. We'll explain these variations, but it's not important that you memorize each variation. The lists differ to prevent you from assigning a control source where it would be ineffective. All you have to do is to scroll through the list of control sources available for any given control source parameter, and choose from the available values.

If you're programming one of the FUNs, you'll see the Main Control Source list, which includes almost every control source from the MIDI Control Source list (with the exception of Data Inc, Data Dec, and Panic, which belong exclusively to the MIDI Control Source list). The list for the FUNs also includes a set of constant values, that set an unvarying control signal level for one or both of the FUN's inputs.

For most other control source parameters, you'll see the Main Control Source list (without the FUN constants and the three special MIDI control sources we mentioned above). There are two exceptions to this rule, which have to do with global control source parameters. Globals affect every note in each program's layer(s). Consequently they can't use local control sources as their values, since local control sources affect each note independently.

One control source parameter is always global: the Enable parameter on the LAYER page (Program Editor). When programming this parameter, you'll see the Main Control Source list minus the three special MIDI control sources, minus the following local control sources:

| | |
|---------|---------|
| Note St | VTRIG2 |
| Key St | RandV1 |
| KeyNum | RandV2 |
| BKeyNum | ASR1 |
| AttVel | LFO1 |
| InvAVel | FUN1 |
| PPress | FUN3 |
| BPPress | Loop St |
| RelVel | PB Rate |
| Bi-AVel | AtkSt |
| VTRIG1 | Rel St |

Finally, if you've turned on the Globals parameter on the COMMON page in the Program Editor, the available values for GLFO2, and the values for GASR2's trigger will lack the local control sources listed above, as well as the three special MIDI control sources and the FUN constants. The available values for GFUN2 and GFUN4 will exclude the same list of local control sources, but will include the FUN constants.

Descriptions of Control Sources

This section is organized into two sets of descriptions: the MIDI Control Source list, and the rest of the control sources. The numeral preceding the name of each control source can be entered on the alphanumeric pad to select the control source directly (press **Enter** after typing the numeral).

Many of the MIDI control sources are assigned as default values for the control assignment parameters in the Setup Editor. We'll indicate these assignments as they appear, simply by mentioning that they're the default control source for a control assignment parameter.

MIDI Control Source List

With a few exceptions, the MIDI control sources correspond to the standard MIDI controller numbers used by every MIDI device.

128 **OFF**

This value eliminates the effect of any control source parameter to which it's assigned.

0, 33 **Mono Pressure (MPress)**

Many of the K2600's factory programs are assigned to modify parameters such as pitch, filter cutoff frequency, and depth control when MPress messages are received. The mono pressure (Press) control assignment parameters in MIDI and Setup modes are set by default to transmit MPress messages when mono pressure messages are received from a controller.

Control Sources

MIDI Control Source List

- 1 MIDI 01 (MWheel)**

Many factory programs are assigned to respond to MWheel messages. The MWheel parameter in the Setup Editor is set by default to transmit MWheel.
- 2 MIDI 02 (Breath)**
- 3 MIDI 03**
- 4 MIDI 04 (Foot)**

This is the standard MIDI Controller number for continuous control foot pedals. It's the default value for the CPedal control assignment parameter, so a control pedal on your MIDI controller which sends MIDI controller 04 messages will send MIDI controller 04 messages to the K2600 by default.
- 5 MIDI 05 (PortTim)**

This is the standard MIDI controller number for portamento time control. The K2600 always responds to this control message. For any program that has portamento turned on (on the COMMON page in the Program Editor), MIDI Portamento Time messages received via MIDI will affect the rate of the program's portamento.
- 6 MIDI 06 (Data)**

MIDI 06 is the standard MIDI controller number for data entry. The Slider A parameter on the SLIDER page in the Setup Editor is set by default to transmit this message, and can be used to select programs and edit parameters on MIDI slaves if your controller can send it.
- 7 MIDI 07 (Volume)**

This is the standard MIDI controller number for volume. The Volume parameter on the CHANNELS page in MIDI mode will respond to MIDI controller 07 unless the VolLock parameter is turned on.
- 8 MIDI 08 (Balance)**
- 9 MIDI 09**
- 10 MIDI 10 (Pan)**

MIDI controller 10 is defined as Pan control. The Pan parameter on the CHANNELS page in MIDI mode will respond to MIDI controller 10 unless the PanLock parameter is turned on.

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|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | MIDI 11 (Express) |
| 12—14 | MIDI 12—14 |
| 15 | MIDI 15 (AuxBend2) The K2600 interprets MIDI Controller 15 as AuxBend2, which is assigned by default to the short ribbon (below the pitch and mod wheels) on keyboard models of the instrument. A value of 64 is centered. |
| 16—19 | MIDI 16—19 (Ctl A—D) |
| 20 | MIDI 20 |
| 21 | MIDI 21 (AuxBend1) The K2600 interprets MIDI Controller 21 as AuxBend1, which is assigned by default to the long ribbon (above the keyboard) on keyboard models of the instrument. A value of 64 is centered. |
| 22—31 | MIDI 22—31 |
| 64 | MIDI 64 (Sustain) This is the standard MIDI Controller number for Sustain. The control assignment parameter FtSw1 is set by default to MIDI Controller 64, so a switch pedal on your MIDI controller that sends MIDI 64 will send sustain messages to the K2600 by default. The K2600 will always respond to sustain messages by sustaining currently active notes. |
| 65 | MIDI 65 (PortSw) This is the standard MIDI Controller number for Portamento Switch. The Portamento parameter on the COMMON page in the Program Editor always responds to this controller, and will turn Portamento on for monophonic programs when the controller signal is at 64 or above. It won't affect polyphonic programs. |
| 66 | MIDI 66 (SostPD) MIDI Controller 66 is defined as Sostenuto Switch. The control assignment parameter FtSw2 is set by default to MIDI Controller 66, so a switch pedal on your MIDI controller that sends MIDI 66 will send sostenuto messages to the K2600 by default. The K2600 will always respond to sostenuto messages. |
| 67 | MIDI 67 (SoftPd) This is the standard MIDI Controller number for Soft Pedal. The K2600 will always respond to Soft pedal messages. |
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Control Sources

MIDI Control Source List

- 68** **MIDI 68**
- 69** **MIDI 69 (FrezPd)**
The K2600 will always respond to this message. It causes all notes to be frozen at their current amplitude levels while the function is on.
- 70—74** **MIDI 70—74**
- 75** **MIDI 75 (LegatoSw)**
The K2600 always responds to this message. When a MIDI Controller 75 message with a value above 64 is received, the K2600 will force polyphonic programs to be monophonic.
- 76—79** **MIDI 76—79**
- 80—83** **MIDI 80—83 (Ctl E—H)**
- 84—90** **MIDI 84—90**
- 91** **MIDI 91 (FXDep)**
The MIDI specification defines this Controller as External Effects Depth. If the FX Mode parameter is set to **Master**, and the FX Channel parameter is set to a specific MIDI channel, the K2600 will respond to this message when it is received on the FX channel. It responds by adjusting the Wet/Dry mix of the current studio.
- 92—95** **MIDI 92—95**
- 96** **MIDI 96 (DataInc)**
This is defined as Data Increment. It's intended to be assigned to a switch control. When the control is on (value 127), the currently selected parameter's value will be increased by one increment. This could be assigned to FtSw2, for example, to scroll through the program list while in Program mode.
- 97** **MIDI 97 (DataDec)**
This is defined as Data Decrement. It's intended to be assigned to a switch control. When the control is on (value 127), the currently selected parameter's value will be decreased by one increment.
- 123** **MIDI 123 (Panic)**
The K2600 always responds to this message by sending an All Notes Off and All Controllers Off message on all 16 MIDI channels.

Main Control Source List

This list contains all but the last three control sources in the MIDI Control Source list. It also contains the following control sources. All are local unless specified as global.

- 32 Channel State (Chan St)**
Chan St refers to whether any notes are currently active on a given MIDI channel. Chan St switches on whenever a note is started, and switches off when a Note Off has been received for each current note on that channel, even if notes are sustained.
- 33 Mono Pressure (MPress)**
This is the same as the MPress control source in the MIDI Control Source list, but is assigned by entering 33 on the alphanumeric pad when used with a parameter that takes its values from the Main Control Source list.
- 34 Bipolar Mono Pressure (BMPress)**
This control source generates a control signal of -1 when the value of the control to which it's assigned is at its minimum, and +1 when the control is at its maximum. For example, if you had the MPress control assignment parameter assigned to send BMPress, and you had Src1 on a program layer's PITCH page assigned to **BMPress**, with its depth parameter set to **1200 cents**, then the layer would be transposed down an octave when no pressure (value 0) was applied to your controller's keys (assuming it sends mono pressure). Maximum pressure (value 127) would transpose the layer up an octave, while a pressure level of 64 would leave the pitch unchanged.
- 35 Pitch Wheel Message (PWheel)**
The K2600 is hard-wired to respond to this message. Any parameter with **PWheel** assigned as its value will be affected when your MIDI controller's Pitch Wheel is moved.
- 36 Bipolar Mod Wheel (Bi-Mwl)**
This control source will always respond to MIDI controller 01 (MWheel). Control source parameters set to this value will generate control signals of -1 when the MIDI Controller 01 message value is 0, and will generate a control signal of +1 when the MIDI Controller 01 message is at 127, scaling all values in between. For example, you might set Src1 on a program layer's PITCH page to a value of **Bi-Mwl**, and its depth parameter to **1200 cents**. Then as long as the MWhl control assignment parameter is set to a value of **MWheel**, your controller's Mod Wheel will be bipolar; in this case it will bend the layer's pitch down as you move the Mod Wheel toward minimum, and bend the pitch up as you move the Mod Wheel toward maximum.
- 37 Absolute Value of Pitch Wheel (AbsPwl)**
This control source always responds to movement of your MIDI controller's Pitch Wheel, but makes the Pitch Wheel unipolar. Whereas pulling the Pitch Wheel fully down usually generates a control signal value of -1, this control source generates a value of +1 when the Pitch Wheel is pulled fully down.

Control Sources

Main Control Source List

- 38 Global ASR (GASR2)**
When the Globals parameter on the COMMON page is turned on, ASR2 becomes global, and is labeled GASR2. The functions of ASRs are explained on page 6-42 of the *Musician's Guide*. This control source does not appear in the Control Source list for parameters whose functions are local.
- 39 Global FUN2 (GFUN2)**
When the Globals parameter on the COMMON page is turned on, FUN2 becomes global, and is labeled GFUN2. The functions of FUNs are explained in Chapter 17 of the *Musician's Guide*. This control source does not appear in the Control Source list for parameters whose functions are local.
- 40 Global LFO (GLFO2)**
When the Globals parameter on the COMMON page is turned on, LFO2 becomes global, and is labeled GLFO2. The functions of LFOs are explained on page 6-40 of the *Musician's Guide*. This control source does not appear in the Control Source list for parameters whose functions are local.
- 41 Global LFO Phase (GLFO2ph)**
When the Globals parameter on the COMMON page is turned on, LFO2 becomes global, and is labeled GLFO2. The functions of LFOs are explained on page 6-40 of the *Musician's Guide*. This control source does not appear in the Control Source list for parameters whose functions are local.
- 42 Global FUN 4 (GFUN4)**
When the Globals parameter on the COMMON page is turned on, FUN 4 becomes global, and is labeled GFUN4. This control source does not appear in the Control Source list for parameters whose functions are local.
- 43 Volume Control (VolCtl)**
This control source will always respond to MIDI Controller 07 messages. Assign this value to a parameter when you want MIDI volume messages to affect the parameter.
- 44 Pan Control (PanCtl)**
This control source always responds to MIDI Controller 10 messages. Assign this value to a parameter when you want MIDI pan messages to affect the parameter.
- 45 Balance Control (BalCtl)**
This control source will always respond to MIDI Controller 08 messages. Assign this value to a parameter when you want MIDI balance messages to affect the parameter.
- 46 Channel Count (ChanCnt)**
This control source keeps track of the total number of active voice channels (how many notes are playing), and converts the number into a control signal between 0 and +1. The control signal's value is 1 when all 48 voice channels are active, and 0 when no voice channels are active.

You can use this control source in several ways. One example is to limit the volume of each note so that you have a more nearly constant volume regardless of how many notes you're playing (this is independent of the effect of attack velocity on volume). To set this up, you would go to the F4 AMP page in the Program Editor, and set the Src1 parameter to a value of **ChanCnt**. Then set the Depth parameter to a negative value. This will decrease the overall amplitude of each note as you play more simultaneous notes. This example works best with short-release sounds. It's great for an organ program, for example.

Channel count is also useful for controlling the modulation applied to a sound. For example, you may have a sound that you use both as a lead and for rhythm. Suppose you want a deep vibrato when you're soloing, but less vibrato when you're playing chords. Set up the vibrato by using **LFO1** as the value for the Src2 parameter on the PITCH page in the Program Editor. Set the MinDpt parameter to **72 cts**, and the MaxDpt parameter to **12 cts**. Then set the value of the DptCtl parameter to **ChanCnt**, and You'll get maximum vibrato depth when only one note is active. (Channel count outputs a control signal of 0 when no notes are playing, so with only one note playing, its value is near 0, which causes the DptCtl parameter to generate a value near its minimum: 72 cents in this case.)

If you want to increase the depth of the vibrato as you increase the number of active notes, set the value of the MaxDpt parameter higher than that of the MinDpt parameter.

Note: There are no control sources that correspond to the numeric entries 47—54.

55 Sync State (SyncSt)

This unipolar control source responds to MIDI clock messages received from an external MIDI device. Sync State switches on (+1) at each clock start, and switches off (0) with each clock stop.

56 A Clock

This is a unipolar square wave that responds to MIDI clock messages. It switches to +1 and back to 0 with every clock beat. This control source looks first for externally received MIDI clock messages, and if none is received, it responds to the K2600's internal clock, which is always running. The internal clock speed is set with the Tempo parameter in Song mode.

57 Negative A Clock (~A Clock)

This is the opposite of A clock, that is, it switches from 0 to +1 with every clock beat (the square wave is 180 degrees out of phase with that of A Clock).

58 B Clock

This is similar to A Clock, but it's bipolar—it switches from +1 to -1 with every clock beat.

59 Negative B Clock (~B Clock)

The opposite of B Clock, this bipolar control source switches from -1 to +1 with every clock beat (the square wave is 180 degrees out of phase with that of B Clock).

Control Sources

Main Control Source List

- 60, 61 Global Phase 1 and 2 (G Phase 1, G Phase 2)**
These bipolar global control sources are both rising sawtooth waves that rise from -1 to +1 with each MIDI clock beat. Like A Clock and B clock, they look for an external clock signal, and if none is received, they respond to the K2600's internal clock.
- 62, 63 Global Random Variant 1 and 2 (GRandV 1, GRandV 2)**
These are also bipolar and global, and generate random control signal values between -1 and +1 when assigned to a control source parameter. There is a subtle difference in the randomness of the signals they generate, therefore choosing between them is a matter of preference.
- 96 Note State (Note St)**
At any moment, any given note is either on or off; this is its Note State. Note State can be used as a unipolar control source that responds to each note that's played. It switches to +1 when the note starts, and stays on as long as the note is held on (by the sustain pedal, for example), or by holding down the trigger for that note. It switches to 0 when the note is no longer sustained by any means. For example, if you play a note, then hold it with the sustain pedal, its Note State is still on (+1) even if you've released the key that triggered the note. As soon as you release the sustain pedal, the note's Note State switches to off (0), even if it has a long release and you can still hear the release section of the note.
- 97 Key State (Key St)**
This is a unipolar control source that responds to the motion of your MIDI source's keys (or other note trigger). It switches to +1 when a key is pressed, and switches to 0 when the key is released. Its effect differs from Note State in that when the key that switched it on is released, it will switch off even if the note is sustained. If you're using a non-keyboard MIDI source, Key State switches to 0 when the equivalent of a key release is sent.
- 98 Key Number (KeyNum)**
This is a unipolar control source that generates its signal value based on the MIDI key number of each note triggered. That is, it generates a value of 0 in response to MIDI key number 0, a value of 64 in response to MIDI key number 64, and so on. Note that some parameters, such as Enable Sense on the Program Editor Layer Page, will not accept this parameter. GKeyNum, controller number 129, would be acceptable however.
- 99 Bipolar Key Number (BKeyNum)**
This is like KeyNum, but generates a signal value of -1 in response to MIDI key number 0, a value of 0 in response to MIDI key number 64, and a value of +1 in response to MIDI key number 127.
- 100 Attack Velocity (AttVel)**
This unipolar control source responds to Attack velocity values received at the K2600's MIDI In port. Velocity values of 0 cause it to generate a signal value of 0, while velocity values of 127 will generate a value of +1. All other velocity values will result in signal values proportionally scaled between 0 and +1. Note that some parameters, such as Enable Sense on the Program Editor Layer Page, will not accept this control source. GAttVel, controller number 130, would be acceptable however.

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- 101 Inverse Attack Velocity (InvAttVel)**
This is the opposite of AttVel, generating a signal value of 0 in response to attack velocity values of 127.
- 102 Polyphonic Pressure (PPress)**
This unipolar control source responds to poly pressure (aftertouch) messages received via MIDI. It generates a signal value scaled from 0 to +1 based on the poly pressure value range of 0—127.
- 103 Bipolar Polyphonic Pressure (BPPress)**
This is like PPress, but scales its signal value from -1 to +1.
- 104 Release Velocity (RelVel)**
Also unipolar, this control source scales its signal value from 0 to +1 in response to release velocity values from 0—127.
- 105 Bipolar Attack Velocity (Bi-AVel)**
This is similar to AttVel, but scales its signal values from -1 to +1.
- 106, 107 Velocity Triggers 1 and 2 (VTRIG1, VTRIG2)**
These unipolar control sources are switch controls, that is, they generate signal values of either 0 or +1. These must be programmed in order to have an effect; their programming parameters are found on the VTRIG page in the Program Editor. When a VTRIG's Sense parameter is set to normal, it switches to +1 when a note plays at a dynamic level exceeding the dynamic level set for its Level parameter. See page 6-44 of the *Musician's Guide* for more information.
- 108, 109 Random Variants 1 and 2 (RandV1, RandV2)**
These are similar to GRandV1 and GRandV2, but are local, so will affect each control source parameter independently.
- 110, 111 ASR1, ASR2**
These are programmable envelopes with three segments, Attack, Sustain, and Release. Their control source signals are unipolar. See page 6-42 of the *Musician's Guide* for a thorough explanation.
- 112, 113 FUN1, FUN2**
These generate their control source signals by combining the control signal values of two programmable inputs, and performing a mathematical function on the result. Their control signals can be unipolar or bipolar, depending on the control sources assigned as their inputs. See page 6-43 of the *Musician's Guide*. FUN2 becomes global (GFUN2) when the Globals parameter on the COMMON page in the Program Editor is set to **On**.
- 114 LFO1**
LFO1 can be unipolar or bipolar depending on the value set for the Shape parameter on its programming page. See page 6-40 of the *Musician's Guide*.
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Control Sources

Main Control Source List

- 115 LFO1 Phase (LFO1ph)**
This bipolar control source generates its signal based on the cycle of LFO1. When the phase of LFO1 is 0 degrees, the signal value of LFO1ph is 0. When the phase of LFO1 is 90 degrees, the signal value of LFO1ph is 1. When the phase of LFO1 is 180 degrees, the signal value of LFO1ph is 0. When the phase of LFO1 is 270 degrees, the signal value of LFO1ph is -1.
- 116 LFO2**
This functions exactly the same as LFO1, when the Globals parameter is set to **Off** (on the COMMON page in the Program Editor). When the Globals parameter is set to **On**, LFO2 becomes global (GLFO2).
- 117 LFO2 Phase (LFO2ph)**
This functions exactly the same as LFO1ph, responding to the cycle of LFO2.
- 118, 119 FUN3, FUN4**
These function exactly the same as FUNs 1 and 2, when the Globals parameter is set to **Off** (on the COMMON page in the Program Editor). When the Globals parameter is set to **On**, FUN4 becomes global (GFUN4).
- 120 Amplitude Envelope (AMPENV)**
This programmable unipolar control source lets you vary the effect of a control source parameter over time. See page 6-35 of the *Musician's Guide*.
- 121, 122 Envelopes 2 and 3 (ENV2, ENV3)**
These are programmed in the same way as AMPENV, but they can be bipolar.
- 123 Loop State (Loop St)**
This unipolar control source switches to +1 when the currently playing sample reaches its LoopStart point. If you've programmed a sound with a User amplitude envelope, Loop St will always be on (+1) for that sound. See page 14-17 of the *Musician's Guide* for more about sample loops.
- 124 Sample Playback Rate (PB Rate)**
The signal value of this bipolar control source is determined by the sample playback rate of each note. The playback rate is a function of the amount of transposition applied to a sample root to play it at the proper pitch for each note. If you trigger a note where a sample root is assigned, the PB Rate signal value for that note is 0. If the note is above the sample root, the sample is transposed upward, and its playback rate is higher than that of the sample root. Consequently the PB Rate signal value for that note will be positive. If the note is below the sample root, the PB Rate signal value will be negative.
- 125 Attack State (Atk State)**
This unipolar control source switches to +1 and back to 0 very quickly with each note start.

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- 126 Release State (Rel State)**
This unipolar control source switches to +1 when a note is released, and stays on until the note has completed its release (faded to silence), then it switches to 0. It will stay on if a note is sustained, even if its trigger (key, string, whatever) is released.
- 127 ON**
This generates a constant control signal value of +1.
- 128 -ON**
This generates a constant control signal value of -1 (the numeric entry 128 selects a value of **OFF** in the MIDI Control Source list).
- 129 GKeyNum**
Uses the key number (global) to modify whatever it is patched into. Higher notes will have a very different effect than will lower notes. Users can use this new Source to control any K2600 parameters, or to scale amplitude or pitch.
- 130 GAttVel**
This is updated every time you strike another key (kind of a multi-trigger function).

In addition to enabling (triggering) layers from any controller (works like an on/off switch), you can set the assigned controller's threshold (value, or range of values from 0-127), thus defining the controller's active range where it will enable the layer.

For example, you could create a 32-layer nylon guitar in which each layer is assigned to a different VAST algorithm and each layer is enabled by discrete narrow velocity ranges. This would produce 32 different sounding layers with 32 cross switch points emulating a picked guitar where no two attacks are exactly alike. If the layers' velocity ranges were very close together yet not overlapping, you could create very subtle nonrepeating changes. This kind of power usually eludes most sample playback devices, as this technique uses only one layer of polyphony, due to cross switching versus cross fading.
- 131, 132 GHiKey, GLoKey**
These control sources work the same as GKeyNum except that they track the highest key currently held and the lowest key currently held respectively. By using one of these as the only source for pitch tracking, you can create monophonic-like layers within a polyphonic program.

Control Sources

Constant Control Sources

Constant Control Sources

The remaining control sources are constants, which appear only when you're assigning control sources as inputs for the FUNs. Assigning one of these values fixes the input's control signal value at a steady level.

| Assigned Value | Corresponding Constant | Assigned Value | Corresponding Constant |
|----------------|------------------------|----------------|------------------------|
| 133 | -0.99 | 201 | 0.09 |
| 134 | -0.98 | 202 | 0.10 |
| 135 | -0.97 | 203 | 0.12 |
| 136-140 | -0.96 to -0.92 | 204 | 0.14 |
| 141 | -0.91 | 205 | 0.16 |
| 142 | -0.90 | 206-210 | 0.18 to 0.26 |
| 143-145 | -0.88 to -0.84 | 211-215 | 0.28 to 0.36 |
| 146-150 | -0.82 to -0.74 | 216-220 | 0.38 to 0.46 |
| 151-155 | -0.72 to -0.64 | 221-225 | 0.48 to 0.56 |
| 156-160 | -0.62 to -0.54 | 226-230 | 0.58 to 0.66 |
| 161-165 | -0.52 to -0.44 | 231-235 | 0.68 to 0.76 |
| 166-170 | -0.42 to -0.34 | 236-240 | 0.78 to 0.86 |
| 171-175 | -0.32 to -0.24 | 241 | 0.88 |
| 176-180 | -0.22 to -0.14 | 242 | 0.90 |
| 181 | -0.12 | 243 | 0.91 |
| 182 | -0.10 | 244 | 0.92 |
| 183 | -0.09 | 245 | 0.93 |
| 184 | -0.08 | 246-250 | 0.94 to 0.98 |
| 185 | -0.07 | 251 | 0.99 |
| 186-190 | -0.06 to -0.02 | 256 | OFF |
| 191 | -0.01 | | |
| 192 | 0.00 | | |
| 193 | 0.01 | | |
| 194 | 0.02 | | |
| 195 | 0.03 | | |
| 196-200 | 0.04 to 0.08 | | |

Note: There are no control sources that correspond to numeric entries 252—254.

