

# Maestro

Multi-Format Master Control

## Automation Interface Protocol Technical Reference Manual



SOFTWARE VERSION 1.5.1

071847205  
March 20, 2008



Affiliate with the N.V. KEMA in The Netherlands

# CERTIFICATE

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## Grass Valley Web Site

The [www.thomsongrassvalley.com](http://www.thomsongrassvalley.com) web site offers the following:

**Online User Documentation** — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

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Grass Valley's innovation and excellence in product design also extends to the programs we've established to manage the recycling of our products. Grass Valley has developed a comprehensive end-of-life product take back program for recycle or disposal of end-of-life products. Our program meets the requirements of the European Union's WEEE Directive, the United States Environmental Protection Agency, and U.S. state and local agencies.

Grass Valley's end-of-life product take back program assures proper disposal by use of Best Available Technology. This program accepts any Grass Valley branded equipment. Upon request, a Certificate of Recycling or a Certificate of Destruction, depending on the ultimate disposition of the product, can be sent to the requester.

Grass Valley will be responsible for all costs associated with recycling and disposal, including freight. However, you are responsible for the removal of the equipment from your facility and packing the equipment to make it ready for pickup.



For further information on the Grass Valley product take back system please contact Grass Valley at + 800 80 80 20 20 or +33 1 48 25 20 20 from most other countries. In the U.S. and Canada please call 800-547-8949 or 530-478-4148, and ask to be connected to the EH&S Department. Additional information concerning the program can be found at: [www.thomsongrassvalley.com/environment](http://www.thomsongrassvalley.com/environment)



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# *Safety Summary*

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

**WARNING** Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

## **Safety Terms and Symbols**

### **Terms in This Manual**

Safety-related statements may appear in this manual in the following form:

**WARNING** Warning statements identify conditions or practices that may result in personal injury or loss of life.

**CAUTION** Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

### **Terms on the Product**

The following terms may appear on the product:

**DANGER** — A personal injury hazard is immediately accessible as you read the marking.

**WARNING** — A personal injury hazard exists but is not immediately accessible as you read the marking.

**CAUTION** — A hazard to property, product, and other equipment is present.

## Symbols on the Product

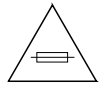
The following symbols may appear on the product:



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.



This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

## Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life.

**Dangerous voltage or current may be present** — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

**Do not service alone** — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

**Remove jewelry** — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

**Avoid exposed circuitry** — Do not touch exposed connections, components or circuitry when power is present.

**Use proper power cord** — Use only the power cord supplied or specified for this product.

**Ground product** — Connect the grounding conductor of the power cord to earth ground.

**Operate only with covers and enclosure panels in place** — Do not operate this product when covers or enclosure panels are removed.

**Use correct fuse** — Use only the fuse type and rating specified for this product.

**Use only in dry environment** — Do not operate in wet or damp conditions.

**Use only in non-explosive environment** — Do not operate this product in an explosive atmosphere.

**High leakage current may be present** — Earth connection of product is essential before connecting power.

**Dual power supplies may be present** — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

**Double pole neutral fusing** — Disconnect mains power prior to servicing.

**Use proper lift points** — Do not use door latches to lift or move equipment.

**Avoid mechanical hazards** — Allow all rotating devices to come to a stop before servicing.

## Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property

**Use correct power source** — Do not operate this product from a power source that applies more than the voltage specified for the product.

**Use correct voltage setting** — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

**Provide proper ventilation** — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

**Use anti-static procedures** — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

**Do not operate with suspected equipment failure** — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

**Ensure mains disconnect** — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

**Route cable properly** — Route power cords and other cables so that they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

**Use correct power supply cords** — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

**Use correct replacement battery** — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

**Troubleshoot only to board level** — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICs). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

# *Regulatory Notices*

## **Certifications and Compliances**

### **FCC Emission Control**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by Grass Valley Group can affect emission compliance and could void the user's authority to operate this equipment.

### **Canadian EMC Notice of Compliance**

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

### **EN55022 Class A Warning**

For products that comply with Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## **Canadian Certified Power Cords**

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

## **Canadian Certified AC Adapter**

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

## **Laser Compliance**

### **Laser Safety Requirements**

The device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering from its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21CFR Chapter 1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to recertify and reidentify this product in accordance with provisions of 21CFR subchapter J for distribution within the U.S.A., and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

### **Laser Safety**

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the “Laser Product Performance Standard,” Code of Federal Regulation (CFR), Title 21, Subchapter J.

The international Electrotechnical Commission (IEC) Standard 825, “Radiation of Laser Products, Equipment Classification, Requirements and User’s Guide,” governs laser products outside the United States. Europe and member nations of the European Free trade Association fall under the jurisdiction of the Comité Européen de Normalization Electrotechnique (CENELEC).

For the CDRH: The radiant power is detected through a 7 mm aperture at a distance of 200 mm from the source focused through a lens with a focal length of 100 mm.

For IEC compliance: The radiant power is detected through a 7 mm aperture at a distance of 100 mm from the source focused through a lens with a focal length of 100 mm.

## **FCC Emission Limits**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation. This device has been tested and found to comply with FCC Part 15 Class B limits for a digital device when tested with a representative laser-based fiber optical system that complies with ANSI X3T11 Fiber Channel Standard.

## **Certification**

<b>Category</b>	<b>Standard</b>	<b>Designed/tested for compliance with:</b>
Safety	UL1950	Safety of Information Technology Equipment, including Electrical Business Equipment (Second edition, 1993).
	IEC 950	Safety of Information Technology Equipment, including Electrical Business Equipment (Second edition, 1991).
	CAN/CSA C22.2, No. 950-93	Safety of Information Technology Equipment, including Electrical Business Equipment.
	EN60950	Safety of Information Technology Equipment, including Electrical Business Equipment.





# *Introduction*

The Maestro automation command set is an extended version of the Saturn command set, which in turn was derived from the M-2100 protocol. An automation system designed to operate with Saturn or Master-21 should operate with Maestro with minimal changes.

This document includes all Saturn commands, Maestro applicability to Saturn commands, and new Maestro commands. The Master-21 command set is defined in Grass Valley document number TP3504-00.

These protocols are based upon standards described in SMPTE documents EG29-1993, RP113-1992, RP138-1992, RP139-1992, RP163-1992, and RP172-1993; and on the EBus standard as defined in EBU document Tech 3245-E.

The features described in this document are applicable to software release Maestro 1.0 and later.

## **Legacy Command Caveats**

1. The order of the **Saturn Input table** is ascending category/number combinations. For example, if the categories are defined (in order) as VTR, AUX and TEST, the Saturn Input table will be ordered as VTR 1, VTR 2, VTR 3 (etc.), then AUX 1, AUX 2, AUX 3 (etc.), TEST 1, TEST 2 TEST 3 (etc.). Invoking autoXptSelectionShow at the shell prompt of the Saturn video processor will list sources and their associated source numbers.

2. Mixer & Keyer - The method for selecting and manipulating sources on the Mix and Key buses is as follows:

Mixer: Use the TAKE\_XPT command to bring the desired source into the Mixer. Then use the PST\_OVER or the PGM\_OVER to select the source on the PST or PGM bus. **Alternatively, use the SET\_MIX command for full mixer control.**

Keyer: Use the TAKE\_XPT command to bring the desired source into the Keyer. Then use the SEL\_1KEY or the SEL\_2KEY to select the source on the PST or PGM bus. SEL\_1KEY selects KEY 1, SEL\_2KEY selects KEY 2. **Alternatively, use the SET\_KEY command for full keyer control.**

3. VID\_1KEY and VID\_2KEY change the settings on Keyer 1 and Keyer 2 respectively. Note that neither of these commands provide complete control of the Saturn keyers. **The SET\_KEY command allows complete manipulation of the keyers.**
4. The RATIO command sets the same ratio for both mixers. The READ RATIO command returns the ratio setting for Mixer 1.
5. Audio gain reads (MAL\_PST, MAL\_PGM, etc.) will occasionally return a value one less than the value from a preceding SET command. This is due to the command being rounded down to assure a minimum gain setting occurs.
6. SET\_MIX command controls all audio levels on the specified mixer. It reports status only on the first audio level. The SET\_AUDIO command allows complete manipulation/reporting of audio parameters.
7. READ PROLL reports 9.9 seconds for preroll times greater than 9.9 seconds.
8. The time value passed in PROLL is two bytes, the first byte being the seconds (0-9), the second byte being tenths (0-9).
9. READ CLK reports the time known by the video processor board. This is set by time manager, which gets its source from the VM board or the file server. Automation can not currently change the time.
10. System service BEGIN/END keywords are supported.
11. UPDATE command - Issuing an UPDATE of commands that normally use an argument to report status (TAKE\_XPT, SET\_KEY, SET\_MIX) will result in a generated status message when the state of any of their respective arguments change.  
  
For additional information concerning the UPDATE command, see page 146.
12. The MUTE command clears all UPDATE commands.
13. The 6 character "R Message Block" timeout specified in RP113-1992 is not currently supported.
14. Group Select specified in RP113-1992 is not currently supported.

# Transport Medium Characteristics

## Serial

The ESBUS standard as defined in EBU document Tech 3245-E states, “standard transmission rate on the interface bus is 38.4 kbit/s”. The supported transmission rates in Maestro for the serial interface will be 38.4 kbit/s and 115.2 kbit/s and will be configurable through the Maestro Configuration Editor.

Furthermore, Maestro will conform with the ESBUS standard as defined in EBU document Tech 3245-E which states, “The complete serial data word consists of one start bit (SPACE), eight data bits (ONE BYTE), a parity bit (EVEN), and one stop bit (MARK). The least significant bit is transmitted first.

## Determinacy

Execution of received commands as a result of internal processing shall be [TBD] frames latent from the frame in which a command is received at the automation module boundary. This latency only specifies when the command will be executed. Determinacy of command completion is not guaranteed where execution involves an indeterminate external element (Router Control System, Network, etc.). Where possible, the determinacy of command executions will be specified.

## Automation Input Set

The Configuration Editor shall allow the user to specify an Automation Input Set for a specific channel based upon that channel’s available inputs. This is necessary to allow the user to specify the available sources (typically all that are available to the channel) and the order of those sources for automation. The Automation Input Set shall be independent of the Channel Input Set with respect to ordering so that Category/Entry changes to the Channel Input Set do not reorder the Automation Input Set causing an unexpected inconsistency between Maestro and the Automation system. It is the responsibility of the Configuration Editor to validate the Automation Input Set with respect to the Channel Input Set.

## Control Panel Background Button Assignment

In systems to be controlled by an automation computer, three of the control panel background buttons must be dedicated to the automation function. This assignment is made during system configuration using the Background Button table. (For more information about the Background Button table, refer to the Software Configuration section of the Installation and Service manual.)

During automation control, one of the three buttons will be selected on PGM for each defined Video/Audio group, one will be selected on PST for each defined Video/Audio group, and since these buses can't be disturbed when assigning/selecting a new source, a third button must be available at all times. Automation activity is thus constrained to the three defined buttons. Otherwise, the automation system may eventually replace many, if not all, sources that the user has manually assigned. If such replaced sources were needed later, the operator would have to re-assign them before they could be used.

It should be noted that if an unused "Automation" associated button is not available on the hardware control panel (for example, none are defined in the Background Button table), then a source request from automation will fail and a message indicating "ESChannelCmds::ESCMaestroAssign() - No available background buttons for groups..." will be printed to the console on the affected channel.

## General ES Support

The following ES functionality is not currently supported:

- Cycle Updates
- Group Selects

## Emergency Alert System Caveat

There is a potential for conflict if both the automation system and the EAS event triggers want to control the same resources. To address conflicts, Maestro will restrict certain automation operations for any keyer(s) /audio over(s) specified in the Background Buttons table as having a fixed assignment. The automation restriction will be that the following automation commands will not allow the source to be specified and/or changed on keyer(s)/audio over(s) with fixed assignments:

- SET\_KEY
- MAESTRO\_KEYER\_SOURCE\_REQUEST
- TAKE\_XPT
- VID\_PSET
- AUD\_PSET
- AUD\_BPSET
- SET\_MIX
- MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST

If the automation command has the option to specify a NOOP for the source argument then that source argument must be set to a NULL in order to process other arguments. All other automation commands not specifically mentioned in the list above will be allowed on fixed assignments.



# *Saturn Command Summaries*

The following are summaries of the automation commands as implemented for the Saturn Master Control switcher.

**Note** A summary of Maestro commands is in preparation. In the meantime, please refer to the Maestro command reference in *Section 5-Definition of Extended Maestro Commands*.

# Alphabetical command summary

Command	C/R/U	Hex	Arguments
ALL_STOP	C/-/-	0x76	
AUD_BPSET	C/R/U	0xC1	audio_source ign
AUD_PSET	C/R/U	0x58	audio_source ign
CLK	C/R/-	0x90	time_value
FTBLK	C/R/U	0x78	
LRS_PGM	C/R/U	0xA3	audio_mode
LRS_PST	C/R/U	0xA1	audio_mode
MAL_PGM	C/R/U	0xA7	audio_level
MAL_PST	C/R/U	0xA4	audio_level
PGM_OVER	C/R/U	0x5B	over_selection
PROLL	C/R/U	0x91	seconds
PST_OVER	C/R/U	0x5A	over_selection
RATIO	C/R/U	0xAA	audio_level
RECALL_REG	C/R/U	0xE4	register_bits register_number
REM_MODE	C/R/U	0x61	off_on_null
RFTB	C/-/-	0x79	
SAP0_PGM	C/R/U	0xAD	audio_level
SAP0_PST	C/R/U	0xAB	audio_level
SAP1_PGM	C/R/U	0xAE	audio_level
SAP1_PST	C/R/U	0xAC	audio_level
SEL_1KEY	C/R/U	0x50	key_src
SEL_2KEY	C/R/U	0x51	key_src
SET_AUDIO	C/R/U	0xE2	src_bus channel_bits ratio balance gain mode ch_rev phase_inv
SET_KEY	C/R/U	0xE0	keyer_video_src key_mix_bus key_type invert_mod key_shadow matte_mod key_timing key_clip key_gain matte_hue matte_sat matte_lum
SET_MIX	C/R/U	0xE1	mixer_src key_mix_bus audio_ratio ign
SWAP_PGM	C/-/-	0xC3	backup_bits
SWAP_PST	C/-/-	0xC2	backup_bits
TAKE_XPT	C/R/U	0x7F	bus video_source audio_source ign ign
TRAN_PRESET	C/R/U	0xE3	board_bits type rate_rate_SS:FF delay_SS:FF black_SS:FF
TX_STAT	-/R/U	0x45	trans_status
TX_TRIG	C/-/-	0x44	trigger_bits
VID_1KEY	C/R/U	0x4A	key_type key_mod ign matte_mod
VID_2KEY	C/R/U	0x4E	key_type key_mod ign matte_mod
VID_BPSET	C/R/U	0xC0	video_source ign
VID_MODE	C/R/U	0x4C	transition
VID_PSET	C/R/U	0x48	video_source ign
VID_RATE	C/-/-	0x4D	trans_rate
VID_RATE	-/R/U	0x4D	trans_rate
VID_SYNC	-/R/-	0x49	sync_bits

`C' = Used as a Command

`R' = Used as a READ command

`U' = Can be used with UPDATE command

`-' = not applicable as a command or a Read command, as indicated

`\*' = required argument to a READ command message



# Numerical command summary

Hex	Command	C/R/U	Arguments
0x44	TX_TRIG	C/-/-	trigger_bits
0x45	TX_STAT	-/R/U	trans_status
0x48	VID_PSET	C/R/U	video_source ign
0x49	VID_SYNC	-/R/-	sync_bits
0x4A	VID_1KEY	C/R/U	key_type key_mod ign matte_mod
0x4C	VID_MODE	C/R/U	transition
0x4D	VID_RATE	C/-/-	trans_rate
0x4D	VID_RATE	-/R/U	trans_rate
0x4E	VID_2KEY	C/R/U	key_type key_mod ign matte_mod
0x50	SEL_1KEY	C/R/U	key_src
0x51	SEL_2KEY	C/R/U	key_src
0x58	AUD_PSET	C/R/U	audio_source ign
0x5A	PST_OVER	C/R/U	over_selection
0x5B	PGM_OVER	C/R/U	over_selection
0x61	REM_MODE	C/R/U	off_on_null
0x76	ALL_STOP	C/-/-	
0x78	FTBLK	C/R/U	
0x79	RFTB	C/-/-	
0x7F	TAKE_XPT	C/R/U	bus video_source audio_source ign ign
0x90	CLK	C/R/-	time_value
0x91	PROLL	C/R/U	seconds
0xA1	LRS_PST	C/R/U	audio_mode
0xA3	LRS_PGM	C/R/U	audio_mode
0xA4	MAL_PST	C/R/U	audio_level
0xA7	MAL_PGM	C/R/U	audio_level
0xAA	RATIO	C/R/U	audio_level
0xAB	SAP0_PST	C/R/U	audio_level
0xAC	SAP1_PST	C/R/U	audio_level
0xAD	SAP0_PGM	C/R/U	audio_level
0xAE	SAP1_PGM	C/R/U	audio_level
0xC0	VID_BPSET	C/R/U	video_source ign
0xC1	AUD_BPSET	C/R/U	audio_source ign
0xC2	SWAP_PST	C/-/-	backup_bits
0xC3	SWAP_PGM	C/-/-	backup_bits
0xE1	SET_MIX	C/R/U	mixer_src key_mix_bus audio_ratio ign
0xE0	SET_KEY	C/R/U	keyer video_src key_mix_bus key_type invert_mod key_shadow matte_mod key_timing key_clip key_gain matte_hue matte_sat matte_lum
0xE2	SET_AUDIO	C/R/U	src_bus channel_bits ratio balance gain mode ch_rev phase_inv
0xE3	TRAN_PRESET	C/R/U	board_bits type rate rate_SS:FF delay_SS:FF black_SS:FF
0xE4	RECALL_REG	C/R/U	register_bits register_number

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`U' = Can be used with UPDATE command

`-' = not applicable as a command or a Read command, as indicated

`\*' = required argument to a READ command message

# Alphabetical command cross reference

Command	C/R/U	Hex	Explanation
ALL_STOP	C/-/-	0x76	Cut to new video
AUD_BPSET	C/R/U	0xC1	Backup audio PST bus take
AUD_PSET	C/R/U	0x58	Audio PST bus take
CLK	C/R/-	0x90	Clock time
FTBLK	C/R/U	0x78	Fade to black
LRS_PGM	C/R/U	0xA3	PGM audio mode
LRS_PST	C/R/U	0xA1	PST audio mode
MAL_PGM	C/R/U	0xA7	PGM main audio level
MAL_PST	C/R/U	0xA4	PST main audio level
PGM_OVER	C/R/U	0x5B	PGM over take
PROLL	C/R/U	0x91	Preroll time
PST_OVER	C/R/U	0x5A	PST over take
RATIO	C/R/U	0xAA	Over to main ratio
RECALL_REG	C/R/U	0xE4	<i>Recall configured independent transition</i>
REM_MODE	C/R/U	0x61	Remote switch
RFTB	C/-/-	0x79	Return from fade to black
SAP0_PGM	C/R/U	0xAD	SAP0 PGM level
SAP0_PST	C/R/U	0xAB	SAP0 PST level
SAP1_PGM	C/R/U	0xAE	SAP1 PGM level
SAP1_PST	C/R/U	0xAC	SAP1 PST level
SEL_1KEY	C/R/U	0x50	Key 1 bus take
SEL_2KEY	C/R/U	0x51	Key 2 bus take
SET_AUDIO	C/R/U	0xE2	<i>Channel related audio parameters</i>
SET_KEY	C/R/U	0xE0	<i>Keyer related parameters</i>
SET_MIX	C/R/U	0xE1	<i>Mixer related parameters</i>
SWAP_PGM	C/-/-	0xC3	Swap primary and backup PGM inputs
SWAP_PST	C/-/-	0xC2	Swap primary and backup PST inputs
TAKE_XPT	C/R/U	0x7F	Bus take
TRAN_PRESET	C/R/U	0xE3	<i>Distributed transition parameters</i>
TX_STAT	-/R/U	0x45	Transition status
TX_TRIG	C/-/-	0x44	Transition trigger
VID_1KEY	C/R/U	0x4A	Key 1 source and parameters
VID_2KEY	C/R/U	0x4E	Key 2 source and parameters
VID_BPSET	C/R/U	0xC0	Backup video PST bus take
VID_MODE	C/R/U	0x4C	Transition type select
VID_PSET	C/R/U	0x48	Video PST bus take
VID_RATE	C/R/U	0x4D	Transition rate select
VID_SYNC	-/R/-	0x49	Video sync status

`C' = Used as a Command

`R' = Used as a READ command

`U' = Can be used with UPDATE command

`-' = not applicable as a command or a Read command, as indicated

`\*' = required argument to a READ command message

# Numerical command cross reference

Hex	Command	C/R/U	Explanation
0x44	TX_TRIG	C/-/-	Transition trigger
0x45	TX_STAT	-/R/U	Transition status
0x48	VID_PSET	C/R/U	Video PST bus take
0x49	VID_SYNC	-/R/-	Video sync status
0x4A	VID_1KEY	C/R/U	Key 1 source and parameters
0x4C	VID_MODE	C/R/U	Transition type select
0x4D	VID_RATE	C/R/U	Transition rate select
0x4E	VID_2KEY	C/R/U	Key 2 source and parameters
0x50	SEL_1KEY	C/R/U	Key 1 bus take
0x51	SEL_2KEY	C/R/U	Key 2 bus take
0x58	AUD_PSET	C/R/U	Audio PST bus take
0x5A	PST_OVER	C/R/U	PST over take
0x5B	PGM_OVER	C/R/U	PGM over take
0x61	REM_MODE	C/R/U	Remote switch
0x76	ALL_STOP	C/-/-	Cut to new video
0x78	FTBLK	C/R/U	Fade to black
0x79	RFTB	C/-/-	Return from fade to black
0x7F	TAKE_XPT	C/R/U	Bus take
0x90	CLK	C/R/-	Clock time
0x91	PROLL	C/R/U	Preroll time
0xA1	LRS_PST	C/R/U	PST audio mode
0xA3	LRS_PGM	C/R/U	PGM audio mode
0xA4	MAL_PST	C/R/U	PST main audio level
0xA7	MAL_PGM	C/R/U	PGM main audio level
0xAA	RATIO	C/R/U	Over to main ratio
0xAB	SAP0_PST	C/R/U	SAP0 PST level
0xAC	SAP1_PST	C/R/U	SAP1 PST level
0xAD	SAP0_PGM	C/R/U	SAP0 PGM level
0xAE	SAP1_PGM	C/R/U	SAP1 PGM level
0xC0	VID_BPSET	C/R/U	Backup video PST bus take
0xC1	AUD_BPSET	C/R/U	Backup audio PST bus take
0xC2	SWAP_PST	C/-/-	Swap primary and backup PST inputs
0xC3	SWAP_PGM	C/-/-	Swap primary and backup PGM inputs
0xE1	SET_MIX	C/R/U	<i>Mixer related parameters</i>
0xE0	SET_KEY	C/R/U	<i>Keyer related parameters</i>
0xE2	SET_AUDIO	C/R/U	<i>Channel related audio parameters</i>
0xE3	TRAN_PRESET	C/R/U	<i>Distributed transition parameters</i>
0xE4	RECALL_REG	C/R/U	<i>Recall configured independent transition</i>

`C' = Used as a Command

`R' = Used as a READ command

`U' = Can be used with UPDATE command

`-' = not applicable as a command or a Read command, as indicated

`\*' = required argument to a READ command message



# *Saturn Argument Summary*

The following is a summary of the automation command arguments as implemented for the Saturn Master Control switcher.

Italicized items are extensions to the original GVG Master-21 command set, defined in Grass Valley document number TP3504-00.

## **Notes**

1. All arguments are one byte unless indicated otherwise.
2. NOP = No Operation.
3. A summary of Maestro arguments is in preparation. In the meantime, please refer to the Maestro command reference in *Section 5-Definition of Extended Maestro Commands*.

### Section 3 — Saturn Argument Summary

off_on_null:	0,2,3	0 = No Change 2 = Off 3 = On	IF_NULL IF_OFF IF_ON
trigger_bits:		B7 = Trigger Enable B6 = Inhibit Preroll B5 - B0 = reserved	VX_TRIG NO_PROL
trans_status:	2-5	2 = Quiescent 3 = Prerolling 4 = Transitioning 5 = In Black	TS_Q TS_PROL TS_TRAN TS_BLK
video_source:	0,1-255	0 = video source NOP 1-255 = Maps to the order of the Saturn input table. See commentary below for discussion of Saturn Input table.	IF_NULL
audio_source:	0,1-255	0 = audio source NOP 1-255 = Maps to the order of the Saturn input table.	IF_NULL
ign:	0-255	Value ignored by Saturn. Included to maintain compatibility with Master-21 protocol.	
bus:	0,1-8	0 = Bus NOP 1 = PGM 2 = PST 3 = Backup PGM 4 = Backup PST 5 = Mixer 1 6 = Mixer 2 7 = Keyer 1 8 = Keyer 2	IF_NULL D_PGM D_PST D_BPGM D_BPST D_MIX1 D_MIX2 D_KEY1 D_KEY2
mixer:	5,6	5 = Mixer 1 6 = Mixer 2	D_MIX1 D_MIX2
keyer:	7,8	7 = Keyer 1 8 = Keyer 2	D_KEY1 D_KEY2
transition:	0,1-8	0 = Transition Type NOP 1 = Cut 2 = Mix 3 - 5 = reserved 6 = Fade-Fade 7 = Cut-Fade 8 = Fade-Cut	IF_NULL XTAKE XMIX  XVFADE XCFADE XFADEC

trans_rate:	0,1-3	0 = Transition Rate NOP 1 = Slow 2 = Medium 3 = Fast	IF_NULL RATES RATEM RATEF
audio_mode:	0,1-4	0 = Audio Mode NOP 1 = Mono L + R 2 = Mono L 3 = Mono R 4 = Stereo	IF_NULL AMONO ALFT ARGHT AST
over_selection:		B7 = Must be set for over selection to occur for commands B6 - B4 = reserved B3 = Over 3 (not used by Saturn) B2 = Over 2 (not used by Saturn) B1 = Over 1 (Saturn Mix 2 In/Next) B0 = Over 0 (Saturn Mix 1 In/Next)	
key_src:		B7 = Must be set for key selection and PST key enable in commands. Indicates key is on PST for replies. <i>B6 = Must be set for key selection and PGM key enable in commands. Indicates key is on PGM for replies.</i> B5 = Indicates key is to be removed from both PST and PGM in commands. Don't care for replies. B4 = Key 4 (not used by Saturn) B3 = Key 3 (not used by Saturn) B2 = Key 2 (not used by Saturn) B1 = Key 1 (not used by Saturn) B0 = Key 0 (Saturn Key 1/Key 2 In/Next)	
key_mix_bus:		<i>B7 = Must be set for key/mix selection and PST key/mix enable in commands. Indicates key/mix is on PST for replies.</i> <i>B6 = Must be set for key/mix selection and PGM key/mix enable in commands. Indicates key/mix is on PGM for replies.</i> <i>B5 = Indicates key is to be removed from busses indicated by B7 &amp; B6. Don't care for replies.</i> <i>B4 - B0 = reserved</i>	
key_type:	0,3,5,6	0 = Key Type NOP 3 = Self Key 5 = External Key 6 = Chroma Key (not used by Saturn)	IF_NULL K_SELF K_EXT
key_mod:	0,1,2,8	0 = Key Modifier NOP 1 = Normal 2 = Shadow 8 = Border (not used by Saturn)	IF_NULL KSNORM KSSHAD (not supported)

### Section 3 — Saturn Argument Summary

key_hold:	0,2,3	0 = Key Hold NOP 2 = Key Hold Off 3 = Key Hold On	IF_NULL IF_OFF IF_ON
matte_mod:	0,2-3	0 = Key Matte NOP 2 = Matte Off 3 = Matte On	IF_NULL IF_OFF IF_ON
key_shadow:	0-3	Key Shadow Depth (not supported)	
invert_mod:	0,2,3	0 = Key Invert NOP 2 = Invert Off 3 = Invert On	IF_NULL IF_OFF IF_ON
sync_bits:		B7 = PST & Internal Black in sync B6 = PST & KEY in sync B5 = PGM & PST in sync B4 = PGM & KEY in sync B3 = PGM video present B2 = PST video present B1 = reserved B0 = reserved	
time_value:	0-23 0-59 0-59 0-29	HH = BCD Hours MM = BCD Minutes SS = BCD Seconds FF = BCD Frames	
secs:	0-9	BCD 0..9 (one byte)	
tenths:	0-9	BCD 0..9 (one byte)	
seconds:	0-9,0-9	secs:tenths (two bytes)	
seconds_tenths:	0-9 0-9	B7-B4 = BCD seconds B3-B0 = BCD tenths of seconds	
audio_level:	0-99	(base 10) percent of full-scale	
backup_bits:		B7 = Set for command to execute. Don't care replies. B6-B2 = reserved B1 = swap backup and primary video B0 = swap backup and primary audio	
key_timing:	0,1-255	0 = Key Timing NOP 1-255 = key timing (128 = default) (not supported)	IF_NULL
key_clip:	0,1-255	0 = Key Clip NOP 1-255 = key clip	IF_NULL



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<i>ratio:</i>	<i>00,01-FD,FE-FF (hex, one byte)</i> <i>00 - Audio ratio NOP</i> <i>01-FD = Audio ratio linearly corresponding to -18.0 dB through +18.0 dB.</i> Mixer ratios change in 0.375 (3/8) dB steps. <i>FE-FF = Audio ratio corresponding to +INF dB.</i>
<i>balance:</i>	<i>00,01-FF (hex, one byte)</i> <i>00 = Audio balance NOP</i> <i>01-FF = Audio balance linearly corresponding to 10.0 dB Left through 10.0 dB Right.</i> Balance changes in 0.375 (3/8) dB steps.
<i>gain:</i>	<i>00,01-FF (hex, one byte)</i> <i>00 = Audio gain NOP</i> <i>01-FF = Audio gain linearly corresponding to -24.0 dB through +24.0 dB.</i> Gain changes in 0.375 (3/8) dB steps.
<i>mode:</i>	<i>0,1-4</i> <i>0 = Audio mode NOP</i> <i>1 = MONO L+R</i> <i>2 = MONO L</i> <i>3 = MONO R</i> <i>4 = STEREO</i>
<i>ch_rev:</i>	<i>0,2,3</i> <i>0 = Channel reverse NOP</i> <i>2 = Channel reverse OFF</i> <i>3 = Channel reverse ON</i>
<i>phase_inv:</i>	<i>0,2,3</i> <i>0 = Phase invert NOP</i> <i>2 = Phase invert OFF</i> <i>3 = Phase invert ON</i>
<i>board_bits:</i>	<i>00-0F (hex, one byte)</i> <i>bit7-bit4 = reserved</i> <i>bit 3 = Audio 5/6 board (Mode 2-CH5 Mono, Mode 1-CH5/6 Stereo)</i> <i>bit 2 = Audio 3/4 board (Mode 3-CH3 &amp; CH4 Mono, Mode 1,2-CH3/4 Stereo)</i> <i>bit 1 = Audio 1/2 board (All Modes-CH1/2 Stereo)</i> <i>bit 0 = Video board</i>
<i>type:</i>	<i>0,1-4</i> <i>0 = Transition type NOP</i> <i>1 = Cross-fade</i> <i>2 = Fade-cut</i> <i>3 = Cut-fade</i> <i>4 = Fade-fade</i>

*rate:*                0,1-5    0 = Transition rate NOP  
                              1 = Slow  
                              2 = Medium  
                              3 = Fast  
                              4 = Cut  
                              5 = Custom (used with <rate\_SS:FF> argument to specify transition rate)

*rate\_SS:FF:*        <seconds><frames>

*delay\_SS:FF:*        <seconds><frames>

*black\_SS:FF:*        <seconds><frames>

*seconds:*            FF,00-09 (hex, one byte)  
                              FF = argument NOP, causes Saturn to ignore the contents of the <seconds><frames> pair  
                              00-09 = Seconds representing 0:00-9:00

*frames:*             00-1D (hex, one byte)  
                              00-1D = Frames representing 0:00-0:29



# *Definition of Supported Saturn Commands*

The existing Saturn Automation commands, their parameters and functionality, are defined as follows for Maestro. It should be noted that in order to ensure backwards compatibility with Saturn, no changes, redefinition, or use of unused parameters will be made to the existing Saturn Automation commands for use by Maestro. Instead, Maestro Applicability will be stated for each Saturn command. For Maestro specific commands, refer to *Section 5-Definition of Extended Maestro Commands*.

**Note** “Use applicable with UPDATE:” refers to commands supported for automatic updating.

**Note** The “Maestro Applicability” statements in this section are preliminary and subject to change without notice.

## All stop (cut to new video)

Hex definition

Mnemonic

76

ALL\_STOP

### Command format:

ALL\_STOP

### Query format:

Illegal

### Reply format:

None

### Use applicable with UPDATE:

No

### Argument definitions:

None

### Maestro applicability:

Not presently supported

## **AUD\_BPSET (Audio backup preset bus Take)**

Hex definition

Mnemonic

C1

AUD\_BPSET

### **Command format:**

AUD\_BPSET <audio source> <ign>

### **Query format:**

READ AUD\_BPSET

### **Reply format:**

IFRE AUD\_BPSET <audio source> <ign>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<audio source> = 0, 1-255

0 = audio source NOP                      IF\_NULL

1-255 = Maps to the order of the Saturn input table.

<ign> = 0-255

Value ignored by Saturn.

### **Maestro applicability:**

Not Supported – Backup sources are not currently a requirement of Maestro

## AUD\_PSET (Audio preset bus Take)

Hex definition

Mnemonic

58

AUD\_PSET

### Command format:

AUD\_PSET <audio source> <ign>

### Query format:

READ AUD\_PSET

### Reply format:

IFRE AUD\_PSET <audio source> <ign>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio source> = 0, 1-255

0 = audio source NOP

IF\_NULL

1-255 = Maps to the order of the Saturn input table.

<ign> = 0-255

Value ignored by Saturn.

### Maestro applicability:

As stated



## **CEXT (0x3F) Common Extension**

The Extension Set command UPDATE (0x07) is used to specify Saturn commands for automatic updates. E.g.:

STX | LEN | 3F | 07 | 01 | 58 | 78 | 02 |

This would active UPDATE for AUD\_PSET and REM\_MODE. The RBGN/REND is necessary since this example selects more than one command for updates.

The MUTE command would switch off all responses (Legacy or Maestro).

## (0x3F) Common Extension

The Extension Set command UPDATE (0x07) is enhanced to specify Maestro commands. Extension (0xFF) precedes each Maestro command (I/F name). E.g.:

STX | LEN | 3F | 07 | 01 | FF | 40 | FF | 41 | 02 |

This would activate UPDATE for MAESTRO\_TRANSITION\_TYPE and MAESTRO\_TRANSITION\_RATE

The MUTE command would switch off all responses (Legacy or Maestro).

# CLK (Clock time)

Hex definition

90

Mnemonic

CLK

## Command format:

CLK <time value>

## Query format:

READ CLK

## Reply format:

IFRE CLK <time value>

## Use applicable with UPDATE:

No

## Argument definitions:

<time value>

0-23HH = BCD Hours

0-59MM = BCD Minutes

0-59SS = BCD Seconds

0-29FF = BCD Frames

## Maestro applicability:

The CLK command format is not supported in Maestro as Maestro Time is set by the timecode input only. The CLK query/reply format functions in Maestro as stated.

## FTBLK (Fade to black)

Hex definition

78

Mnemonic

FTBLK

### Command format:

FTBLK

### Query format:

READ FTBLK

### Reply format:

IFRE FTBLK <off\_on\_null>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<off\_on\_null>

0 = No change

2 = Off

3 = On

IF\_NULL

IF\_OFF

IF\_ON

### Maestro applicability:

As stated

## **LRS\_PGM (Left/right/stereo PGM audio mode)**

Hex definition

Mnemonic

A3

LRS\_PGM

### **Command format:**

LRS\_PGM <audio mode>

### **Query format:**

READ LRS\_PGM

### **Reply format:**

IFRE LRS\_PGM <audio mode>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<audio mode> = 0, 1-4

0 = Audio Mode NOP

IF\_NULL

1 = Mono L + R

AMONO

2 = Mono L

ALFT

3 = Mono R

ARGHT

4 = Stereo

AST

### **Maestro applicability:**

Applies only to:

- Audio Group 1
- Only if Audio Group 1 is configured as a Stereo Audio Group type.

## LRS\_PST (Left/right/stereo PST audio mode)

Hex definition

Mnemonic

A1

LRS\_PST

### Command format:

LRS\_PST <audio mode>

### Query format:

READ LRS\_PST

### Reply format:

IFRE LRS\_PST <audio mode>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio mode> = 0, 1-4

0 = Audio Mode NOP

IF\_NULL

1 = Mono L + R

AMONO

2 = Mono L

ALFT

3 = Mono R

ARGHT

4 = Stereo

AST

### Maestro applicability:

Applies only to:

- Audio Group 1
- Only if Audio Group 1 is configured as a Stereo Audio Group type.

## **MAL\_PGM (PGM main audio level)**

Hex definition

Mnemonic

A7

MAL\_PGM

### **Command format:**

MAL\_PGM <audio level>

### **Query format:**

READ MAL\_PGM

### **Reply format:**

IFRE MAL\_PGM <audio level>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<audio level> = 0-99 (base 10) percent of full-scale

### **Maestro applicability:**

Applies only to:

- Audio Group 1
- Only if the Audio Group 1 type supports audio level adjustment.

## MAL\_PST (PST main audio level)

Hex definition

Mnemonic

A4

MAL\_PST

### Command format:

MAL\_PST <audio level>

### Query format:

READ MAL\_PST

### Reply format:

IFRE MAL\_PST <audio level>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio level> = 0-99 (base 10) percent of full-scale

### Maestro applicability:

Applies only to:

- Audio Group 1
- Only if the Audio Group 1 type supports audio level adjustment



## PGM\_OVER (Program bus over take)

Hex definition

Mnemonic

5B

PGM\_OVER

### Command format:

PGM\_OVER <over selection>

### Query format:

READ PGM\_OVER

### Reply format:

IFRE PGM\_OVER <over selection>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<over selection>

B7 = Must be set for over selection to occur for commands

B6 - B4 = reserved

B3 = Over 3 (not used by Saturn)

B2 = Over 2 (not used by Saturn)

B1 = Over 1 Saturn Mix 2 In/Next

B0 = Over 0 Saturn Mix 1 In/Next

### Maestro applicability:

Command Selects/Unselects the specified <over selection> on **all** Audio Groups that support Overs (e.g.: Dolby Passthrough does not support Overs).

Query: Reports whether the specified <over selection> is selected on **any** Audio Groups.

## PROLL (Preroll time)

Hex definition

Mnemonic

91

PROLL

### Command format:

PROLL <seconds>

### Query format:

READ PROLL

### Reply format:

IFRE PROLL <seconds>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<seconds> = 0-9, 0-9 secs:tenths (two bytes)

### Maestro applicability:

Not presently supported

## PST\_OVER (Preset bus over take)

Hex definition

Mnemonic

5A

PST\_OVER

### Command format:

PST\_OVER <over selection>

### Query format:

READ PST\_OVER

### Reply format:

IFRE PST\_OVER <over selection>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<over selection>

B7 = Must be set for over selection to occur for commands

B6 - B4 = reserved

B3 = Over 3 (not used by Saturn)

B2 = Over 2 (not used by Saturn)

B1 = Over 1 Saturn Mix 2 In/Next

B0 = Over 0 Saturn Mix 1 In/Next

### Maestro applicability:

Command: Selects/Unselects the specified <over selection> on **all** Audio Groups that support Overs (e.g.: Dolby Passthrough does not support Overs).

Query: Reports whether the specified <over selection> is selected on **any** Audio Groups.

## Ratio (audio mixer to main ratio)

Hex definition

Mnemonic

AA

RATIO

### Command format:

RATIO <audio level>

### Query format:

READ RATIO

### Reply format:

IFRE RATIO <audio level>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio level> = 0-99 (base 10) percent of full-scale

### Maestro applicability:

Applies only to Over 1.

Command: The specified <audio level> is applied to **all** Audio Groups that support ratio on both Program and Preview.

Query: Reports the <audio level> associated with Audio Group 1.

# RECALL\_REG (Recall configured independent transition)

This command allows Saturn's distributed transition parameters to be preset using the customer's predefined configuration sets.

Hex definition	Mnemonic
E4	RECALL_REG

## Command format:

RECALL\_REG <register bits> <register number>

## Query format:

READ RECALL\_REG <register bits> <register number>

## Reply format:

IFRE RECALL\_REG <register bits> <register number>

Note: The response will contain a reply for each board requested in the <board bits> argument of the query, wrapped within a begin-end construct.

## Use applicable with UPDATE:

Yes

## Argument definitions:

<register\_bits> = 00, 10 (hex, one byte)

00 = Valid on query only--verify existence of transition table specified in <register\_number>. (If bit 4 is set in the reply, then the table exists in the customer's configuration set.)

10 = (Bit 4 set--all other bits reserved) Recall transition configuration table.

<register\_number> = 00, 01-63, 64, 65 (hex, one byte)

Specifies the configuration transition table number, or reports on the current table on a reply.

00 = Specifies default transition parameters.

01-63 = Specifies configuration transition table numbers 1-99.

64 = Valid on reply only--reports that transition parameters have been set by TRAN\_PRESET.

65 = Valid on reply only--reports that transition parameters have been manually set.

## Examples

Request validation on existence of transition configuration table #25:

STX 04 READ E4 00 19 <checksum>

REPLY: STX 04 IFRE E4 10 19 <checksum>

REPLY: STX 04 IFRE E4 00 19 <checksum>

Set up transition parameters by recalling transition table #25:

STX 03 E4 10 19 <checksum>

Request the current transition table setting:

STX 04 READ E4 10 00 <checksum>

REPLY: STX 04 IFRE E4 10 19 <checksum> (if #25 is active)

REPLY: STX 04 IFRE E4 10 65 <checksum> (if operator intervened)

## Maestro applicability:

<register bits> = 00, 0x10 (hex, one byte)

0x00 = Valid on query only. Verify existence of the Transition Association Table number specified in <register number>. (If bit 4 is set in the reply, then the Association exists in the customer's configuration set.)

0x10 = (Bit 4 set--all other bits reserved) Recall the specified Transition Association.

<register number> = 0x00-0x03, 0x04-0x63, 0x64, 0x65 (hex, one byte)

Specifies the configuration Transition Association Table number, or reports on the current table on a reply.

0x00-0x03 = Fixed values where:

0x00 = Cross-Fade	MAESTRO_TRANSITION_TYPE_CROSS_FADE
0x01 = Fade-Cut	MAESTRO_TRANSITION_TYPE_FADE_CUT
0x02 = Cut-Fade	MAESTRO_TRANSITION_TYPE_CUT_FADE
0x03 = Fade-Fade	MAESTRO_TRANSITION_TYPE_FADE_FADE

0x04-0x63 = Specifies configuration Transition Association numbers 4-99.

0x64 = Valid on reply only. Reports that transition parameters have been set by TRAN\_PRESET (only if a Custom Transition is processed, refer to Maestro Applicability of TRAN\_PRESET ) or MAESTRO\_TRANSITION\_TYPE\_CUSTOM.

0x65 = Valid on reply only. Reports that transition parameters have been manually set.

## REM\_MODE (Remote switch mode)

Hex definition

Mnemonic

61

REM\_MODE

### Command format:

REM\_MODE <off on null>

### Query format:

READ REM\_MODE

### Reply format:

IFRE REM\_MODE <off on null>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<off on null> = 0, 2, 3

0 = No Change

IF\_NULL

2 = Off

IF\_OFF

3 = On

IF\_ON

### Maestro applicability:

As stated

## RTFB (Return from fade to black)

Hex definition

Mnemonic

79

RTFB

### Command format:

RTFB

### Query format:

Illegal

### Reply format:

None

### Use applicable with UPDATE:

No

### Argument definitions:

None

### Maestro applicability:

As stated



## **SAP0\_PGM (SAP 0 program level)**

Hex definition

Mnemonic

AD

SAP0\_PGM

### **Command format:**

SAP0\_PGM <audio level>

### **Query format:**

READ SAP0\_PGM

### **Reply format:**

IFRE SAP0\_PGM <audio level>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<audio level> = 0-99 (base 10) percent of full-scale

### **Maestro applicability:**

Applies only to:

- Audio Group 2
- Only if Audio Group 2 is a Mono Audio Group type

## SAP0\_PST (SAP 0 preset level)

Hex definition

Mnemonic

AB

SAP0\_PST

### Command format:

SAP0\_PST <audio level>

### Query format:

READ SAP0\_PST

### Reply format:

IFRE SAP0\_PST <audio level>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio level> = 0-99 (base 10) percent of full-scale

### Maestro applicability:

Applies only to:

- Audio Group 2
- Only if Audio Group 2 is a Mono Audio Group type

## **SAP1\_PGM (SAP 1 program level)**

Hex definition

Mnemonic

AE

SAP1\_PGM

### **Command format:**

SAP1\_PGM <audio level>

### **Query format:**

READ SAP1\_PGM

### **Reply format:**

IFRE SAP1\_PGM <audio level>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<audio level> = 0-99 (base 10) percent of full-scale

### **Maestro applicability:**

Applies only to:

- Audio Group 3
- Only if Audio Group 3 is a Mono Audio Group type

## SAP1\_PST (SAP 1 preset level)

Hex definition

Mnemonic

AC

SAP1\_PST

### Command format:

SAP1\_PST <audio level>

### Query format:

READ SAP1\_PST

### Reply format:

IFRE SAP1\_PST <audio level>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<audio level> = 0-99 (base 10) percent of full-scale

### Maestro applicability:

Applies only to:

- Audio Group 3
- Only if Audio Group 3 is a Mono Audio Group type

## **SEL\_1KEY (Select key 1 bus source)**

Hex definition

Mnemonic

50

SEL\_1KEY

### **Command format:**

SEL\_1KEY <key src>

### **Query format:**

READ SEL\_1KEY

### **Reply format:**

IFRE SEL\_1KEY <key src>

### **Use applicable with UPDATE:**

Yes

### **Argument definitions:**

<key src>

B7 = Must be set for key selection and PST key enable in commands. Indicates key is on PST for replies.

B6 = Must be set for key selection and PGM key enable in commands. Indicates key is on PGM for replies.

B5 = Indicates key is to be removed from both PST and PGM in commands. Don't care for replies.

B4 = Key 4 (not used by Saturn)

B3 = Key 3 (not used by Saturn)

B2 = Key 2 (not used by Saturn)

B1 = Key 1 (not used by Saturn)

B0 = Key 0 Saturn Key 1/Key 2 In/Next

### **Maestro applicability:**

As stated

## SEL\_2KEY (Select key 2 bus source)

Hex definition

Mnemonic

51

SEL\_2KEY

### Command format:

SEL\_2KEY <key src>

### Query format:

READ SEL\_2KEY

### Reply format:

IFRE SEL\_2KEY <key src>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<key src>

B7 = Must be set for key selection and PST key enable in commands. Indicates key is on PST for replies.

B6 = Must be set for key selection and PGM key enable in commands. Indicates key is on PGM for replies.

B5 = Indicates key is to be removed from both PST and PGM in commands. Don't care for replies.

B4 = Key 4 (not used by Saturn)

B3 = Key 3 (not used by Saturn)

B2 = Key 2 (not used by Saturn)

B1 = Key 1 (not used by Saturn)

B0 = Key 0 (Saturn Key 1/Key 2 In/Next)

### Maestro applicability:

As stated

## SET\_AUDIO (Set channel related audio parameters)

This command allows all of Saturn's audio parameters to be preset directly.

Hex definition	Mnemonic
E2	SET_AUDIO

### Command format:

SET\_AUDIO <src bus> <channel bits> <ratio> <bal> <gain> <mode> <ch rev> <phase inv>

### Query format:

READ SET\_AUDIO <src bus> <channel bits>

### Reply format:

IFRE SET\_AUDIO <src bus> <channel bits> <ratio> <bal> <gain> <mode> <ch rev> <phase inv>

Note: the response will contain a reply for each channel requested in the <channel bits> argument of the query, wrapped within a begin-end construct.

Note: If src bus is D\_MIX1 or D\_MIX2, the stereo mode returned is the Program Stereo Mode.

### Use applicable with UPDATE:

Yes

### Argument definitions:

<src bus> = 1, 2, 5, 6.

Specifies the source bus affected by the command.

- 1 = Program bus
- 2 = Preset bus
- 5 = Mixer 1
- 6 = Mixer 2

<channel bits> = 00-07 (hex, one byte).

Specifies the audio channels affected by the command.

- bit 7-bit3 = reserved
- bit 2 = Mode 1-CH5/6 Stereo, Mode 2-CH5 Mono, Mode 3-CH4 Mono
- bit 1 = Mode 1,2-CH3/4 Stereo, Mode 3-CH3 Mono
- bit 0 = All Modes-CH1/2 Stereo

**<ratio>** = 00, 01-FD, FE-FF (hex, one byte)

When <src bus> = Mixer 1 or Mixer 2, specifies the audio ratio or reports the current ratio on a reply.

00 =Audio ratio NOP

01-FD = Audio ratio linearly corresponding to -18.0 dB through +18.0 dB. Mixer ratios change in 0.375 (3/8) dB steps.

FE-FF = Audio ratio corresponding to +INF dB.

**<bal>** = 00, 01-FF (hex, one byte)

On a stereo channel, specifies the audio balance or reports the current balance on a reply.

00 =Audio balance NOP

01-FF = Audio balance linearly corresponding to 10.0 dB Left through 10.0 dB Right. Balance changes in 0.375 (3/8) dB steps.

**<gain>** = 00, 01-FF (hex, one byte)

Specifies the audio gain or reports the current audio gain on a reply.

00 =Audio gain NOP

01-FF = Audio gain linearly corresponding to -24.0 dB through +24.0 dB. Gain changes in 0.375 (3/8) dB steps.

**<mode>** = 0, 1-4

On a stereo channel, specifies the audio mode or reports the current audio mode on a reply.

0 = Audio mode NOP

1 = MONO L+R

2 = MONO L

3 = MONO R

4 = STEREO

**<ch rev>** = 0, 2, 3

On a stereo channel, specifies channel reverse or reports the current state of channel reverse on a reply.

0 = Channel reverse NOP

2 = Channel reverse OFF

3 = Channel reverse ON

**<phase inv>** = 0, 2, 3

On a stereo channel, specifies phase invert or reports the current state of channel reverse on a reply.

0 = Phase invert NOP

2 = Phase invert OFF

3 = Phase invert ON



## Maestro applicability:

<channel bits> = 00-07 (hex, one byte).

Specifies the Audio Groups affected by the command.

bit 7-bit3 = reserved  
 bit 2 = Audio Group 3  
 bit 1 = Audio Group 2  
 bit 0 = Audio Group 1

<ratio> = 00-FF (hex, one byte)

When <src bus> = Mixer 1 or Mixer 2, specifies the audio ratio to be applied *on all audio channels*, or reports the current ratio of *CH1/2* on a reply. Saturn audio ratio is -18.0 dB through 18.0 dB in 0.375 (3/8) dB steps where FE-FF is +INF dB. The Maestro range is from 0 dB to 24.0 dB in 0.1 dB increments. The Range supported by this command is from 0 dB to 18.0 dB in 0.1dB increments and 24.0 dB for INF. Maestro does not support negative (-) dB values. Maestro does not have +INF so +INF will result in the Maestro maximum of +24.0 dB.

00 = Audio Ratio NOP      IF\_NULL  
 01-7F = Audio ratio set to 0 db.  
 80-FD = Audio ratio scaled to 0.1 dB through 18.0 dB in 0.1dB increments rounded to the lower whole 0.1 dB step.  
 FE-FF = Audio ratio set to 24.0 dB

<bal> = 00, 01-FF (hex, one byte)

On a stereo channel, specifies the audio balance or reports the current balance on a reply.

00 =                      Audio balance NOP  
 01-FF =                  Audio balance linearly corresponding to 10.0 dB Left through 10.0 dB Right. Balance changes in 0.375 (3/8) dB steps (Saturn compatibility) but will be applied as the lower whole 0.1 dB step in Maestro.

<gain> = 00, 01-FF (hex, one byte)

Specifies the audio gain or reports the current audio gain on a reply.

00 =                      Audio gain NOP  
 01-FF =                  Audio gain linearly corresponding to -24.0 dB through +24.0 dB. Gain changes in 0.375 (3/8) dB steps (Saturn compatibility) but will be applied as the lower whole 0.1 dB step in Maestro.

**<mode> <ch rev>**

Stereo Mode and Channel Reverse are not independent parameters in Maestro. In situations where there is a conflict between the requested Stereo Mode and the requested and/or current Channel Reverse mode, the requested Stereo Mode takes precedence over Channel Reverse. Basically, the only way to turn Channel Reverse ON is to request NOP for the Stereo Mode parameter. The following table indicates the interaction between Stereo Mode and Channel Reverse:

Decision Table for <mode> vs. <ch rev> parameters (SET\_AUDIO)

<u>&lt;mode&gt;</u>	<u>&lt;ch rev&gt;</u>	<u>&lt;mode&gt; Result</u>	<u>&lt;ch rev&gt; Result</u>
NOP	NOP	NOP	NOP
NOP	OFF	NOP	OFF
NOP	ON	NOP	ON
MONO L+R	NOP	MONO L+R	OFF
MONO L	NOP	MONO L	OFF
MONO R	NOP	MONO R	OFF
STEREO	NOP	STEREO	OFF
MONO L+R	OFF	MONO L+R	OFF
MONO L	OFF	MONO L	OFF
MONO R	OFF	MONO R	OFF
STEREO	OFF	STEREO	OFF
MONO L+R	ON	MONO L+R	OFF
MONO L	ON	MONO L	OFF
MONO R	ON	MONO R	OFF
STEREO	ON	STEREO	OFF

# SET\_KEY (Set keyer related parameters)

Hex definition

Mnemonic

E0

SET\_KEY

## Command format:

SET\_KEY <keyer> <video src> <key mix bus> <key type> <invert mod> <key shadow> <matte mode> <key timing>  
<key clip> <key gain> <matte hue> <matte sat> <matte lum>

## Query format:

READ SET\_KEY <keyer>

## Reply format:

IFRE SET\_KEY <keyer> <video src> <key mix bus> <key type> <invert mod> <key shadow> <matte mode> <key timing>  
<key clip> <key gain> <matte hue> <matte sat> <matte lum>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<keyer> = 7, 8

7 = Keyer 1	D_KEY1
8 = Keyer 2	D_KEY2

<video src> = 0, 0x01-0xFF

0 = video source NOP	IF_NULL
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0x01-0xFF = Input source numbers 1 through 255 (list sources with autoXptSelectionShow pROBE command)

0xFF = 255 is used to select the Direct Input

<key mix bus>:

B7 = Must be set for key/mix selection and PST key/mix enable in commands. Indicates key/mix is on PST for replies.

B6 = Must be set for key/mix selection and PGM key/mix enable in commands. Indicates key/mix is on PGM for replies.

B5 = Indicates key is to be removed from busses indicated by B7 & B6. Don't care for replies.

B4 - B0 = reserved

<key type> = 0, 3, 5, 6

0 = Key Type NOP	IF_NULL
3 = Self Key	K_SELF
5 = External Key	K_EXT
6 = Chroma Key (not used by Saturn)	

<invert mod> = 0, 2, 3

0 = Key Invert NOP	IF_NULL
2 = Invert Off	IF_OFF

3 = Invert On	IF_ON
<key shadow> = 0-3 Key Shadow Depth	
<matte mod> = 0, 2-3	
0 = Key Matte NOP	IF_NULL
2 = Matte Off	IF_OFF
3 = Matte On	IF_ON
<key timing> = 0, 1-255	
0 = Key Timing NOP	IF_NULL
1-255 = key timing (128 = default)	
<key timing> = 0, 1-255	
0 = Key Timing NOP	IF_NULL
1-255 = key timing (128 = default)	
<key clip> = 0, 1-255	
0 = Key Clip NOP	IF_NULL
1-255 = key clip	
<key gain> = 0, 1-255	
0 = Key Gain NOP	IF_NULL
1-255 = key gain	
<matte hue> = 0, 1-255	
0 = Matte Hue NOP	IF_NULL
1-255 = matte hue	
<matte sat> = 0, 1-255	
0 = Matte Saturation NOP	IF_NULL
1-255 = matte saturation	
<matte lum> = 0, 1-255	
0 = Matte Luminance NOP	IF_NULL
1-255 = matte luminance	

### Maestro applicability:

<key timing> is not supported in Maestro. <key shadow>, <matte hue>, <matte sat>, and <matte lum> are not presently supported.

The Saturn protocol query described above can only accommodate sources numbered from 1 to 255. If a Maestro command was used to set a video/audio source (which could be from 1 to 65535), the Saturn query will return a value of zero.

## SET\_MIX (Set mixer related parameters)

Since the SET\_AUDIO command allows modification of Saturn audio parameters on a per channel basis, the <audio\_bal> argument of SET\_MIX will be ignored. This parameter was never implemented and is not consistent with manual balance control, as it would affect all channels.

Hex definition	Mnemonic
E1	SET_MIX

### Command format:

SET\_MIX <mixer> <audio src> <key mix bus> <audio ratio> <unused>

### Query format:

READ SET\_MIX <mixer>

### Reply format:

IFRE SET\_MIX <mixer> <audio src> <key mix bus> <audio ratio> <unused>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<mixer> = 5, 6

Specifies the mixer affected by the command.

5 = Mixer 1	D_MIX1
6 = Mixer 2	D_MIX2

<audio src> = 00, 01-FF (hex, one byte)

Specifies the audio source to assign to the mixer, or report the current assignment on a reply.

00 = Audio source NOP IF\_NULL

01-FF = Input source numbers 1 through 255 (list sources with *autoXptSelectionShow* pROBE command).

<key mix bus> = 00, 40, 60, 70, 80, A0, C0 (hex, one byte)

Controls mix selection or reports on mix selection on a reply.

B7 = Must be set for key/mix selection and PST key/mix enable in commands. Indicates key/mix is on PST for replies.

B6 = Must be set for key/mix selection and PGM key/mix enable in commands. Indicates key/mix is on PGM for replies.

B5 = Indicates key is to be removed from busses indicated by B7 & B6. Don't care for replies.

B4-B0 = Reserved

<audio ratio> = 00, 01-FD, FE-FF (hex, one byte)

Specifies the audio ratio to *on all audio channels*, or reports the current ratio of *CHI/2* on a reply.

00 = Audio Ratio NOP IF\_NULL

01-FD= Audio ratio linearly corresponding to -18.0 dB through 18.0 dB. Mixer ratios change in 0.365 (3/8) dB

steps.

FE-FF= Audio ratio corresponding to +INF dB

<unused> = 00-FF (hex, one byte). Don't care about value.

### Maestro applicability:

<audio ratio> = 00-FF (hex, one byte)

Specifies the audio ratio to be applied *on all audio channels*, or reports the current ratio of *CHI/2* on a reply. Saturn audio ratio is -18.0 dB through 18.0 dB in 0.375 (3/8) dB steps where FE-FF is +INF dB. The Maestro range is from 0 dB to 24.0 dB in 0.1dB increments. The Range supported by this command is from 0 dB to 18.0 dB in 0.1 dB increments and 24.0 dB for INF. Maestro does not support negative (-) dB values. Maestro does not have +INF so +INF will result in the Maestro maximum of +24.0 dB.

00 = Audio Ratio NOP IF\_NULL

01-7F = Audio ratio set to 0 dB

80-FD = Audio ratio scaled to 0.1 dB through 18.0 dB in 0.1dB increments rounded to the lower whole 0.1 dB step.

FE-FF = Audio ratio set to 24.0 dB.

<key mix bus> = 00, 40, 60, 70, 80, A0, C0 (hex, one byte)

Commands: Enables/Disables the specified mixer on **all** Audio Groups.

Query: Indicates whether the specified mixer is enabled on **any** Audio Group.

The Saturn protocol query described above can only accommodate sources numbered from 1 to 255. If a Maestro command was used to set a video/audio source (which could be from 1 to 65535), the Saturn query will return a value of zero.

## **SWAP\_PGM (Swap primary and backup program inputs)**

Hex definition

Mnemonic

C3

SWAP\_PGM

### **Command format:**

SWAP\_PGM <backup bits>

### **Query format:**

Illegal

### **Reply format:**

None

### **Use applicable with UPDATE:**

No

### **Argument definitions:**

**<backup bits>**

B7 = Set for command to execute. Don't care replies.

B6-B2 = reserved

B1 = swap backup and primary video

B0 = swap backup and primary audio

### **Maestro applicability:**

Not Supported – Backup sources are not currently a requirement of Maestro

## SWAP\_PST (Swap primary and backup preset inputs)

Hex definition

Mnemonic

C2

SWAP\_PST

### Command format:

SWAP\_PST <backup bits>

### Query format:

Illegal

### Reply format:

None

### Use applicable with UPDATE:

No

### Argument definitions:

<backup bits>

B7 = Set for command to execute. Don't care replies.

B6-B2 = reserved

B1 = swap backup and primary video

B0 = swap backup and primary audio

### Maestro applicability:

Not Supported – Backup sources are not currently a requirement of Maestro



# TAKE\_XPT (Take crosspoint to a bus)

Hex definition

Mnemonic

7F

TAKE\_XPT

## Command format:

TAKE\_XPT &lt;bus&gt; &lt;video source&gt; &lt;audio source&gt; &lt;ign&gt; &lt;ign&gt;

## Query format:

READ TAKE\_XPT &lt;bus&gt;

## Reply format:

IFRE TAKE\_XPT &lt;bus&gt; &lt;video source&gt; &lt;audio source&gt; &lt;ign&gt; &lt;ign&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;bus&gt; = 0, 1-8

0 = Bus NOP	IF_NULL
1 = PGM	D_PGM
2 = PST	D_PST
3 = Backup PGM	D_BPGM
4 = Backup PST	D_BPST
5 = Mixer 1	D_MIX1
6 = Mixer 2	D_MIX2
7 = Keyer 1	D_KEY1
8 = Keyer 2	D_KEY2

&lt;video source&gt; = 0, 1-255

0 = video source NOP	IF_NULL
1-255 = Maps to the order of the Saturn input table.	
See "Comments" below for discussion of Saturn Input table.	

&lt;audio source&gt; = 0, 1-255

0 = audio source NOP	IF_NULL
1-255 = Maps to the order of the Saturn input table.	

&lt;ign&gt; = 0-255

Value ignored by Saturn.

## Maestro applicability:

As stated. <video source> contains the source associated with the Video level. <audio source> contains the source associated with all Audio Groups.

## TRAN\_PRESET (Preset distributed transition parameters)

This command allows all of Saturn's distributed transition parameters to be preset directly.

Hex definition	Mnemonic
E3	TRAN_PRESET

### Command format:

TRAN\_PRESET <board bits> <type> <rate> <rate SS:FF> <delay SS:FF> <black SS:FF>

### Query format:

READ TRAN\_PRESET <board bits>

### Reply format:

IFRE TRAN\_PRESET <board bits> <type> <rate> <rate SS:FF> <delay SS:FF> <black SS:FF>

Note: The response will contain a reply for each board requested in the <board bits> argument of the query, wrapped within a begin-end construct.

### Use applicable with UPDATE:

Yes

### Argument definitions:

<board bits> = 00-0F(hex, one byte)

Specifies the Saturn board affected by the command.

bit 7 - bit 4 = reserved

bit 3 = Audio 5/6 board (Mode 2-CH5 Mono, Mode 1-CH5/6 Stereo)

bit 2 = Audio 3/4 board (Mode 3-CH3 & CH4 Mono, Mode 1,2-CH3/4 Stereo)

bit 1 = Audio 1/2 board (All Modes-CH1/2 Stereo)

bit 0 = Video board

<type> = 0, 1-4

Specifies the transition type, or reports the current transition type on a reply.

0 = Transition type NOP

1 = Cross-fade

2 = Fade-cut

3 = Cut-fade

4 = Fade-fade

<rate> = 0, 1-5

Specifies the transition rate, or reports the current transition rate on a reply.

0 = Transition rate NOP

1 = Slow

2 = Medium

3 = Fast

4 = Cut

5 = Custom (used with <rate\_SS:FF> argument to specify transition rate)

**<rate SS:FF>** = <seconds> <frames>

Specifies the transition rate when <rate> = 5, or reports the current transition rate on a reply. See "<seconds>" and "<frames>" below.

**<delay SS:FF>** = <seconds> <frames>

Specifies the take delay, or reports the current take delay on a reply. See "<seconds>" and "<frames>" below.

**<black SS:FF>** = <seconds> <frames>

Specifies the black duration, or reports the current black duration on a reply. See "<seconds>" and "<frames>" below.

**<seconds>** = FF, 00-09 (hex, one byte)

FF = argument NOP, causes Saturn to ignore the contents of the <seconds> <frames> pair.

00-09 = Seconds representing 0:00 through 9:00.

**<frames>** = 00-1D (hex, one byte). Frames representing 0:00 through 0:29.

## Examples

Set all boards to Fade-fade, Slow, without disturbing the current Take delay or black duration:

STX 0A E3 0F 04 01 FF 00 FF 00 FF 00 <checksum>

Set up a custom transition rate of 9:29 on all boards, without disturbing the current type, Take delay or black duration:

STX 0A E3 0F 00 05 09 1D FF 00 FF 00 <checksum>

Set up a 1:00 Fade-cut transition, with a black duration of 0:14, on all boards. This produces an event which fades to black in 0:08, remains in black for 0:22, then cuts to the new source:

STX 0A E3 0F 02 05 01 00 00 00 00 0E <checksum>

Set up a medium rate mixed transition, with Fade-fade on video, and Cross-fade on audio:

STX 0A E3 01 04 02 FF 00 FF 00 FF 00 <checksum>

STX 0A E3 06 01 02 FF 00 FF 00 FF 00 <checksum>

Set up an audio seque, where all boards are set up to do a Cross-fade, 1:00 in duration, but audio "leads" video by 0:15 (audio from both sources would be mixed in equally before the video would begin mixing. The total time to complete the transition is  $1:00 + 0:15 = 1:15$ ):

STX 0A E3 01 01 05 01 00 00 0F 00 00 <checksum>

STX 0A E3 06 01 05 01 00 00 00 00 00 <checksum>

Request the current transition settings on the Saturn video board:

STX 03 READ E3 01 <checksum>

REPLY: STX 0B IFRE E3 01 04 04 00 00 00 00 00 00 <checksum>

(video board is set to Fade-fade, at Cut rate, 0:00 actual rate)

Request the current transition settings on all boards (only two boards exist in the system):

STX 03 READ E3 0F <checksum>

REPLY: STX 19 RGBN

IFRE E3 01 04 04 00 00 00 00 00 00 00 (Video: Fade-fade, Cut, 0:00 all else)

IFRE E3 02 03 03 00 0F 00 00 00 00 00 (Audio 1/2: Cut-fade, Fast, 0:15 rate)

REND <checksum>

## **Maestro applicability:**

Argument definitions:

**<board bits>** = 00-0F (hex, one byte)

Specifies the Maestro groups affected by the command.

bit 7 - bit 2 = Reserved

bit 1 = All audio groups

bit 0 = Video

Reply format:

The response will contain a reply for the Video Group and/or All Audio Groups requested in the <board bits> argument of the query, wrapped within a begin-end construct.

Notes:

If the Transition Duration is 0 then **<type>** in the reply will be “4 = Fade-Fade” since the system cannot resolve this case.

## TX\_STAT (query transition status)

Hex definition

45

Mnemonic

TX\_STAT

### Command format:

Illegal

### Query format:

READ TX\_STAT

### Reply format:

IFRE TX\_STAT <trans status>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<trans status> = 2-5

2 = Quiescent

3 = Prerolling

4 = Transitioning

5 = In Black

TS\_Q

TS\_PROL

TS\_TRAN

TS\_BLK

### Maestro applicability:

As stated

# TX\_TRIG (Transition trigger)

Hex definition	Mnemonic
44	TX_TRIG

**Command format:**

TX\_TRIG <trigger bits>

**Query format:**

Illegal

**Reply format:**

None

**Use applicable with UPDATE:**

No

**Argument definitions:**

<trigger bits>	
B7 = Trigger Enable	VX_TRIG
B6 = Inhibit Preroll	NO_PROL
B5 - B0 = reserved	

**Maestro applicability:**

As stated

## VID\_1KEY (Set Key 1 source and parameters)

Hex definition

Mnemonic

4A

VID\_1KEY

### Command format:

VID\_1KEY <key type> <key mod> <ign> <matte mod>

### Query format:

READ VID\_1KEY

### Reply format:

IFRE VID\_1KEY <key type> <key mod> <ign> <matte mod>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<key type> = 0, 3, 5, 6

0 = Key Type NOP	IF_NULL
3 = Self Key	K_SELF
5 = External Key	K_EXT
6 = Chroma Key (not used by Saturn)	

<key mod> = 0, 1, 2, 8

0 = Key Modifier NOP	IF_NULL
1 = Normal	KSNORM
2 = Shadow	KSSHAD
8 = Border (not used by Saturn)	

<ign> = 0-255

Value ignored by Saturn.

<matte mod> = 0, 2-3

0 = Key Matte NOP	IF_NULL
2 = Matte Off	IF_OFF
3 = Matte On	IF_ON

### Maestro applicability:

<key mod> 2 (Shadow) not presently supported.



# VID\_2KEY (Set Key 2 source and parameters)

Hex definition

Mnemonic

4E

VID\_2KEY

## Command format:

VID\_2KEY &lt;key type&gt; &lt;key mod&gt; &lt;key shadow&gt; &lt;matte mod&gt; &lt;invert mod&gt; &lt;ign&gt; &lt;cksum&gt;

## Query format:

READ VID\_2KEY

## Reply format:

IFRE VID\_2KEY &lt;key type&gt; &lt;key mod&gt; &lt;key shadow&gt; &lt;matte mod&gt; &lt;invert mod&gt; &lt;ign&gt; &lt;cksum&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;key type&gt; = 0, 3, 5, 6

0 = Key Type NOP	IF_NULL
3 = Self Key	K_SELF
5 = External Key	K_EXT
6 = Chroma Key (not used by Saturn)	

&lt;key mod&gt; = 0, 1, 2, 8

0 = Key Modifier NOP	IF_NULL
1 = Normal	KSNORM
2 = Shadow	KSSHAD
8 = Border (not used by Saturn)	

&lt;key shadow&gt; = 0-3 Key Shadow Depth

&lt;matte mod&gt; = 0, 2-3

0 = Key Matte NOP	IF_NULL
2 = Matte Off	IF_OFF
3 = Matte On	IF_ON

&lt;invert mod&gt; = 0, 2, 3

0 = Key Invert NOP	IF_NULL
2 = Invert Off	IF_OFF
3 = Invert On	IF_ON

&lt;ign&gt; = 0-255

Value ignored by Saturn.

## Maestro applicability:

As stated

## VID\_BPSET (Backup video preset bus Take)

Hex definition

Mnemonic

C0

VID\_BPSET

### Command format:

VID\_BPSET <video source> <ign>

### Query format:

READ VID\_BPSET

### Reply format:

IFRE VID\_BPSET <video source> <ign>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<video source> = 0, 1-255

0 = video source NOP

IF\_NULL

1-255 = Maps to the order of the Saturn input table.

See "Comments" below for discussion of Saturn Input table.

<ign> = 0-255

Value ignored by Saturn.

### Maestro applicability:

Not Supported – Backup sources are not currently a requirement of Maestro

## VID\_MODE (Transition mode select)

Hex definition

Mnemonic

4C

VID\_MODE

### Command format:

VID\_MODE &lt;transition&gt;

### Query format:

READ VID\_MODE

### Reply format:

IFRE VID\_MODE &lt;transition&gt;

### Use applicable with UPDATE:

Yes (NOTE: A "Cut" to Saturn is a rate change, NOT a mode change. Therefore, the UPDATE response to setting the VID\_MODE to XTAKE will be a VID\_RATE response with the <seconds> bytes indicating the duration of the "Cut" as configured in the Saturn Master Control Description table of the Configuration Editor.)

### Argument definitions:

&lt;transition&gt; = 0, 1-8

0 = Transition Type NOP	IF_NULL
1 = Cut	XTAKE
2 = Mix	XMIX
3 - 5 = reserved	
6 = Fade-Fade	XVFADE
7 = Cut-Fade	XCFADE
8 = Fade-Cut	XFADEC

### Maestro applicability:

As stated

## VID\_PSET (Video preset bus Take)

Hex definition

Mnemonic

48

VID\_PSET

### Command format:

VID\_PSET <video source> <ign>

### Query format:

READ VID\_PSET

### Reply format:

IFRE VID\_PSET <video source> <ign>

**Use applicable with UPDATE:** Yes

### Argument definitions:

<video source> = 0, 1-255

0 = video source NOP

IF\_NULL

1-255 = Maps to the order of the Saturn input table.

See Item on page for discussion of Saturn Input table.

<ign> = 0-255

Value ignored by Saturn.

### Maestro applicability:

As stated

## VID\_RATE (Transition rate (command))

Hex definition

Mnemonic

4D

VID\_RATE

### Command format:

VID\_RATE &lt;trans rate&gt;

### Query format:

READ VID\_RATE

### Reply format:

IFRE VID\_RATE &lt;trans rate&gt; &lt;value SS.TT&gt;

**Use applicable with UPDATE:** No

### Argument definitions:

&lt;trans rate&gt; = 0, 1-3

0 = Transition Rate NOP	IF_NULL
1 = Slow	RATES
2 = Medium	RATEM
3 = Fast	RATEF

&lt;value SS.TT&gt; = &lt;seconds&gt; &lt;tenths of seconds&gt;

Specifies the transition duration in seconds and tenths of seconds.

&lt;seconds&gt; = 00-09 (hex, one byte)

00-09 = Seconds representing 0:00 through 9:00

&lt;tenths of seconds&gt; = 00-09 (hex, one byte)

00-09 = Tenths of seconds representing 0.0 through 0.9

### Maestro applicability:

As stated

## VID\_RATE (Transition rate [query])

Hex definition

Mnemonic

4D

VID\_RATE

### Command format:

Illegal

### Query format:

READ VID\_RATE

### Reply format:

IFRE VID\_RATE <trans rate> <seconds>

**Use applicable with UPDATE:** Yes (NOTE: A "Cut" to Saturn is a rate change, NOT a mode change. Therefore, the UPDATE response to setting the VID\_MODE to XTAKE will be a VID\_RATE response with the <seconds> bytes indicating the duration of the "Cut" as configured in the Saturn Master Control Description table of the Configuration Editor.)

### Argument definitions:

<trans rate> = 0, 1-3

0 = Transition Rate NOP	IF_NULL
1 = Slow	RATES
2 = Medium	RATEM
3 = Fast	RATEF

<seconds> = 0-9, 0-9 secs:tenths (two bytes)

### Maestro applicability:

As stated

## VID\_SYNC (Video sync status)

Hex definition

Mnemonic

49

VID\_SYNC

### Command format:

Illegal

### Query format:

READ VID\_SYNC

### Reply format:

IFRE VID\_SYNC <sync bits>

**Use applicable with UPDATE:** No

### Argument definitions:

<sync bits>

B7 = PST & Internal Black in sync

B6 = PST & KEY in sync

B5 = PGM & PST in sync

B4 = PGM & KEY in sync

B3 = PGM video present

B2 = PST video present

B1 = reserved

B0 = reserved

### Maestro applicability:

As stated





# *Definition of Extended Maestro Commands*

## **Introduction**

The Maestro Automation Extensions to the Saturn ES serial protocol will be accessed through the Virtual Machine Type-Specific Subset Extension Keyword (0xFF, Mnemonic: ESMC\_MAESTRO\_EXT) capability of the ES protocol. The extended Maestro Automation commands, their parameters and functionality, are defined as follows.

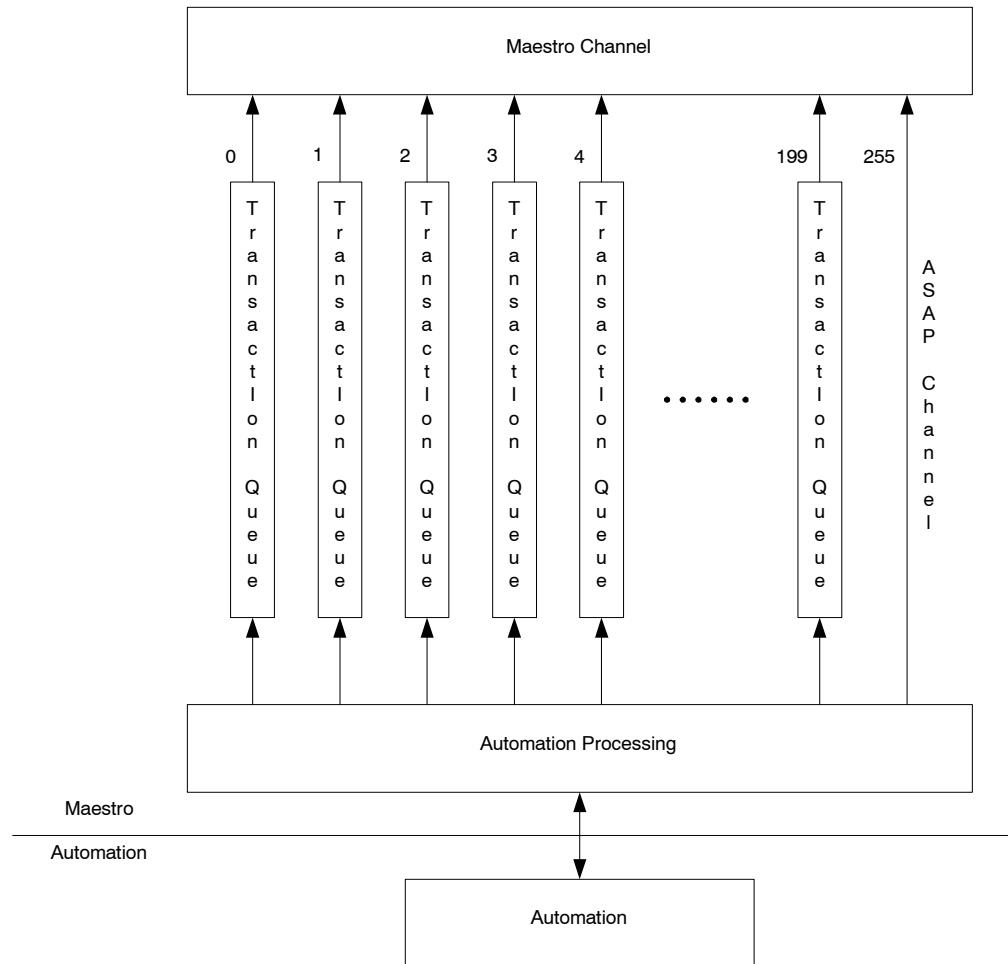
All Maestro Extended commands are preceded by the transaction queue in which it is to be placed. Refer to **Sequential Transaction Queues Theory of Operation**.

**CAUTION** Using a mix of new Maestro commands (as described in this section) and Saturn legacy commands (as described in the previous section) is not encouraged. Certain combinations of Maestro/Saturn commands are not compatible and may cause unpredictable results. For example, since a Maestro command can set a video/audio source from 1 to 65535, but a subsequent Saturn protocol query can only accommodate sources numbered from 1 to 255, the Saturn query will return a value of zero.

## Sequential Transaction Queues Theory of Operation

In order to provide the means for execution of Maestro specific automation commands in a successive manner, the following is implemented. It is desired that an automation system have the ability to specify that a group of commands be executed in a successive manner and only after the previously issued command in the sequence has completed.

Figure 1.



255 Transaction Queues (0-199 are available for use by automation, 200-254 are reserved for internal use) will be created that will allow an automation vendor to specify which queue a command message will be placed. Providing multiple queues allows an automation system to set up multiple unrelated command sequences that will then be executed in parallel to minimize the latency. All command messages within a queue will be executed in a successive manner. In addition to the Sequential Transaction Queues (0-254), an ASAP channel (with an identifier of 255) will exist that will provide a channel for the execution of ALL existing Saturn Automation commands and can be specified as the Transaction

Queue in the Maestro Automation commands to facilitate immediate execution of commands with no regard for execution of other command messages. **Transaction Queues (200-254) are reserved for internal use (e.g. break down and convert Legacy Commands such as Set Key, Set Mix etc. into Transaction Queues so that they are processed correctly).** Any command messages using Transactions Queues 200-254 will not be executed and an error message will be generated.

Transaction Queues will be processed on a field basis. First, system events will be processed to remove and report any completed or failed commands from the queues. Then, the subsequent command in any pending queues will be executed.

If a command in a Transaction Queue fails and no TransactionQueueBegin command has been received for that queue, all subsequent commands pending in that Transaction Queue will not be executed and will be reported as failed.

If a command in a Transaction Queue fails and a TransactionQueueBegin command has been received for that queue, all subsequent commands pending in that Transaction Queue and any additional commands received utilizing that transaction queue will not be executed and will be reported as failed until a TransactionQueueEnd command is encountered for that Transaction Queue. It is recommended that TransactionQueueBegin and TransactionQueueEnd commands be used by automation vendors to demarcate a set of commands comprising a transaction as this prevents the situation where: 1) a sequence of commands are in the process of being communicated to be placed into a TransactionQueue, 2) A command in the Transaction Queue fails, 3) All remaining pending commands in that queue are marked as failed and removed from the transaction queue, and 4) Subsequent commands in the transaction are received and acted upon as though they are a new transaction. If one were to use TransactionQueueBegin and TransactionQueueEnd in this situation, if a failure occurred after a TransactionQueueBegin had been encountered, all subsequent commands either pending in the queue or received via the communication channel would be marked as failed and not executed until a TransactionQueueEnd command for that Transaction Queue was encountered. It is recommended that unrelated or independent commands be placed in separate transaction queues to prevent deletion of unrelated commands in the event of failure.

# Packet Format Summary

## Legacy

Legacy Command Packet:

<STX> <LEN> <CMD> <DATA> <CHKSUM>

Legacy Query Packet:

<STX> <LEN> <READ> <CMD> <DATA> <CHKSUM>

Legacy Query Reply Packet:

<STX> <LEN> <IFRE> <CMD> <DATA> <CHKSUM>

## Maestro

<TransactionQueue> <Command ID> All Maestro Extended commands are preceded by the Transaction Queue (1 hex byte) in which it is to be placed and the Command ID (2 hex bytes, MSB first).

<PREAMBLE> is used to indicate the following:

<0xFF> <TRANSACTION QUEUE> <COMMAND ID>

Maestro Extension Command Packet:

<STX> <LEN> <PREAMBLE> <CMD> <DATA> <CHKSUM>

Maestro Extension Query Packet:

<STX> <LEN> <READ> <PREAMBLE> <CMD> <DATA> <CHKSUM>

Maestro Extension Query Reply Packet:

<STX> <LEN> <IFRE> <PREAMBLE> <CMD> <DATA> <CHKSUM>

# Extended Maestro Commands Summary

## Audio Mixer

MAESTRO\_AUDIO\_MIXER\_CHANNEL\_DEFAULT\_MAPPING <audioMixer>  
 MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING <audioMixer> <(Input) groupMask> <(Output) groupMask>  
 MAESTRO\_AUDIO\_MIXER\_CHANNEL\_UNMAPPING <audioMixer> <(Output) groupMask>  
 MAESTRO\_AUDIO\_MIXER\_SELECT <audioMixer> <groupMask> <select> <destInputBus>  
 MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST <audioMixer> <source> <groupMask>  
 MAESTRO\_AUDIO\_MIXER\_RATIO <audioMixer> <destInputBus> <groupMask> <audioMixerRatio>

Note: Video in <groupMask> is ignored for audio only commands.

## Background

MAESTRO\_BACKGROUND\_AUDIO\_BALANCE <destInputBus><groupMask> <audioBalance>  
 MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_DEFAULT\_MAPPING <destInputBus>  
 MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_MAPPING <destInputBus> <source> <(Input)groupMask> <(Output) groupMask>  
 MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_UNMAPPING <destInputBus> <(Output) groupMask>  
 MAESTRO\_BACKGROUND\_AUDIO\_GAIN <destInputBus><groupMask> <audioGain>  
 MAESTRO\_BACKGROUND\_SELECT <source> <destInputBus> <groupMask>  
 MAESTRO\_BACKGROUND\_STEREO\_MODE <destInputBus> <groupMask> <stereoMode>

Note: Video in <groupMask> is ignored for audio only commands.

## Channel

MAESTRO\_DISABLE\_AUTOMATION

## DVE

MAESTRO\_DVEFFECT <effectID> <effectAction> <audioMode>  
 MAESTRO\_DVEFFECT\_SELECT <select>  
 MAESTRO\_DVEFFECT <effectID> <effectAction> <audioMode>  
 MAESTRO\_DVEFFECT\_STATE

## Keyer

MAESTRO\_KEYER\_CLIP <keyer> <clip>  
MAESTRO\_KEYER\_FILL\_MODE <keyer> <keyFillMode>  
MAESTRO\_KEYER\_GAIN <keyer> <keyerGain>  
MAESTRO\_KEYER\_HOLE\_CUT\_MODE <keyer> <keyHoleCutMode>  
MAESTRO\_KEYER\_INVERT\_MODE <keyer> <keyInvertMode>  
MAESTRO\_KEYER\_SELECT <keyer> <select> <destInputBus>  
MAESTRO\_KEYER\_SHADOW\_MODE <keyer> <keyShadowMode>  
MAESTRO\_KEYER\_SOURCE\_REQUEST <keyer> <fillSource> <cutSource>

## Transaction Queue

MAESTRO\_TRANSACTION\_BEGIN  
MAESTRO\_TRANSACTION\_END  
MAESTRO\_TRANSACTION\_QUEUE\_STATUS  
MAESTRO\_TRANSACTION\_QUEUE\_PURGE  
MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID <aec>  
MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET <offOn>

## Transition

MAESTRO\_MASTER\_FADE\_BLACK <fadeState>  
MAESTRO\_TAKE <requestedTransitionTimecode>  
MAESTRO\_TAKE\_BLACK <toFrom> <requestedTransitionTimecode>  
MAESTRO\_TRANSITION\_NEXT <transitionNextBitsCommand>  
MAESTRO\_TRANSITION\_RATE <transitionRate><transitionRate SS:FF><blackDuration SS:FF>  
MAESTRO\_TRANSITION\_STATE  
MAESTRO\_TRANSITION\_TYPE <transitionType>  
MAESTRO\_TRANSITION\_TYPE\_CUSTOM <videoTransitionType> <videoTransitionDelay SS:FF>  
    <videoTransitionFromOld SS:FF> <videoTransitionblack SS:FF> <reserved 2 Bytes> <videoTransiti-  
    onToNew SS:FF> <audioTransitionType> <audioTransitionDelay SS:FF> <audioTransitionFromOld  
    SS:FF> <audioTransitionSilent SS:FF> <reserved 2 Bytes> <audioTransitionToNew SS:FF>  
MAESTRO\_WIPE\_SELECT> <select>  
MAESTRO\_WIPE\_STATE>  
MAESTRO\_WIPE\_TYPE <wipeType>

# MAESTRO CERR (0x29) EXEC CODES

## 29 CERR (ERROR)

CERR indicates that the command string was not processed. EXEC CODES 0x10 and 0x20 are additions for Maestro.

Format:	<ERROR>	
	<EXEC CODE>	8-bits:
	00	- Parse error
	01	- Cannot do by design
	02	- Insufficiently equipped
	03	- Buffer overflow
	04	- Invalid keyword
	05	- Invalid keyword argument
	10	- Transaction Queue Full
	20	- Internal Processing Error
	FF	- PROTECT (not used by Maestro, used by Jupiter)
	<BYTE COUNT>	8-bits, not including the byte count
	<OFFENDING STRING>	Truncated not to exceed an overall ERROR message length of 256 bytes.

Note: “20 – Internal Processing Errors” includes failures such as an error returned from a vxWorks commands (e.g. msgQSend). Logging will include more details of the exact error encountered. These types of errors should rarely occur.

## MAESTRO CEXT (0x3F) Common Extension

When using the Common Extension command UPDATE (0x07), Extended Maestro Commands are specified within the UPDATE command by indicating the Extension Command (0xFF) followed by the desired Extended Maestro Command. For example:

02	STX
08	Byte count
3F	Common Message Extension
07	UPDATE
01	<b>RBGN</b>
FF	Extension
40	MAESTRO_TRANSITION_TYPE
FF	Extension
41	MAESTRO_TRANSITION_RATE
02	<b>REND</b>
CS	Checksum

This would activate UPDATE for MAESTRO\_TRANSITION\_TYPE and MAESTRO\_TRANSITION\_RATE. The RBGN/REND is necessary since this example selects more than one command for updates.

The MUTE command would switch off all responses (Legacy and/or Maestro).



# MAESTRO\_AUDIO\_MIXER\_CHANNEL\_DEFAULT\_MAPPING

## Hex definition

0x24

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_CHANNEL\_DEFAULT\_MAPPING

## Command format:

<PREAMBLE><MAESTRO\_AUDIO\_MIXER\_CHANNEL\_DEFAULT\_MAPPING><audioMixer>

## Query format: N/A

## Reply format: N/A

## Use applicable with UPDATE:

No. Mapping UPDATES are all controlled by the Maestro Audio Mixer Channel Mapping command. See that command for details.

## Argument definitions:

<audioMixer> = 1-4

1 = Audio Mixer 1

2 = Audio Mixer 2

3 = Audio Mixer 3

4 = Audio Mixer 4

AUDIO\_MIXER1

AUDIO\_MIXER2

AUDIO\_MIXER3

AUDIO\_MIXER4

## Notes:

Since there are not independent Audio Mixer inputs for Pgm and Pst, Audio Mixer Channel Mapping on Pgm and Pst is NOT independent of the other. Therefore, Audio Mixer Channel Mapping changes **always** affect BOTH Pgm and Pst buses. This is consistent with other Audio Mixer parameters such as Stereo Mode, Gain, and Balance.

# MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING

## Hex definition

0x22

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING

## Command format:

<PREAMBLE><MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING><audioMixer> <(Input) groupMask> <(Output) groupMask>

## Query format:

READ<PREAMBLE><MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING> <audioMixer> <(Output)groupMask>

Note: A query with all groupMask bytes set to 0xFF returns mapping information for all Output Groups.

## Reply format:

IFRE<PREAMBLE><MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING><audioMixer> <(Input)groupMask> <(Output)groupMask>

## Use applicable with UPDATE:

YES

Note: Updates for the related Audio Mixer channel mapping commands are all controlled by setting this UPDATE to YES/NO. I.e., if UPDATE is set to YES then updates can/will result from updates to any of the following events:

MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING  
MAESTRO\_AUDIO\_MIXER\_CHANNEL\_UNMAPPING  
MAESTRO\_AUDIO\_MIXER\_CHANNEL\_DEFAULT\_MAPPING

## Argument definitions:

<audioMixer> = 1-4

1 = Audio Mixer 1	AUDIO_MIXER1
2 = Audio Mixer 2	AUDIO_MIXER2
3 = Audio Mixer 3	AUDIO_MIXER3
4 = Audio Mixer 4	AUDIO_MIXER4

<(input/output) groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO VIDEOGROUP

1 = Audio Group 1	AUDIOGROUP1
2 = Audio Group 2	AUDIOGROUP2
...	
15 = Audio Group 15	AUDIOGROUP15
16 = Audio Group 16	AUDIOGROUP16

Notes:

Since there are not independent Audio Mixer inputs for Pgm and Pst, Audio Mixer Channel Mapping on Pgm and Pst is NOT independent of the other. Therefore, Audio Mixer Channel Mapping changes **always** affect BOTH Pgm and Pst buses. This is consistent with other Audio Mixer parameters such as Stereo Mode, Gain, and Balance.

Mapping is one to one or one to many. Only a single group can be specified in the input groupMask.

# MAESTRO\_AUDIO\_MIXER\_CHANNEL\_UNMAPPING

## Hex definition

0x23

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_CHANNEL\_UNMAPPING

## Command format:

&lt;PREAMBLE&gt;&lt;MAESTRO\_AUDIO\_MIXER\_CHANNEL\_UNMAPPING&gt;&lt;audioMixer&gt; &lt;(Output) groupMask&gt;

## Query format: N/A

## Reply format: N/A

## Use applicable with UPDATE:

No. Mapping UPDATES are all controlled by the Maestro Audio Mixer Channel Mapping command. See that command for details.

## Argument definitions:

&lt;audioMixer&gt; = 1-4

1 = Audio Mixer 1

2 = Audio Mixer 2

3 = Audio Mixer 3

4 = Audio Mixer 4

AUDIO\_MIXER1

AUDIO\_MIXER2

AUDIO\_MIXER3

AUDIO\_MIXER4

&lt;(output) groupMask&gt; = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO

1 = Audio Group 1

2 = Audio Group 2

...

15 = Audio Group 15

16 = Audio Group 16

VIDEOGROUP

AUDIOGROUP1

AUDIOGROUP2

AUDIOGROUP15

AUDIOGROUP16

## Notes:

Since there are not independent Audio Mixer inputs for Pgm and Pst, Audio Mixer Channel Mapping on Pgm and Pst is NOT independent of the other. Therefore, Audio Mixer Channel Mapping changes **always** affect BOTH Pgm and Pst buses. This is consistent with other Audio Mixer parameters such as Stereo Mode, Gain, and Balance.

# MAESTRO\_AUDIO\_MIXER\_SELECT

## Hex definition

0x20

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_SELECT

## Command format:

<PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SELECT <audioMixer> <groupMask> <select> <destInputBus>

## Query format:

READ <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SELECT <audioMixer> <groupMask> <destInputBus>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SELECT <audioMixer> <groupMask> <select> <destInputBus>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<audioMixer> = 1-4

1 = Audio Mixer 1	AUDIO_MIXER_01
2 = Audio Mixer 2	AUDIO_MIXER_02
3 = Audio Mixer 3	AUDIO_MIXER_03
4 = Audio Mixer 4	AUDIO_MIXER_04

<groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO	VIDEOGROUP
1 = Audio Group 1	AUDIOGROUP1
2 = Audio Group 2	AUDIOGROUP2
...	
15 = Audio Group 15	AUDIOGROUP15
16 = Audio Group 16	AUDIOGROUP16

<select> = 0-1

0 = Unselect	MAESTRO_UNSELECT
1 = Select	MAESTRO_SELECT

<destInputBus> =

0 = Preset	IB_PRESET
1 = Program	IB_PROGRAM

# MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST (Take Crosspoint to a Mixer)

## Hex definition

60

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST

## Command format:

<PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST <audioMixer><source><groupMask>

## Command notes:

If a Mixer is selected on Program or Preset, attempting to assign a different source will not be allowed and will fail.

## Query format:

READ <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST <audioMixer>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST <audioMixer><source><groupMask>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<audioMixer> = 1-4

1 = Audio Mixer 1	AUDIO_MIXER_01
2 = Audio Mixer 2	AUDIO_MIXER_02
3 = Audio Mixer 3	AUDIO_MIXER_03
4 = Audio Mixer 4	AUDIO_MIXER_04

<source> = (2 bytes, MSB first) automation input 1-65535 or 0 to Unassign source

<groupMask> = 4 bytes (Most Significant Bit first)

Bit	0 = VIDEO	VIDEOGROUP
	1 = Audio Group 1	AUDIOGROUP1
	2 = Audio Group 2	AUDIOGROUP2
	...	
	15 = Audio Group 15	AUDIOGROUP15
	16 = Audio Group 16	AUDIOGROUP16

# MAESTRO\_AUDIO\_MIXER\_RATIO

## Hex definition

0x21

## Mnemonic

MAESTRO\_AUDIO\_MIXER\_RATIO

## Command format:

<PREAMBLE> MAESTRO\_AUDIO\_MIXER\_RATIO <AudioMixer> <destInputBus> <groupMask> <audioMixerRatio>

## Query format:

READ <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_RATIO <AudioMixer> <destInputBus> <groupMask>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_AUDIO\_MIXER\_RATIO <AudioMixer> <destInputBus> <groupMask>  
<audioMixerRatio>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<destInputBus> = 0-1

0 = Preset

IB\_PRESET

1 = Program

IB\_PROGRAM

<AudioMixer> = 1-4

1= Audio Mixer 1

AUDIO\_MIXER1

2= Audio Mixer 2

AUDIO\_MIXER2

3= Audio Mixer 3

AUDIO\_MIXER3

4 = Audio Mixer 4

AUDIO\_MIXER4

<groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO

VIDEOGROUP

1 = Audio Group 1

AUDIOGROUP1

2 = Audio Group 2

AUDIOGROUP2

...

15 = Audio Group 15

AUDIOGROUP15

16 = Audio Group 16

AUDIOGROUP16

<audioMixerRatio> = 0-0xF0 (1 hex byte). The range is from 0-0xF0 which corresponds to 0 dB to 24.0 dB in 0.1 dB increments.

# MAESTRO\_BACKGROUND\_AUDIO\_BALANCE

## Hex definition

0x12

## Mnemonic

MAESTRO\_BACKGROUND\_AUDIO\_BALANCE

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_AUDIO\_BALANCE &lt;destInputBus&gt; &lt;groupMask&gt; &lt;audioBalance&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_AUDIO\_BALANCE &lt;destInputBus&gt; &lt;groupMask&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_AUDIO\_BALANCE &lt;destInputBus&gt; &lt;groupMask&gt; &lt;audioBalance&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;destInputBus&gt; = 0-2

0 = Preset	IB_PRESET
1 = Program	IB_PROGRAM
2 = Auxiliary	IB_AUXILIARY

&lt;groupMask&gt; = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO	VIDEOGROUP
1 = Audio Group 1	AUDIOGROUP1
2 = Audio Group 2	AUDIOGROUP2
...	
15 = Audio Group 15	AUDIOGROUP15
16 = Audio Group 16	AUDIOGROUP16

<audioBalance> = 0-0xF0 (1 hex byte). The range is from 0-0xF0 which corresponds to 12 dB Left to 12 dB Right in 0.1 dB increments.

# MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_DEFAULT\_MAPPING

## Hex definition

0x16

## Mnemonic

MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_DEFAULT\_MAPPING

## Command format:

<PREAMBLE><MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_DEFAULT\_MAPPING> <destInputBus>

## Query format: N/A

## Reply format: N/A

## Use applicable with UPDATE:

No. Mapping UPDATES are all controlled by the Maestro Background Audio Channel Mapping command. See that command for details.

## Argument definitions:

<destInputBus> = 0-2

0 = Preset

1 = Program

2 = Auxiliary

IB\_PRESET

IB\_PROGRAM

IB\_AUXILIARY



# MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_MAPPING

## Hex definition

0x14

## Mnemonic

MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_MAPPING

## Command format:

```
<PREAMBLE><MAESTRO_BACKGROUND_AUDIO_CHANNEL_MAPPING> <destInputBus> <source>
<(Input)groupMask> <(Output) groupMask>
```

## Query format:

```
READ<PREAMBLE><MAESTRO_BACKGROUND_AUDIO_CHANNEL_MAPPING> <destInputBus><(Out-
put)groupMask>
```

Note: A query with all groupMask bytes set to 0xFF returns mapping information for all Output Groups.

## Reply format:

```
IFRE<PREAMBLE><MAESTRO_BACKGROUND_AUDIO_CHANNEL_MAPPING> <destInputBus><source>
<(Input)groupMask> <( Output)groupMask>
```

## Use applicable with UPDATE:

Yes

Note: Updates for the related Background Audio channel mapping commands are all controlled by setting this UPDATE to YES/NO. I.e., if UPDATE is set to YES then updates can/will result from updates to any of the following events:

```
MAESTRO_BACKGROUND_AUDIO_CHANNEL_MAPPING
MAESTRO_BACKGROUND_AUDIO_CHANNEL_UNMAPPING
MAESTRO_BACKGROUND_AUDIO_CHANNEL_DEFAULT_MAPPING
```

## Argument definitions:

<destInputBus> = 0-2

0 = Preset

IB\_PRESET

1 = Program

IB\_PROGRAM

2 = Auxiliary

IB\_AUXILIARY

<source> = (2 bytes, MSB first) automation input 1-65535

<(input/output) groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO

VIDEO-

GROUP

1 = Audio Group 1

AUDIOGROUP1

2 = Audio Group 2

AUDIOGROUP2

...

15 = Audio Group 15

AUDIOGROUP15

16 = Audio Group 16

AUDIOGROUP16

Notes:

Mapping is one to one or one to many. Only a single group can be specified in the input groupMask.

The VIDEO group cannot be mapped.

Command will Assign, Select and Map as necessary.

# MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_UNMAPPING

Hex definition	Mnemonic
0x15	MAESTRO_BACKGROUND_AUDIO_CHANNEL_UNMAPPING

**Command format:**

<PREAMBLE><MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_UNMAPPING> <destInputBus> <(Output) groupMask>

**Query format: N/A**

**Reply format: N/A**

**Use applicable with UPDATE:**

No. Mapping UPDATES are all controlled by the Maestro Background Audio Channel Mapping command. See that command for details.

**Argument definitions:**

<destInputBus> = 0-2		
0 = Preset		IB_PRESET
1 = Program		IB_PROGRAM
2 = Auxiliary		IB_AUXILIARY
<(Output) groupMask> = 4 bytes (Most Significant Bit first)		
Bit 0 = VIDEO		VIDEOGROUP
	1 = Audio Group 1	AUDIOGROUP1
	2 = Audio Group 2	AUDIOGROUP2
	...	
	15 = Audio Group 15	AUDIOGROUP15
	16 = Audio Group 16	AUDIOGROUP16

## MAESTRO\_BACKGROUND\_AUDIO\_GAIN

### Hex definition

0x11

### Mnemonic

MAESTRO\_BACKGROUND\_AUDIO\_GAIN

### Command format:

<PREAMBLE> MAESTRO\_BACKGROUND\_AUDIO\_GAIN <destInputBus> <groupMask > <audioGain>

### Query format:

READ <PREAMBLE> MAESTRO\_BACKGROUND\_AUDIO\_GAIN <destInputBus> <groupMask>

### Reply format:

IFRE <PREAMBLE> MAESTRO\_BACKGROUND\_AUDIO\_GAIN <destInputBus> <groupMask> <audioGain>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<destInputBus> = 0-2

0 = Preset

1 = Program

2 = Auxiliary

IB\_PRESET

IB\_PROGRAM

IB\_AUXILIARY

<groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO

1 = Audio Group 1

2 = Audio Group 2

...

15 = Audio Group 15

16 = Audio Group 16

VIDEOGROUP

AUDIOGROUP1

AUDIOGROUP2

AUDIOGROUP15

AUDIOGROUP16

<audioGain> = 0-0x1FE (2 hex bytes, MSB first). The range is from 0-0x1FE which corresponds to -24 dB to +24 dB in 0.1 dB increments.

# MAESTRO\_BACKGROUND\_SELECT

## Hex definition

0x10

## Mnemonic

MAESTRO\_BACKGROUND\_SELECT

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_SELECT &lt;source&gt; &lt;destInputBus&gt; &lt;groupMask&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_SELECT &lt;destInputBus&gt; &lt;groupMask&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_BACKGROUND\_SELECT &lt;source&gt; &lt;destInputBus&gt; &lt;groupMask&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;source&gt; = (2 bytes, MSB first) automation input 1-65535

&lt;destInputBus&gt; = 0-2

0 = Preset	IB_PRESET
1 = Program	IB_PROGRAM
2 = Auxiliary	IB_AUXILIARY

&lt;groupMask&gt; = 4 bytes (Most Significant Bit first)

Bit	0 = VIDEO	VIDEOGROUP
	1 = Audio Group 1	AUDIOGROUP1
	2 = Audio Group 2	AUDIOGROUP2
	...	
	15 = Audio Group 15	AUDIOGROUP15
	16 = Audio Group 16	AUDIOGROUP16

Note: Unless one desires a breakaway, the <groupMask> must always be set to “FF FF FF FF” (i.e., all four hex bytes set to 0xFF).

# MAESTRO\_BACKGROUND\_STEREO\_MODE

## Hex definition

0x13

## Mnemonic

MAESTRO\_BACKGROUND\_STEREO\_MODE

## Command format:

<PREAMBLE> MAESTRO\_BACKGROUND\_STEREO\_MODE <destInputBus> <groupMask> <stereoMode>

## Query format:

READ <PREAMBLE> MAESTRO\_BACKGROUND\_STEREO\_MODE <destInputBus> <groupMask>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_BACKGROUND\_STEREO\_MODE <destInputBus> <groupMask> <stereoMode>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<destInputBus> = 0-2

0 = Preset	IB_PRESET
1 = Program	IB_PROGRAM
2 = Auxiliary	IB_AUXILIARY

<groupMask> = 4 bytes (Most Significant Bit first)

Bit 0 = VIDEO	VIDEOGROUP
1 = Audio Group 1	AUDIOGROUP1
2 = Audio Group 2	AUDIOGROUP2
...	
15 = Audio Group 15	AUDIOGROUP15
16 = Audio Group 16	AUDIOGROUP16

<stereoMode> = 0-4

0 = Stereo	STEREO_MODE_STEREO
1 = Stereo Reversed	STEREO_MODE_STEREO_REVERSE
2 = Mono Left	STEREO_MODE_MONO_L
3 = Mono Right	STEREO_MODE_MONO_R
4 = Mono Left Right	STEREO_MODE_MONO_LR

# MAESTRO\_DISABLE\_AUTOMATION

## Hex definition

0x50

## Mnemonic

MAESTRO\_DISABLE\_AUTOMATION

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_DISABLE\_AUTOMATION

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_DISABLE\_AUTOMATION

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_DISABLE\_AUTOMATION &lt;offOn&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;offOn&gt; = 0-1(Reply format only)

0 = Off	MAESTRO_IF_OFF
1 = On	MAESTRO_IF_ON

## Usage notes:

An automation system can *disable* automation control, but it cannot *enable* automation control. This is to prevent an automation system from overriding manual intervention by the operator.

# MAESTRO\_DVEFFECT

## Hex definition

0x71

## Mnemonic

MAESTRO\_DVEFFECT

## Command format:

<PREAMBLE> MAESTRO\_DVEFFECT <effectID> <effectAction> <audioMode>

## Query format:

READ <PREAMBLE> MAESTRO\_DVEFFECT

## Reply format:

IFRE <PREAMBLE> MAESTRO\_DVEFFECT <effect> <effectAction> <audioMode>

## Use applicable with UPDATE:

Yes

## Command Usage Notes:

- On all commands, a valid <audiomode> greater than 0 must be specified. with the exception of the following commands:

MAESTRO_DVE_EFFECT_EXIT_PGM	MAESTRO_DVE_EFFECT_EXIT_AUX
MAESTRO_DVE_EFFECT_EXIT_PST	

On the above 3 commands, an <audioMode> of 0 (Effect NOP) should be used.

- If a DVE is not active (i.e. DVE is not on program) then one must only send the following <effectAction> argument values:

1 = Enter PGM	MAESTRO_DVE_EFFECT_ENTER_PGM
3 = Enter AUX	MAESTRO_DVE_EFFECT_ENTER_AUX
5 = Enter PST	MAESTRO_DVE_EFFECT_ENTER_PST

- If a DVE is active (i.e. DVE is on program) then one must only send the following <effectAction> argument values:

2 = Exit PGM	MAESTRO_DVE_EFFECT_EXIT_PGM
4 = Exit AUX	MAESTRO_DVE_EFFECT_EXIT_AUX
6 = Exit PST	MAESTRO_DVE_EFFECT_EXIT_PST
7 = Transition AUX PST	MAESTRO_DVE_EFFECT_TRANS_AUX_PST
8 = Audio Only	MAESTRO_DVE_EFFECT_AUDIO_ONLY
9 = Swap PGM AUX	MAESTRO_DVE_EFFECT_SWAP_PGM_AUX
10 = Rotate PST PGM AUX	MAESTRO_DVE_EFFECT_ROTATE_PST_PGM_AUX



11 = Rotate AUX PGM PST      MAESTRO\_DVE\_EFFECT\_ROTATE\_AUX\_PGM\_PST

4. The <effect> argument is ignored with the exception of the following <effectAction> argument values:

1 = Enter PGM	MAESTRO_DVE_EFFECT_ENTER_PGM
3 = Enter AUX	MAESTRO_DVE_EFFECT_ENTER_AUX
5 = Enter PST	MAESTRO_DVE_EFFECT_ENTER_PST

The <effect> argument cannot be 0 (effect NOP) for the above <effectAction> parameter values.

### Argument definitions:

<effect> = 0, 1-255

0 = effect NOP	IF_NULL
1-255 = Maps to the order of the DVE Set table.	

<effectAction> = 1-11

1 = Enter PGM	MAESTRO_DVE_EFFECT_ENTER_PGM
2 = Exit PGM	MAESTRO_DVE_EFFECT_EXIT_PGM
3 = Enter AUX	MAESTRO_DVE_EFFECT_ENTER_AUX
4 = Exit AUX	MAESTRO_DVE_EFFECT_EXIT_AUX
5 = Enter PST	MAESTRO_DVE_EFFECT_ENTER_PST
6 = Exit PST	MAESTRO_DVE_EFFECT_EXIT_PST
7 = Transition AUX PST	MAESTRO_DVE_EFFECT_TRANS_AUX_PST
8 = Audio Only	MAESTRO_DVE_EFFECT_AUDIO_ONLY
9 = Swap PGM AUX	MAESTRO_DVE_EFFECT_SWAP_PGM_AUX
10 = Rotate PST PGM AUX	MAESTRO_DVE_EFFECT_ROTATE_PST_PGM_AUX
11 = Rotate AUX PGM PST	MAESTRO_DVE_EFFECT_ROTATE_AUX_PGM_PST

<audioMode> = 0, 1-5

0 = audioMode NOP	IF_NULL
1 = PGM Off AUX On	MAESTRO_DVE_AUDIO_MODE_PGM_OFF_AUX_ON
2 = PGM On AUX Off	MAESTRO_DVE_AUDIO_MODE_PGM_ON_AUX_OFF
3 = PGM On AUX On	MAESTRO_DVE_AUDIO_MODE_PGM_ON_AUX_ON
4 = PGM Over AUX	MAESTRO_DVE_AUDIO_MODE_PGM_OVER_AUX
5 = AUX Over PGM	MAESTRO_DVE_AUDIO_MODE_AUX_OVER_PGM

# MAESTRO\_DVEFFECT\_SELECT

## Hex definition

0x70

## Mnemonic

MAESTRO\_DVEFFECT\_SELECT

## Command format:

<PREAMBLE> MAESTRO\_DVEFFECT\_SELECT <select>

## Query format:

READ <PREAMBLE> MAESTRO\_DVEFFECT\_SELECT

## Reply format:

IFRE <PREAMBLE> MAESTRO\_DVEFFECT\_SELECT <select>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<select> = 0-1

0 = Unselect

1 = Select

MAESTRO\_UNSELECT

MAESTRO\_SELECT

# MAESTRO\_DVEFFECT\_STATE

## Hex definition

0x72

## Mnemonic

MAESTRO\_DVEFFECT\_STATE

## Command format:

N/A

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_DVEFFECT\_STATE

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_DVEFFECT\_STATE &lt;dvEffectState&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;dvEffectState&gt; = 0-10

0 = Idle	DVE_STATE_IDLE
1 = Enter Pending	DVE_STATE_ENTER_PENDING
2 = Enter In Progress	DVE_STATE_ENTER_IN_PROGRESS
3 = Enter Complete	DVE_STATE_ENTER_COMPLETE
4 = Active	DVE_STATE_ACTIVE
5 = Exit Pending	DVE_STATE_EXIT_PENDING
6 = Exit In Progress	DVE_STATE_EXIT_IN_PROGRESS
7 = Exit Complete	DVE_STATE_EXIT_COMPLETE
8 = No Motion Pending	DVE_STATE_NO_MOTION_PENDING
9 = No Motion In Progress	DVE_STATE_NO_MOTION_IN_PROGRESS
10 = No Motion Complete	DVE_STATE_NO_MOTION_COMPLETE

# MAESTRO\_KEYER\_CLIP

## Hex definition

0x31

## Mnemonic

MAESTRO\_KEYER\_CLIP

## Command format:

<PREAMBLE> MAESTRO\_KEYER\_CLIP <keyer> <clip>

## Query format:

READ <PREAMBLE> MAESTRO\_KEYER\_CLIP <keyer>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_KEYER\_CLIP <keyer> <clip>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<keyer> = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

<clip> = 0-0x03E8 (2 hex bytes, MSB first). The range is from 0.0% to 100% in 0.1 increments. 0 to 0x03E8 corresponds to 0.0% to 100.0%.

# MAESTRO\_KEYER\_FILL\_MODE

## Hex definition

0x35

## Mnemonic

MAESTRO\_KEYER\_FILL\_MODE

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_KEYER\_FILL\_MODE &lt;keyer&gt; &lt;keyFillMode&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_KEYER\_FILL\_MODE &lt;keyer&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_KEYER\_FILL\_MODE &lt;keyer&gt; &lt;keyFillMode&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;keyer&gt; = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

&lt;keyFillMode&gt; = 0-1

0 = Video	KEY_FILL_VIDEO
1 = Matte	KEY_FILL_MATTE

# MAESTRO\_KEYER\_GAIN

## Hex definition

0x32

## Mnemonic

MAESTRO\_KEYER\_GAIN

## Command format:

<PREAMBLE> MAESTRO\_KEYER\_GAIN <keyer> <keyerGain>

## Query format:

READ <PREAMBLE> MAESTRO\_KEYER\_GAIN <keyer>

## Reply format:

IFRE <PREAMBLE> MAESTRO\_KEYER\_GAIN <keyer> <gain>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<keyer> = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

<keyerGain> = 0-0x0257 (2 hex bytes, MSB first). The range is from 0.0 dB to -59.9 dB. 0 to 0x0257 corresponds to 0.0 dB to -59.9 dB.

# MAESTRO\_KEYER\_HOLE\_CUT\_MODE

## Hex definition

0x33

## Mnemonic

MAESTRO\_KEYER\_HOLE\_CUT\_MODE

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_KEYER\_HOLE\_CUT\_MODE &lt;keyer&gt; &lt;keyHoleCutMode&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_KEYER\_HOLE\_CUT\_MODE &lt;keyer&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_KEYER\_HOLE\_CUT\_MODE &lt;keyer&gt; &lt;keyHoleCutMode&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;keyer&gt; = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

&lt;keyHoleCutMode &gt; = 0-1

0 = Cut Self Key	KEY_HOLE_CUT_SELF_KEY
1 = Cut External Key	KEY_HOLE_CUT_EXT_KEY

## MAESTRO\_KEYER\_INVERT\_MODE

### Hex definition

0x36

### Mnemonic

MAESTRO\_KEYER\_INVERT\_MODE

### Command format:

<PREAMBLE> MAESTRO\_KEYER\_INVERT\_MODE <keyer> <keyInvertMode>

### Query format:

READ <PREAMBLE> MAESTRO\_KEYER\_INVERT\_MODE <keyer>

### Reply format:

IFRE <PREAMBLE> MAESTRO\_KEYER\_INVERT\_MODE <keyer> <keyInvertMode>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<keyer> = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

<keyInvertMode > = 0-1

0 = Invert Off	MAESTRO_IF_OFF
1 = Invert On	MAESTRO_IF_ON



# MAESTRO\_KEYER\_SELECT

## Hex definition

0x30

## Mnemonic

MAESTRO\_KEYER\_SELECT

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_KEYER\_SELECT &lt;keyer&gt; &lt;select&gt; &lt;destInputBus&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_KEYER\_SELECT &lt;keyer&gt; &lt;destInputBus&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_KEYER\_SELECT &lt;keyer&gt; &lt;select&gt; &lt;destInputBus&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;keyer&gt; = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

&lt;select&gt; = 0-1

0 = Unselect	MAESTRO_UNSELECT
1 = Select	MAESTRO_SELECT

&lt;destInputBus &gt; = 0-2

0 = Preset	IB_PRESET
1 = Program	IB_PROGRAM
2 = Auxiliary	IB_AUXILIARY

## MAESTRO\_KEYER\_SHADOW\_MODE

### Hex definition

0x34

### Mnemonic

MAESTRO\_KEYER\_SHADOW\_MODE

### Command format:

<PREAMBLE> MAESTRO\_KEYER\_SHADOW\_MODE<keyer> <keyShadowMode>

### Query format:

READ <PREAMBLE> MAESTRO\_KEYER\_SHADOW\_MODE <keyer>

### Reply format:

IFRE <PREAMBLE> MAESTRO\_KEYER\_SHADOW\_MODE <keyer> <keyShadowMode>

### Use applicable with UPDATE:

Yes

### Argument definitions:

<keyer> = 1-8

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

<keyShadowMode> = 0

0 = Shadow None	KEY_SHADOW_NONE
-----------------	-----------------

# MAESTRO\_KEYER\_SOURCE\_REQUEST (Take Crosspoint to a Keyer)

## Hex definition

61

## Mnemonic

MAESTRO\_KEYER\_SOURCE\_REQUEST

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_KEYER\_SOURCE\_REQUEST &lt;keyer&gt; &lt;fillSource&gt; &lt;cutSource&gt;

## Command notes:

If there is an associated cut specified in the table, it will be automatically routed. If a <cutSource> is specified then it will override any associated cut specified in the table. If a Keyer is selected on Program or Preset, attempting to assign a source to that keyer will not be allowed and will fail.

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_KEYER\_SOURCE\_REQUEST &lt;keyer&gt;

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_KEYER\_SOURCE\_REQUEST &lt;keyer&gt; &lt;fillSource&gt; &lt;cutSource&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;keyer&gt; = 1-8 decimal

1= Keyer 1	MAESTRO_KEY_01
2= Keyer 2	MAESTRO_KEY_02
3= Keyer 3	MAESTRO_KEY_03
4= Keyer 4	MAESTRO_KEY_04
5= Keyer 5	MAESTRO_KEY_05
6= Keyer 6	MAESTRO_KEY_06
7= Keyer 7	MAESTRO_KEY_07
8= Keyer 8	MAESTRO_KEY_08

&lt;fillSource&gt; = (2 bytes, MSB first)

NOP	=	Utilize the current source
1-65534	=	Automation Input
65535 (0xFFFF)	=	Unassign source

&lt;cutSource&gt; = (2 bytes, MSB first)

NOP	=	See <i>Command Notes</i> above
1-65534	=	Automation Input
65535 (0xFFFF)	=	Unassign source

# MAESTRO\_MASTER\_FADE\_BLACK

## Hex definition

0x45

## Mnemonic

MAESTRO\_MASTER\_FADE\_BLACK

## Command format:

<PREAMBLE> MAESTRO\_MASTER\_FADE\_BLACK<fadeState>

## Query format:

READ <PREAMBLE> MAESTRO\_MASTER\_FADE\_BLACK

## Reply format:

IFRE <PREAMBLE> MAESTRO\_MASTER\_FADE\_BLACK<videoState> <audioState>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<fadeState> = 0,1

0 = Fade from Black and not Silent  
MAESTRO\_IF\_OFF

1 = Fade to Black and Silent  
MAESTRO\_IF\_ON

<videoState> = 0,1

0 = not Black  
1 = Black

<audioState> = 0,1

0 = not Silent  
1 = Silent

# MAESTRO\_TAKE

## Hex definition

0x43

## Mnemonic

MAESTRO\_TAKE

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_TAKE &lt;requestedTransitionTimecode&gt;

## Query format:

N/A

## Reply format:

## Use applicable with UPDATE:

No

## Argument definitions:

&lt;requestedTransitionTimecode&gt; (four BCD bytes or set all four bytes to FF for immediate Transition) =

0-23	HH	= packed BCD Hours
0-59	MM	= packed BCD Minutes
0-59	SS	= packed BCD Seconds
0-29	FF	= packed BCD Frames

## Usage notes:

The requested Transition Time Code can be up to 12 hours in the future. A requested Time Code that is 12 hours or more in the future will result in an immediate Transition.

# MAESTRO\_TAKE\_BLACK

## Hex definition

0x44

## Mnemonic

MAESTRO\_TAKE\_BLACK

## Command format:

<PREAMBLE> MAESTRO\_TAKE\_BLACK <toFrom> <requestedTransitionTimecode>

## Query format:

N/A

## Reply format:

See MAESTRO\_TRANSITION\_STATE

## Use applicable with UPDATE:

No

## Argument definitions:

<toFrom> =

1 = Take to Black      MAESTRO\_TO  
2 = Take from Black    MAESTRO\_FROM

<requestedTransitionTimecode> (four BCD bytes or set all four bytes to FF for immediate Transition) =

0-23    HH      = packed BCD Hours  
0-59    MM      = packed BCD Minutes  
0-59    SS      = packed BCD Seconds  
0-29    FF      = packed BCD Frames

## Usage notes:

The requested Transition Time Code can be up to 12 hours in the future. A requested Time Code that is 12 hours or more in the future will result in an immediate Transition.

# MAESTRO\_TRANSACTION\_BEGIN

**Hex definition**

0x01

**Mnemonic**

MAESTRO\_TRANSACTION\_BEGIN

**Command format:**<PREAMBLE<sup>1</sup>> MAESTRO\_TRANSACTION\_BEGIN**Query format:**

N/A

**Reply format:**

N/A

**Use applicable with UPDATE:**

No

**Argument definitions:**

N/A

---

<sup>1</sup> <PREAMBLE> is described on page 90.

## MAESTRO\_TRANSACTION\_END

**Hex definition**

0x02

**Mnemonic**

MAESTRO\_TRANSACTION\_END

**Command format:**

<PREAMBLE> MAESTRO\_TRANSACTION\_END

**Query format:**

N/A

**Reply format:**

N/A

**Use applicable with UPDATE:**

No

**Argument definitions:**

N/A



# MAESTRO\_TRANSACTION\_QUEUE\_STATUS

**Hex definition**

0x03

**Mnemonic**

MAESTRO\_TRANSACTION\_QUEUE\_STATUS

**Command format:**

N/A

**Query format:**

READ &lt;PREAMBLE&gt; MAESTRO\_TRANSACTION\_QUEUE\_STATUS

**Reply format:**

IFRE &lt;PREAMBLE&gt; MAESTRO\_TRANSACTION\_STATUS &lt;transactionQueueStatus&gt;

**Use applicable with UPDATE:**

No

**Argument definitions:**

N/A

&lt;transactionQueueStatus&gt; = 1-5

1 = OK

2 = ERROR – Queue Full

3 = ERROR – Automation Defeat Enabled

4 = ERROR – Transaction Failed

5 = ERROR – Invalid Queue

## MAESTRO\_TRANSACTION\_QUEUE\_PURGE

**Hex definition**

0x04

**Mnemonic**

MAESTRO\_TRANSACTION\_QUEUE\_PURGE

**Command format:**

<PREAMBLE> MAESTRO\_TRANSACTION\_QUEUE\_PURGE

**Query format:**

N/A

**Reply format:**

N/A

**Use applicable with UPDATE:**

No

**Argument definitions:**

N/A

# MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID

## Hex definition

0x05

## Mnemonic

MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID

## Command format:

N/A

## Query format:

N/A

## Reply format:

IFRE<PREAMBLE>MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID <aec>

## Use applicable with UPDATE:

No

## Argument definitions:

<aec> =

0 = OK	AEC_OK
1 = Automation Defeat Enabled	AEC_AUTOMATION_DEFEAT_IS_ENABLED
2 = Invalid Begin/End	AEC_AUTOMATION_INVALID_TRANSACTION_BEGIN_END
3 = Command Failed	AEC_COMMAND_FAILED
4 = Transaction Failed	AEC_TRANSACTION_FAILED
5 = Transaction Queue Full	AEC_TRANSACTION_QUEUE_FULL

## Notes:

The activation of this Reply is controlled by MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET

## MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET

**Hex definition**

0x06

**Mnemonic**

MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET

**Command format:**

<PREAMBLE> MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET <offOn>

**Query format:**

READ<PREAMBLE> MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID\_SET

**Reply format:**

IFRE<PREAMBLE>MAESTRO\_TRANSACTION\_QUEUE\_REPLY\_COMMAND\_ID <offOn>

**Use applicable with UPDATE:**

No

**Argument definitions:**

<offOn> = 0-1

0 = Off

1 = On

# MAESTRO\_TRANSITION\_NEXT

## Hex definition

0x42

## Mnemonic

MAESTRO\_TRANSITION\_NEXT

## Command format:

<PREAMBLE> MAESTRO\_TRANSITION\_NEXT <transitionNextBitsCommand>

## Query format:

READ <PREAMBLE> MAESTRO\_TRANSITION\_NEXT

## Reply format:

IFRE <PREAMBLE> MAESTRO\_TRANSITION\_NEXT <transitionNextBitsReply>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<transitionNextBitsCommand> = (hex, 1 byte)

Bit 7 - Bit 3 = reserved

Bit 2 = Transition Next Effect

Bit 1 = Transition Next Downstream

Bit 0 = Transition Next Upstream

MAESTRO\_TRANSITION\_NEXT\_EFFECT

MAESTRO\_TRANSITION\_DOWNSTREAM\_NEXT

MAESTRO\_TRANSITION\_UPSTREAM\_NEXT

<transitionNextBitsReply> = (hex, 1 byte)

Bit 7 - Bit 4 = reserved

Bit 3 = Transition Next Preview Transition

Bit 2 = Transition Next Effect

Bit 1 = Transition Next Downstream

Bit 0 = Transition Next Upstream

MAESTRO\_TRANSITION\_PVW\_TRANS

MAESTRO\_TRANSITION\_NEXT\_EFFECT

MAESTRO\_TRANSITION\_DOWNSTREAM\_NEXT

MAESTRO\_TRANSITION\_UPSTREAM\_NEXT

# MAESTRO\_TRANSITION\_RATE

## Hex definition

0x41

## Mnemonic

MAESTRO\_TRANSITION\_RATE

## Command format:

<PREAMBLE> MAESTRO\_TRANSITION\_RATE <transitionRate><transitionRate SS:FF><blackDuration SS:FF>

## Query format:

READ <PREAMBLE> MAESTRO\_TRANSITION\_RATE

## Reply format:

IFRE <PREAMBLE> MAESTRO\_TRANSITION\_RATE <transitionRate ><transitionRate SS:FF><blackDuration SS:FF>

## Use applicable with UPDATE:

Yes

## Argument definitions:

<transitionRate> = 0-4

0 = Cut	MAESTRO_TRANSITION_RATE_CUT
1 = Slow	MAESTRO_TRANSITION_RATE_SLOW
2 = Medium	MAESTRO_TRANSITION_RATE_MEDIUM
3 = Fast	MAESTRO_TRANSITION_RATE_FAST
4 = Custom	MAESTRO_TRANSITION_RATE_CUSTOM

<transitionRate SS:FF> (2 Hex Bytes)

0x00-0x09, 0xFF	SS	= transition duration seconds (0xFF = NOP)
0x00-0x1D, 0xFF	FF	= transition duration frames (0xFF = NOP)

The <transitionRate SS:FF> parameter is only applicable in the Command Format when <transitionRate> = Custom. The values are ignored otherwise.

The <transitionRate SS:FF> parameter in the Reply Format will always indicate the actual transition duration in seconds and frames for all <transitionRate> types.

<blackDuration SS:FF> (2 Hex Bytes)

0x00-0x09, 0xFF	SS	= black duration seconds (0xFF = NOP)
0x00-0x1D, 0xFF	FF	= black duration frames (0xFF = NOP)

The <blackDuration SS:FF> parameter is currently not utilized and the values will be ignored.

The <blackDuration SS:FF> parameter in the Reply Format will always indicate the actual black duration in seconds and frames.

# MAESTRO\_TRANSITION\_STATE

**Hex definition**

0x4F

**Mnemonic**

MAESTRO\_TRANSITION\_STATE

**Command format:**

N/A

**Query format:**

READ &lt;PREAMBLE&gt; MAESTRO\_TRANSITION\_STATE

**Reply format:**

IFRE &lt;PREAMBLE&gt; MAESTRO\_TRANSITION\_STATE &lt;transitionState&gt;

**Use applicable with UPDATE:**

Yes

**Argument definitions:**

&lt;transitionState&gt; = 0-5 (Reply format only)

0 = Idle

1 = Pending

2 = From Old

3 = Black Silent

4 = To New

5 = Complete

# MAESTRO\_TRANSITION\_TYPE

Hex definition	Mnemonic
0x40	MAESTRO_TRANSITION_TYPE

**Command format:**

<PREAMBLE> MAESTRO\_TRANSITION\_TYPE <transitionType>

**Query format:**

READ <PREAMBLE> MAESTRO\_TRANSITION\_TYPE

**Reply format:**

IFRE <PREAMBLE> MAESTRO\_TRANSITION\_TYPE <transitionType>

**Use applicable with UPDATE:**

Yes

**Argument definitions:**

<transitionType> = 0x00-0x03 fixed, 0x04-0x63 user definable, 0x64	
0x00 = Cross-Fade	MAESTRO_TRANSITION_TYPE_CROSS_FADE
0x01 = Fade-Cut	MAESTRO_TRANSITION_TYPE_FADE_CUT
0x02 = Cut-Fade	MAESTRO_TRANSITION_TYPE_CUT_FADE
0x03 = Fade-Fade	MAESTRO_TRANSITION_TYPE_FADE_FADE
0x04-0x63 = User Definable	Transition Association Table
0x64 =	Valid on reply only. Reports that transition parameters have been set by TRAN_PRESET (only if a Custom Transition is processed, refer to Maestro Applicability of TRAN_PRESET ) or MAESTRO_TRANSITION_TYPE_CUSTOM.

Notes:

The first 4 rows in the Transition Association Table are fixed values (i.e., values 0-3 above).



# MAESTRO\_TRANSITION\_TYPE\_CUSTOM

## Hex definition

0x4A

## Mnemonic

MAESTRO\_TRANSITION\_TYPE\_CUSTOM

## Command format:

<PREAMBLE> MAESTRO\_TRANSITION\_TYPE\_CUSTOM <videoTransitionType> <videoTransitionDelay SS:FF>  
 <videoTransitionFromOld SS:FF> <videoTransitionblack SS:FF> <reserved 2 Bytes> <videoTransitionToNew SS:FF>  
 <audioTransitionType> <audioTransitionDelay SS:FF> <audioTransitionFromOld SS:FF> <audioTransitionSilent  
 SS:FF> <reserved 2 Bytes> <audioTransitionToNew SS:FF>

Notes: 1) If Cross-Fade is selected and From Old does not equal To New then an error will result. 2) If Cross-Fade is selected and Black Duration is not 0:00 then an error will result.

## Query format:

READ <PREAMBLE> MAESTRO\_TRANSITION\_TYPE\_CUSTOM

## Reply format:

IFRE <PREAMBLE> MAESTRO\_TRANSITION\_TYPE\_CUSTOM <videoTransitionType> <videoTransitionDelay  
 SS:FF> <videoTransitionFromOld SS:FF> <videoTransitionblack SS:FF> <reserved 2 Bytes> <videoTransitionToNew  
 SS:FF> <audioTransitionType> <audioTransitionDelay SS:FF> <audioTransitionFromOld SS:FF> <audioTransitionSi-  
 lent SS:FF> <reserved 2 Bytes> <audioTransitionToNew SS:FF>

## Use applicable with UPDATE:

Yes

## Argument definitions:

Command Arguments: <videoTransitionType>, <audioTransitionType> = 0x00, 0x03

0x00 = Cross-Fade	MAESTRO_TRANSITION_TYPE_CROSS_FADE
0x03 = Fade-Fade	MAESTRO_TRANSITION_TYPE_FADE_FADE

Reply Arguments: <videoTransitionType>, <audioTransitionType> = 0x00-0x03 fixed, 0x04-0x63 user definable, 0x64

0x00 = Cross-Fade	MAESTRO_TRANSITION_TYPE_CROSS_FADE
0x01 = Fade-Cut	MAESTRO_TRANSITION_TYPE_FADE_CUT
0x02 = Cut-Fade	MAESTRO_TRANSITION_TYPE_CUT_FADE
0x03 = Fade-Fade	MAESTRO_TRANSITION_TYPE_FADE_FADE
0x04-0x63 = User Definable Transition Association Table	
0x64 = Valid on reply only. Reports that transition parameters have been set by TRAN_PRESET (only if a Custom Transition is processed, refer to Maestro Applicability of TRAN_PRESET ) or MAESTRO_TRANSITION_TYPE_CUSTOM	

<videoTransitionDelay SS:FF>, <audioTransitionDelay SS:FF> = <seconds> <frames>

Specifies the Take delay, or reports the current Take delay on a reply. See “<seconds>” and “<frames>” below.

<videoTransitionFromOld SS:FF>, <audioTransitionFromOld SS:FF> = <seconds> <frames>

Specifies the From Old duration, or reports the current From Old duration on a reply. See “<seconds>” and “<frames>” below.

**<videoTransitionblack SS:FF>, <audioTransitionSilent SS:FF> = <seconds> <frames>**

Specifies the Black duration, or reports the current Black duration on a reply. See “<seconds>” and “<frames>” below.

**<videoTransitionToNew SS:FF>, <audioTransitionToNew SS:FF> = <seconds> <frames>**

Specifies the To New duration, or reports the current To New duration on a reply. See “<seconds>” and “<frames>” below.

**<seconds> = 00-09** (hex, one byte)

00-09 = Seconds representing 0:00 through 9:00.

**<frames> = 00-1D** (hex, one byte). Frames representing 0:00 through 0:29.

**<reserved 2 Bytes>**

A two byte parameter reserved for a possible future enhancement. It is suggested that the parameter be set to NOP's (0x00)

# **.MAESTRO\_WIPE\_SELECT**

## **Hex definition**

0x46

## **Mnemonic**

MAESTRO\_WIPE\_SELECT

## **Command format:**

<PREAMBLE> MAESTRO\_WIPE\_SELECT <select>

## **Query format:**

READ <PREAMBLE> MAESTRO\_WIPE\_SELECT

## **Reply format:**

IFRE <PREAMBLE> MAESTRO\_WIPE\_SELECT <select>

## **Use applicable with UPDATE:**

Yes

## **Argument definitions:**

<select> = 0-1

0 = Unselect

1 = Select

MAESTRO\_UNSELECT

MAESTRO\_SELECT

## MAESTRO\_WIPE\_STATE

**Hex definition**

0x48

**Mnemonic**

MAESTRO\_WIPE\_STATE

**Command format:**

N/A

**Query format:**

READ <PREAMBLE> MAESTRO\_WIPE\_STATE

**Reply format:**

IFRE <PREAMBLE> MAESTRO\_WIPE\_STATE <wipeState>

**Use applicable with UPDATE:**

Yes

**Argument definitions:**

<wipeState> = 0-3

0 = Idle

1 = Pending

2 = In Progress

3 = Complete

WIPE\_STATE\_IDLE

WIPE\_STATE\_PENDING

WIPE\_STATE\_IN\_PROGRESS

WIPE\_STATE\_COMPLETE

# MAESTRO\_WIPE\_TYPE

## Hex definition

0x47

## Mnemonic

MAESTRO\_WIPE\_TYPE

## Command format:

&lt;PREAMBLE&gt; MAESTRO\_WIPE\_TYPE &lt;wipeType&gt;

## Query format:

READ &lt;PREAMBLE&gt; MAESTRO\_WIPE\_TYPE

## Reply format:

IFRE &lt;PREAMBLE&gt; MAESTRO\_WIPE\_TYPE &lt;wipeType&gt;

## Use applicable with UPDATE:

Yes

## Argument definitions:

&lt;wipeType&gt; = 0-19, 0xFF

0 = L2R	MAESTRO_WIPE_TYPE_L2R
1 = R2L	MAESTRO_WIPE_TYPE_R2L
2 = LR2M	MAESTRO_WIPE_TYPE_LR2M
3 = M2LR	MAESTRO_WIPE_TYPE_M2LR
4 = T2B	MAESTRO_WIPE_TYPE_T2B
5 = B2T	MAESTRO_WIPE_TYPE_B2T
6 = TB2M	MAESTRO_WIPE_TYPE_TB2M
7 = M2TB	MAESTRO_WIPE_TYPE_M2TB
8 = ULBOX2LR	MAESTRO_WIPE_TYPE_ULBOX2LR
9 = URBOX2LL	MAESTRO_WIPE_TYPE_URBOX2LL
10 = LLBOX2UR	MAESTRO_WIPE_TYPE_LLBOX2UR
11 = LRBOX2UL	MAESTRO_WIPE_TYPE_LRBOX2UL
12 = MBOX2CORNERS	MAESTRO_WIPE_TYPE_MBOX2CORNERS
13 = CORNERS2MBOX	MAESTRO_WIPE_TYPE_CORNERS2MBOX
14 = PLUS2CORNERS	MAESTRO_WIPE_TYPE_PLUS2CORNERS
15 = CORNERS2PLUS	MAESTRO_WIPE_TYPE_CORNERS2PLUS
16 = ULDIAG2LR	MAESTRO_WIPE_TYPE_ULDIAG2LR
17 = URDIAG2LL	MAESTRO_WIPE_TYPE_URDIAG2LL
18 = LLDIAG2UR	MAESTRO_WIPE_TYPE_LLDIAGUR
19 = LRDIAG2UL	MAESTRO_WIPE_TYPE_LRDIAGUL
0xFF = Undefined	MAESTRO_WIPE_TYPE_UNDEFINED (Reply format only)



# Examples

## Maestro State Progression

Maestro will progress through, and remain in, certain protocol states based upon the current state and received data.

IDLE state: A BRK character is required to proceed to the ACTIVE state and from the ACTIVE state one can proceed to either the POLL or SELECT state.

In order to proceed to the POLL state, use BRK followed by the poll address:

Automation: BRK 82 81	<i>proceed to POLL state</i>
Maestro: 04	<i>ACK - Maestro remains in ACTIVE state</i>

In order to proceed to the SELECT state, use BRK followed by the select address:

Automation: BRK 82 80 <data>	<i>proceed to SELECT state</i>
Maestro: 04	<i>ACK - Maestro remains in SELECT state</i>

ACTIVE state: Maestro will remain in the ACTIVE state after reception of a BRK character or after successful POLL processing.

In order to proceed to the POLL state, use the poll address:

Automation: 82 81	<i>proceed to POLL state</i>
Maestro: 04	<i>ACK - Maestro remains in ACTIVE state</i>

In order to proceed to the SELECT state, use the select address:

Automation: 82 80 <data>	<i>proceed to SELECT state</i>
Maestro: 04	<i>ACK - Maestro remains in SELECT state</i>

SELECT state: Maestro will remain in the SELECT state after entry into the SELECT state and after successful SELECT state processing.

In order to remain in SELECT state, SELECT state processing must be successful:

Automation: <data>	<i>SELECT state message</i>
Maestro: 04	<i>ACK - Maestro remains in SELECT state</i>

## Power On or Reset

After a power on or reset of Maestro, Maestro will first respond to polling with a RST (07h) to indicate that a reboot cycle has occurred:

Maestro:	<i>Power On or Reset</i>	
Automation:	BRK 82 81	<i>poll Maestro</i>
Maestro:		<i>booting - no response</i>
Automation:	BRK 82 81	<i>poll Maestro</i>
Maestro:		<i>booting - no response</i>
Automation:	BRK 82 81	<i>poll Maestro</i>
Maestro:	07	<i>RST</i>
Automation:	82 81	<i>poll Maestro</i>
Maestro:	04	<i>ACK - remains in ACTIVE state</i>

## Interrupted Communications

If communications between the automation system and Maestro is interrupted (disconnected cable, system reboot, etc.) it is suggested that after a timeout period determined by the automation vendor, the automation system attempt to reestablish communications from the IDLE state:

Automation:	82 81		<i>poll Maestro from ACTIVE state</i>
Maestro:	04		<i>ACK - remains in ACTIVE state</i>
Automation:	82 81		<i>poll Maestro from ACTIVE state</i>
Maestro:			<i>no response</i>
Automation:	82 81	Vendor Timeout	<i>poll Maestro from ACTIVE state</i>
Maestro:			<i>no response</i>
Automation:	82 81		<i>poll Maestro from ACTIVE state</i>
Maestro:			<i>no response</i>
Automation:	BRK 82 81		<i>poll Maestro from IDLE state</i>
Maestro:			<i>no response</i>
Automation:	BRK 82 81		<i>poll Maestro from IDLE state</i>
Maestro:	04		<i>ACK - remains in ACTIVE state</i>
			<i>NOTE: RST (07h) if due to reboot cycle</i>
Automation:	82 81		<i>poll Maestro from ACTIVE state</i>
Maestro:	04		<i>ACK - remains in ACTIVE state</i>



# Polling Options

Following are a couple of options for polling Maestro.

When Maestro is in the SELECT state, it is not necessary for automation to use BRKs, the POLL address, or the SELECT address before issuing commands. Maestro can be directly commanded or queried. This is the preferable way of polling Maestro. Since this application of the ESBUS protocol is not a multi-drop environment, once automation is communicating with Maestro and Maestro is SELECTed, it will only be communicating with Maestro.

```
Automation: BRK 82 81      poll Maestro from IDLE state
Maestro:    04             ACK - remains in ACTIVE state
Automation: 82 80 02 02 22 61 7B SELECT and query REM_MODE
Maestro:    04             ACK - remains in SELECT state
Automation: 09             TEN (select address NOT required)
Maestro:    05             NAK - nothing to send (YET!)
Automation: 02 02 22 45 97  query TX_STAT (select address NOT required)
Maestro:    04             ACK - Maestro remains in SELECT state
Automation: 09             TEN
Maestro:    02 03 23 61 03 76 REM_MODE On
Automation: 04             ACK response
Automation: 09             TEN
Maestro:    02 03 23 45 02 93 TX_STAT = quiescent
Automation: 04             ACK response
Automation: 09             TEN
Maestro:    05             NAK - nothing to send
Automation: 09             TEN
Maestro:    05             NAK - nothing to send
...
```

In the case where UPDATE is used for REM\_MODE, the above reduces to:

```
Automation: BRK 82 81      poll Maestro from IDLE state
Maestro:    04             ACK - remains in ACTIVE state
Automation: 82 80 02 03 3F 07 61 56 register for REM_MODE auto-updates
          3F - Common Message Extension
          07 - UPDATE
          61 - REM_MODE
Maestro:    04             ACK - remains in SELECT state
Automation: 02 02 22 45 97  query TX_STAT
Maestro:    04             ACK
Automation: 09             TEN
Maestro:    02 03 23 45 02 93 TX_STAT = quiescent
Automation: 04             ACK response
Automation: 09             TEN
Maestro:    05             NAK
```

```

...
    Manual intervention - Auto Defeat pressed on Maestro
Automation: 09                                TEN
Maestro:    02 03 23 61 02 77                REM_MODE = Off
Automation: 04                                ACK response
Automation: 09                                TEN
Maestro:    05                                NAK
...

```

Another method for polling Maestro, less preferable due to the overhead of ESBUS state machine processing, is to poll from the POLL state and act upon Maestro responses. If automation was being used in a multi-drop environment, this is the polling/command method that would be required. This requires selection of Maestro before every command, TEN, etc., and requires numerous passes through the IDLE state. It should be noted that reception of a BRK character forces Maestro to abort any transmissions that may be in progress and may affect throughput due to the need to resend.

```

Automation: BRK 82 81                        poll Maestro from IDLE state
Maestro:    04                                ACK - remains in ACTIVE state
Automation: 82 80 02 02 22 61 7B            SELECT and query REM_MODE
Maestro:    04                                ACK - remains in SELECT state
Automation: BRK 82 81                        poll Maestro from IDLE state
Maestro:    04                                ACK - remain in ACTIVE state
Automation: 82 80 02 02 22 45 97            SELECT and query TX_STAT
Maestro:    04                                ACK - remains in SELECT state
Automation: BRK 82 81                        poll Maestro from IDLE state
Maestro:    08                                SVC - Maestro has a message to send
Automation: 82 80 09                        SELECT and TEN
Maestro:    02 03 23 61 03 76                REM_MODE = On
Automation: 04                                ACK response
Automation: BRK 82 81                        poll Maestro from IDLE state
Maestro:    08                                SVC - Maestro has a message to send
Automation: 82 80 09                        SELECT and TEN
Maestro:    02 03 23 45 02 93                TX_STAT = quiescent
Automation: 04                                ACK response
Automation: BRK 82 81                        poll Maestro from IDLE state
Maestro:    04                                ACK - remains in ACTIVE state
Automation: 82 81                            poll from ACTIVE state
Maestro:    04                                ACK - remains in ACTIVE state
...

```

## RBGN/REND

It is possible for automation to send multiple commands to Maestro within the same packet using the Begin/End (RBGN/REND) construct. For example:

BRK	BREAK
82	SELECT address MSB
80	SELECT address LSB
02	STX
06	Byte count
3F	Common Message Extension
07	UPDATE
01	<b>RBGN</b>
61	REM_MODE
7F	TAKE_XPT
02	<b>REND</b>
D1	Checksum

BRK	BREAK
82	SELECT address MSB
80	SELECT address LSB
02	STX
0A	Byte count
01	<b>RBGN</b>
22	Query
7F	TAKE_XPT
01	PGM
22	Query
7F	TAKE_XPT
02	PST
22	Query
61	REM_MODE
02	<b>REND</b>
2B	Checksum

## Use of UPDATE

Use of the UPDATE command by automation provides a convenient way for the automation system to be aware of changes as they occur on Maestro without the overhead on either system of constant command queries. Once a command has been registered, Maestro will automatically queue a message to be sent to automation for that command when any of its parameters change. The automation system will be made aware of these queued messages by receiving a SVC (08h) response to a poll.

The following commands are supported for automatic updating:

- AUD\_BPSET,
- AUD\_PSET,
- FTBLK,
- LRS\_PGM,
- LRS\_PST,
- MAL\_PGM,
- MAL\_PST,
- PGM\_OVER,
- PST\_OVER,
- PROLL,
- RATIO,
- RECALL\_REG,
- REM\_MODE,
- SAP0\_PGM,
- SAP0\_PST,
- SAP1\_PGM,
- SAP1\_PST,
- SEL\_1KEY,
- SEL\_2KEY,
- SET\_AUDIO,
- SET\_KEY,
- SET\_MIX,
- TAKE\_XPT,
- TRAN\_PRESET,
- TX\_STAT,
- VID\_1KEY,
- VID\_2KEY,
- VID\_BPSET,
- VID\_MODE,
- VID\_PSET,
- VID\_RATE,
- MAESTRO\_AUDIO\_MIXER\_CHANNEL\_MAPPING
- MAESTRO\_AUDIO\_MIXER\_SELECT,
- MAESTRO\_AUDIO\_MIXER\_RATIO,
- MAESTRO\_AUDIO\_MIXER\_SOURCE\_REQUEST,
- MAESTRO\_BACKGROUND\_SELECT,
- MAESTRO\_BACKGROUND\_AUDIO\_GAIN,
- MAESTRO\_BACKGROUND\_AUDIO\_BALANCE,
- MAESTRO\_BACKGROUND\_AUDIO\_CHANNEL\_MAPPING
- MAESTRO\_BACKGROUND\_STEREO\_MODE,
- MAESTRO\_DISABLE\_AUTOMATION,

MAESTRO\_DVEFFECT  
 MAESTRO\_DVEFFECT\_SELECT  
 MAESTRO\_DVEFFECT\_STATE  
 MAESTRO\_KEYER\_SELECT,  
 MAESTRO\_KEYER\_CLIP,  
 MAESTRO\_KEYER\_GAIN,  
 MAESTRO\_KEYER\_HOLE\_CUT\_MODE,  
 MAESTRO\_KEYER\_FILL\_MODE,  
 MAESTRO\_KEYER\_INVERT\_MODE,  
 MAESTRO\_KEYER\_SOURCE\_REQUEST,  
 MAESTRO\_MASTER\_FADE\_BLACK,  
 MAESTRO\_TRANSITION\_NEXT,  
 MAESTRO\_TRANSITION\_RATE,  
 MAESTRO\_TRANSITION\_STATE,  
 MAESTRO\_TRANSITION\_TYPE,  
 MAESTRO\_TRANSITION\_TYPE\_CUSTOM,  
 MAESTRO\_WIPE\_SELECT,  
 MAESTRO\_WIPE\_STATE, and  
 MAESTRO\_WIPE\_TYPE.

Issuing an UPDATE of commands that normally use an argument to report status (TAKE\_XPT, SET\_KEY, SET\_MIX, etc.) will result in a generated status message when the state of any of their respective arguments change.

The MUTE command clears all UPDATE commands.

Some previous examples have already used the UPDATE command. Following is a more comprehensive example of how it might be used:

Automation:	BRK 82 81	<i>poll Maestro from IDLE state</i>
Maestro:	04	<i>ACK - remains in ACTIVE state</i>
Automation:	82 80 02 08 3F 07 01 7F 45 4C 4D 02 52	<i>register for auto-updates</i>
	3F - Common Message Extension	
	07 - UPDATE	
	01 - RBGN	
	7F - TAKE_XPT	
	45 - TX_STAT	
	4C - VID_MODE	
	4D - VID_RATE	
	02 - REND	
Maestro:	04	<i>ACK - remains in SELECT state</i>
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
...		
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
Automation:	02 02 22 61 7B	<i>query REM_MODE</i>
Maestro:	04	<i>ACK</i>
Automation:	02 03 22 7F 01 5B	<i>query TAKE_XPT PGM</i>

Maestro:	04	ACK
Automation:	02 03 22 7F 02 5A	query TAKE_XPT PST
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	02 02 23 61 03 76	REM_MODE = On
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	02 07 23 7F 01 02 02 00 00 50	TAKE_XPT PGM = 02,02
Automation:	04	ACK
Automation:	09	TEN
Maestro:	02 07 23 7F 02 03 03 00 00 4D	TAKE_XPT PST = 03,03
Automation:	04	ACK
Automation:	09	TEN
Maestro:	05	NAK
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	02 06 7F 02 04 04 00 00 71	set TAKE_XPT PST to 04,04
Maestro:	04	ACK
Automation:	02 02 4C 02 B0	set VID_MODE to Mix
Maestro:	04	ACK
Automation:	02 02 4D 02 AF	set VID_RATE to Medium
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	02 03 23 4C 02 8C	auto-update VID_MODE = Mix
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	02 03 23 4D 02 01 00 88	auto-update VID_RATE = Medium (1:00)
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	09	TEN
Maestro:	02 07 23 7F 02 04 04 00 00 4B	auto-update TAKE_XPT PST = 04,04
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	02 02 44 80 3A	TX_TRIG (preroll enabled)
Maestro:	04	ACK
...		
Automation:	09	TEN
Maestro:	02 03 23 45 03 80	TX_STAT = prerolling

Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	09	TEN
Maestro:	02 03 23 45 04 8F	TX_STAT = transitioning
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	09	TEN
Maestro:	02 03 23 45 02 91	TX_STAT = quiescent
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	09	TEN
Maestro:	02 07 23 7F 01 04 04 00 00 5C	TAKE_XPT PGM = 04,04
Automation:	04	ACK
...		
Automation:	09	TEN
Maestro:	02 07 23 7F 02 02 02 00 00 4F	TAKE_XPT PST = 02,02
Automation:	04	ACK
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	02 02 4C 01 B1	set VID_MODE to Cut
Maestro:	04	ACK
...		
Automation:	09	TEN
Maestro:	02 05 23 4D 03 00 00 88	auto-update VID_RATE = Fast (0:00 => Cut)
Automation:	04	ACK response
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	02 02 44 C0 3A	TX_TRIG (inhibit preroll)
Maestro:	04	ACK
...		
Automation:	09	TEN
Maestro:	02 03 23 45 02 91	TX_STAT = quiescent
Automation:	04	ACK response

NOTE: In this case, a TX\_STAT indicating a status of “transitioning” was never received by automation. However, the

mere fact that a TX\_STAT containing “quiescent” was received via auto-update indicates that the transition state has changed and that the TX\_TRIG is now complete. In the case of very short duration transitions, all transition states will not necessarily be reported due to other system tasks of higher priority delaying auto-update message formation until after the state has again changed. But, it is guaranteed that at least one auto-update TX\_STAT will be reported for every TX\_TRIG to indicate a change of transition status. If only one auto-update TX\_STAT is reported, it will indicate “quiescent” meaning TX\_TRIG complete.



Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
...		
Automation:	09	<i>TEN</i>
Maestro:	02 07 23 7F 01 02 02 00 00 50	<i>auto-update TAKE_XPT PGM = 02,02</i>
Automation:	04	<i>ACK</i>
...		
Automation:	09	<i>TEN</i>
Maestro:	02 07 23 7F 02 04 04 00 00 4B	<i>auto-update TAKE_XPT PST = 04,04</i>
Automation:	04	<i>ACK</i>
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
...		

## Maestro Command Examples

### MAESTRO\_KEYER\_SOURCE\_REQUEST

Request Fill Source 0x42, Cut Source NOP to Keyer 5

Use Transaction Queue 1 with a Command ID of 1

02 0A FF 01 00 01 61 05 00 42 00 00 CS

### MAESTRO\_KEYER\_SOURCE\_REQUEST (query)

Use Transaction Queue 1 with a Command ID of 2

02 07 22 FF 01 00 02 61 05 00

Response: 02 0B 23 FF FF 00 01 61 05 00 42 00 00 CS

### MAESTRO\_KEYER\_SELECT

Select Keyer 5 on PST

Use Transaction Queue 1 with a Command ID of 3

02 08 FF 01 00 03 30 05 01 00 CS

### MAESTRO\_KEYER\_SELECT (query)

Use Transaction Queue 1 with a Command ID of 4

02 08 22 FF 01 00 04 30 05 00 CS

Response: 02 09 23 FF FF 00 01 30 05 01 00 CS

### MAESTRO\_TRANSITION\_NEXT

Select Downstream Next Transition Type

Use Transaction Queue 1 with a Command ID of 5

02 06 FF 01 00 05 42 02 CS

### MAESTRO\_TRANSITION\_NEXT(query)

Use Transaction Queue 1 with a Command ID of 6

02 06 22 FF 01 00 06 42 00

Response: 02 07 23 FF FF 00 01 42 02 CS

### MAESTRO\_TAKE

Initiate a Take to occur immediately (no requested transition time)

Use Transaction Queue 1 with a Command ID of 7

02 09 FF 01 00 07 43 FF FF FF CS

# Maestro Command Sequence Example

**CS = Checksum**

**All values in hexadecimal e.g. 42 is 0x42**

Automation:	02 0A FF 01 00 01 61 05 00 42 00 00 CS	Keyer Source Request Transaction Queue 01 Command ID 00 01 Keyer 05 Fill Source 0x42 Cut Source NOP
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	05	NAK
Automation:	09	TEN
Maestro:	05	NAK
...		
Automation:	02 07 22 FF 01 00 02 61 05 CS	Keyer Source Query Command ID 00 02
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	02 0B 23 FF FF 00 02 61 05 00 42 00 00 CS	Response to Query <sup>1</sup>
Automation:	04	ACK
...		
Automation:	02 08 FF 01 00 03 30 05 01 00 CS	Select Keyer Keyer 05 on PST
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	05	NAK
Automation:	09	TEN
Maestro:	05	NAK
Automation:	02 08 22 FF 01 00 04 30 05 00 CS	Select Keyer Query Command ID 00 04
...		
Maestro:	04	ACK
Automation:	09	TEN
Maestro:	02 09 23 FF FF 00 04 30 05 01 00 CS	Response to Query <sup>2</sup>
Automation:	04	ACK
...		
Automation:	02 06 FF 01 00 05 42 02 CS	Transition Next Downstream Next Type Command ID 00 05
Maestro:	04	ACK

<sup>1</sup> The Command ID [is] was set to "00 01" in releases prior to v1.5. Starting with v1.5, the Command ID field is set to match what was received in the prior Automation Command; in this example, "00 02."

<sup>2</sup> See Note 1. In this example, the Command ID is "00 04."

## Section 6 — Examples

Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
Automation:	02 06 22 FF 01 00 06 42 CS	Next Query Command ID 00 06
...		
Maestro:	04	<i>ACK</i>
Automation:	09	<i>TEN</i>
Maestro:	02 07 23 FF FF 42 02 CS	Response to Query <sup>1</sup>
Automation:	04	<i>ACK</i>
...		
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
Automation:	02 09 FF 01 00 07 43 FF FF FF FF CS	Take (Immediate) Command ID 00 07
Maestro:	04	<i>ACK</i>
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>
Automation:	09	<i>TEN</i>
Maestro:	05	<i>NAK</i>

---

<sup>1</sup> See Note 1 on previous page. In this example, the Command ID is “00 06.”

## Typical Pitfalls

### Source selection latency and subsequent modifications to that source

A common error among automation vendors is to assume instantaneous and sequential completion by Maestro of all automation commands. As a result, a command which selects a bus source will be immediately followed by commands to modify that new bus source. One example of this would be to issue a TAKE\_XPT and immediately, or even within the same BEGIN-END construct, issue a command such as LRS-PST to modify the new source. In this case, where the automation system attempts to modify the source selected in TAKE\_XPT without first verifying its presence on the desired bus, it is likely that the specified modifications will be applied to the current source and not the source specified in the TAKE\_XPT command. A worse situation would be the immediate issuance of a TX\_TRIG after a TAKE\_XPT potentially resulting in the wrong source “On Air”. One reason for this is due to the fact that Maestro may be relying upon an external router to perform source switching and will only apply modifications to the selected source upon switch confirmation. Another example is an automation system issuing a TX\_TRIG and then immediately following it with commands modifying the PST bus. Unless the automation system has verified that the transition is complete via TX\_STAT messages, modifications may unexpectedly appear on the PGM bus. If the automation vendor uses a query approach to determine if TX\_TRIG is complete, as opposed to the superior automatic update solution, they must resolve the problem of an immediate “quiescent” TX\_STAT reply meaning the transition hasn't started or the transition is complete (especially difficult in the case of Cut). In the past, some attempts have been made to estimate the latency between receiving a source selection command and when that source is available for modification. Due to the fact that every installation may be unique in its configuration and external hardware setup, the following statements are made to supersede all previous estimates:

**The latency of command execution at every installation is potentially unique due to such influences as hardware and software configuration, dependencies upon external hardware (possibly 3rd party), system load, etc. Due to this uniqueness, it is imperative that the automation vendor NOT assume a fixed period of time between a command being issued and its completion. The ideal solution to this problem is to use Maestro automatic updates of relevant commands. Another, less than ideal, solution is to query relevant commands to determine when an issued command has completed (must deal with aforementioned “quiescent” TX\_STAT pitfall).**

In conclusion, commands do not complete instantaneously and may not even complete sequentially in a multi-threaded real-time environment such as Maestro.

### Incorrect association of reply with query

Another common error when interfacing with Maestro is the incorrect association of a response from Maestro with the wrong query. An example of this, and its result, is shown below:

Automation:	BRK 82 80 02 06 7f 02 01 01 00 00 77	Set TAKE_XPT PST -> 01
Maestro:	04	ACK
Automation:	02 02 A1 04 59	Set LRS_PST -> Stereo
Maestro:	04	ACK
Automation:	02 02 4C 01 B1	Set VID_MODE -> Cut
Maestro:	04	ACK
Automation:	02 03 91 01 06 65	Set PROLL -> 1.6 seconds
Maestro:	04	ACK
Automation:	02 0E E0 07 09 80 05 00 00 02 00 00 00 00 00 00 7B	Set SET_MIX -> ...
Maestro:	04	ACK
Automation:	02 02 44 80 3A	TX_TRIG (with preroll)
Maestro:	04	ACK
Automation:	02 02 22 45 97	(a) Query TX_STAT

Maestro:	04	(b)	ACK
Automation:	09	(c)	TEN
Maestro:	05	(d)	NAK - problem begins here
Automation:	02 02 22 45 97	(e)	Query TX_STAT
Maestro:	04		ACK
Automation:	09		TEN
Maestro:	02 03 23 45 03 92	(f)	TX_STAT = quiescent
Automation:	04		ACK
Automation:	02 02 22 45 97	(g)	Query TX_STAT
Maestro:	04		ACK
Automation:	09		TEN
Maestro:	02 03 23 45 03 92	(h)	TX_STAT = quiescent
Automation:	04		ACK
Automation:	02 06 7F 02 01 01 00 00 77	(i)	Set TAKE_XPT PST -> 01
Maestro:	04		ACK
Automation:	02 02 A1 04 59		Set LRS_PST -> Stereo
Maestro:	04		ACK
Automation:	02 02 4C 01 B1		Set VID_MODE -> Cut
Maestro:	04		ACK
Automation:	02 03 91 01 06 65		Set PROLL -> 1.6 seconds
Maestro:	04		ACK
Automation:	02 02 44 80 3A	(j)	TX_TRIG (with preroll)
Maestro:	04		ACK
Automation:	02 02 22 45 97	(k)	Query TX_STAT
Maestro:	04		ACK
Automation:	09		TEN
Maestro:	02 03 23 45 02 93	(l)	TX_STAT = quiescent
Automation:	04	(m)	ACK
Automation:	02 06 7f 02 02 02 00 00 75	(n)	Set TAKE_XPT PST -> 02
Maestro:	04		ACK

The result of the above example was that source 02 (n) was transitioned to air rather than the expected source 01 (i) for the following reason: Automation queried Maestro for TX\_STAT at (a) which Maestro ACKnowledged receiving the request at (b). When automation sent TEN (c), Maestro responded with NAK (d) indicating it had nothing to send (YET!). Automation again queried Maestro for TX\_STAT (e) which Maestro ACKnowledged. When automation sent TEN, Maestro responded (f) with quiescent. However, Maestro's response (f) was the response to the query at (a), NOT the query at (e). In this case, automation was incorrectly handling a NAK response to a TEN resulting in all subsequent responses to be out of sync with the queries by 1 command. Therefore, when automation later queries Maestro for TX\_STAT (k) after the TX\_TRIG (j), the TX\_STAT response (l) is actually queued from, and associated with, the TX\_STAT query (g). Automation then immediately (and incorrectly) acted upon the quiescent TX\_STAT and proceeded to change the PST source (n) before the transition was complete resulting in the wrong source 02 on air. It is important to keep in mind that if Maestro acknowledges a query, a response will be queued and returned to the automation system. A NAK in response to a TEN when there are pending requests does NOT mean “Nothing to send”, but rather “Nothing to send YET”. It is also important to remember that any pending requests for transition status (TX\_STAT) should be read from Maestro buffers prior to issuing a TX\_TRIG to prevent processing of pre-transition status post-trigger.