

POLYCOM®

Installed Voice Business Group

RS-232 Command Set:

Vortex EF2201 Programming Guide

Copyright © 2003 Polycom, Inc.

Polycom ® and the Polycom logo are registered trademarks of Polycom, Inc.

ASPI, Vortex, VS4000, Viewstation, and iPower are
registered trademarks of Polycom, Inc.

All other brand names, product names, and trademarks are the
sole property of their respective owners

Vortex EF2201 Programming Guide

Table of Contents

1. [Introduction](#)
2. [RS-232 Hardware](#)
3. [Programming Tips](#)
 - 3.1. [Initialization](#)
 - 3.2. [Wildcard Characters](#)
 - 3.3. [Using Acknowledgements](#)
 - 3.4. [Macros and Presets](#)
4. [Command Structure](#)
 - 4.1. [Device Type](#)
 - 4.2. [Device ID](#)
 - 4.3. [Command Name](#)
 - 4.4. [Command Data](#)
 - 4.5. [Command Terminator](#)
 - 4.6. [Examples](#)
5. [Status Messages](#)
6. [Command Types](#)
 - 6.1. [Boolean Commands](#)
 - 6.2. [Integer Commands](#)
 - 6.3. [Channel Commands](#)
 - 6.4. [Matrix Commands](#)
 - 6.5. [Miscellaneous Commands](#)
7. [Command List](#)
8. [Command Reference](#)
 - 8.1. [AA -- Enable or Disable Auto Answer Mode](#)
 - 8.2. [ACKMOD -- Enable or Disable Acknowledgment Mode](#)
 - 8.3. [AGC -- Enable or Disable Mic/Line Input Automatic Gain Control](#)
 - 8.4. [AGCMAX -- Set Maximum Allowed Mic/Line Input AGC Gain](#)
 - 8.5. [AGCMIN -- Set Minimum Allowed Mic/Line Input AGC Gain](#)
 - 8.6. [AGCRATE -- Set Ramp Rate of Mic/Line Input AGC](#)
 - 8.7. [AHCP -- Enable or Disable Call Progress Based Auto Hangup](#)
 - 8.8. [AHLD -- Enable or Disable Loop Drop Based Auto Hangup](#)
 - 8.9. [AMNOMAT -- Select NOM Attenuation on Each Output](#)
 - 8.10. [BAUD -- Set Baud Rate for RS-232 Port](#)
 - 8.11. [BLAUTO -- Enable Automatic BLDATA Messages](#)
 - 8.12. [BLDATA -- Request Level Information](#)
 - 8.13. [BLINFO -- Select Information to be Reported in BLDATA](#)
 - 8.14. [BROAD2 -- Broadcast Arbitrary Command Strings to RS-232 Port](#)
 - 8.15. [BROADA -- Broadcast Commands to Other Connected Devices](#)
 - 8.16. [COUNTRY -- Specify Country Definitions for Phone Interface](#)

- 8.17. [DELAYO -- Set Output Delay](#)
- 8.18. [DELAYOE -- Enable Output Delay](#)
- 8.19. [DIAL -- Send DTMF Digits to Phone Interface](#)
- 8.20. [DSPAUTO -- Enable Automatic DSPLOAD Status Messages](#)
- 8.21. [DSPLOAD -- Query Percentage of Variable DSP Resources Used](#)
- 8.22. [ERROR -- Enable or Disable Error Messages](#)
- 8.23. [FADERI -- Set Input Gain Fader](#)
- 8.24. [FLASH -- Execute Hook Flash](#)
- 8.25. [FLOW -- Set Flow Control Mode for RS-232 Port](#)
- 8.26. [FPLOCK -- Lock/Unlock Front Panel](#)
- 8.27. [FPPSWD -- Change Front Panel Password](#)
- 8.28. [GAINA -- Set Phone Input Gain](#)
- 8.29. [GAIND -- Set Gain of Incoming DTMF Tones](#)
- 8.30. [GAINDIT -- Set Gain of Incoming DTMF Tones](#)
- 8.31. [GAINDT -- Set Dial Tone Gain](#)
- 8.32. [GAINI -- Set Input Gain](#)
- 8.33. [GAINO -- Set Output Gain](#)
- 8.34. [GAINP -- Set Phone Output Gain](#)
- 8.35. [GAINSIT -- Set From Phone User Tone Gain](#)
- 8.36. [GAINSOT -- Set To Phone User Tone Gain](#)
- 8.37. [GMUTEO -- Mute All Outputs](#)
- 8.38. [ID -- Set Device ID](#)
- 8.39. [LABEL -- Set or Query one of the Device Labels](#)
- 8.40. [LEC -- Enable or Disable LEC](#)
- 8.41. [LECMODE -- Set Amount of Double Talk Suppression used in the LEC.](#)
- 8.42. [LI -- Query State of Logic Inputs](#)
- 8.43. [LIA -- Assign Action for when Logic Input is Activated](#)
- 8.44. [LID -- Assign Action for when Logic Input is Deactivated](#)
- 8.45. [LIH -- Assign Action for when Logic Input is Held](#)
- 8.46. [LIEN -- Enable Automatic Logic Input Status Messages](#)
- 8.47. [LIG -- Configure Logic Input Pins Into a Group](#)
- 8.48. [LIK -- Delete One or All Logic Input Pin Commands](#)
- 8.49. [LIM -- Mask Logic Input Pins](#)
- 8.50. [LIN -- Assign Command to Logic Input Group](#)
- 8.51. [LIP -- Set Polarity for Logic Inputs](#)
- 8.52. [LO -- Query or Set Status of Logic Output Pins](#)
- 8.53. [LOA -- Define Behavior for Logic Output Activated State](#)
- 8.54. [LOD -- Define Behavior for Logic Output Deactivated Status](#)
- 8.55. [LOEN -- Enable Automatic Logic Output Status Messages](#)
- 8.56. [LOK -- Delete One or All Logic Output Pin Commands](#)
- 8.57. [LOM -- Mask Logic Output Pins](#)
- 8.58. [LOP -- Set Polarity for Logic Outputs](#)
- 8.59. [MACROA -- Add Command to Current Macro](#)
- 8.60. [MACROK -- Delete One or All Macros](#)
- 8.61. [MACROL -- List All Commands in a Macro](#)
- 8.62. [MACROQ -- Execute Macro Quietly](#)

- 8.63. [MACROS -- Start a New Macro](#)
- 8.64. [MACROW -- Write Macro to Non-Volatile Memory](#)
- 8.65. [MACROX -- Execute Macro](#)
- 8.66. [METER -- Select which Signal is Displayed on the Front Panel LED Meter](#)
- 8.67. [MGAIN -- Set Crosspoint Gains in Main Matrix or Submatrix](#)
- 8.68. [MINI -- Enable Modem Initialization String](#)
- 8.69. [MINISTR -- Set Modem Initialization String](#)
- 8.70. [MMUTE -- Mute Crosspoint in Main Matrix or Submatrix](#)
- 8.71. [MUTEI -- Mute One or More Inputs](#)
- 8.72. [MUTEO -- Mute One or More Outputs](#)
- 8.73. [NC -- Enable Noise Cancellation](#)
- 8.74. [NCL -- Set Noise Cancellation Attenuation](#)
- 8.75. [NVINIT -- Reinitialize Non-Volatile Memory](#)
- 8.76. [NVLOCK -- Lock/Unlock Non-Volatile Memory](#)
- 8.77. [NVPSWD -- Change Non-Volatile Memory Password](#)
- 8.78. [PEQIA -- Set All Parameters for Specified Parametric EQ Input Stage](#)
- 8.79. [PEQIB -- Set Bandwidth Parameter for Specified Parametric EQ Input Stage](#)
- 8.80. [PEQIE -- Set Enabled Parameter for Specified Parametric EQ Input Stage](#)
- 8.81. [PEQIF -- Set Frequency Parameter for Specified Parametric EQ Input Stage](#)
- 8.82. [PEQIG -- Set Gain Parameter for Specified Parametric EQ Input Stage](#)
- 8.83. [PEQIS -- Set Slope Parameter for Specified Parametric EQ Input Stage](#)
- 8.84. [PEQIT -- Set Type Parameter for Specified Parametric EQ Input Stage](#)
- 8.85. [PEQOA -- Set All Parameters for Specified Parametric EQ Output Stage](#)
- 8.86. [PEQOB -- Set Bandwidth Parameter for Specified Parametric EQ Output Stage](#)
- 8.87. [PEQOE -- Set Enabled Parameter for Specified Parametric EQ Output Stage](#)
- 8.88. [PEQOF -- Set Frequency Parameter for Specified Parametric EQ Output Stage](#)
- 8.89. [PEQOG -- Set Gain Parameter for Specified Parametric EQ Output Stage](#)
- 8.90. [PEQOS -- Set Slope Parameter for Specified Parametric EQ Output Stage](#)
- 8.91. [PEQOT -- Set Type Parameter for Specified Parametric EQ Output Stage](#)
- 8.92. [PHONE -- Take Phone On-Hook or Off-Hook](#)
- 8.93. [PING -- See Which Devices Are Present](#)
- 8.94. [PRESETK -- Delete One or All Presets](#)
- 8.95. [PRESETL -- List All Commands in a Preset](#)
- 8.96. [PRESETP -- Set Which Preset Will Be Activated At Power-Up](#)
- 8.97. [PRESETQ -- Execute a Preset Quietly](#)
- 8.98. [PRESETW -- Save a Preset](#)
- 8.99. [PRESETX -- Execute a Preset](#)
- 8.100. [REDIAL -- Redial the Last Dialed Phone Number](#)
- 8.101. [RING -- Enable or Disable Ring Messages](#)
- 8.102. [SGGAIN -- Set Gain of Signal Generator](#)
- 8.103. [SGMUTE -- Mute Signal Generator](#)
- 8.104. [SGTYPE -- Set Type of Signal Produced by Signal Generator](#)
- 8.105. [SOUNDL -- Play Sound Locally](#)
- 8.106. [SOUNDP -- Play Sound to Phone](#)
- 8.107. [SSDELAY -- Set Delay Between Screen Saver Screens](#)
- 8.108. [SSEN -- Enable or Disable Screen Saver](#)

- 8.109. [SSSTART -- Set Idle Time Required for Screen Saver to Start](#)
- 8.110. [SSTEXT -- Set Text to be Displayed by Screen Saver](#)
- 8.111. [SWRESET -- Perform Soft Reset of System](#)
- 8.112. [SWVER -- Query Software Version](#)
- 8.113. [TONEE -- Enable or Disable Entry and Exit Tones](#)
- 8.114. [TONER -- Enable or Disable Ring Tones](#)

1. Introduction

This document describes the command protocol that is used to communicate with the Vortex EF2201 via its RS-232 port.

2. RS-232 Hardware

The communication between the Vortex and a host controller is conducted via the RS-232 port on the back panel of the Vortex. The Vortex's RS-232 port operates at the following settings:

- Bit Rate (bps): 9600 (default), 19200, or 38400
- Data Format: 8 data bits, no parity, 1 stop bit (8N1)
- Flow Control: none (default) or hardware (RTS, CTS)

Note that although the flow control setting is user selectable to none or hardware, hardware flow control must be used when updating the firmware of the Vortex. This means that while a 3-wire RS-232 cable (RX, TX, GND) is acceptable for control of the Vortex, the minimum cable for updating firmware should contain 5 wires (RX, TX, RTS, CTS, GND).

3. Programming Tips

3.1. Initialization

During power up of the Vortex device or initialization of the host program, electrical fluctuations on the RS-232 lines may cause the Vortex to receive spurious data. After initialization, the host program should send a few carriage return characters (^M, ASCII 13) to the connected Vortex to flush out any spurious characters it may have received. Failure to do this could result in the Vortex ignoring the first command received after initialization.

As part of the host program initialization, the host will want to synchronize the status of its controls with the current status of the Vortex devices that are being controlled. The host could initialize its controls to default values and then send commands to the Vortexes to set them to the same state. This approach has significant disadvantages since initializing the host program could undo settings made by other host programs or by the front panel controls of one of the linked Vortex devices. A better approach is to query the linked Vortex devices for their status and set the host program controls based on the return values.

3.2. Wildcard Characters

The use of the wildcard character, '*', can make programming the host controller much easier. Be careful when using wildcards, however, since they can generate a lot of traffic on the digital bus.

3.3. Using Acknowledgements

It is a good idea for the host program or control system to make sure that all connected Vortex devices have acknowledgment mode enabled (see the [ACKMOD](#) command). When acknowledgment mode is on, a Vortex device will send an acknowledgment for each command it receives. Proper use of acknowledgments makes the host program more robust and makes supporting multiple hosts effortless. The rest of this section describes how to use acknowledgments to achieve these goals.

As a convenient example, let us imagine a host program with a graphical user interface (GUI). The user presses buttons on the GUI to enable or disable features of various linked Vortex devices. The buttons on the GUI reflect the current status of the corresponding feature.

When the user presses a button on the GUI to enable or disable a feature, the host program should send the corresponding command to the selected Vortex device. It may be tempting to update the status of the GUI button at this point, but this can cause problems if there are transmission errors or if there are multiple host controllers. The proper way to handle this is to only update the GUI controls based on acknowledgments received from the Vortex device.

To implement this, organize your code so that the functions that send commands are totally separate from the functions that receive responses from the Vortex devices. This also enables your host program to support the presence of multiple host controllers. For example, consider the following sequence of events.

1. Another host sends a command to a Vortex device.
2. The Vortex device responds with an acknowledgment that is broadcast to all of the other hosts.
3. Your host program receives the acknowledgment and updates the status of the corresponding control.

The result of this programming model is that all hosts and linked Vortex devices will always be synchronized.

For simple on/off features, your host program can make use of the toggle arguments to some commands (e.g., 'SSEN2'). By sending a toggle command when a button is pressed, and updating the button based on acknowledgments, your host program will not have to keep track of the status of the button.

In a similar fashion, many of the integer commands (such as gains) can be controlled by incrementing or decrementing them by a specific amount. For example, the command 'GAINIT>1' increments the input gain on channel T by 1 dB. The acknowledgment for this command will return the actual value that the gain was incremented to. Thus, to implement a volume control, your control program can send a command to increment the gain by 1 dB when the "up" button is pressed and decrement the gain by 1 dB when the "down" button is pressed. The control can update its level indicator based on the acknowledgment that is received.

3.4. Macros and Presets

Although macros and presets are similar, there are times when using one is better than the other. Presets store the absolute values of all of the non-global settings of the device. This includes, but is not limited to, input and output gain settings, matrix settings, algorithm settings, parametric EQ settings, and automixer settings. See [Section 7](#) for a list showing all the commands and which are saved to presets.

Presets should be used when you really want to change all the settings in a device. One example would be when you want to have one unit be able to control different rooms. In this case, having a preset for each different room is the easiest solution.

Macros are like mini-presets. You can define them to change only the settings you are interested in. One advantage of macros over presets is that macros can make relative changes in addition to absolute changes. An absolute change is something like "set the input gain to -3 dB". A relative change is something like "raise the input gain by 3 dB". One example of using macros for a relative change is stereo volume ramping. If you have two outputs setup to have left and right program audio, then you could build a macro that contains two commands: one to increment the left channel by 1 dB and the other to increment the right channel by 1 dB. Then, by calling that macro, you can ramp the stereo outputs. A similar thing can be done with decreasing the volume.

Another thing to consider when using macros and presets is to use the [MACROQ](#) and [PRESETQ](#) commands instead of the [MACROX](#) and [PRESETX](#) commands. Both the Q and X versions execute the macro or preset, but the X versions produce acknowledgements for the settings that change, while the Q versions don't. If your control system updates its status by looking at the acknowledgements that come back, then you'll probably want to use the X versions. Another option would be to use the Q versions and then manually query the values you're interested in. If your control system does not need use acknowledgements, or if you are manually querying the values you're interested in, using the Q versions is better since it doesn't generate acknowledgements and thus reduces RS-232 traffic.

4. Command Structure

A Vortex command consists of a series of ASCII characters with the following structure.

| Description | Number of Characters | Range of Values |
|--------------------|-----------------------------|------------------------|
| Device Type | 1 | 0-9, A-Z, * |
| Device ID | 2 | 0-9, * |
| Command Name | 1-7 | 0-9, A-Z |
| Command Data | 0-64 | ASCII characters |
| Command Terminator | 1 | ^M (ASCII 13) |

4.1. Device Type

A single alphanumeric character is used to indicate the device type. The devices in Polycom's EchoFree family have the following device types.

| Device | Device Type |
|---------------|--------------------|
| EF200 | A |
| EF1210 | C |
| EF2280 | F |
| EF2241 | B |
| EF2211 | S |
| EF2210 | Q |
| EF2201 | T |

Device type '*' can be used to send a command to all device types simultaneously.

4.2. Device ID

Two numeric characters are used to indicate the device ID. The Vortex can be configured for device IDs from '00' to '07'. Note that even though the device ID is less than 10, the leading '0' must be included. Device ID '**' can be used to send a command to all device IDs simultaneously. Some examples of using wildcard characters are given below.

- 'T**' broadcasts to all EF2201 devices that are linked together.
- '*07' broadcasts to all devices with device ID 07 (this format is not commonly used).
- '***' broadcasts to all devices that are linked together.

4.3. Command Name

The command name can be from 1 to 7 characters long. Command names will be specific to device types. In other words, the EF2280 has its own command set, which is different from the EF2241's, which is different from the EF1210's, etc. There are some commands, such as 'PING', that are common among all the various command sets.

4.4. Command Data

The command data is a series of 0-64 characters containing payload data for the command. Obviously, the command data will be specific to the command type. Note that the maximum number of payload characters for the EF200 and EF1210 is 32, but the Vortex devices support up to 64 characters in the payload. This increase was necessary to accommodate the matrix gain and macro/preset commands.

4.5. Command Terminator

The command terminator is a single character indicating the end of a command. ASCII 13 (^M) was chosen as the terminator to allow manually typing commands using a simple text terminal.

4.6. Examples

In the following examples, Vortex commands are enclosed in single quotes, 'like this'. Also, the terminator character is not explicitly shown, but its presence is implied.

Consider the command '***PING'. The device type and ID for this command are wildcards, thus the command will be sent to all devices. The command name in this case is 'PING', and there are no data characters (payload). Note that the 'PING' command is supported by all of the Vortex devices, thus broadcasting the command to all devices makes sense.

Consider the command 'T**GAINIT10'. The device type for this command is 'T' and the device ID is a wildcard, thus the command will be broadcast to all EF2201 devices linked together. The command name in this case is 'GAINIT' and the command data (payload) is '10'. This command sets the gain on input T of all connected EF2201's to 10 dB.

| Command | Effects |
|-------------|--|
| ***PING | Requests PONG response from all linked Vortex devices. |
| T**GAINIT10 | Sets the gain on input T of all connected EF2201 devices to 10 dB. |

5. Status Messages

The Vortex sends status messages via RS-232 and EF Bus any time one of its internal parameters changes. This means that the host program does not need to continually poll the Vortex in order to detect status changes. Status messages are in the same format as the commands used to set the corresponding parameter.

For example, suppose you send the command 'T**GAINIT10' and there are two EF2201's linked together with device IDs 3 and 7. The EF2201's will respond with 'T03GAINIT10' and 'T07GAINIT10', respectively. Now, someone uses the front panel of the EF2201 set to ID 7 to decrease input T's gain by 1 dB. When this happens, the EF2201 will respond with 'T07GAINIT9'. This example illustrates that status messages can be sent as the result of an RS-232 command or as the result of some other change in the Vortex device such as front panel adjustments, logic inputs, etc.

Status messages can be turned off via the [ACKMOD](#) command. [ACKMOD](#) refers to acknowledgement mode since the term status message and acknowledgement are synonymous for our purposes.

6. Command Types

Many of the Vortex commands have similar formats. The main formats are described here in order to provide a better understanding of the command set.

6.1. Boolean Commands

Boolean commands take one of the three following arguments.

- '0' indicates that the parameter should be turned off.

- '1' indicates that the parameter should be turned on.
- '2' indicates that the parameter should be toggled (i.e., '0' becomes '1' and '1' becomes '0').

Parameters associated with boolean commands can be queried using the '?' character. For example, if input T is muted, and you send 'T04MUTEIT?', the EF2201 will respond with a status message of 'T04MUTEIT1'. When a status message is generated for a boolean command, the command data will either be a '0' or '1', since '2' is obviously not a valid state.

6.2. Integer Commands

Integer commands can take one of two types of arguments. The first argument type is absolute, meaning that the parameter will be set to the specified number. For example, 'T04GAINIT10' means that the gain on input T will be set to 10 dB. In this case, the device will respond with a status message of 'T04GAINIT10'.

The second argument type is relative, meaning that the parameter will be incremented or decremented by the specified amount. The increment character is '>' and the decrement character is '<'. For example, 'T04GAINIT>3' increments the gain on input T by 3 dB. If the input's gain was previously set to 6 dB, then it would now be set to 9 dB. In this case the device would respond with a status message of 'T04GAINIT9'.

The numeric part of both the absolute and relative arguments can contain a '+' or '-' to indicate the algebraic sign of the argument. If no sign is given, '+' is assumed.

The parameters associated with integer commands have maximum and minimum values associated with them. If you try to set a parameter above its maximum or below its minimum, the parameter will be set to its maximum or minimum value, respectively.

Parameters associated with integer commands can be queried using the '?' character. For example, if input T's gain is set to 12, and you send 'T04GAINIT?', the device will respond with a status message of 'T04GAINIT12'.

6.3. Channel Commands

A command can be a channel command in addition to being one of the other types of commands (integer or boolean). A channel command means that the command applies to a specific input or output channel. The channel is specified by a single character (e.g., 'T') occurring before any other payload data.

An example of a boolean channel command is the '[AGC](#)' (Automatic Gain Control) command. 'T04AGCT0' disables the AEC on input channel T. After sending this command, the device will respond with a status message of 'T04AGCT0'.

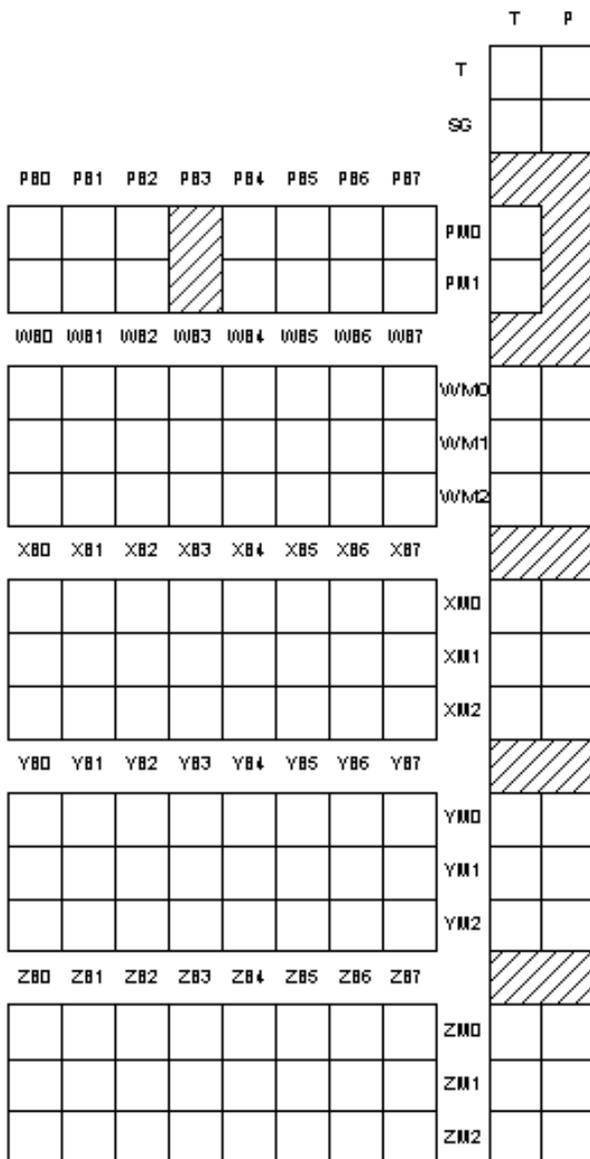
An example of an integer channel command is the '[GAINI](#)' command, which adjusts the gain on the input channels. 'T04GAINIT12' sets the input gain of channel T to 12 dB. After sending this command, the device will respond with a status message of 'T04GAINIT12'.

A wildcard character ('*') can be used as the channel specifier for many of the channel commands. If this is the case, there are two options for specifying the values for the channels. The first method is to specify a single value that will be applied to all the channels.

Using the wildcard character for channel commands is not common on the EF2201, since it has only one input channel and one output channel. The wildcard character for channel commands is generally more useful on devices with multiple inputs, such as the EF2280 and EF2241.

6.4. Matrix Commands

Matrix commands are used for controlling parameters that exist at the crosspoints of the mixing matrices. Typical parameters include gain and mute. Before describing the matrix commands, it is necessary to give a description of the matrices involved. During the following discussion, it will be helpful to refer to the figure below, which shows all the matrices with their input and output labels.



The EF2201 has only one physical output, which is the telephone output, labeled T.

The EF2201 has only one physical input. This input comes from the telephone interface, and is labeled T. The T input has signal processing which includes the following algorithms: Line Echo Cancellation, Noise Cancellation, and AGC.

Vortex devices can be linked together so that they can share control information and digital audio signals. The audio signals are shared on four digital busses labeled P, W, X, Y, and Z. All Vortex devices can receive signals from all of these busses. Only certain devices can transmit on the busses. This information is given in the following table.

| Device | Transmit on P Bus | Transmit on W, X, Y, Z Busses | Receive P Bus | Receive W, X, Y, Z Busses |
|---------------|--------------------------|--------------------------------------|----------------------|----------------------------------|
| EF2280 | No | Yes | Yes | Yes |
| EF2241 | Yes | Yes | Yes | Yes |
| EF2211 | Yes | Yes | Yes | Yes |
| EF2210 | No | Yes | Yes | Yes |
| EF2201 | Yes | No | Yes | Yes |

The P bus is meant for routing telephone audio between the devices. The W, X, Y, and Z busses are meant for routing microphone and auxiliary audio between the devices. The W, X, Y, and Z busses also carry NOM (Number of Open Microphones) information from the automixer so that outputs created from these busses can be appropriately attenuated for the number of open microphones.

The digital inputs consist of all of the signals placed on the EF Bus by the other connected Vortex devices. Each P, W, X, Y, and Z bus can carry channels from up to eight other devices, so we have the following digital inputs to each Vortex device: PB0-PB7, WB0-WB7, XB0-XB7, YB0-YB7, and ZB0-ZB7. The inputs are designated by three characters: the bus letter (P, W, X, Y, or Z), a B indicating that it is a bus input, and a number between 0 and 7 indicating the channel of the bus.

There is also an internal signal generator, labeled SG, that is capable of producing white or pink noise. this signal is fed into the matrix so that it can be routed to the appropriate outputs for calibration or testing.

The mixing capabilities of the Vortex devices can be broken down into two parts: the EF Bus submatrices and the main matrix.

For each of the W, X, Y, and Z signal busses, there is a 8 x 3 matrix that allows the user to define up to three mixes of each of the four signal busses. The inputs and outputs for the 8 x 3 matrices are as follows.

W Submatrix

- Inputs: WB0-WB7
- Outputs: WM0-WM2

X Submatrix

- Inputs: XB0-XB7
- Outputs: XM0-XM2

Y Submatrix

- Inputs: YB0-YB7
- Outputs: YM0-YM2

Z Submatrix

- Inputs: ZB0-ZB7
- Outputs: ZM0-ZM2

For the P signal, bus there is a 7 x 2 matrix that allows the user to define up to two mixes of the P signal bus. The reason the matrix is 7 x 2 instead of 8 x 2 is that since we can transmit on the P bus, we do not need to mix our own channels in this matrix. The inputs and outputs for the 7 x 2 P bus matrix are as follows.

P Submatrix

- Inputs: PB0-PB7 (with one invalid)
- Outputs: PM0-PM1

The crosspoint gains on all outputs are user adjustable. The "M" in the output labels of the submatrices indicates that the signals are being fed into the Main Matrix.

The main matrix consists of the following inputs: the telephone input T, the signal generator (SG), the outputs of the EF Bus submatrices PM0-PM1, WM0-WM2, XM0-XM2, YM0-YM2, and ZM0-ZM2. This is a total of 16 inputs.

The main matrix consists of the following outputs: the output to the telephone interface T, and the EF bus outputs P. This is a total of 2 outputs.

The matrix commands can adjust two types of parameters: integer and boolean. We will introduce the matrix commands by using the MGAIN command as an example. This is an integer matrix command that is used to set the gain (in dB) at any of the crosspoints in the main matrix or EF Bus submatrices.

Matrix commands are similar to channel commands except that instead of specifying a single channel, it is necessary to specify a crosspoint (or range of crosspoints). In order to specify a single crosspoint, you use the input and output labels discussed in this section. The first label always specifies the input to the matrix and the second label always specifies the output of the matrix. For example, to set the gain of the crosspoint (T, P) to -3 dB, you would send 'T04MGAIN T, P, -3' which sets the gain at the crosspoint to -3 dB. In this case, a status message will be generated similar to 'T04MGAIN T, P, -3'.

It is also possible to use the wildcard character ('*') to specify ranges of crosspoints with the matrix commands. The only restriction is that you can only use a wildcard to specify the input or output, but not both simultaneously. Thus you could specify all the inputs going to a specific output (one column) or the value of an input to all of the outputs (one row), but not the entire matrix. One example of using a wildcard for an integer matrix command would be 'T04MGAIN SG, *, 0'. This will set all the crosspoints in the signal generator row of the main matrix to 0 dB. Thus, the signal generator will be added to all of the outputs of the main matrix with a gain of 0 dB. In this case a status message will be generated that looks like 'T04MGAIN SG, *, ää'. The binary representation used here is the same

method described in [Section 6.3](#).

You can also use the wildcard character to set the crosspoints of a row or column individually. For example, 'T04MGAIN_T, *, äx' sets the crosspoints of input 1 to 0 dB for output T, and -12 dB for output P. In this case, the EF2201 will respond with a status message of 'T04MGAIN_T, *, äx'.

Queries using the '?' character work in the usual manner. For example, 'T04MGAIN_T, P, ?' might return 'T04MGAIN_T, P, -6', while 'T04MGAIN_T, *, ?' might return 'T04MGAIN₂, *, ää'.

Boolean matrix commands work as you would expect. They use the characters '0', '1', and '2' as described in [Section 6.1](#). Here are some examples.

- 'T04MMUTET, P, 1' mutes crosspoint (T, P) of the main matrix. In other words, the signal at input T will not be heard on output P. A status message will be generated of the form 'T04MMUTET, P, 1'.
- 'T04MMUTET, *, 10' sets the mutes for input T of the main matrix. The signal path from input T to output T is muted, while the signal path from input T to output P is unmuted. The EF2201 will respond with a status message of 'T04MMUTET, *, 10'.
- 'T04MMUTET, *, 2' toggles the mutes for input T of the main matrix. If this command follows after the command in the above example, the EF2201 will respond with a status message of 'T04MMUTET, *, 01'.
- 'T04MMUTET, *, ?' queries the status of the mutes for input T of the main matrix. If this command follows after the commands in the above examples, the EF2201 will respond with a status message of 'T04MMUTET, *, 01'.

6.5. Miscellaneous Commands

Miscellaneous commands are those that don't fall under any of the other categories. See the description of a given command for specific details on how it operates.

7. Command List

The following table is a list of the commands recognized by the EF2201. Detailed descriptions of each command are given in the next section.

The Storage column contains one of the following values indicating when and where the parameter is stored.

- "Global"
- "Preset"
- "-" = not stored or not applicable

Globally stored parameters are not changed when a preset is executed. Only one copy of a global parameter is stored. Global parameters are written to non-volatile memory each time they are changed. Globally stored parameters retain their values when the power is cycled.

Parameters stored in presets are changed each time a new preset is restored/executed. Preset

parameters are not saved in non-volatile memory until a [PRESETW](#) command is executed. Parameters stored in the power-on preset (see [PRESETP](#)) are restored when the power is cycled.

| Command | Storage | Description |
|--------------------------|----------------|---|
| AA | Preset | Enable or Disable Auto Answer Mode |
| ACKMOD | Global | Enable or Disable Acknowledgment Mode |
| AGC | Preset | Enable or Disable Mic/Line Input Automatic Gain Control |
| AGCMAX | Preset | Set Maximum Allowed Mic/Line Input AGC Gain |
| AGCMIN | Preset | Set Minimum Allowed Mic/Line Input AGC Gain |
| AGCRATE | Preset | Set Ramp Rate of Mic/Line Input AGC |
| AHCP | Preset | Enable or Disable Call Progress Based Auto Hangup |
| AHL D | Preset | Enable or Disable Loop Drop Based Auto Hangup |
| AMNOMAT | Preset | Select NOM Attenuation on Each Output |
| BAUD | Global | Set Baud Rate for RS-232 Port |
| BLAUTO | Preset | Enable Automatic BLDATA Messages |
| BLDATA | - | Request Level Information |
| BLINFO | Preset | Select Information to be Reported in BLDATA |
| BROAD2 | - | Broadcast Arbitrary Command Strings to RS-232 Port |
| BROADA | - | Broadcast Commands to Other Connected Devices |
| COUNTRY | Global | Specify Country Definitions for Phone Interface |
| DELAYO | Preset | Set Output Delay |
| DELAYOE | Preset | Enable Output Delay |
| DIAL | - | Send DTMF Digits to Phone Interface |
| DSPAUTO | - | Enable Automatic DSPLOAD Status Messages |
| DSPLOAD | - | Query Percentage of Variable DSP Resources Used |
| ERROR | Global | Enable or Disable Error Messages |
| FADERI | Preset | Set Input Gain Fader |
| FLASH | - | Execute Hook Flash |
| FLOW | Global | Set Flow Control Mode for RS-232 Port |
| FPLOCK | Global | Lock/Unlock Front Panel |
| FPPSWD | - | Change Front Panel Password |
| GAINA | Preset | Set Phone Input Gain |
| GAIN D | Preset | Set Gain of Incoming DTMF Tones |
| GAIN DIT | Preset | Set Gain of Incoming DTMF Tones |
| GAIN D T | Preset | Set Dial Tone Gain |

| | | |
|-------------------------|--------|---|
| GAINI | Preset | Set Input Gain |
| GAINO | Preset | Set Output Gain |
| GAINP | Preset | Set Phone Output Gain |
| GAINSIT | Preset | Set From Phone User Tone Gain |
| GAINSOT | Preset | Set To Phone User Tone Gain |
| GMUTEO | Preset | Mute All Outputs |
| ID | Global | Set Device ID |
| LABEL | Global | Set or Query one of the Device Labels |
| LEC | Preset | Enable or Disable LEC |
| LECMODE | Preset | Set Amount of Double Talk Suppression used in the LEC. |
| LI | Global | Query State of Logic Inputs |
| LIA | Global | Assign Action for when Logic Input is Activated |
| LID | Global | Assign Action for when Logic Input is Deactivated |
| LIH | Global | Assign Action for when Logic Input is Held |
| LIEN | Preset | Enable Automatic Logic Input Status Messages |
| LIG | Global | Configure Logic Input Pins Into a Group |
| LIK | Global | Delete One or All Logic Input Pin Commands |
| LIM | Preset | Mask Logic Input Pins |
| LIN | Global | Assign Command to Logic Input Group |
| LIP | Global | Set Polarity for Logic Inputs |
| LO | - | Query or Set Status of Logic Output Pins |
| LOA | Global | Define Behavior for Logic Output Activated State |
| LOD | Global | Define Behavior for Logic Output Deactivated Status |
| LOEN | Preset | Enable Automatic Logic Output Status Messages |
| LOK | Global | Delete One or All Logic Output Pin Commands |
| LOM | Preset | Mask Logic Output Pins |
| LOP | Global | Set Polarity for Logic Outputs |
| MACROA | - | Add Command to Current Macro |
| MACROK | Global | Delete One or All Macros |
| MACROL | - | List All Commands in a Macro |
| MACROQ | - | Execute Macro Quietly |
| MACROS | - | Start a New Macro |
| MACROW | Global | Write Macro to Non-Volatile Memory |
| MACROX | - | Execute Macro |
| METER | Preset | Select which Signal is Displayed on the Front Panel LED Meter |

| | | |
|-------------------------|--------|--|
| MGAIN | Preset | Set Crosspoint Gains in Main Matrix or Submatrix |
| MINI | Global | Enable Modem Initialization String |
| MINISTR | Global | Set Modem Initialization String |
| MMUTE | Preset | Mute Crosspoint in Main Matrix or Submatrix |
| MUTEI | Preset | Mute One or More Inputs |
| MUTEO | Preset | Mute One or More Outputs |
| NC | Preset | Enable Noise Cancellation |
| NCL | Preset | Set Noise Cancellation Attenuation |
| NVINIT | - | Reinitialize Non-Volatile Memory |
| NVLOCK | Global | Lock/Unlock Non-Volatile Memory |
| NVPSWD | - | Change Non-Volatile Memory Password |
| PEQIA | Preset | Set All Parameters for Specified Parametric EQ Input Stage |
| PEQIB | Preset | Set Bandwidth Parameter for Specified Parametric EQ Input Stage |
| PEQIE | Preset | Set Enabled Parameter for Specified Parametric EQ Input Stage |
| PEQIF | Preset | Set Frequency Parameter for Specified Parametric EQ Input Stage |
| PEQIG | Preset | Set Gain Parameter for Specified Parametric EQ Input Stage |
| PEQIS | Preset | Set Slope Parameter for Specified Parametric EQ Input Stage |
| PEQIT | Preset | Set Type Parameter for Specified Parametric EQ Input Stage |
| PEQOA | Preset | Set All Parameters for Specified Parametric EQ Output Stage |
| PEQOB | Preset | Set Bandwidth Parameter for Specified Parametric EQ Output Stage |
| PEQOE | Preset | Set Enabled Parameter for Specified Parametric EQ Output Stage |
| PEQOF | Preset | Set Frequency Parameter for Specified Parametric EQ Output Stage |
| PEQOG | Preset | Set Gain Parameter for Specified Parametric EQ Output Stage |
| PEQOS | Preset | Set Slope Parameter for Specified Parametric EQ Output Stage |
| PEQOT | Preset | Set Type Parameter for Specified Parametric EQ Output Stage |
| PHONE | - | Take Phone On-Hook or Off-Hook |
| PING | - | See Which Devices Are Present |
| PRESETK | Global | Delete One or All Presets |
| PRESETL | - | List All Commmands in a Preset |
| PRESETP | Global | Set Which Preset Will Be Activated At Power-Up |
| PRESETQ | - | Execute a Preset Quietly |
| PRESETW | Global | Save a Preset |
| PRESETX | - | Execute a Preset |
| REDIAL | - | Redial the Last Dialed Phone Number |
| RING | Preset | Enable or Disable Ring Messages |

| | | |
|-------------------------|--------|--|
| SGGAIN | Preset | Set Gain of Signal Generator |
| SGMUTE | Preset | Mute Signal Generator |
| SGTYPE | Preset | Set Type of Signal Produced by Signal Generator |
| SOUNDL | - | Play Sound Locally |
| SOUNDP | - | Play Sound to Phone |
| SSDELAY | Preset | Set Delay Between Screen Saver Screens |
| SSEN | Preset | Enable or Disable Screen Saver |
| SSSTART | Preset | Set Idle Time Required for Screen Saver to Start |
| SSTEXT | Preset | Set Text to be Displayed by Screen Saver |
| SWRESET | - | Perform Soft Reset of System |
| SWVER | - | Query Software Version |
| TONEE | Preset | Enable or Disable Entry and Exit Tones |
| TONER | Preset | Enable or Disable Ring Tones |

8. Command Reference

8.1. AA -- Enable or Disable Auto Answer Mode

This command sets or queries the status of the auto answer feature.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---------------------------|---|
| T01AA1 | Enable auto answer mode. | T01AA1 |
| T01AA0 | Disable auto answer mode. | T01AA0 |
| T01AA2 | Toggle auto answer mode. | T01AAx, where x is 0 or 1 depending on the current state of auto answer mode. |
| T01AA? | Query auto answer mode. | T01AAx, where x is 0 or 1 depending on the current state of auto answer mode. |

8.2. ACKMOD -- Enable or Disable Acknowledgment Mode

This command controls whether or not status messages are sent. See [Section 5](#) for more information on status messages. This parameter is enabled by default, and it is rarely turned off by the host controller.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------|-------------------------------|---|
| T01ACKMOD1 | Enable acknowledgement mode. | T01ACKMOD1 |
| T01ACKMOD0 | Disable acknowledgement mode. | T01ACKMOD0 |
| T01ACKMOD2 | Toggle acknowledgement mode. | T01ACKMOD x , where x is 0 or 1 depending on the current state of acknowledgement mode. |
| T01ACKMOD? | Query acknowledgement mode. | T01ACKMOD x , where x is 0 or 1 depending on the current state of acknowledgement mode. |

8.3. AGC -- Enable or Disable Mic/Line Input Automatic Gain Control

This command sets or queries the status of the Automatic Gain Control (AGC) algorithm on input channel T (the telephone input).

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--------------------------------------|---|
| T01AGCT1 | Enable AGC on input channel T. | T01AGCT1 |
| T01AGCT0 | Disable AGC on input channel T. | T01AGCT0 |
| T01AGCT2 | Toggle AGC state on input channel T. | T01AGCT x , where x is 0 or 1 depending on the current state of the AGC on input channel T. |
| T01AGCT? | Query AGC state on input channel T. | T01AGCT x , where x is 0 or 1 depending on the current state of the AGC on input channel T. |

8.4. AGCMAX -- Set Maximum Allowed Mic/Line Input AGC Gain

This command sets the maximum gain that the AGC can apply on input channel T (the telephone input). For example, if AGCMAX is set to 10, then the AGC for that channel can apply a maximum of 10 dB of gain to the input signal.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 15,

respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--|--|
| T01AGCMAXT3 | Set AGC maximum gain on input channel T to 3 dB. | T01AGCMAXT3 |
| T01AGCMAXT? | Query the AGC maximum gain on input channel T. | T01AGCMAXTx where x is a number between 0 and 15, depending on the current setting of the AGC maximum gain on input channel T. |

8.5. AGCMIN -- Set Minimum Allowed Mic/Line Input AGC Gain

This command sets the minimum gain that the AGC can apply on input channel T (the telephone input). For example, if AGCMIN is set to -10, then the AGC for that channel can apply a minimum of -10 dB of gain to the input signal.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -15 and 0, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|---|
| T01AGCMINT-3 | Set AGC minimum gain on input channel T to -3 dB. | T01AGCMINT-3 |
| T01AGCMINT? | Query the AGC minimum gain on input channel T. | T01AGCMINTx where x is a number between -15 and 0, depending on the current setting of the AGC minimum gain on input channel T. |

8.6. AGCRATE -- Set Ramp Rate of Mic/Line Input AGC

This command sets or queries the maximum rate at which the AGC can increase or decrease the gain of the signals on input channel T (the telephone input). The ramp rate is expressed in dB/sec.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 1 and 5, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|---|
| T01AGCRATET3 | Set AGC ramp rate on input channel T to 3 dB/sec. | T01AGCRATET3 |
| T01AGCRATET? | Query the AGC ramp rate on input channel T. | T01AGCRATETx where x is a number between 1 and 5, depending on the current setting of the AGC ramp rate on input channel T. |

8.7. AHCP -- Enable or Disable Call Progress Based Auto Hangup

This command sets or queries the status of the call progress based auto hangup feature. There are two methods of auto hangup supported: call progress and loop drop. The call progress method listens for off-hook or busy tones and hangs up the phone if they are detected. The loop drop method looks for a drop in loop current on the phone line and hangs up the phone if a loop current drop is detected. The AHCP command controls the call progress auto hangup feature. The AHL D command controls the loop drop auto hangup feature. These two features are controlled and implemented independently.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|---|
| T01AHCP1 | Enable call progress based auto hangup mode. | T01AHCP1 |
| T01AHCP0 | Disable call progress based auto hangup mode. | T01AHCP0 |
| T01AHCP2 | Toggle call progress based auto hangup mode. | T01AHCPx, where x is 0 or 1 depending on the current state of the call progress based auto hangup mode. |
| T01AHCP? | Query auto hangup mode. | T01AHCPx, where x is 0 or 1 depending on the current state of the call progress based auto hangup mode. |

8.8. AHL D -- Enable or Disable Loop Drop Based Auto Hangup

This command sets or queries the status of the loop drop based auto hangup feature. There are two methods of auto hangup supported: call progress and loop drop. The call progress method listens for off-hook or busy tones and hangs up the phone if they are detected. The loop drop method looks for a drop in loop current on the phone line and hangs up the phone if a loop current drop is detected. The AHCP command controls the call progress auto hangup feature. The AHL D command controls the loop drop auto hangup feature. These two features are controlled and implemented independently.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|--|
| T01AHL D1 | Enable loop drop based auto hangup mode. | T01AHL D1 |
| T01AHL D0 | Disable loop drop based auto hangup mode. | T01AHL D0 |
| T01AHL D2 | Toggle loop drop based auto hangup mode. | T01AHL D x , where x is 0 or 1 depending on the current state of the loop drop based auto hangup mode. |
| T01AHL D? | Query auto hangup mode. | T01AHL D x , where x is 0 or 1 depending on the current state of the loop drop based auto hangup mode. |

8.9. AMNOMAT -- Select NOM Attenuation on Each Output

This command enables, disables, or queries NOM attenuation for the specified output . (A, B, T). NOM attenuation is calculated as $10 \cdot \log(\text{Number of Open Microphones})$.

Remember that even though there are no microphones on this device, other microphones can be brought in via the W, X, Y, and Z busses. These signals will have NOM information carried with them from the other devices, which is why NOM attenuation is provided at the outputs.

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--|---|
| T01AMNOMATA1 | Enable NOM attenuation on output A. | T01AMNOMATA1 |
| T01AMNOMATA0 | Disable NOM attenuation on output A. | T01AMNOMATA0 |
| T01AMNOMATB2 | Toggle NOM attenuation status on output B. | T01AMNOMATB x , where x is either 0 or 1 depending on the current mute status of NOM attenuation on the output. |
| T01AMNOMATB? | Query NOM attenuation status of output B. | T01AMNOMATB x , where x is either 0 or 1 depending on the current NOM attenuation status of the output. |
| T01AMNOMAT*1 | Enable NOM attenuation on all outputs (A, B). | T01AMNOMAT*11 |
| T01AMNOMAT*0 | Disable NOM attenuation on all outputs (A, B). | T01AMNOMAT*00 |

| | | |
|---------------|---|--|
| T01AMNOMAT*10 | Enable NOM attenuation on output A and disable NOM attenuation on output B. | T01AMNOMAT*10 |
| T01AMNOMAT*2 | Toggle status of NOM attenuation on all outputs. | T01AMNOMAT*ab, where each of the letters (a, b, etc.) is either 0 or 1 depending of the current status of NOM attenuation on the corresponding output. If this command was sent after the example above, then the status message would be T01AMNOMAT*01. |
| T01AMNOMAT*? | Query NOM attenuation status of all outputs. | T01AMNOMAT*ab, where each of the letters (a, b, etc.) is either 0 or 1 depending of the current status of the NOM attenuation on the corresponding output. If this command was sent after the example above, then the status message would be T01AMNOMAT*01. |

8.10. BAUD -- Set Baud Rate for RS-232 Port

This command sets the baud rate for the rear panel RS-232 port. The baud rate is specified in bits per second (bps). Valid baud rates are 9600, 19200, and 38400. Although, this command returns an acknowledgement, it is likely that you will not receive it, since it is sent at the new baud rate. If you setup your control system to quickly change its RS-232 baud rate after you send this command, then you can probably receive the acknowledgement at the new baud rate.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|--------------|---|--|
| T01BAUD38400 | Set baud rate of rear panel RS-232 port to 38400 bps. | T01BAUD38400 |
| T01BAUD? | Query current baud rate of rear panel RS-232 port. | T01BAUDx, where x is 9600, 19200, or 38400 depending on the current baud rate setting. |

8.11. BLAUTO -- Enable Automatic BLDATA Messages

This command sets whether or not [BLDATA](#) messages are automatically generated by the Vortex. See the [BLDATA](#) command for more information.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
|---------|-------------|----------------|

| | | |
|------------|---|---|
| T01BLAUTO0 | Disable automatic BLDATA messages. | T01BLAUTO0 |
| T01BLAUTO1 | Enable automatic BLDATA messages. | T01BLAUTO1 |
| T01BLAUTO2 | Toggle enabled status of automatic BLDATA messages. | T01BLAUTO x , where x is 0 or 1 depending on the current setting of BLAUTO. |
| T01BLAUTO? | Query enabled status of automatic BLDATA messages. | T01BLAUTO x , where x is 0 or 1 depending on the current setting of BLAUTO. |

8.12. BLDATA -- Request Level Information

This command is used to request "blinking light" data from the EF2201. Blinking light data consists of signal levels for the 1 inputs (T) and 1 output (T).

The blinking light data can be received in two ways. The first way is by polling the Vortex by sending a BLDATA? command. The second way is to have the Vortex automatically send BLDATA responses via the [BLAUTO](#) command.

The most general format of the BLDATA responses generated by the Vortex is as follows.

```
T01BLDATAi○
```

Each of the *i* and *○* characters above represents a single byte of data as shown in the table below.

| BLDATA Bytes | Meaning |
|--------------|----------------|
| <i>i</i> | input level T |
| <i>○</i> | output level T |

The *i* byte corresponds to signal levels on the T input. The *○* byte corresponds to signal levels on the T output.

The formats of the *i* and *○* bytes are the same as for the binary gain commands (binary values offset by 132). See [Section 6.3](#) and [Section 6.4](#) for more information on the binary format.

The range for the *i* and *○* bytes is -100 dB to +20 dB, which corresponds to byte values of 32 to 152. For reference, the LEDs on the front panel signal meter correspond to the following dB levels (left to right): -20, -12, -7, -3, 0, 3, 9, 20.

Here's an example BLDATA message to clear things up.

```
T01BLDATAèç
```

The first byte (*è*) consists of only one value.

$$\text{è} = 0x8A = 138 \rightarrow 138 - 132 = 6$$

So, the signal at input T is at 6 dB.

The next byte (ζ) consists of only one value.

$$\zeta = 0x87 = 135 \rightarrow 135 - 132 = 3$$

So, the signal at output T is at 3 dB.

In the above description, the data in the `BLDATA` command consists of 2 bytes (1 input level + 1 output level). It is possible to tell the EF2201 to only send a subset of this information. Depending on your control system, this could make parsing the data easier since you can ask for only the data that you are interested in.

Suppose you were only interested in signal levels on output T. You could send the following command.

```
T01BLINFO01
```

In the above `BLINFO` command, there are 1's in the positions of the data that we want and 0's in the positions of the data that we don't want. Now, when we send a `BLDATA?` command or enable `BLAUTO`, the Vortex sends messages of the form:

```
T01BLDATAo
```

Where the `o` byte is the signal level for output T.

8.13. BLINFO -- Select Information to be Reported in BLDATA

This command controls which bytes are sent in the `BLDATA` command. See the description of the `BLDATA` command for more information on the `BLINFO` command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

8.14. BROAD2 -- Broadcast Arbitrary Command Strings to RS-232 Port

This command is used to broadcast arbitrary commands to the RS-232 port for controlling other devices (not necessarily other Vortex devices). For example, `''''T01BROAD2:ATDT4048921180'` would cause the Vortex to send out `'ATDT4048921180'` via its RS-232 port. If a modem was connected to the RS-232 port, this command would cause the modem to dial the Polycom Installed Voice Business Group in Atlanta.

| Example | Description | Status Message |
|---------|-------------|----------------|
|---------|-------------|----------------|

| | | |
|--------------------------|--|-----------|
| T01BROAD2:ATDT4048921180 | Sends the string ATDT4048921180 out the RS-232 port. | T01BROAD2 |
|--------------------------|--|-----------|

8.15. BROADA -- Broadcast Commands to Other Connected Devices

This command is used to broadcast commands to other connected Polycom devices via the EF Bus and/or ASPI Bus. For example, the command 'T01BROADA:B02PHONE1' would cause device ID 1 to send a command to the EF2241 at device ID 2 to tell it to take its phone off-hook. The EF2241 at device ID 2 would respond by taking its device off-hook and sending an acknowledgement.

This command is usually used in macros when one needs to have a macro on one device trigger an action on another device.

| Example | Description | Status Message |
|---------------------|---|--|
| T01BROADA:B02PHONE1 | Sends the command B02PHONE2 over the digital bus. | T01BROADA B02PHONE1, this second status message is from the EF2241 at device ID 2 when it takes its phone off hook. |

8.16. COUNTRY -- Specify Country Definitions for Phone Interface

This command is used to set or query the country that the Vortex is configured for operation in. The country setting affects parameters associated with the phone interface including transmit and receive impedances, flash hook timing, timing thresholds for detecting hangup based on loop current drop, timing thresholds for detecting incoming rings, and outgoing DTMF levels.

The following table lists the numeric values for this command and the associated countries.

| Command Value | Country |
|---------------|-----------|
| 0 | Undefined |
| 1 | USA |

More countries will be added as the Vortex is approved for operation in other countries.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 1, respectively.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------|--------------------------------|--|
| T01COUNTRY1 | Set country definition to USA. | T01COUNTRY1 |
| T01COUNTRY? | Query current country setting. | T01COUNTRYx, where x is one of the numbers in the above table that corresponds to the current country setting. |

8.17. DELAYO -- Set Output Delay

This command sets the amount of output delay (in tenths of milliseconds) on the output channel T. Use of the wildcard character (*) for specifying the channel is not supported for this command. The output delay can be separately enabled or disabled via the [DELAYOE](#) command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 3400, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-----------------|--|---|
| T01DELAYOT1500 | Set output delay on output channel T to 150 ms (1500 tenths of milliseconds). | T01DELAYOT1500 |
| T01DELAYOT>1700 | Increase output delay on output channel T by 170 ms (1700 tenths of milliseconds.) | T01DELAYOTx, where x is between 0 and 3400 depending on the current output delay setting for output channel T. If this command is issued after the above example, then the status message will be T01DELAYOT3200. |
| T01DELAYOT? | Query current output delay on output channel T. | T01DELAYOTx, where x is between 0 and 3400 depending on the current output delay setting for output channel 2. If this command is issued after the above example, then the status message will be T01DELAYOT3200. |

8.18. DELAYOE -- Enable Output Delay

This command sets or queries the enabled state of the output delay for the output channel T.

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------|---|--|
| T01DELAYOET1 | Enable output delay on output T. | T01DELAYOET1 |
| T01DELAYOETO | Disable output delay on output T. | T01DELAYOETO |
| T01DELAYOETO | Toggle enabled status of output delay on output T. | T01DELAYOETx, where x is either 0 or 1 depending on the current enabled status of the output delay on the output. |
| T01DELAYOET? | Query enabled status of output delay on output T. | T01DELAYOETx, where x is either 0 or 1 depending on the current enabled status of the output delay on the output. |
| T01DELAYOE*1 | Enable output delay on all outputs (T). | T01DELAYOE*1 |
| T01DELAYOE*0 | Disable output delay on all outputs (T). | T01DELAYOE*0 |
| T01DELAYOE*2 | Toggle enabled status of output delay on all outputs. | B01DELAYOE*x, where x is either 0 or 1 depending of the current enabled status of the output delay on the corresponding output. If this command was sent after the example above, then the status message would be T01DELAYOE*1. |
| T01DELAYOE*? | Query enabled status of output delay on all outputs. | B01DELAYOE*x, where x is either 0 or 1 depending of the current enabled status of the output delay on the corresponding output. If this command was sent after the example above, then the status message would be T01DELAYOE*1. |

8.19. DIAL -- Send DTMF Digits to Phone Interface

This command dials the specified string of digits by sending the equivalent DTMF tones to the phone interface. Valid digits are '0'-'9', '*', '#', and ',' (delay). If the phone is not off-hook when this command is executed, it will automatically be taken off-hook.

| Example | Description | Status Message |
|-----------------------|---|----------------|
| T01DIAL9,,,4048921180 | Dial 9 (to get an outside line), then pause (the three commas), then dial 4048921180. | T10DIAL |

8.20. DSPAUTO -- Enable Automatic DSPLOAD Status Messages

This command sets or queries whether or not [DSPLOAD](#) messages will be automatically generated whenever the DSP utilization changes.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

| Example | Description | Status Message |
|----------------|---|---|
| T01DSPAUTO1 | Enable automatic DSPLOAD messages. | T01DSPAUTO1 |
| T01DSPAUTO0 | Disable automatic DSPLOAD messages. | T01DSPAUTO0 |
| T01DSPAUTO2 | Toggle automatic DSPLOAD messages. | T01DSPAUTOx, where x is 0 or 1 depending on the current setting of the DSPAUTO parameter. |
| T01DSPAUTO? | Query the value of the DSPAUTO parameter. | T01DSPAUTOx, where x is 0 or 1 depending on the current setting of the DSPAUTO parameter. |

8.21. DSPLOAD -- Query Percentage of Variable DSP Resources Used

This command queries the current percentage used of the available variable DSP resources. When this number reaches 100 percent, no more variable DSP features may be enabled. An 'ERROR#060' will be generated if a command attempts to exceed 100 percent utilization.

If the [DSPAUTO](#) feature is enabled, then a DSPLOAD status message will be generated automatically any time the percent utilization changes.

| Example | Description | Status Message |
|----------------|--|---|
| T01DSPLOAD? | Query percentage of variable DSP resources used. | T01DSPLOADx, where x is between 0 and 99 and indicates the percentage of the variable DSP resources being used. |

8.22. ERROR -- Enable or Disable Error Messages

This command sets or queries whether or not error messages for non-fatal errors are reported via RS-232 and the digital bus.

If an error is generated and error messages are enabled, a status message will be automatically generated of the form 'T01ERROR#xxx', where xxx is a three digit number indicating the error code. The following table lists the non-fatal error messages that can be generated by the Vortex.

| Error Number | Description |
|---------------------|---|
| ERROR#001 | Unrecognized command. |
| ERROR#002 | Syntax error in command. |
| ERROR#004 | Attempt to change parameter that is locked via NVLOCK or FPLOCK . |
| ERROR#005 | Attempt to unlock NVLOCK or FPLOCK , but invalid password given. |

| | |
|-----------|--|
| ERROR#060 | This error occurs when the user has attempted to utilize more variable DSP resources than are available. This may occur if too many matrix crosspoints are unmuted or too many parametric EQ filters are enabled. The DSPLOAD command can query the current percentage utilization of DSP resources. |
| ERROR#070 | This error occurs as a result of a macro or preset execution command (PRESETX , PRESETQ , MACROX , MACROQ). It indicates that the macro or preset requested was empty. |
| ERROR#071 | This error occurs as a result of a PRESETW or PRESETK command. In the case of PRESETW it indicates that an attempt was made to write to a factory preset, which is not allowed. In the case of PRESETK , it indicates that an attempt was made to delete a factory preset, which is not allowed. |
| ERROR#072 | This error occurs as a result of a PRESETQ command. It indicates that one or more commands in the preset had errors during execution. |
| ERROR#073 | This error occurs as a result of a MACROA command when there are already too many commands in the macro. The limit is 256 commands per macro. |
| ERROR#074 | This error occurs in response to a MACROA or a logic pin (LIA , LIH , etc.) command. If the command written to the macro or logic pin is illegal, then this error occurs. |
| ERROR#075 | This error occurs when a command attempts to write non-volatile memory, but non-volatile memory is password protected via NVLOCK . |
| ERROR#076 | This error occurs when attempting to add a macro command (either during an upload or while writing a single macro) and the Vortex runs out of room in non-volatile memory. As a result, the entire macro is discarded. If this occurs during an upload, all previous macros (before the one that caused the error) are written successfully. |
| ERROR#077 | This error occurs when attempting to add a command to a macro, but the Vortex is not in the process of writing a macro. This may happen if you forget to do a MACROS or UMACROS command, or if you had an ERROR#076 and continued trying to add commands. |
| ERROR#090 | This error indicates an EF Bus hardware handshaking error. This could happen if bussed units are not powered on simultaneously. Powering the units up simultaneously should remove the error. |
| ERROR#091 | This error indicates an EF Bus software handshaking error. This could happen if bussed units are not powered on simultaneously. Powering the units up simultaneously should remove the error. |
| ERROR#092 | This error indicates an EF Bus ID conflict. See the Vortex user manual for information on valid device IDs. |

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-----------|------------------------|----------------|
| T01ERROR1 | Enable error messages. | T01ERROR1 |

| | | |
|-----------|--------------------------------|--|
| T01ERROR0 | Disable error messages mode. | T01ERROR0 |
| T01ERROR2 | Toggle error message mode. | T01ERRORx, where x is 0 or 1 depending on the current state of error mode. |
| T01ERROR? | Query the state of error mode. | T01ERRORx, where x is 0 or 1 depending on the current state of error mode. |

8.23. FADERI -- Set Input Gain Fader

This command adjusts the fader gain of the input signals, which on the EF2201 consist only of the input from the telephone interface. The fader gain is different from the analog gain ([GAINI](#)) in that it is done in the digital domain. The fader gains are intended to be used for volume control.

This command was introduced in firmware version 2.5.0.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------|---|--|
| T01FADERIT10 | Set fader gain on input T to 10 dB. | T01FADERIT10 |
| T01FADERIT? | Query the fader gain on input T . | T01FADERITx, where x is a number between 0 and 30, depending on the current setting of the fader gain on input channel T . |
| T01FADERI*6 | Set fader gain on all inputs (T) to 6 dB. | T01FADERI*è |
| T01FADERI*? | Query fader gain on all inputs (T). | T01FADERI*x, where x is between ä and ÿ, depending on the current setting of the fader gain for the input channel. |

8.24. FLASH -- Execute Hook Flash

This command puts the phone on-hook and then takes it back off-hook after a delay. The amount of time between on-hook and off-hook is controlled by the [COUNTRY](#) setting and has be set for each country to meet each country's specific compliance requirements. If the phone is on-hook when this command is given, then no action is performed.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|----------|---------------------|---|
| | | If the phone is on-hook, no action is performed, and the response will be T01FLASH |
| T01FLASH | Execute hook flash. | If the phone is off-hook, the response will be T01FLASH T01PHONE0 T01PHONE1 |
| | | The PHONE status messages occur when the phone goes on-hook and back off-hook. |

8.25. FLOW -- Set Flow Control Mode for RS-232 Port

This command sets the flow control mode for the rear panel RS-232 port. The valid settings are:

| Command Value | Description |
|---------------|---|
| 0 | No flow control. |
| 1 | Hardware flow control. |
| 2 | Auto-detect hardware flow control or no flow control. |

We recommend using hardware flow control whenever possible, especially when using higher baud rates.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------|--|--|
| T01FLOW1 | Set rear panel RS-232 port to use hardware flow control. | T01FLOW1 |
| T01FLOW? | Query flow control setting of rear panel RS-232 port. | T01FLOWx, where x is 0, 1, or 2 depending on the current flow control setting. |

8.26. FPLOCK -- Lock/Unlock Front Panel

This command controls the front panel lock feature. When FPLOCK is enabled, the user may not make any changes to the system via the front panel. The system settings will still be viewable on the LCD, but the user will get an error message if he tries to change them. When FPLOCK is disabled, the user has full access to the system settings via the front panel.

Usage of this command is similar to other boolean commands (see [Section 6.1](#)) except that when disabling this feature, the password must be supplied for the command to work. If an incorrect password is supplied, 'ERROR#005' will be generated. The examples below illustrate the correct usage.

The examples assume that the password has been set to 'aspi' (the default). The front panel password can be changed via the [FPPSWD](#) command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|---------------------|---|--|
| T01FPLOCK1 | Lock the front panel to prevent users from changing the settings. | T01FPLOCK1 |
| T01FPLOCK0 ,yummyum | Attempt to unlock the front panel by using an invalid password (yummyum). | T01ERROR#005 -- since an invalid password was given, an error message was generated. If error messages have been disabled (via the ERROR command), then no status message will be generated. |
| T01FPLOCK0 ,aspi | Unlock the front panel by using the correct password. | T01FPLOCK0 |
| T01FPLOCK? | Query the locked status of the front panel. | T01FPLOCKx, where x is 0 or 1 depending on whether the front panel is unlocked or locked, respectively. |

8.27. FPPSWD -- Change Front Panel Password

This command sets or queries the front panel password. This password is used in conjunction with the [FPLOCK](#) command. The front panel must be unlocked ('FPLOCK0') in order to use this command to set or query the front panel password. If the front panel is locked, then this command will result in 'ERROR#004'. The examples below assume that the front panel is unlocked.

| Example | Description | Status Message |
|-----------------|---|-----------------|
| T01FPPSWDmonkey | Set front panel password to 'monkey'. | T01FPPSWDmonkey |
| T01FPPSWD? | Query the current front panel password. | T01FPPSWDmonkey |

8.28. GAINA -- Set Phone Input Gain

This command sets the gain of the incoming signal from the phone interface. This command is an alias for the [GAINIT](#) command. It is provided for backwards compatibility with and ease of migration from the EF200. When possible, the [GAINIT](#) command should be used instead of this command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|------------------------------------|--|
| T01GAINA6 | Set phone input gain to 6 dB. | T01GAINA6 |
| T01GAINA>3 | Increase phone input gain by 3 dB. | T01GAINAx, where x is the new value of the phone input gain. If this command was issued after the example above, then the status message would be T01GAINA9. |
| T01GAINA? | Query phone input gain. | T01GAINAx, where x is the new value of the phone input gain. If this command was issued after the example above, then the status message would be T01GAINA9. |

8.29. GAIN -- Set Gain of Incoming DTMF Tones

This command sets the gain of the incoming DTMF tones. The gain of the outgoing DTMF depends on the country that the Vortex is configured for (see the [COUNTRY](#)) command. This command is an alias for the [GAINBIT](#) command. It is provided for backwards compatibility with and ease of migration from the EF200. When possible, the [GAINBIT](#) command should be used instead of this command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -20 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--------------------------------------|---|
| T01GAIN6 | Set incoming DTMF gain to 6 dB. | T01GAIN6 |
| T01GAIN>3 | Increase incoming DTMF gain by 3 dB. | T01GAINdx, where x is the new value of the incoming DTMF gain. If this command was issued after the example above, then the status message would be T01GAIN9. |
| T01GAIN? | Query incoming DTMF gain. | T01GAINdx, where x is the new value of the incoming DTMF gain. If this command was issued after the example above, then the status message would be T01GAIN9. |

8.30. GAINBIT -- Set Gain of Incoming DTMF Tones

This command sets the gain of the incoming DTMF tones. The gain of the outgoing DTMF depends on the country that the Vortex is configured for (see the [COUNTRY](#)) command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -20 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will

be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|---|
| T01GAINEDIT6 | Set incoming DTMF tone gain to 6 dB. | T01GAINEDIT6 |
| T01GAINEDIT>3 | Increase incoming DTMF tone gain by 3 dB. | T01GAINEDITx, where x is the new value of the incoming DTMF tone gain. If this command was issued after the example above, then the status message would be T01GAINEDIT9. |
| T01GAINEDIT? | Query incoming DTMF tone gain. | T01GAINEDITx, where x is the new value of the incoming DTMF tone gain. If this command was issued after the example above, then the status message would be T01GAINEDIT9. |

8.31. GAINDT -- Set Dial Tone Gain

This command sets the gain of the dial tone received from the phone interface.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -20 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|----------------------------------|--|
| T01GAINDT6 | Set dial tone gain to 6 dB. | T01GAINDT6 |
| T01GAINDT>3 | Increase dial tone gain by 3 dB. | T01GAINDTx, where x is the new value of the dial tone gain. If this command was issued after the example above, then the status message would be T01GAINDT9. |
| T01GAINDT? | Query dial tone gain. | T01GAINDTx, where x is the new value of the dial tone gain. If this command was issued after the example above, then the status message would be T01GAINDT9. |

8.32. GAINI -- Set Input Gain

This command adjusts the gain of the input signals, which on the EF2201 consist only of the input from the telephone interface.

The GAINIT command has a range of -100 to +20.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 20 or 30,

respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-------------|-------------------------------------|---|
| T01GAINIT10 | Set gain on input T to 10 dB. | T01GAINIT10 |
| T01GAINIT? | Query the gain on input T . | F01GAINI2xB01GAINITxS01GAINIAxQ01GAINIAxT01GAINITx, where x is a number between 0 and 30, depending on the current setting of the gain on input channel T . |
| T01GAINI*6 | Set gain on all inputs (T) to 6 dB. | T01GAINI*è |
| T01GAINI*? | Query gain on all inputs (T). | T01GAINI*x, where x is between ä and ÿ, depending on the current setting of the gain for the input channel. |

8.33. GAINO -- Set Output Gain

This command sets or queries the gain (in dB) of the output channels (only T on the EF2201).

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-------------|---|---|
| T01GAINOT10 | Set gain on output channel T to 10 dB. | T01GAINOT10 |
| T01GAINOT? | Query the gain on output channel T. | , , T01GAINOTx where x is a number between -100 and 20, depending on the current setting of the gain on output channel T. |
| T01GAINO*6 | Set the gain on all output channels (only T on the EF2201) to 6 dB. | T01GAINO*è |
| T01GAINO*? | Query gain settings on all output channels (only T on the EF2201). | T01GAINO*x, where x is between <space> and ÿ, depending on the current setting of the gains for each of the output channel T. |

8.34. GAINP -- Set Phone Output Gain

This command sets the gain of the output to the phone interface. This command is an alias for the [GAINOT](#). It is provided for backwards compatibility with and ease of migration from the EF200. When possible, the [GAINOT](#) command should be used instead of this command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|-------------------------------------|---|
| T01GAINP6 | Set phone output gain to 6 dB. | T01GAINP6 |
| T01GAINP>3 | Increase phone output gain by 3 dB. | T01GAINPx, where x is the new value of the phone output gain. If this command was issued after the example above, then the status message would be T01GAINP9. |
| T01GAINP? | Query phone output gain. | T01GAINPx, where x is the new value of the phone output gain. If this command was issued after the example above, then the status message would be T01GAINP9. |

8.35. GAINSIT -- Set From Phone User Tone Gain

This command sets the gain of the user tones coming from the phone DSP. User tones include entry and exit tones (see [TONEE](#)) and custom tones (see the [SOUNDP](#) and [SOUNDL](#) commands). In most cases, the tones are played out "locally" and their gains are adjusted by the GAINSIT command. Sometimes, the tones are played out to the phone, and the gain is adjusted by the [GAINSOT](#) command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -20 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|------------------------------------|--|
| T01GAINSIT6 | Set tone output gain to 6 dB. | T01GAINSIT6 |
| T01GAINSIT>3 | Increase tone output gain by 3 dB. | T01GAINSITx where x is the new value of the tone output gain. If this command was issued after the example above, then the status message would be T01GAINSIT9. |
| T01GAINSIT? | Query tone output gain. | T01GAINSITx, where x is the new value of the tone output gain. If this command was issued after the example above, then the status message would be T01GAINSIT9. |

8.36. GAINSOT -- Set To Phone User Tone Gain

This command sets the gain of the user tones coming from the phone DSP. User tones include entry and exit tones (see [TONEE](#)) and custom tones (see the [SOUNDP](#) and [SOUNDL](#) commands). In most cases, the tones are played out "locally" and their gains are adjusted by the [GAINSIT](#) command. Sometimes, the tones are played out to the phone, and the gain is adjusted by the `GAINSOT` command.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -20 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------|------------------------------------|--|
| T01GAINSOT6 | Set tone output gain to 6 dB. | T01GAINSOT6 |
| T01GAINSOT>3 | Increase tone output gain by 3 dB. | T01GAINSOTx, where x is the new value of the tone output gain. If this command was issued after the example above, then the status message would be T01GAINSOT9. |
| T01GAINSOT? | Query tone output gain. | T01GAINSOTx, where x is the new value of the tone output gain. If this command was issued after the example above, then the status message would be T01GAINSOT9. |

8.37. GMUTE0 -- Mute All Outputs

The name of this command is an abbreviation of "Global Mute Outputs." Enabling this option causes all of the physical outputs to be muted (output T). This muting is independent of the normal output mute command, [MUTE0](#). This command is provided so that the control program can implement a "saftey mute" feature. The idea is that if the user accidentally misconfigures the Vortex and feedback begins to occur, they can press the saftey mute to instantly mute all outputs before they damage their equipment or ears.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------|-----------------------------|---|
| T01GMUTE01 | Enable global output mute. | T01GMUTE01 |
| T01GMUTE00 | Disable global output mute. | T01GMUTE00 |
| T01GMUTE02 | Toggle global output mute. | T01GMUTE0x, where x is 0 or 1 depending on the current state of the global output mute. |

| | | |
|------------|-----------------------------|---|
| T01GMUTE0? | Query acknowledgement mode. | T01GMUTE0x, where x is 0 or 1 depending on the current state of the global output mute. |
|------------|-----------------------------|---|

8.38. ID -- Set Device ID

This command sets or queries the Device ID for the Vortex. Typically, the device ID is set from the front panel of the Vortex, so this command is not normally used. There are restrictions involving having devices with the same ID linked on EF Bus -- see the Vortex Reference Manual for more details.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 7, respectively.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|---------|----------------------------------|----------------|
| T01ID3 | Change the device ID from 1 to 3 | T03ID3 |
| T01ID? | Query current device ID. | T01ID1 |

8.39. LABEL -- Set or Query one of the Device Labels

This command sets or queries one of the many labels stored in the device. The LABEL command has the following syntax:

```
iLABELx,y
```

where i is the device type and ID, x is the label specifier, and y is the label text (to set the label) or a ? character (to query the label). The label specifiers are as follows:

| Label Specifier | Description |
|---|--|
| D | A label for the device itself. |
| SG | A label for the signal generator. |
| IT | Label for the telephone input channel. |
| OT | Label for the telephone output channel. |
| P | Label for matrix output to EF Bus. |
| PB0-PB7, WB0-WB7, XB0-XB7, YB0-YB7, ZB0-ZB7 | Labels for inputs from EF Bus to submatrices. |
| PM0-PM1, WM0-WM2, XM0-XM2, YM0-YM2, ZM0-ZM2 | Labels for outputs from EF Bus submatrices to main matrix. |
| G0-G3 | Labels for logic input groups. |
| LI1-LI24 | Labels for logic input pins |

| | |
|----------|------------------------------|
| LO1-LO20 | Labels for logic output pins |
| P0-P47 | Labels for user presets. |
| M0-M255 | Labels for user macros. |

The text of each label can be up to 16 characters long. Labels for presets 0-15 are read-only.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------------------|--|--|
| T01LABELLI5,Mute Button | Set label of logic input 5 to "Mute Button". | T01LABELLI5,Mute Button |
| T01LABELLI5,? | Query label for logic input 5. | T01LABELLI5,<string>, where <string> is the current label assigned to logic input 5. |

8.40. LEC -- Enable or Disable LEC

This command sets or queries the status of the line echo canceller (LEC).

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------------|---|
| T01LEC1 | Enable LEC. | T01LEC1 |
| T01LEC0 | Disable LEC. | T01LEC0 |
| T01LEC2 | Toggle LEC state. | T01LECx, where x is 0 or 1 depending on the current state of the LEC. |
| T01LEC? | Query LEC state. | T01LECx, where x is 0 or 1 depending on the current state of the LEC. |

8.41. LECMODE -- Set Amount of Double Talk Suppression used in the LEC.

This command sets the amount of double talk suppression used in the LEC on the telephone input (T). The values correspond to the following settings.

- 1 = No Suppression
- 2 = Light Suppression
- 3 = Heavy Suppression
- 4 = Half Duplex

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 1 and 4, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-------------|-------------------------------|--|
| T01LECMODE3 | Set LEC to Heavy Suppression. | T01LECMODE3 |
| T01LECMODE? | Query LEC suppression level. | T01LECMODE x where x is 1, 2, 3, or 4 depending on the current setting of the LEC suppression level. |

8.42. LI -- Query State of Logic Inputs

This command returns the current state of the logic inputs. There are 24 logic inputs, so an array of 24 boolean values is returned with the first value indicating the state of the first logic input, the second value indicating the state of the second logic input, and so on.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|---------|--------------------------------------|--|
| T01LI*? | Query current state of logic inputs. | T01LI*111010100010111100001110, this is an example response, the actual values will depend on the actual states on the logic inputs. |

8.43. LIA -- Assign Action for when Logic Input is Activated

This function assigns a single command to be executed when a given logic input changes from the inactive state to the active state. Typically, the inactive state is logic high ('1') and the active state is logic low ('0'). This is commonly referred to as active low. Active low is considered normal because a closed switch would ground the input and a closed switch would normally be considered active. This polarity setting can be changed via the [LIP](#) command.

A single command can be assigned to each of three conditions occurring on the logic pin: a change to the active state, a change to the inactive state, and a repeating command when the pin is held in the active state. The LIA command assigns a single command to the logic pin that is executed when the logic pin changes to the active state.

Although only one command can be assigned to the state change, the command may be a [MACROX](#) or [MACROQ](#) command. Since up to 256 commands can be stored in each macro, this gives the effect of having up to 256 commands execute when the logic pin changes state. The command associated with the state change can also be a [PRESETX](#) or [PRESETQ](#). This makes it easy to reconfigure the device for different rooms based on external logic settings.

The [BROADA](#) is also useful in logic pin assignments. The [BROADA](#) command transmits a command to another device on the EF Bus, so you can effectively make a logic pin state change on one device cause an action to occur on another device.

ERROR#074 will be generated if the assigned command is one that writes non-volatile memory, and the pin will not actually be assigned.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------------------|--|----------------------------|
| T01LIA4 ,MUTEIT1 | Assign the command MUTEIT1 to occur when logic input pin 4 changes from the inactive to active state. The MUTEIT1 mutes input channel T | T01LIA4 ,MUTEIT1 |
| T01LIA5 ,MACROX23 | Assign the command MACROX23 to occur when logic input pin 5 changes from the inactive state to the active state. The MACROX23 command executes macro 23, which can contain up to 256 other commands. | T01LIA5 ,MACROX23 |
| T01LIA6 ,BROADA:T02MUTEIT1 | Assign the command BROADA:T02MUTEI11 to occur when logic input pin 6 changes from the inactive state to the active state. This command causes the EF2201 at ID 2 to mute its input channel T when logic pin 6 on the EF2201 at ID 1 changes from the inactive to active state. | T01LIA6 ,BROADA:T02MUTEIT1 |
| T01LIA7 , | Assign a blank command to occur when logic input pin 7 changes from the inactive state to the active state. Assigning a blank command means no action will take place as a result of this state change. | T01LIA7 , |

| | | |
|------------|--|---|
| T01LIA4, ? | Query the command associated with the active state of logic pin 4. | T01LIA4, <string>, where <string> is the command string that will be executed when logic input 4 is activated. If this query was given after the example for logic input 4 above, the response would be T01LIA4, MUTEIT1. |
|------------|--|---|

8.44. LID -- Assign Action for when Logic Input is Deactivated

This function assigns a single command to be executed when a given logic input changes from the active state to the inactive state. Typically, the inactive state is logic high ('1') and the active state is logic low ('0'). This is commonly referred to as active low. Active low is considered normal because a closed switch would ground the input and a closed switch would normally be considered active. This polarity setting can be changed via the [LIP](#) command.

A single command can be assigned to each of three conditions occurring on the logic pin: a change to the active state, a change to the inactive state, and a repeating command when the pin is held in the active state. The LID command assigns a single command to the logic pin that is executed when the logic pin changes to the inactive state.

Although only one command can be assigned to the state change, the command may be a [MACROX](#) or [MACROQ](#) command. Since up to 256 commands can be stored in each macro, this gives the effect of having up to 256 commands execute when the logic pin changes state. The command associated with the state change can also be a [PRESETX](#) or [PRESETQ](#). This makes it easy to reconfigure the device for different rooms based on external logic settings.

The [BROADA](#) is also useful in logic pin assignments. The [BROADA](#) command transmits a command to another device on the EF Bus, so you can effectively make a logic pin state change on one device cause an action to occur on another device.

ERROR#074 will be generated if the assigned command is one that writes non-volatile memory, and the pin will not actually be assigned.

See the description of the [LIA](#) for examples on how to use the LID command. The syntax for this command is exactly the same.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

8.45. LIH -- Assign Action for when Logic Input is Held

This function assigns a single command to be executed repeatedly when a given logic input is held in the active state. Typically, the inactive state is logic high ('1') and the active state is logic low ('0'). This

is commonly referred to as active low. Active low is considered normal because a closed switch would ground the input and a closed switch would normally be considered active. This polarity setting can be changed via the [LIP](#) command.

A single command can be assigned to each of three conditions occurring on the logic pin: a change to the active state, a change to the inactive state, and a repeating command when the pin is held in the active state. The [LIH](#) command assigns a single command to the logic pin that is executed repeatedly when the logic pin is held in the active state. This command is useful for volume ramping controls, especially when combined with the relative operators (< and >) of integer commands (see [Section 6.2](#)).

Although only one command can be assigned to the state change, the command may be a [MACROX](#) or [MACROQ](#) command. Since up to 256 commands can be stored in each macro, this gives the effect of having up to 256 commands execute when the logic pin changes state. The command associated with the state change can also be a [PRESETX](#) or [PRESETQ](#). This makes it easy to reconfigure the device for different rooms based on external logic settings.

The [BROADA](#) is also useful in logic pin assignments. The [BROADA](#) command transmits a command to another device on the EF Bus, so you can effectively make a logic pin state change on one device cause an action to occur on another device.

ERROR#074 will be generated if the assigned command is one that writes non-volatile memory, and the pin will not actually be assigned.

See the description of the [LIA](#) for examples on how to use the [LIH](#) command. The syntax for this command is exactly the same. One additional example is given here: using the [LIH](#) command for volume control.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------------|--|-------------------|
| T01LIH8 ,GAINIT>3 | Assign the command GAINIT>3 to occur repeatedly when logic pin 8 is held in the active state. The GAINIT>3 command causes the gain on input channel T to increase by 3 dB each time the command is executed. | T01LIH8 ,GAINIT>3 |

8.46. LIEN -- Enable Automatic Logic Input Status Messages

This command controls whether or not logic input status messages are sent automatically. If [LIEN](#) is enabled, then a logic input query ([LI*?](#)) is performed any time any of the states change on the logic input pins. For example, if all logic inputs are currently in the low state ('0') and [LIEN](#) is enabled, then if logic input 12 changes state to '1', the following status message will be generated:

```
T01LI*000000000001000000000000
```

A status message is only generated if there is a state change. This helps keep data traffic to a minimum.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------|--|---|
| T01LIEN1 | Enable automatic logic input status messages. | T01LIEN1 |
| T01LIEN0 | Disable automatic logic input status messages. | T01LIEN0 |
| T01LIEN2 | Toggle automatic logic input status messages. | T01LIENx, where x is 0 or 1 depending on the current setting of LIEN. |
| T01LIEN? | Query automatic logic input status messages. | T01LIENx, where x is 0 or 1 depending on the current setting of LIEN. |

8.47. LIG -- Configure Logic Input Pins Into a Group

This command configures which logic input pins are in a group. Logic groups allow events to happen when certain combinations of inputs are present on the logic pins. For example, if a logic group was defined that consisted of three logic input pins (pin 1, pin 2, and pin 3), then a total of eight combinations (2^3) are possible, and a command or macro can be assigned to each combination. This feature is particularly useful in room-combining applications. It can also be used to make controls based on rotary switches that output binary, BCD, or Gray codes.

Commands can be assigned to the configurations of a logic group via the [LIN](#) command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------------------------|--|----------------------------------|
| T01LIG2,000011110000000000000000 | Configure Logic Group 2 to contain logic input pins 5-8. | T01LIG2,000011110000000000000000 |

| | | |
|----------------------------------|---|---|
| T01LIG2,011010010000100000000000 | Configure Logic Group 2 to contain logic input pins 2, 3, 5, 8, and 13. Note that the pins in a logic group do not have to be contiguous. | T01LIG2,011010010000100000000000 |
| T01LIG2,? | Query which pins are in logic group 2. | T01LIG2,abcdefghijklmnopqrstuvw, where a-x are each 0 or 1 depending on which logic input pins are assigned to logic group 2. |

8.48. LIK -- Delete One or All Logic Input Pin Commands

This command "kills" or deletes all commands for a given logic input pin. In other words, the commands associated with [LIA](#), [LID](#), and [LIH](#) will be deleted for the specified logic input. A wildcard character can also be specified for the logic input pin, in which case the commands for all logic input pins will be deleted.

Using this command is more efficient than deleting one command or pin at a time since this command deletes them all at once and requires fewer writes to non-volatile memory.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|---------|--|----------------|
| T01LIK5 | Delete all the commands associated with logic input pin 5. This one command is equivalent to executing the commands 'T01LIA5,', 'T01LID5,', and 'T01LIH5,' except that this command is more efficient. | T01LIK5 |
| T01LIK* | Delete all the commands associated with all logic input pins. This one command is equivalent to executing the commands 'T01LIA1,', 'T01LID1,', and 'T01LIH1,' for each logic input, except that this command is much more efficient. | T01LIK* |

8.49. LIM -- Mask Logic Input Pins

This command is used to mask (i.e., disable) logic input pins. The mask consists of 24 fields (one for each logic input) that can each be set to 0 or 1. If the mask bit for a given logic input is set to 1, then the logic input pin works normally. If the mask bit for a given logic input is set to 0, then the logic input

is disabled. When a logic input is disabled, any commands assigned to the logic pin via [LIA](#), [LID](#), and [LIH](#) will not be executed.

If a logic pin is disabled and then re-enabled at some later time and the logic input has changed state from when it was disabled, the command associated with the state change will be executed. For example, if a logic input pin is high when it is disabled, and it is low when it is re-enabled, the command defined via [LID](#) (or [LIA](#) if the polarity is changed via [LIP](#)) will be executed. However, if the pin changes state multiple times while it is disabled, multiple commands will not be executed; only the difference in state when the logic input is re-enabled is considered.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------------------------|---|---|
| T01LIM100101101111011111111111 | Mask (disable) logic inputs 2, 3, 5, 8, and 13. | T01LIM100101101111011111111111 |
| T01LIM? | Query current logic input mask. | T01LIMabcdefghijklmnopqrstuvw where a-x are each 0 or 1 depending on the current state of the logic input mask. |

8.50. LIN -- Assign Command to Logic Input Group

This command assigns a command to be executed when a group of logic input pins is in a certain configuration. Logic groups are defined via the [LIG](#) command.

As an example, assume that the command `T01LIG2,000001111100000000000000` has been sent to the device. This command configures logic input pins 6-10 to be part of logic group 2. Now, we send the command `T01LIN2,10,MACROX25`. This command configures logic input group 2 to execute the command `MACROX25` when logic inputs 7 and 9 are active ('1') and logic inputs 6, 8, and 10 are inactive ('0'). The first number in the `LIN` command specifies which logic group to be affected. The second number specifies the configuration. In this case, the number '10' translates to '01010' in binary. There are zeros in the positions for the first, third, and last bits -- these correspond to logic inputs 6, 8, and 10 for our case. Similarly, the ones in the second and fourth positions correspond to bits 7 and 9. The last part of the command specifies the command to be executed with the pins enter this configuration.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|---------------------|--|---|
| T01LIN2,10,MACROX25 | Configure logic input group 2 to execute MACROX25 when the pins in logic input group 2 correspond to the decimal value 10. | T01LIN2,10,MACROX25 |
| T01LIN1,7,? | Query the command associated with decimal configuration 7 on logic input group 1. | T01LIN1,7,<string>, where <string> corresponds to the command that is associated with decimal configuration 7 on logic input group 1. |

8.51. LIP -- Set Polarity for Logic Inputs

This command sets the polarity for the 24 logic input pins. Setting the polarity for a given pin to 0 indicates that the polarity should be normal (active low). Setting the polarity for a given pin to 1 indicates that the polarity should be inverted (active high). Active low is considered normal because a closed switch would ground the input, and a closed switch would normally be considered active.

This command affects the operation of the [LIA](#), [LID](#), and [LIH](#) commands. If a logic input pin's polarity is reversed, the operation of these commands is reversed.

By default, the polarity for all pins is set to normal (active low).

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------------------------------|--|-------------------------------------|
| T01LIP00000000000000000000000001111 | Set logic inputs 1-20 to normal (active low) and logic inputs 21-24 to inverted (active high). | T01LIP00000000000000000000000001111 |

8.52. LO -- Query or Set Status of Logic Output Pins

This command sets or queries the current state of the logic outputs. There are 20 logic outputs, so an array of 20 boolean values is required or returned, with the first value indicating the state of the first logic output, the second value indicating the state of the second logic output, and so on.

If a logic output pin has conditions driving it (via the [LOA](#) and [LOD](#) commands), those conditions will override any settings imposed by the LO command.

If a logic pin is masked via the [LOM](#) command, its status will still be affected by the LO command.

| Example | Description | Status Message |
|----------------------------|--|---|
| T01LO*00000000000000000000 | Set all logic outputs low. | T01LO*00000000000000000000 |
| T01LO*10101010101010101010 | Set even numbered logic output pins low and odd numbered logic output pins high. | T01LO*10101010101010101010 |
| T01LO*? | Query current state of logic outputs | T01LO*abcdefghijklmnopqrst, where a-t are each 0 or 1 depending on the current state of the corresponding logic output. |

8.53. LOA -- Define Behavior for Logic Output Activated State

This command is used to define the conditions under which a given logic output pin goes into the active state. By default the logic output pins are active high. Active high is the default because it would light an LED connected to the output when the output was in the active state. The polarity of the logic output pins can be changed with the [LOP](#) command.

The syntax of this command allows one to use one of the boolean channel commands to determine the state of the logic output pin. The commands that are valid for use with LOA are [AGC](#), [MUTEO](#), [MUTEI](#), and [NC](#). Each command must be specified using the wildcard character, *, for the channel number.

Each character in the array string is compared to the status of the channels in the Vortex. A 1 or a 0 in the string means that the status for the corresponding channel must match that character for the condition to be true. A period character, ., in the string is a don't care, meaning that the condition will be true no matter what the status for that channel is. A + or - character works as an OR function, with + corresponding to a 1 in the channel status and - corresponding to a 0. If any + or - characters are in the string, at least one channel's status must match for the condition to be true.

The special characters ., +, and - are not particularly useful on the EF2201, since there is only one input channel and one output channel. The special characters are more useful on the other EF22xx devices that have more inputs and outputs. Typically, only the 0 and 1 characters are used with this command on the EF2201.

Consider the following example. In this example, we also use the [LOD](#) command, which is just like the LOA command except that it sets the condition for the logic output to be in the deactivated state. Normally, you must set both the LOA and [LOD](#) commands in order to make use of a logic output pin. In our example, we issue the following commands:

```
T01LOA10,MUTEI*1
T01LOD10,MUTEI*0
```

These two commands set the conditions for activation and deactivation of logic output 10. Under these conditions, logic output 10 will be activated if:

- input T is muted

Logic output 10 will be deactivated if:

- input T is unmuted

An error condition of `ERROR#074` will be generated if the assigned command is invalid.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------------------------|---|-------------------------------|
| <code>T01LOA10,MUTEI*1</code> | Configure the conditions for activation of logic output 10 as described in the example above. | <code>T01LOA10,MUTEI*1</code> |
| <code>T01LOA7,</code> | Delete conditions for activation of logic output 7. | <code>T01LOA7,</code> |

8.54. LOD -- Define Behavior for Logic Output Deactivated Status

This command is used to define the conditions under which a given logic output pin goes into the deactive state. The syntax and behavior of this command is identical to that of the [LOA](#) command. Please refer to the description of the [LOA](#) command for more information, including examples.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

8.55. LOEN -- Enable Automatic Logic Output Status Messages

This command controls whether or not logic output status messages are sent automatically. If `LOEN` is enabled, then a logic output query (`LO*?`) is performed any time any of the states change on the logic output pins. For example, if all logic outputs are currently in the low state ('0') and `LOEN` is enabled, then if logic output 12 changes state to '1', the following status message will be generated:

```
T01LO*00000000000100000000
```

A status message is only generated if there is a state change. This helps keep data traffic to a minimum.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|---|
| T01LOEN1 | Enable automatic logic output status messages. | T01LOEN1 |
| T01LOEN0 | Disable automatic logic output status messages. | T01LOEN0 |
| T01LOEN2 | Toggle automatic logic output status messages. | T01LOENx, where x is 0 or 1 depending on the current setting of LOEN. |
| T01LOEN? | Query automatic logic output status messages. | T01LOENx, where x is 0 or 1 depending on the current setting of LOEN. |

8.56. LOK -- Delete One or All Logic Output Pin Commands

This command "kills" or deletes all commands for a given logic output pin. In other words, the commands associated with [LOA](#) and [LOD](#) will be deleted for the specified logic output. A wildcard character can also be specified for the logic output pin, in which case the commands for all logic output pins will be deleted.

Using this command is more efficient than deleting one command or pin at a time since this command deletes them all at once and requires fewer writes to non-volatile memory.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------|---|-----------------------|
| T01LOK5 | Delete all the commands associated with logic output pin 5. This one command is equivalent to executing the commands 'T01LOA5,' and 'T01LOD5,' except that this command is more efficient. | T01LOK5 |
| T01LOK* | Delete all the commands associated with all logic output pins. This one command is equivalent to executing the commands 'T01LOA1,' and 'T01LOD1,' for each logic output, except that this command is much more efficient. | T01LOK* |

8.57. LOM -- Mask Logic Output Pins

This command is used to mask (i.e., disable) logic output pins. The mask consists of 20 fields (one for each logic output) that can each be set to 0 or 1. If the mask bit for a given logic output is set to 1, then the logic output pin works normally. If the mask bit for a given logic output is set to 0, then the logic output is disabled. When a logic output is disabled, it is "frozen" in whatever state it is in when it is disabled. The output pin's state will not change when the condition that drives it (via [LOA](#) and [LOD](#))

changes. However, any changes to that pin caused by setting the values with an [LO](#) command will affect the output pin value. For instance, you could disable (mask) a pin and then explicitly set its value to low with the [LO](#) command.

When a logic output pin is re-enabled, it will be updated to the current status of whatever condition drives it (via [LOA](#) and [LOD](#)).

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------------------|--|--|
| T01LOM10010110111101111111 | Mask (disable) logic outputs 2, 3, 5, 8, and 13. | T01LOM10010110111101111111 |
| T01LOM? | Query current logic output mask. | T01LOMabcdefghijklmnopqrst, where a-t are each 0 or 1 depending on the current state of the logic output mask. |

8.58. LOP -- Set Polarity for Logic Outputs

This command sets the polarity for the 20 logic input pins. Setting the polarity for a given pin to 1 indicates that the polarity should be normal (active high). Setting the polarity for a given pin to 0 indicates that the polarity should be inverted (active low). Active high is considered normal because it would light an LED connected to an output pin if the output pin was in the active state.

This command affects the operation of the [LOA](#) and [LOD](#) commands. If a logic input pin's polarity is reversed, the operation of these commands is reversed.

By default, the polarity for all pins is set to normal (active high).

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------------------|--|---|
| T01LOP11111111111111110000 | Set logic outputs 1-16 to normal (active high) and logic outputs 17-20 to inverted (active low). | T01LOP11111111111111110000 |
| T01LOP? | Query current polarity settings for logic outputs. | T01LOPabcdefghijklmnopqrst, where a-t are each 0 or 1 depending on the current state of the logic output polarity for the corresponding logic output pin. |

8.59. MACROA -- Add Command to Current Macro

This command adds a command to the macro currently in progress. This is used in conjunction with the [MACROS](#) and [MACROW](#) commands to create a new macro.

The syntax of this command specifies a macro number, a comma, and then the command to be added to the macro. The command to be added to the macro can be any valid command except the following:

- any PRESET command
- any MACRO command
- any logic input or output command

If an attempt to assign an invalid command to a macro is made (via [MACROA](#)), then the error condition ERROR#074 will be generated.

An error will be generated if the specified command is not a valid command. However, an error will not be generated if the specified command is valid, but its data is invalid. For example:

```
T01MACROA25 ,LAYDOWNTHEBOOGIE
```

Would return an error because it does not contain a valid command. However:

```
T01MACROA62 ,MUTEOMYMOTHERINLAW
```

Would not return an error because it contains a [MUTEO](#) command. An error would be returned when the macro is executed with a [MACROX](#) or [MACROQ](#) command and it tries to execute the [MUTEO](#) command with strange data.

The proper sequence for creating a macro (macro number 112 in this example) is as follows.

```
T01MACROS112
T01MACROA112 ,MUTEI*0
T01MACROA112 ,GAINI*0
T01MACROA112 ,MUTEO*0
T01MACROW112
```

This defines macro number 112 to unmute all inputs, set all input gains to 0 dB, and unmute all outputs. It is acceptable if another command is sent in between these commands (such as T01NC*?) as long as it isn't another non-volatile memory command which could interfere with the storage of the macro.

8.60. MACROK -- Delete One or All Macros

This command kills (deletes) the specified macro. If the wildcard character (*) is used to specify the macro number, then all macros are deleted. Deleting all macros via MACROK* is more efficient than deleting them all individually since it requires less writes to non-volatile memory.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------|--|----------------|
| T01MACROK25 | Delete all the commands associated with macro number 25. | T01MACROK25 |
| T01MACROK* | Delete all the commands associated with all 255 macros. | T01MACROK* |

8.61. MACROL -- List All Commands in a Macro

This command lists all the commands in a given macro. For example, assume that a macro has been defined via the following command sequence.

```
T01MACROS112
T01MACROA112,MUTEI*0
T01MACROA112,GAINI*0
T01MACROA112,MUTEO*0
T01MACROW112
```

Once this macro has been defined, issuing the command:

```
T01MACROL112?
```

Will result in the following status messages:

```
T01MACROL112,MUTEI*0
T01MACROL112,GAINI*0
T01MACROL112,MUTEO*0
T01MACROL112
```

8.62. MACROQ -- Execute Macro Quietly

This command executes the macro corresponding to the specified number. The macro must have been previously defined and stored in non-volatile memory via the [MACROS](#), [MACROA](#), and [MACROW](#) commands. If the specified macro is empty, then an error condition of ERROR#070 will be generated.

When the [MACROQ](#) command executes, status messages for all of the commands in the macro will not be generated. The [MACROQ](#) is provided so that a control system can execute a macro and not generate heavy data traffic from the resulting status messages. Of course, this assumes that the control system is not interested in any of the acknowledgements. The [MACROX](#) command can be used to execute the macro without suppressing status messages.

| Example | Description | Status Message |
|--------------|--|----------------|
| T01MACROQ125 | Execute macro number 125 without generating any status messages. | T01MACROQ125 |

8.63. MACROS -- Start a New Macro

This command is used to start writing a new macro with a specified macro number. This command is used in conjunction with the [MACROA](#) and [MACROW](#) commands to create a new macro. If this command is sent while another macro is in the process of being written (before the [MACROW](#) command is sent), then the macro in progress will be deleted and the new one will be started.

See the description of the [MACROA](#) command for detailed information on creating macros.

8.64. MACROW -- Write Macro to Non-Volatile Memory

This command writes the macro that is currently being defined to non-volatile memory. This command is used in conjunction with [MACROA](#) and [MACROS](#) to create a new macro. If this command is sent when no macro is in progress (i.e., if a [MACROS](#) command has not been sent) or if the macro number sent with this command does not match the number of the macro in progress, then an error will be returned.

See the description of the [MACROA](#) command for detailed information on creating macros.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

8.65. MACROX -- Execute Macro

This command executes the macro corresponding to the specified number. The macro must have been previously defined and stored in non-volatile memory via the [MACROS](#), [MACROA](#), and [MACROW](#) commands. If the specified macro is empty, then an error condition of `ERROR#070` will be generated.

When the `MACROX` executes, status messages for all of the commands in the macro will be generated (unless [acknowledgement mode](#) is turned off). The status messages can be suppressed by using the [MACROQ](#) command, which is exactly the same as `MACROX` except that status messages are suppressed.

| Example | Description | Status Message |
|--------------|---------------------------|---|
| T01MACROX125 | Execute macro number 125. | Status messages for all the commands in the macro will be generated first, followed by the message: T01MACROX125 |

8.66. METER -- Select which Signal is Displayed on the Front

Panel LED Meter

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------|---|--|
| T01METERIT | Set front panel LED meter to display the signal on input T. | T01METERIT |
| T01METER? | Query which signal the front panel LED meter is currently set to monitor. | T01METER x , where x is the label corresponding to the signal currently being monitored. If this command was sent after the first example given above, the response would be T01METERIT. |

8.67. MGAIN -- Set Crosspoint Gains in Main Matrix or Submatrix

This command sets or queries one or more crosspoint gains in either the main matrix or one of the EF Bus submatrices.

This command is a matrix integer command. See [Section 6.4](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------------------|---|---|
| T01MGAIN $T, P, -3$ | Set gain from input T (telephone) to P (P-Bus) to -3 dB. | T01MGAIN $T, P, -3$ |
| T01MGAIN $T, P, >6$ | Increase gain from input T (telephone) to output P (P-Bus) by 6 dB. | T01MGAIN T, P, x where x is the new value of the crosspoint gain. If the crosspoint gain was set to -3 dB before this command, then the status message would be T01MGAIN $T, P, 3$. |
| T01MGAIN $T, P, ?$ | Query gain from input T to P Bus output. | T01MGAIN T, P, x , where x is the current value of the crosspoint gain. If the crosspoint gain was set to -12 dB before this command, then the status message would be T01MGAIN $T, P, -12$. |

| | | |
|------------------------|--|---|
| T01MGAINWB0 , WM0 , -3 | Set crosspoint gain in EF Bus submatrix on crosspoint that routes the W bus signal from the device at ID0 (WB0) to W submatrix output 0 (WM0). | T01MGAINWB0 , WM0 , -3 |
| T01MGAIN T , * , èç | Set all crosspoint gains for input channel T. Set the gain to the telephone output to 6 dB (è), and the gain to the P bus output to -3 dB (ç). | T01MGAIN T , * , èç |
| T01MGAIN T , * , -3 | Set all crosspoint gains for input channel T to -3 dB. | T01MGAIN T , * , çç |
| T01MGAIN T , * , >12 | Increase the gain for all crosspoints of input channel T by 12 dB. | T01MGAIN T , * , ab, where the value of each of letters (a, b, etc.) depends on the current state of each of the crosspoint gains. If this command was issued after the example above, then the status message would be T01MGAIN T , * , èè |
| T01MGAIN T , * , ? | Query the gains for all crosspoints of input channel T. | T01MGAIN T , * , ab, where the value of each of letters (a, b, etc.) depends on the current state of each of the crosspoint gains. If this command was issued after the example above, then the status message would be T01MGAIN T , * , èè |

8.68. MINI -- Enable Modem Initialization String

This command controls whether or not the modem initialization string is sent at power-up. If `MINI` is 0, then the modem initialization string is not sent. If `MINI` is 1, then the modem initialization string is sent. The text of the modem initialization string is set via the [MINISTR](#) command.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------|--|--|
| T01MINI1 | Enable modem initialization string. | T01MINI1 |
| T01MINI0 | Disable modem initialization string. | T01MINI0 |
| T01MINI2 | Toggle enabled state of modem initialization string. | T01MINIx, where x is 0 or 1 depending on the current enabled state of the modem initialization string. |

| | | |
|----------|---|--|
| T01MINI? | Query enabled state of modem initialization string. | T01MINIx, where x is 0 or 1 depending on the current enabled state of the modem initialization string. |
|----------|---|--|

8.69. MINISTR -- Set Modem Initialization String

This command is used to set or query the modem initialization string. The string can be a maximum of 32 characters long. The recommended modem initialization string for the Vortex is:

```
ATF1E0&B1S0=2
```

This can be set via the following command.

```
T01MINISTRATF1E0&B1S0=2
```

Whether or not the modem initialization string is sent at power-up is controlled via the [MINI](#) command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|-------------------------|---|--|
| T01MINISTRATF1E0&B1S0=2 | Set modem initialization string to ATF1E0&B1S0=2. | T01MINISTRATF1E0&B1S0=2 |
| T01MINISTR? | Query current modem initialization string. | T01MINISTR<string>, where <string> is the current modem initialization string. If this command was sent after the above example, then the status message would be T01MINISTRATF1E0&B1S0=2. |

8.70. MMUTE -- Mute Crosspoint in Main Matrix or Submatrix

This command sets or queries the mute status of one or more crosspoints in either the main matrix or one of the EF Bus submatrices.

This command is a matrix boolean command. See [Section 6.4](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|-------------------|--|--|
| T01MMUTET,P,1 | Mute signal path (in main matrix) from the telephone input to the P-Bus output. | T01MMUTET,P,1 |
| T01MMUTEWB0,WMO,0 | Mute signal path (in EF Bus W submatrix) from W bus signal at device ID0 (WB0) to W submatrix output 0 (WMO). | T01MMUTEWB0,WMO,0 |
| T01MMUTET,P,2 | Toggle mute status of signal path (in main matrix) from the telephone input to the P-Bus output. | T01MMUTET,P,x, where x is either 0 or 1 depending on the current mute status of the crosspoint. |
| T01MMUTET,P,? | Query mute status of signal path (in main matrix) from the telephone input to the P-Bus output. | T01MMUTET,P,x, where x is either 0 or 1 depending on the current mute status of the crosspoint. |
| T01MMUTET,*,10 | Set all crosspoint mutes for input channel T. Mute the path from input T to output T and unmute the path from input T to output P. | T01MMUTET,*,10 |
| T01MMUTET,*,0 | Unmute all crosspoints for input channel T. | T01MMUTET,*,00 |
| T01MMUTET,*,2 | Toggle all crosspoint mutes for input channel T. | T01MMUTET,*,ab, where the value of each of letters (a, b, etc.) is either 0 or 1 depending on the current state of each of the crosspoint mutes. If this command was issued after the example above, then the status message would be T01MMUTET,*,00 |
| T01MMUTET,*,? | Query all crosspoint mutes for input channel T. | T01MMUTET,*,ab, where the value of each of letters (a, b, etc.) is either 0 or 1 depending on the current state of each of the crosspoint mutes. If this command was issued after the example above, then the status message would be T01MMUTET,*,00 |

8.71. MUTEI -- Mute One or More Inputs

This command sets or queries the mute status of the analog inputs (only T on the EF2201).

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|--|
| T01MUTEIT1 | Mute input T. | T01MUTEIT1 |
| T01MUTEITO | Unmute input T. | T01MUTEITO |
| T01MUTEIT2 | Toggle mute status of input T . | T01MUTEITx, where x is either 0 or 1 depending on the current mute status of the input. |
| T01MUTEIT? | Query mute status of input T. | T01MUTEITx, where x is either 0 or 1 depending on the current mute status of the input. |
| T01MUTEI*1 | Mute all inputs (only T on the EF2201). | T01MUTEI*1 |
| T01MUTEI*0 | Unmute all inputs (only T on the EF2201). | T01MUTEI*0 |
| T01MUTEI*? | Query mute status of all inputs. | T01MUTEI*x where x is either 0 or 1 depending of the current status of the mute on the corresponding input. If this command was sent after the example above, then the status message would be T01MUTEI*0. |

8.72. MUTE0 -- Mute One or More Outputs

This command sets or queries the mute status of the analog outputs (only T on the EF2201).

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--|--|
| T01MUTEOT1 | Mute output T. | T01MUTEOT1 |
| T01MUTEOT0 | Unmute output T. | T01MUTEOT0 |
| T01MUTEOT2 | | T01MUTEOTx, where x is either 0 or 1 depending on the current mute status of the output. |
| T01MUTEOT? | Query mute status of output T. | T01MUTEOTx, where x is either 0 or 1 depending on the current mute status of the output. |
| T01MUTE0*1 | Mute all outputs (only T on the EF2201). | T01MUTE0*1 |
| T01MUTE0*0 | Unmute all outputs (only T on the EF2201). | T01MUTE0*0 |

| | | |
|------------|-----------------------------------|---|
| T01MUTE0*? | Query mute status of all outputs. | T01MUTE0*x, where x is either 0 or 1 depending of the current status of the mute on the corresponding output. If this command was sent after the example above, then the status message would be T01MUTE0*0 |
|------------|-----------------------------------|---|

8.73. NC -- Enable Noise Cancellation

This command sets or queries the status of the Noise Cancellation (NC) algorithm on input channel T.

This command is a channel boolean command. See [Section 6.3](#) and [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|--|--|
| T01NCT1 | Enable NC on input channel T. | T01NCT1 |
| T01NCT0 | Disable NC on input channel T. | T01NCT0 |
| T01NCT2 | Toggle NC state on input channel T. | T01NCTx, where x is 0 or 1 depending on the current state of NC on input channel T. |
| T01NCT? | Query NC state on input channel T. | T01NCTx, where x is 0 or 1 depending on the current state of NC on the input channel. |
| | Toggle NC state on all microphone input channels . | , where 0 or 1 depending on the current state of NC for each of the corresponding input. |

8.74. NCL -- Set Noise Cancellation Attenuation

This command sets or queries the attenuation level of the Noise Cancellation algorithm on input channel T. For example, if NCL is set to 10, then the Noise Cancellation for that channel will cancel 10 dB of noise. Higher numbers mean more cancellation will be applied, but may result in slight artifacts depending on the characteristics of the noise. Typical settings are 10 dB for normal cancellation and 6 dB for light cancellation.

This command is a channel integer command. See [Section 6.3](#) and [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 0 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|----------|--|--|
| T01NCLT3 | Set NC attenuation level on input channel T to 3 dB. | T01NCLT3 |
| T01NCLT? | Query the NC attenuation level on input channel T. | T01NCLTx, where x is a number between 0 and 20, depending on the current setting of the NC attenuation level on input channel T. |

8.75. NVINIT -- Reinitialize Non-Volatile Memory

This command reinitializes (or formats) all non-volatile memory settings. This will effectively erase settings for global settings, user presets, macros, labels, and logic I/O configurations. This will basically reset the unit to a "fresh-out-of-the-box" state.

When this command is issued, it writes to non-volatile memory in order to format the contents back to the factory default state. The writing process results in a short delay. After the non-volatile memory has been reformatted, the Vortex will perform a software reset, which is equivalent to a power cycle.

| Example | Description | Status Message |
|-----------|--|--|
| T01NVINIT | Reinitialize non-volatile memory and perform a software reset. | No status message will be generated. There will be a short delay and then the Vortex will reset. |

8.76. NVLOCK -- Lock/Unlock Non-Volatile Memory

This command controls the non-volatile memory lock feature. When NVLOCK is enabled, the user may not save any system settings to non-volatile memory. This includes global parameters, presets, macros, labels, and logic assignments. The lock applies whether the user tries to make the changes via RS-232, front panel, logic inputs, or any other method. The user will still be able to query all the features of the device, but will get an error message if an attempt is made to change them. When NVLOCK is disabled, the user has full access to the system settings.

Usage of this command is similar to other boolean commands (see [Section 6.1](#)) except that when disabling this feature, the password must be supplied for the command to work. If an incorrect password is supplied, 'ERROR#005' will be generated. The examples below illustrate the correct usage. The examples assume that the password has been set to 'aspi' (the default). The NVLOCK password can be changed via the [NVPSWD](#) command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|------------|---|----------------|
| T01NVLOCK1 | Lock the non-volatile memory to prevent users from changing the settings. | T01NVLOCK1 |

| | | |
|--------------------|---|--|
| T01NVLOCK0 ,yumyum | Attempt to unlock the non-volatile memory by using an invalid password. | T01ERROR#005 -- since an invalid password was given, an error message was generated. If error messages have been disabled (via the ERROR command), then no status message will be generated. |
| T01NVLOCK0 ,aspi | Unlock the non-volatile memory by using the correct password. | T01NVLOCK0 |
| T01NVLOCK? | Query the locked status of the non-volatile memory. | T01NVLOCKx, where x is 0 or 1 depending on whether the non-volatile memory is unlocked or locked, respectively. |

8.77. NVPSWD -- Change Non-Volatile Memory Password

This command sets or queries the non-volatile memory password. This password is used in conjunction with the [NVLOCK](#) command. The non-volatile memory must be unlocked ('NVLOCK0') in order to use this command to set or query the non-volatile memory password. If the non-volatile memory is locked, then this command will result in 'ERROR#004'. The examples below assume that the non-volatile memory is unlocked.

| Example | Description | Status Message |
|----------------|---|----------------|
| T01NVPSWDlemur | Set non-volatile memory password to 'lemur'. | T01NVPSWDlemur |
| T01NVPSWD? | Query the current non-volatile memory password. | T01NVPSWDlemur |

8.78. PEQIA -- Set All Parameters for Specified Parametric EQ Input Stage

This command sets or queries all of the parameters for the parametric equalizer (EQ) filters on . Each channel has five bands of parametric EQ that can be independently controlled.

The input parametric EQ filter parameters can be set individually via the [PEQIT](#), [PEQIF](#), [PEQIB](#), [PEQIG](#), [PEQIS](#), and [PEQIE](#) commands. The output parametric EQ filter parameters can be set simultaneously via the [PEQOA](#) command or individually with the [PEQOT](#), [PEQOF](#), [PEQOB](#), [PEQOG](#), [PEQOS](#), and [PEQOE](#) commands.

When using this command, you must specify all of the following parameters.

| Description | Value Range | Units |
|-------------|-------------|-------|
| Channel | T | N/A |
| Band | 1-5 | N/A |

| | | |
|-------------|--|--|
| Filter Type | 1-5 | 1 = parametric filter 2 = low shelf 3 = high shelf 4 = lowpass 5 = highpass 6 = Linkwitz-Riley lowpass 7 = Linkwitz-Riley highpass |
| Frequency | 20 - 20000 | Hz |
| Bandwidth | 5 - 200 | 1/100th octave |
| Gain | -20 - 20 | dB |
| Slope | 1 - 1.2 * Gain for shelving filters, 12 or 24 for Linkwitz-Riley filters | dB per octave |
| Enable | 0 - 1 | 0 = filter disabled 1 = filter enabled |

The parameters are specified in the order shown and are separated by commas. The wildcard character, *, may not be used for any of the parameters listed above. If an attempt is made to set one of the parameters outside the valid range, the command will fail and return an error message of ERROR#002.

Not all of the parameters are valid for each of the filter types. The following table shows which parameters are used in each of the filter types.

| Filter Type | Bandwidth | Frequency | Gain | Slope |
|-----------------------------|-----------|-----------|------|-------|
| Parametric (1) | Yes | Yes | Yes | No |
| Low Shelf (2) | No | Yes | Yes | Yes |
| High Shelf (3) | No | Yes | Yes | Yes |
| Lowpass (4) | No | Yes | No | No |
| Highpass (5) | No | Yes | No | No |
| Linkwitz-Riley Lowpass (6) | No | Yes | No | Yes |
| Linkwitz-Riley Highpass (7) | No | Yes | No | Yes |

When a parameter is invalid for a given filter type, the parametric EQ commands will still set that parameter, however its value will not be used for filter computations. This valid/invalid parameter information above is provided mainly as guidelines for programmers writing control software for the Vortex. If a parameter is not valid for a specific filter type, then the control for editing that parameter should be disabled or removed when that filter type is selected.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|--|---|---|
| <pre>T01PEQIAT,2,1,1250,40,-20,1,1</pre> | <p>Set the parametric EQ on input , band 2 to the following parameters: type = parametric filter, frequency = 1250 Hz, bandwidth = 40 1/100th octaves, gain = -20 dB, enabled = yes, slope = 1 dB per octave. The value of the slope parameter is irrelevant for this type of filter, we could have set it to anything.</p> | <pre>T01PEQIAT,2,1,1250,40,-20,1,1</pre> |
| <pre>T01PEQIAT,1,?</pre> | <p>Query the current parameter settings for the parametric eq filter on input T, band 1.</p> | <p><code>T01PEQIAT,1,t,f,b,g,s,e</code>, where the parameters <code>t</code>, <code>f</code>, <code>b</code>, <code>g</code>, <code>s</code>, and <code>e</code> correspond to the current settings of the type, frequency, bandwidth, gain, slope, and enabled parameters, respectively. If this filter was set to the same parameters as given in the above example, the status message would be <pre>T01PEQIAT,2,1,1250,40,-20,1,1.</pre></p> |

8.79. PEQIB -- Set Bandwidth Parameter for Specified Parametric EQ Input Stage

This command sets or queries the bandwidth parameter (in 1/100th octaves) for the parametric equalizer (EQ) filters on input channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the bandwidth parameter are 5 and 200, respectively.

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the bandwidth, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the bandwidth parameter for an output parametric EQ filter, use the [PEQOB](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------------|--|---|
| T01PEQIBT, 2, 40 | Set bandwidth of parametric EQ on input T, band 2 to 40 1/100th octaves. | T01PEQIBT, 2, 40 |
| T01PEQIBT, 1, ? | Query current bandwidth setting of parametric EQ on input T, band 1. | T01PEQIBT, 1, b, where b is the current setting of the bandwidth parameter for the parametric EQ on input T, band 1. If the bandwidth parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQIBT, 1, 40. |

8.80. PEQIE -- Set Enabled Parameter for Specified Parametric EQ Input Stage

This command sets or queries the enabled parameter (0 = filter is disabled, 1 = filter is enabled) for the parametric equalizer (EQ) filters on input channel T. Each channel has five bands of parametric EQ that can be independently controlled.

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the enabled status, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the enabled parameter for an output parametric EQ filter, use the [PEOOE](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-----------------|---|--|
| T01PEQIET, 2, 1 | Enable parametric EQ on input T, band 2. | T01PEQIET, 2, 1 |
| T01PEQIET, 1, ? | Query enabled status of parametric EQ on input T, band 1. | T01PEQIET, 1, e, where e is the current setting of the enabled parameter for the parametric EQ on input T, band 1. If the enabled parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQIET, 1, 1. |

8.81. PEQIF -- Set Frequency Parameter for Specified Parametric EQ Input Stage

This command sets or queries the frequency parameter (in Hz) for the parametric equalizer (EQ) filters on input channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the frequency parameter are 20 and 20000, respectively.

For filter types that have a center frequency (e.g., parametric), this parameter specifies the center frequency. For filter types that have a cutoff frequency (e.g, highpass, lowpass, etc.), this parameter specifies the cutoff frequency.

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the frequency, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the frequency parameter for an output parametric EQ filter, use the [PEQOF](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------------|--|---|
| T01PEQIFT,2,1250 | Set frequency of parametric EQ on input T, band 2 to 1250 Hz. | T01PEQIFT,2,1250 |
| T01PEQIFT,1,? | Query current frequency setting of parametric EQ on input T, band 1. | T01PEQIFT,1,f, where f is the current setting of the frequency parameter for the parametric EQ on input T, band 1. If the frequency parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQIFT,1,1250. |

8.82. PEQIG -- Set Gain Parameter for Specified Parametric EQ Input Stage

This command sets or queries the gain parameter (in dB) for the parametric equalizer (EQ) filters on input channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the gain parameter are -20 and 20, respectively.

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the gain, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the gain parameter for an output parametric EQ filter, use the [PEQOG](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-----------------|---|-----------------|
| T01PEQIGT,2,-20 | Set the gain of the parametric EQ on input T, band 2 to -20 dB. | T01PEQIGT,2,-20 |

| | | |
|---------------|---|--|
| T01PEQIGT,1,? | Query current gain setting of parametric EQ on input T, band 1. | T01PEQIGT,1,g, where g is the current setting of the gain parameter for the parametric EQ on input T, band 1. If the gain parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQIGT,1,-20. |
|---------------|---|--|

8.83. PEQIS -- Set Slope Parameter for Specified Parametric EQ Input Stage

This command sets or queries the slope parameter (in dB per octave) for the parametric equalizer (EQ) filters on input channel T. Each channel has five bands of parametric EQ that can be independently controlled.

For the Linkwitz-Riley filters, the slope can either be 12 or 24 (dB/Octave). For the low shelf and high shelf filters, the minimum value for the slope parameter is 1, and the maximum value is 1.2 times the current value of the gain parameter. See the [PEQIG](#) command for information on the gain parameter.

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the slope, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the slope parameter for an output parametric EQ filter, use the [PEQOS](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------------|---|--|
| T01PEQIST,2,1 | Set the slope of the parametric EQ on input T, band 2 to 1 dB per octave. | T01PEQIST,2,1 |
| T01PEQIST,1,? | Query current slope setting of parametric EQ on input T, band 1. | T01PEQIST,1,s, where s is the current setting of the slope parameter for the parametric EQ on input T, band 1. If the slope parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQIST,1,1. |

8.84. PEQIT -- Set Type Parameter for Specified Parametric EQ Input Stage

The type parameter specifies what type of filter is executed for the specified band of the specified input channel. The different filter types and their corresponding values are shown in the table below.

| Filter Type | Value of Type Parameter |
|-------------|-------------------------|
|-------------|-------------------------|

| | |
|-------------------------|---|
| Parametric | 1 |
| Low Shelf | 2 |
| High Shelf | 3 |
| Lowpass | 4 |
| Highpass | 5 |
| Linkwitz-Riley Lowpass | 6 |
| Linkwitz-Riley Highpass | 7 |

This command has the same format and restrictions as the [PEQIA](#) command except that only one parameter, the filter type, is specified instead of all the parameters. See the [PEQIA](#) command for more information. To set the slope parameter for an output parametric EQ filter, use the [PEQOT](#) command. To set all the parameters for an output parametric EQ filter, use the [PEQOA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------------|---|--|
| T01PEQITT,2,1 | Set the type of the parametric EQ on input T, band 2 to parametric. | T01PEQITT,2,1 |
| T01PEQITT,1,? | Query current type setting of parametric EQ on input T, band 1. | T01PEQITT,1,t, where t is the current setting of the type parameter for the parametric EQ on input T, band 1. If the type parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQITT,1,1. |

8.85. PEQOA -- Set All Parameters for Specified Parametric EQ Output Stage

This command sets or queries all of the parameters for the parametric equalizer (EQ) filters on . Each channel has five bands of parametric EQ that can be independently controlled.

The output parametric EQ filter parameters can be set individually via the [PEQOT](#), [PEQOF](#), [PEQOB](#), [PEQOG](#), [PEQOS](#), and [PEQOE](#) commands. The input parametric EQ filter parameters can be set simultaneously via the [PEQIA](#) command or individually with the [PEQIT](#), [PEQIF](#), [PEQIB](#), [PEQIG](#), [PEQIS](#), and [PEQIE](#) commands.

When using this command, you must specify all of the following parameters.

| Description | Value Range | Units |
|-------------|-------------|-------|
| Channel | T | N/A |
| Band | 1-5 | N/A |

| | | |
|-------------|--|--|
| Filter Type | 1-5 | 1 = parametric filter 2 = low shelf 3 = high shelf 4 = lowpass 5 = highpass 6 = Linkwitz-Riley lowpass 7 = Linkwitz-Riley highpass |
| Frequency | 20 - 20000 | Hz |
| Bandwidth | 5 - 200 | 1/100th octave |
| Gain | -20 - 20 | dB |
| Slope | 1 - 1.2 * Gain for shelving filters, 12 or 24 for Linkwitz-Riley filters | dB per octave |
| Enable | 0 - 1 | 0 = filter disabled 1 = filter enabled |

The parameters are specified in the order shown and are separated by commas. The wildcard character, *, may not be used for any of the parameters listed above. If an attempt is made to set one of the parameters outside the valid range, the command will fail and return an error message of ERROR#002.

Not all of the parameters are valid for each of the filter types. The following table shows which parameters are used in each of the filter types.

| Filter Type | Bandwidth | Frequency | Gain | Slope |
|-----------------------------|-----------|-----------|------|-------|
| Parametric (1) | Yes | Yes | Yes | No |
| Low Shelf (2) | No | Yes | Yes | Yes |
| High Shelf (3) | No | Yes | Yes | Yes |
| Lowpass (4) | No | Yes | No | No |
| Highpass (5) | No | Yes | No | No |
| Linkwitz-Riley Lowpass (6) | No | Yes | No | Yes |
| Linkwitz-Riley Highpass (7) | No | Yes | No | Yes |

When a parameter is invalid for a given filter type, the parametric EQ commands will still set that parameter, however its value will not be used for filter computations. This valid/invalid parameter information above is provided mainly as guidelines for programmers writing control software for the Vortex. If a parameter is not valid for a specific filter type, then the control for editing that parameter should be disabled or removed when that filter type is selected.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
| | | |

| | | |
|--|--|--|
| <pre>T01PEQOAT,2,1,1250,40,-20,1,1</pre> | <p>Set the parametric EQ on output , band 2 to the following parameters: type = parametric filter, frequency = 1250 Hz, bandwidth = 40 1/100th octaves, gain = -20 dB, enabled = yes, slope = 1 dB per octave. The value of the slope parameter is irrelevant for this type of filter, we could have set it to anything.</p> | <pre>T01PEQOAT,2,1,1250,40,-20,1,1</pre> |
| <pre>T01PEQOAT,1,?</pre> | <p>Query the current parameter settings for the parametric eq filter on output T, band 1.</p> | <p><code>T01PEQOAT,1,t,f,b,g,s,e</code>, where the parameters <code>t</code>, <code>f</code>, <code>b</code>, <code>g</code>, <code>s</code>, and <code>e</code> correspond to the current settings of the type, frequency, bandwidth, gain, slope, and enabled parameters, respectively. If this filter was set to the same parameters as given in the above example, the status message would be <code>T01PEQOAT,2,1,1250,40,-20,1,1.</code></p> |

8.86. PEQOB -- Set Bandwidth Parameter for Specified Parametric EQ Output Stage

This command sets or queries the bandwidth parameter (in 1/100th octaves) for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the bandwidth parameter are 5 and 200, respectively.

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the bandwidth, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the bandwidth parameter for an input parametric EQ filter, use the [PEQIB](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------------|---|--|
| T01PEQOBT, 2, 40 | Set bandwidth of parametric EQ on output T, band 2 to 40 1/100th octaves. | T01PEQOBT, 2, 40 |
| T01PEQOBT, 1, ? | Query current bandwidth setting of parametric EQ on output T, band 1. | T01PEQOBT, 1, b, where b is the current setting of the bandwidth parameter for the parametric EQ on output T, band 1. If the bandwidth parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOBT, 1, 40. |

8.87. PEQOE -- Set Enabled Parameter for Specified Parametric EQ Output Stage

This command sets or queries the enabled parameter (0 = filter is disabled, 1 = filter is enabled) for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the enabled status, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the enabled parameter for an input parametric EQ filter, use the [PEQIE](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-----------------|--|---|
| T01PEQOET, 2, 1 | Enable parametric EQ on output T, band 2. | T01PEQOET, 2, 1 |
| T01PEQOET, 1, ? | Query enabled status of parametric EQ on output T, band 1. | T01PEQOET, 1, e, where e is the current setting of the enabled parameter for the parametric EQ on output T, band 1. If the enabled parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOET, 1, 1. |

8.88. PEQOF -- Set Frequency Parameter for Specified Parametric EQ Output Stage

This command sets or queries the frequency parameter (in Hz) for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the frequency parameter are 20 and 20000, respectively.

For filter types that have a center frequency (e.g., parametric), this parameter specifies the center frequency. For filter types that have a cutoff frequency (e.g, highpass, lowpass, etc.), this parameter specifies the cutoff frequency.

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the frequency, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the frequency parameter for an input parametric EQ filter, use the [PEQIF](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------------|---|--|
| T01PEQOFT, 2, 1250 | Set frequency of parametric EQ on output T, band 2 to 1250 Hz. | T01PEQOFT, 2, 1250 |
| T01PEQOFT, 1, ? | Query current frequency setting of parametric EQ on output T, band 1. | T01PEQOFT, 1, f, where f is the current setting of the frequency parameter for the parametric EQ on output T, band 1. If the frequency parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOFT, 1, 1250. |

8.89. PEQOG -- Set Gain Parameter for Specified Parametric EQ Output Stage

This command sets or queries the gain parameter (in dB) for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The minimum and maximum values for the gain parameter are -20 and 20, respectively.

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the gain, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the gain parameter for an input parametric EQ filter, use the [PEQIG](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|-------------------|--|-------------------|
| T01PEQOGT, 2, -20 | Set the gain of the parametric EQ on output T, band 2 to -20 dB. | T01PEQOGT, 2, -20 |

| | | |
|---------------|--|---|
| T01PEQOGT,1,? | Query current gain setting of parametric EQ on output T, band 1. | T01PEQOGT,1,g, where g is the current setting of the gain parameter for the parametric EQ on output T, band 1. If the gain parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOGT,1,-20. |
|---------------|--|---|

8.90. PEQOS -- Set Slope Parameter for Specified Parametric EQ Output Stage

This command sets or queries the slope parameter (in dB per octave) for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

For the Linkwitz-Riley filters, the slope can either be 12 or 24 (dB/Octave). For the low shelf and high shelf filters, the minimum value for the slope parameter is 1, and the maximum value is 1.2 times the current value of the gain parameter. See the [PEQIG](#) command for information on the gain parameter.

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the slope, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the slope parameter for an input parametric EQ filter, use the [PEQIS](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------------|--|---|
| T01PEQOST,2,1 | Set the slope of the parametric EQ on output T, band 2 to 1 dB per octave. | T01PEQOST,2,1 |
| T01PEQOST,1,? | Query current slope setting of parametric EQ on output T, band 1. | T01PEQOST,1,s, where s is the current setting of the slope parameter for the parametric EQ on output T, band 1. If the slope parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOST,1,1. |

8.91. PEQOT -- Set Type Parameter for Specified Parametric EQ Output Stage

This command sets or queries the type parameter for the parametric equalizer (EQ) filters on output channel T. Each channel has five bands of parametric EQ that can be independently controlled.

The type parameter specifies what type of filter is executed for the specified band of the specified

output channel. The different filter types and their corresponding values are shown in the table below.

| Filter Type | Value of Type Parameter |
|-------------------------|-------------------------|
| Parametric | 1 |
| Low Shelf | 2 |
| High Shelf | 3 |
| Lowpass | 4 |
| Highpass | 5 |
| Linkwitz-Riley Lowpass | 6 |
| Linkwitz-Riley Highpass | 7 |

This command has the same format and restrictions as the [PEQOA](#) command except that only one parameter, the filter type, is specified instead of all the parameters. See the [PEQOA](#) command for more information. To set the slope parameter for an input parametric EQ filter, use the [PEQIT](#) command. To set all the parameters for an input parametric EQ filter, use the [PEQIA](#) command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------------|--|---|
| T01PEQOTT,2,1 | Set the type of the parametric EQ on output T, band 2 to parametric. | T01PEQOTT,2,1 |
| T01PEQOTT,2,1 | Query current type setting of parametric EQ on output T, band 1. | T01PEQOTT,1,t, where t is the current setting of the type parameter for the parametric EQ on output T, band 1. If the type parameter of this filter is set to the same value given in the example above, then the status message will be T01PEQOTT,1,1. |

8.92. PHONE -- Take Phone On-Hook or Off-Hook

This command sets or queries the on-hook status of the phone interface.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

| Example | Description | Status Message |
|---------|--|----------------|
| | Put phone interface on-hook (hang up phone interface). | |
| | Take phone interface off-hook (pick up phone interface). | |

| | | |
|--|---|---|
| | Toggle hook status of phone interface. If the phone was off-hook, then this command puts it on-hook. If the phone was on-hook, then this command takes it off-hook. | , where x is either 0 or 1 depending on the current hook status of the phone interface. |
| | Query the hook status of phone interface. | , where x is either 0 or 1 depending on the current hook status of the phone interface. |

8.93. PING -- See Which Devices Are Present

When any Vortex device receives this command, it responds with a PONG status message. This is typically used by the host program to determine the types and IDs of all linked devices. When used in this manner, wildcard characters are usually given for the device type and ID so that all connected devices will respond.

In the following example, it is assumed that there are two EF2280's (device IDs 0 and 1), two EF2241's (device IDs 2 and 3), two EF2211's (device IDs 4 and 5), two EF2210's (device ID's 6 and 7), and two EF2201's (device ID's 0 and 1) linked together via EF Bus.

| Example | Description | Status Message |
|---------|---|--|
| ***PING | Ping all connected device to determine the number, type, and ID of the connected devices. | F00PONG F01PONG B02PONG B03PONG S04PONG S05PONG Q06PONG Q07PONG T00PONG T01PONG |

8.94. PRESETK -- Delete One or All Presets

This command kills (deletes) the specified preset. If a wildcard character (*) is used to specify the preset, then all presets are deleted.

If an attempt is made to delete one of the factory presets (in the range 0-15), the PRESETK command will fail and generate an ERROR#071. This is because the factory presets are read-only, thus the cannot be changed or deleted.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------|--------------------------|-----------------------|
| T01PRESETK18 | Delete preset number 18. | T01PRESETK18 |
| T01PRESETK* | Delete all presets. | T01PRESETK* |

8.95. PRESETL -- List All Commands in a Preset

This command lists all the commands in a given preset. For example, assume that user preset 18 has been defined previously by the following command.

```
T01PRESETW18
```

Now, issuing the command:

```
T01PRESETL18?
```

Will result in a long sequence of status messages reflecting all the data stored in the preset. At the end of the status messages, a final message of

```
T01PRESETL18
```

will be displayed.

8.96. PRESETP -- Set Which Preset Will Be Activated At Power-Up

This command sets or queries the power-up preset, which is executed each time the device powers up. The power-up preset must be one of the factory presets (0-15) or one of the user presets (16-47).

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|----------------|---|--|
| T01PRESETP16 | Set the power-up preset to be user preset 16. | T01PRESETP16 |
| T01PRESETP? | Query the current power-up preset. | T01PRESETP x , where x is between 0 and 47 depending on which preset is currently set to be the power-on preset. |

8.97. PRESETQ -- Execute a Preset Quietly

This command executes the preset corresponding to the specified number, which must be between 0 and 47. The preset must either be a pre-defined factory preset (0 - 15) or a user preset (16 - 47) that

has been previously defined via the [PRESETW](#) command. If the specified preset is empty, then an error condition of `ERROR#070` will be returned. If one or more of the commands in the preset generated errors, then an error condition of `ERROR#072` will be returned.

When the `PRESETQ` command executes, status messages for all of the commands in the preset will not be generated. The `PRESETQ` command is provided so that a control system can execute a preset and not generated heavy data traffic from the resulting status messages. Of course, this assumes that the control system is not interested in any of the acknowledgements. The [PRESETX](#) command can be used to execute the preset without suppressing the status messages.

| Example | Description | Status Message |
|--------------|--|----------------|
| T01PRESETQ18 | Execute preset number 18 without generating any status messages. | T01PRESETQ18 |

8.98. PRESETW -- Save a Preset

This command writes the current settings of the device into the user preset with the specified number. Since the factory presets (0 - 15) are read-only, an `ERROR#071` will be generated if they are specified in the `PRESETW` command.

Once a preset is saved, it can be recalled via the [PRESETX](#) and [PRESETQ](#) commands. The preset can also be set to be executed automatically at power-up via the [PRESETP](#) command.

This command is saved to global non-volatile memory and is not part of a preset. Its value is saved each time it is changed. It will retain its value after power-down. Since this command writes to non-volatile memory, there will be a delay before an acknowledgment is returned.

| Example | Description | Status Message |
|--------------|--|----------------|
| T01PRESETW18 | Save the current device settings as preset 18. | T01PRESETW18 |

8.99. PRESETX -- Execute a Preset

This command executes the preset corresponding to the specified number, which must be between 0 and 47. The preset must either be a pre-defined factory preset (0 - 15) or a user preset (16 - 47) that has been previously defined via the [PRESETW](#) command. If the specified preset is empty, then an error condition of `ERROR#070` will be returned. If one or more of the commands in the preset generated errors, then an error condition of `ERROR#072` will be returned.

When the `PRESETX` command executes, status messages for all of the commands in the preset will be generated (unless [acknowledgement mode](#) is turned off). The status messages can be suppressed by using the [PRESETQ](#) command, which is exactly the same as the `PRESETX` command except that status messages are suppressed.

| Example | Description | Status Message |
|---------|-------------|----------------|
|---------|-------------|----------------|

| | | |
|--------------|---------------------------|--|
| T01PRESETX18 | Execute preset number 18. | Status messages for all the commands in the preset will be generated first, followed by the message: T01PRESETX18 |
|--------------|---------------------------|--|

8.100. REDIAL -- Redial the Last Dialed Phone Number

Executing this command causes the Vortex to redial the last number. The last number is defined as all the digits that were dialed since the phone was last taken off-hook. Like the [DIAL](#) command, if the phone is not already off-hook, this command will take it off-hook automatically.

| Example | Description | Status Message |
|-----------|--------------------------------------|----------------|
| T01REDIAL | Redial the last dialed phone number. | T01REDIAL |

8.101. RING -- Enable or Disable Ring Messages

This command sets or queries the enabled status of the ring message feature. If ring messages are enabled, a RING status message will be generated each time the connected phone line rings.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------|---------------------------|---|
| T01RING1 | Enable auto answer mode. | T01RING1 |
| T01RING0 | Disable auto answer mode. | T01RING0 |
| T01RING2 | Toggle auto answer mode. | T01RING x , where x is 0 or 1 depending on the current state of auto answer mode. |
| T01RING? | Query auto answer mode. | T01RING x , where x is 0 or 1 depending on the current state of auto answer mode. |

8.102. SGGAIN -- Set Gain of Signal Generator

This command sets the gain of the internal signal generator. The value of SGGAIN specifies the gain in dB applied to signal generator. A gain of 0 dB produces a signal at nominal level (-20 dB full scale).

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are -100 and 20, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|---------|-------------|----------------|
|---------|-------------|----------------|

| | | |
|-------------|---|---|
| T01SGGAIN6 | Set signal generator gain to 6 dB. | T01SGGAIN6 |
| T01SGGAIN>3 | Increase signal generator gain by 3 dB. | T01SGGAINx, where x is the new value of the signal generator gain. If this command was issued after the example above, then the status message would be T01SGGAIN9. |
| T01SGGAIN? | Query signal generator gain. | T01SGGAINx, where x is the new value of the signal generator gain. If this command was issued after the example above, then the status message would be T01SGGAIN9. |

8.103. SGMUTE -- Mute Signal Generator

This command controls the muting of the signal generator.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------|----------------------------------|--|
| T01SGMUTE1 | Mute signal generator. | T01SGMUTE1 |
| T01SGMUTE0 | Unmute signal generator. | T01SGMUTE0 |
| T01SGMUTE2 | Toggle mute on signal generator. | T01SGMUTE x , where x is 0 or 1 depending on the current state of the signal generator mute. |
| T01SGMUTE? | Query signal generator mute. | T01SGMUTE x , where x is 0 or 1 depending on the current state of the signal generator mute. |

8.104. SGTYPE -- Set Type of Signal Produced by Signal Generator

This command sets the type of signal produced by the internal signal generator. Setting the type to 0 produces white noise, while setting the type to 1 produces pink noise.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|------------|--|----------------|
| T01SGTYPE0 | Configure signal generator to produce white noise. | T01SGTYPE0 |
| T01SGTYPE1 | Configure signal generator to produce pink noise. | T01SGTYPE1 |

| | | |
|------------|--------------------------------------|---|
| T01SGTYPE? | Query current signal generator type. | T01SGTYPE x , where x is either 0 or 1 depending on whether the signal generator is currently configured to generate white or pink noise, respectively. |
|------------|--------------------------------------|---|

8.105. SOUNDL -- Play Sound Locally

This command can be used to play sounds from the telephone interface to serve as audio cues. The [SOUNDP](#) command plays sounds out to the phone output. The [SOUNDL](#) command plays sounds through the input from the telephone interface (so they will be heard locally). The same sound generator is also used for playing entry and exit tones for the auto answer and auto hangup features.

This command takes a single argument that indicates the sound to be played. The following table lists the sound numbers and a description of the generated sound.

| Sound Number | Sound Description |
|--------------|---------------------|
| 0 | ascending thirds |
| 1 | descending thirds |
| 2 | ascending chorus |
| 3 | descending chorus |
| 4 | ascending doorbell |
| 5 | descending doorbell |
| 6 | quick double buzz |
| 7 | long single buzz |

The [SOUNDL](#) and [SOUNDP](#) were originally implemented to allow users to implement custom passcode systems that require users calling in via phone to enter a passcode before entering the conference. The sound commands could be used to provide feedback to the caller as well as the conference.

| Example | Description | Status Message |
|------------|---|----------------|
| T01SOUNDL0 | Play "ascending thirds" sound (same as entry tone) locally. | T01SOUNDL0 |

8.106. SOUNDP -- Play Sound to Phone

This command can be used to play sounds from the telephone interface to serve as audio cues. The [SOUNDP](#) command plays sounds out to the phone output. The [SOUNDL](#) command plays sounds through the input from the telephone interface (so they will be heard locally). The same sound generator is also used for playing entry and exit tones for the auto answer and auto hangup features.

This command takes a single argument that indicates the sound to be played. The following table lists the sound numbers and a description of the generated sound.

| Sound Number | Sound Description |
|--------------|-------------------|
|--------------|-------------------|

| | |
|---|---------------------|
| 0 | ascending thirds |
| 1 | descending thirds |
| 2 | ascending chorus |
| 3 | descending chorus |
| 4 | ascending doorbell |
| 5 | descending doorbell |
| 6 | quick double buzz |
| 7 | long single buzz |

The [SOUNDL](#) and [SOUNDP](#) were originally implemented to allow users to implement custom passcode systems that require users calling in via phone to enter a passcode before entering the conference. The sound commands could be used to provide feedback to the caller as well as the conference.

| Example | Description | Status Message |
|---------|---|----------------|
| | Play "descending thirds" sound (same as exit tone) to phone output. | |

8.107. SSDELAY -- Set Delay Between Screen Saver Screens

This command sets or queries the amount of time (in milliseconds) between each new screen of the LCD screen saver.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 500 and 600000, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--|---|
| T01SSDELAY2000 | Set screen saver delay to 2 seconds (2000 ms). | T01SSDELAY2000 |
| T01SSDELAY>500 | Increase screen saver delay by 0.5 seconds (500 ms). | T01SSDELAYx, where x is the new value of the screen saver delay. If this command was issued after the example above, then the status message would be T01SSDELAY2500. |
| T01SSDELAY? | Query screen saver delay. | T01SSDELAYx, where x is the new value of the screen saver delay. If this command was issued after the example above, then the status message would be T01SSDELAY2500. |

8.108. SSEN -- Enable or Disable Screen Saver

This command controls whether or not the LCD screen saver is enabled.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|------------------------------------|---|
| T01SSEN1 | Enable screen saver. | T01SSEN1 |
| T01SSEN0 | Disable screen saver. | T01SSEN0 |
| T01SSEN2 | Toggle screen saver enabled state. | T01SSENx, where x is 0 or 1 depending on the current enabled state of the screen saver. |
| T01SSEN? | Query screen saver enabled state. | T01SSENx, where x is 0 or 1 depending on the current enabled state of the screen saver. |

8.109. SSSTART -- Set Idle Time Required for Screen Saver to Start

This command sets or queries the amount of time (in milliseconds) that the front panel buttons must be idle before the screen saver starts.

This command is an integer command. See [Section 6.2](#) for more information on this type of command. The minimum and maximum values for this command are 500 and 600000, respectively.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|---|--|
| T01SSSTART2000 | Set screen saver start time to 2 seconds (2000 ms). | T01SSSTART2000 |
| T01SSSTART>500 | Increase screen saver start time by 0.5 seconds (500 ms). | T01SSSTARTx, where x is the new value of the screen saver start time. If this command was issued after the example above, then the status message would be T01SSSTART2500. |
| T01SSSTART? | Query screen saver start time. | T01SSSTARTx, where x is the new value of the screen saver start time. If this command was issued after the example above, then the status message would be T01SSSTART2500. |

8.110. SSTEEXT -- Set Text to be Displayed by Screen Saver

This command sets or queries the text messages displayed by the screen saver. The arguments of this command are the screen number, the line number, and the text to be displayed. The screen number must be between 0 and 3. It indicates which message screen we are trying to set or query. Each message screen consists of two lines of text that can be up to 16 characters long. The second number indicates which line of the message we are trying to set or query. The line number must be 0 or 1

corresponding to the first and second line, respectively. Finally, the text argument is the actual text that will be displayed on the LCD. If the text is '?', then a query will be performed. If the text empty, then the message will be cleared. If both message lines are cleared for a given screen, then that screen will not be displayed by the screen saver. If all screens have been cleared, then the screen saver will never start (although it is easier just to use the [SSEN](#) command for this).

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|--------------------------|--|--|
| T01SSTEXT0,0,Play that | Set the first line of the first screen to read "Play that". | T01SSTEXT0,0,Play that |
| T01SSTEXT0,1,funky music | Set the second line of the first screen to read "funky music". | T01SSTEXT0,1,funky music |
| T01SSTEXT0,1,? | Query the text of the second line of the first screen. | T01SSTEXT0,1,<string>, where <string> is the text of the second line of the first screen. If this command was issued after the example above, then the status message would be T01SSTEXT0,1,funky music. |

8.111. SWRESET -- Perform Soft Reset of System

Executing this command causes the Vortex to perform a software reset. The effect of the software reset is similar to cycling the power.

| Example | Description | Status Message |
|------------|---------------------------|---|
| T01SWRESET | Perform a software reset. | No status message will be received. The Vortex will reset within a few seconds. |

8.112. SWVER -- Query Software Version

This command is used to query the firmware version of the Vortex.

| Example | Description | Status Message |
|-----------|---------------------------------|--|
| T01SWVER? | Query current software version. | T01SWVER<string>, where <string> is the current software version. If the software version was 2.5.0, then the status message would be T01SWVER2.5.0. |

8.113. TONEE -- Enable or Disable Entry and Exit Tones

This command sets or queries the enabled status of the entry and exit tone feature. If entry and exit tones are enabled, a specific tone is played whenever the auto-answer feature takes the phone off-

hook. A different tone is played whenever the auto-hangup feature puts the phone on-hook. This feature is typically enabled to prevent a caller from entering or exiting a conference unannounced.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--|--|
| T01TONEE1 | Enable auto entry and exit tones. | T01TONEE1 |
| T01TONEE0 | Disable entry and exit tones. | T01TONEE0 |
| T01TONEE2 | Toggle enabled status of entry and exit tones. | T01TONEEx, where x is 0 or 1 depending on the current enabled state of entry and exit tones. |
| T01TONEE? | Query enabled state of entry and exit tones. | T01TONEEx, where x is 0 or 1 depending on the current enabled state of entry and exit tones. |

8.114. TONER -- Enable or Disable Ring Tones

This command sets or queries the enabled status of the ring tone feature. If ring tones are enabled, a ring tone is played whenever there is an incoming ring signal on the connected phone line.

This command is a boolean command. See [Section 6.1](#) for more information on this type of command.

This command is saved to non-volatile memory only as part of a preset. The state of this command will be restored after power-up only if a preset is saved and that preset is set to be the power-on preset.

| Example | Description | Status Message |
|----------------|--------------------------------------|--|
| T01TONER1 | Enable auto ring tones. | T01TONER1 |
| T01TONER0 | Disable ring tones. | T01TONER0 |
| T01TONER2 | Toggle enabled status of ring tones. | T01TONERx, where x is 0 or 1 depending on the current enabled state of ring tones. |
| T01TONER? | Query enabled state of ring tones. | T01TONERx, where x is 0 or 1 depending on the current enabled state of ring tones. |