MC850 Operation Manual

1 Important safety instructions

1. Please read carefully prior to product installation or operation.
2. Read these instructions.
3. Keep these instructions.
4. Heed all warnings.
5. Follow all instructions.
6. Do not use this apparatus near water.
7. Clean only with dry cloth.
8. Do not block any ventilation openings. Install in accordance with manufacturer's instructions.
9. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
10. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade and/or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
11. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point they exit from the apparatus.
12. Only use attachments/accessories specified by the manufacturer.
13. Use only with the cart, stand, tripod, bracket, or table provided by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
14. Unplug this apparatus during lightning storms or when unused for long periods of time.
15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate properly, or has been dropped.

2 Approvals

This equipment has been tested and found to be compliant with the limits for Class A Digital device pursuant to part 15 of the FCC rules.

This equipment has been tested to UL 60065 and is listed with that agency

3 Warnings

3.1 Explanation of Warning Symbols

3.1.1 Lightning Bolt

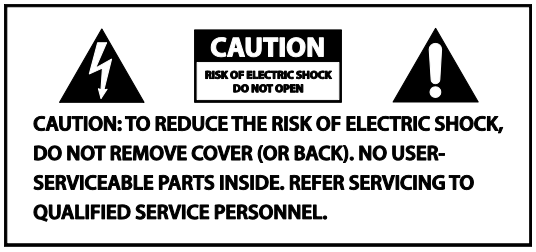
The lightning bolt within arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electrical shock to person.

3.1.2 Exclamation Point

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instruction in the literature accompanying the appliance.

3.2 Warnings

WARNING: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT EXPOSE THIS AMPLIFIER TO RAIN OR MOISTURE. DANGEROUS HIGH VOLTAGES ARE PRESENT INSIDE THE ENCLOSURE. DO NOT OPEN THE CABINET. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.



Please refer to the following table for AC Line plug information.

Voltage	Line plug (according to standard)
110-125 V (US)	UL817 and CSA C22.2 no 42.
220-230 V (EUROPE)	CEE 7 page VII, SR section 107-2-D1/IEC 83 page C4
240 V (UK)	BS 1363 of 1984. Specification for 13 A fused plugs and switched and unswitched socket outlets.

3.3 User Responsibility

3.3.1 Mains Connection Grounding

Your amplifier must be connected to a grounded outlet. Do not defeat the safety purpose of the polarized or grounding-type plug.

3.3.2 Speaker Output Hazard

Power amplifiers are capable of producing hazardous output voltages, especially constant voltage amplifiers. To avoid electrical shock, do not touch any exposed speaker wiring while the amplifier

is operating. External wiring connected to the speaker terminals shall be installed by a qualified person. Do not connect or disconnect speaker wires while the mains power is on. Do not connect speaker wires together or to ground as this may result in permanent damage to your amplifier.

3.3.3 Radio Interference

This product has been tested and complies with the EMC directive, and with FCC part 15 Class A. If this product is not used in accordance with these operating instructions, it may cause interference with to other equipment, such as radio and television receivers.

3.3.4 Speaker Damage

Loudspeakers may be damaged or destroyed if overpowered. Always check the loudspeaker's continuous and peak power ratings to prevent such an occurrence. Do not rely solely on the amplifier's volume control to reduce output power to a level safe for the loudspeakers.

3.3.5 Maintenance

Clean regularly with a soft cloth to remove dust and debris. Also check that vent holes and slots are not covered and that there is adequate ventilation for convection cooling.

4 Table of Contents

5 Welcome

Congratulations on the purchase of your new Stewart Audio MC850 Multi-channel audio amplifier. This amplifier has been designed and built to provide you with years of high-quality audio performance and trouble-free operation. If after reading this operation manual you have questions concerning amplifier installation and operation, please contact your Authorized Stewart dealer, or you may contact us directly using the contact information provided on the back of this guide.

5.1 Features

The MC850 amplifiers offer 8 channels of audio with nominally 50W output power per channel. The output power can be allocated up to a maximum of 125W (low impedance) or 100W (constant voltage) per channel as long as the 200W/ 4 channel limit is not exceeded. (See Section 7.2.2.6 for more information.) These network-enabled models employ the Dante™ audio transport protocol to deliver low latency audio over category 5e/6 cables via a 100/1000BaseT network. The low impedance model (LZ) operate into 4Ω or 8Ω loudspeakers, while the constant voltage or high impedance model (CV) are designed to be used with one or more high impedance loudspeakers per channel. The mixed impedance model (MXZ) operates into 6 channels of high impedance loudspeakers and 2 channels of 4Ω or 8Ω loudspeakers. All models offer control and status via the Ethernet control port using Stewart Audio's Multichannel Amplifier Control and Status application. Output level control is also available over an RS-232 interface for legacy controllers.

5.2 Unpacking and Visual Inspection

Every Stewart Audio product is carefully tested and inspected before leaving the factory and should arrive in perfect condition. If any damage is discovered, please notify the shipping carrier immediately. Save the packing materials for the carrier's inspection and for any future shipping.

5.3 Installation and Setup

5.3.1 Rack Mounting

The MC850 is designed for rack mounting in a standard 19" rack using the rack mount brackets supplied with the amplifier. The CV and MXZ models weigh in excess of 10 pounds (4.5kg). While the design places the center of mass of these amplifiers near the front panel, **it is strongly advised that the rear of the enclosure be supported using the #6-32 tpi threaded nut in the center of the back panel.**

5.3.2 Cooling and Ventilation

Ensure that there is sufficient open space around the amplifier to allow for free air flow. The MC850 contains no fans and thus relies on convection cooling. Do not block the ventilation holes or slots. Use the following chart to determine cooling requirements for your application.

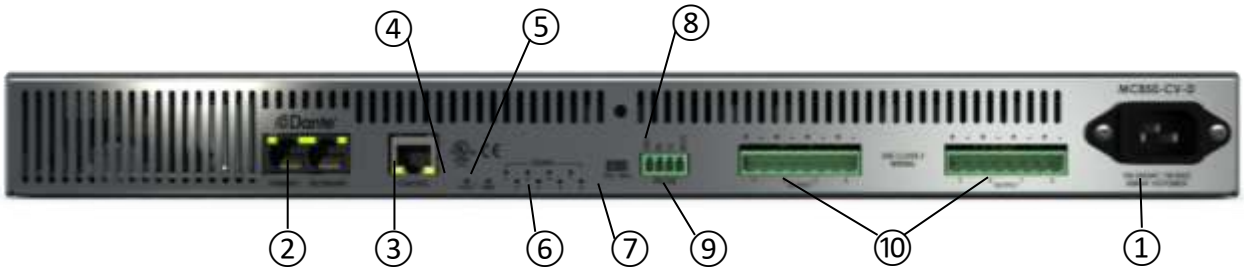
Operating Mode	Power consumption (W)	Power dissipated (W)	Energy dissipated (BTU/hr)
Standby (non-operational)	4.1	4.1	14
Idle (operational, no input signals)	28	28	96
1/8 rated audio power	103	53	181
50W/channel audio power	585	185	631

Power consumption and energy dissipated

5.3.3 Operating Voltage

The MC850 uses an integral universal power supply that operates on AC mains from 100-240V at 50 or 60 Hz. The power receptacle on the rear panel accepts IEC-60320-C13 power cords. The MC850 has no power switch. The amplifier will turn on automatically when AC power is connected to the device.

6 Rear Panel



1. **AC line input** – Connect the included IEC power cable.
2. **Network audio connectors** – Connect one end of a Cat 5e or Cat 6 cable to primary port, and the other to the 100/1000BaseT switch carrying audio traffic. By default, the two port jack is configured as a switch, so the other (secondary) jack may be used to "daisy-chain" other network components. These ports can be configured in Dante Controller as redundant audio ports, in which case each port should be connected to a switch on a separate audio network.
3. **Control and status connector** – Connect one end of a Cat5e or Cat 6 cable to this port, and the other to an Ethernet switch for network control and status. This port can be on the same network as the audio traffic or on a separate network. Further, if a redundant audio network is not required, and if the control port can be on the same subnet mask as the audio data, the two-port audio Ethernet jacks can be configured (via Dante Controller) in switch mode and the control port can be daisy-chained from the unused audio port. The PC running Stewart Audio's MC850 Control and Status application must be on the same network as the control port.
4. **Fault indicator** – This red LED illuminates in the presence of a fault. A steady LED indicates that the internal temperature of the device is reaching an unsafe level. A flashing LED indicates that the amplifier has reached an unsafe internal temperature level and has shut down for protection. The LED will remain flashing until a safe operating temperature is attained. At that time, the amplifier will automatically restart. If this condition persists, reassess airflow and cooling conditions.
5. **Power LED** – This green LED illuminates whenever AC power is applied. A steady LED indicates normal operation, while a flashing LED indicates that the amplifier has reached an unsafe internal temperature and is in a cool down phase.
6. **Signal LEDs** – The green LED associated with that channel will illuminate when the input signal level for that channel is greater than -60dBV. There is an approximately 0.5 second hysteresis at the -60dBV level to prevent excessive flashing.
7. **70/100V Switch (Constant Voltage and Mixed models only)** – Select the desired output voltage (70.7V or 100V) by sliding the switch to the appropriate position in order to meet the requirements of the country of sale. Note that a change in the desired output voltage will only take effect after the amplifier is power cycled. This is intended as a safety feature.
8. **RS-232 connector** – Connect to a standard RS-232 controller using the 3.5mm Euro-style terminal blocks provided. For RS-232 codes, see Section 6.1.3.
9. **Contact Mute** – Dry contact closure to mute all amplifier outputs.
10. **Speaker outputs** – Connect loudspeakers using the 5mm Euro-style terminal blocks provided. Use 4Ω or 8Ω speakers for low impedance models (–LZ) and the two low impedance outputs (7

and 8) on the mixed impedance models (–MXZ). Use high impedance speakers for the constant voltage models (–CV) and the six constant voltage outputs (1-6) of the mixed impedance models (–MXZ). Observe proper polarity to avoid low frequency cancellation loss.

The sum of the tapped wattage for all speakers connected to a single output should not exceed 100W_{RMS}.

The total tapped wattage for all speakers connected to outputs 1-4 should not exceed 200W_{RMS}. The total tapped power for all speakers connected to outputs 5-8 should not exceed 200W_{RMS}.

In normal operation, the DC voltage on the speaker output connectors is approximately 24VDC. Do not connect any speaker output to ground or to the amplifier chassis. Do not connect speakers across speaker outputs. (Bridge mode is not supported.)

6.1 Operation

6.1.1 Dante™ Audio

MC850 amplifiers utilize Audinate's Dante™ multi-channel digital media networking technology, with near-zero latency and synchronization. Routing audio signals from Dante-enabled transmitters to Dante-enabled receivers is accomplished via the Dante Controller Software available from Audinate's web site. Please visit their web site for detailed information regarding this technology, system and network configuration, troubleshooting, and other support. Note that the MC850 Series amplifier supports the AES67 standard. To enable the AES67 mode, click on the AES67 Config tab in the Device View in Dante Controller.

6.1.2 RS-232 Control

An RS–232 port (settings: 9600 baud; 8 n 1) allows remote control of selected amplifier functions. The RS-232 commands are defined in the following table. Each command string consists of 4 bytes (except the SET ATTENUATION LEVEL command, which has 5 bytes), all transmitted in hex values. Each command string starts with the start transmit code byte,0x02, and ends with the end transmit code 0x03.

Note that the MC850 is a DCE device, that is, the transmit pin from the RS-232 controller should connect to the transmit pin of the MC850, and similarly for the receive connection.

Command Name and Description	Hex Command	Response
DECREASE ATTENUATION BY 3dB Increases the signal level by 3dB on CHAN[1]	0x02 0x01 CHAN[1] 0x03	0x02 0x01 CHAN[1] LEVEL[2] 0x03
INCREASE ATTENUATION BY 3dB Lowers the signal level by 3dB on CHAN[1]	0x02 0x02 CHAN[1] 0x03	0x02 0x02 CHAN[1] LEVEL[2] 0x03
DECREASE ATTENUATION BY 1dB Increases the signal level by 1dB on CHAN[1]	0x02 0x03 CHAN[1] 0x03	0x02 0x03 CHAN[1] LEVEL[2] 0x03
INCREASE ATTENUATION BY 1dB Lowers the signal level by 1dB on CHAN[1]	0x02 0x04 CHAN[1] 0x03	0x02 0x04 CHAN[1] LEVEL[2] 0x03
SET ATTENUATION LEVEL Sets the attenuation to VALUE[3] (in dB) on CHAN[1]	0x02 0x05 VALUE[3] CHAN[1] 0x03	0x02 0x05 CHAN[1] LEVEL[2] 0x03
MUTE TOGGLE Toggles mute for CHAN[1]	0x02 0x6 CHAN[1] 0x03	0x02 0x06 CHAN[1] STATE[4] 0x03
MUTE ON Mutes CHAN[1]	0x02 0x7 CHAN[1] 0x03	0x02 0x07 CHAN[1] STATE[4] 0x03
MUTE OFF Un-mutes CHAN[1]	0x02 0x8 CHAN[1] 0x03	0x02 0x08 CHAN[1] STATE[4] 0x03
GET ATTENUATION Return CHAN[1] attenuation level in dB	0x02 0x09 CHAN[1] 0x03	0x02 0x09 CHAN[1] LEVEL[2] 0x03
GET MUTE Return the mute status of CHAN[1]	0x02 0x0A CHAN[1] 0x03	0x02 0x0A CHAN[1] STATE[4] 0x03

[1] CHAN selects the channel affected as follows:
0x00 = All channels
0x01 = Channel 1
0x02 = Channel 2, etc.

[2] LEVEL is the attenuation in decibels (dB), expressed as a hexadecimal (0x00 . . . 0x50)

[3] VALUE is the desired attenuation in decibels (dB), expressed as a hexadecimal (0x00 . . . 0x50)

[4] STATE is in the mute status where 0x00 is un-muted; 0x01 is muted

Note that the RS-232 level (attenuation) is ***in addition to*** the individual channel level and master level. If, for example, the individual channel level is set at 12 dB and the master level is set at 8 dB, then a 7 dB RS-232 level will result in 27 dB of attenuation relative to full power. Also, the individual channel mute button and the RS-232 command will mute the channel. ***Both*** need to be "unmuted" to restore output to the loudspeaker. RS-232 settings are retained even if power is removed from and restored to the device.

6.1.3 Speaker Connections

6.1.3.1 Channel-by-Channel Power Allocation (All Models)

Stewart Audio has incorporated channel-by-channel power allocation into the MC850 amplifiers to further enhance deployment flexibility. Each output can be configured to deliver up to 100W maximum audio power, **with the limitation that the *total* audio power from outputs 1-4 cannot**

exceed 200W, and the *total* audio power from outputs 5-8 cannot exceed 200W.

6.1.3.2 Low Impedance Models (and Low Impedance Outputs on MXZ Model)

Stewart Audio recommends using high-quality, heavy-gauge speaker wire and connectors to send the output signal of your amplifier to the speakers. Use the table in Appendix A as a guideline when selecting your wire gauge.

Speaker leads connect by means of removable terminal block connectors supplied with the unit. Strip speaker leads 1/4" and insert into connector observing proper polarity. With a small, flat-blade screwdriver, tighten the screw until the leads are held securely in place. Inspect for possible shorts or broken wires.

6.1.3.3 Constant Voltage (High Impedance) Models (and High Impedance Outputs on MXZ Model)

Constant voltage amplifiers are designed to facilitate paralleling a number of high impedance speakers on a single output (channel). Ideally the output signal level is set to deliver nominally $70.7V_{RMS}$ ($100V_{RMS}$ in Europe) at the output terminals. The output voltage is selected by positioning the 70/100V switch on the rear of the device to the appropriate position. Each speaker transformer is then appropriately tapped to deliver the required volume level for that speaker. Make certain that the total tapped power from all speakers connected to an output channel does not exceed the rated power of that channel. A good rule of thumb is to load the channel no more than 75-80% of rated power.

Care should be used when working around the speaker terminals. Though not officially recognized as a shock hazard in the UL 60065 Safety Requirements, touching these terminals can be quite unpleasant and should be avoided.

Because the current flow in constant voltage systems and speakers is much lower than in 4/8Ω systems, higher gauge (thinner diameter) wire can be used. Please refer to the table in Appendix A to choose the appropriate wire gauge for your installation.

Speaker leads connect by means of removable terminal block connectors supplied with the unit. Strip speaker leads 1/4" and insert into connector observing proper polarity. With a small, flat-blade screwdriver, tighten the screw until the leads are held securely in place. Inspect for possible shorts or broken wires.

NOTE: Class 2 wiring must be used on the speaker terminals to comply with UL requirements.

CAUTION: Do not connect either speaker terminal to ground. This will cause a short circuit which may damage the amplifier, speaker, or both. Similarly, do not connect any speaker terminal to ground.

CAUTION: The speaker terminals represent a shock hazard as they carry 70.7V and 100V when driven with an audio signal. Disconnect the amplifier from the AC power source when working on these terminals.

7 MC850 Configuration and Status Application

The MC850 Configuration and Status application allows the user to set various amplifier parameters, and receive amplifier status information via a network connection. This application is available for Windows operating systems from Stewart Audio's web site.

7.1 MC850 System Status Screen

When the MC850 Configuration and Status Application is launched, the application automatically discovers all MC850 devices on the network and populates the System Status screen. Selecting the Program and System drop down menus provide options described below. The refresh button causes the application to poll and recreate a list of all MC850 devices on the network. This list includes the IP address of the control port (note that the control port may be either on the Dante audio network, or on a separate network), MAC address, host name, device name, model, and firmware version of the device. To connect to a specific device, double-click anywhere along the row describing that device.

7.1.1 Program Drop-down Menu

There are two selections on the Program drop-down menu. The About option provides the version information for the application. The Exit option exits the application.

7.1.2 System Drop-down Menu

There are four options on the System drop-down menu. The Select option allows the user to select all or none of the connected devices for subsequent operation (change mute status, change run/standby status, and update firmware on selected devices). If the intent is to change the status of just some of the connected devices, the status box may be checked for each individual device.

The Mute option mutes or unmutes all selected devices. The Standby option changes the run/standby status of all selected amplifiers.

The Update Firmware on Selected Devices option sequentially updates all selected devices. To update firmware, first download the new firmware version from the Stewart Audio web site (Stewart Audio MC850 Firmware Update Site) and save it to a known location on your PC. Then select the devices you wish to update and select the Update Firmware on

Selected Devices option on the system screen drop-down menu. A window will open for you to select the new firmware hex file. Navigate to the storage location, select the file, and click open.

7.2 MC850 Device Status Screen

There are four tabs associated with device status: Status, Setup, Event Log, and Load Test. Click on the desired tab to move to that screen.

7.2.1 Status Tab

7.2.1.1 VU Meters and Signal Indicators

The Status tab displays VU meters at the top. These may be set to monitor either the input signal level or the output signal level of all channels by moving the switch to the left of the meters. Just below the meters are 8 green lights. These mirror the LEDs on the amplifiers and illuminate when an audio signal is present on that channel.

7.2.1.2 Trim Level Sliders and Level Entry

Below the VU meters and lights are 9 sliders. These trim the level of each channel. There is also a master slider that trims all channels simultaneously. The master trim and individual channel trims are additive. These may be set by either moving the slider with the mouse, entering the level in the box below the slider, or by using the up/down arrows on the right side of each level box. The level can be adjusted in 0.5 dB steps.

7.2.1.3 RS-232 Settings

The MC850 Series of amplifiers are also equipped with an RS-232 port for volume control and status. The RS-232 levels for each channel and the master level set by the RS-232 controller are indicated at the bottom of the Status Tab page. The Reset RS232 button resets all levels to 0dB. This is provided in the event the RS-232 controller has failed or gotten out of sync with the amplifier.

7.2.1.4 External Mute LED

This LED indicates the status of the external dry contact mute terminal. When illuminated, the amplifier is muted.

7.2.1.5 Run/Standby, Identify, and Connection Buttons

On the upper right side of the Status tab there is a Run/Standby button. The text in the button indicates the amplifier status, and the strip at the bottom appears dark green when in the Standby mode and bright green when in the Run mode. The Standby mode is recommended when the amplifier will not be delivering an audio program for extended periods of time. The total power draw in Standby mode is just over 4W (as compared with 28W in idle mode). There is less than a half second time lag for the amplifier to emerge from Standby mode. Note that the power to the Dante device remains on during Standby so the amplifier never drops off the Dante network.

Just below the Run/Standby button is the Identify button. When this button is pressed, the signal present LEDs on the amplifier will flash for several seconds, providing a visual indicator of the device currently being controlled and monitored by the application.

To the right of the Run/Standby button is a light that indicates whether the application is connected to or disconnected from the device.

7.2.1.6 Firmware Version, Device Name, and Fault Indicator

Also to the right of the VU meters is a Connection button which is bright green when the control program is connected to the amplifier (and dark green when disconnected). Below that the device's firmware version, device name (see Setup Tab Section 7.2.2 for details), and model.

7.2.1.7 Channel Status Indicators and Temperature Gauges

To the right of the trim sliders are four Channel Status boxes that illuminate to indicate the amplifier status. The MC850 actually uses four separate amplifiers, each in BTL mode to provide power to the eight speaker loads. The status of each amplifier is displayed in the box beside its associated channels. There are five possible conditions for each amplifier: Normal, Standby, Disabled, Over temperature, and Over current. When the amplifier is operating normally, the box will appear green. When the amplifier is in Standby, the box will appear orange. When the amplifier is disabled (the PWM switching has been stopped), the box will appear yellow. When the amplifier is in danger of exceeding its maximum temperature rating or if it has exceeded its maximum current rating, the box will appear red.

To the right of the Channel Status boxes are two temperature gauges indicating the approximate temperature of the PCB in the area of the amplifiers and of the MCU. If these gauges show excessive temperature, check the ventilation and ambient air temperature surrounding the amplifier. Adjust these environmental conditions until the temperature indicators are in the green (safe) range.

7.2.2 Setup Tab

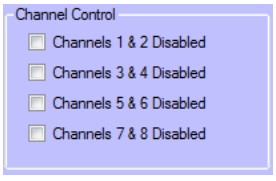
7.2.2.1 Name Section

The amplifier and channel names can be entered in the upper left section of the Setup Tab. When the Save button below the entry boxes is pressed, the new channel and device names are propagated through all tabs of the application. To avoid confusion, it is recommended that these identifiers be the same as those used in Dante Controller, but the choice is left to the user.

7.2.2.2 IP Address Section

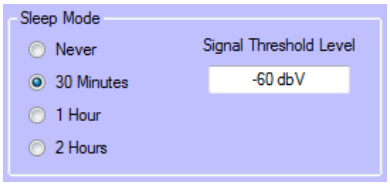
The default condition for the MC850 is to receive a control port IP address automatically from the DHCP server. However if a static IP address is desired, this section provides a mechanism to assign that address. Use care when exercising this option as setting an IP address that is not in the same subnet as the controlling PC will result in a failure to discover the device.

7.2.2.3 Channel Control Section



To the right of the Name section is the Channel Control section. Pairs of channels (corresponding to one of the physical amplifiers) can be enabled or disabled. When disabled, the PWM switching of the amplifier is halted. While this does not save a significant amount of energy, it ensures absolute silence at the speakers for the disabled channel pair.

7.2.2.4 Sleep Mode Section



To the right of the Channel Control section is the sleep mode section. The user may set the signal threshold level as desired. When there is no audio signal greater than the set threshold level at any of the eight inputs for the time selected, the amplifier will enter the sleep mode. The main power supplies will be turned off (but not the power to the Dante device) just as in the standby mode. However, when a signal above the threshold level appears at any channel, the amplifier will automatically wake from this mode and return to its operating conditions when it entered sleep mode. There is a short time delay (approximately ½ second) before the amplifier is restored to normal operation. Sleep mode can be defeated by selecting Never as the time interval.

7.2.2.5 Speaker Impedance Section (–LZ and Channels 7 & 8 of the –MXZ)

The Speaker Impedance section) is to the right of the Sleep Mode section. Select the impedance that matches the speakers connected to the low impedance outputs. This ensures that the proper signal levels are delivered to the load to prevent overdriving the amplifier.

7.2.2.6 Power Allocation Section (–LZ and Channels 7 & 8 of the –MXZ)

The low impedance output models (–LZ Model and Channels 7 & 8 of the –MXZ model) allow the user to allocate different audio power levels for each channel. As delivered, each channel is allocated 50W$_{rms}$. Larger spaces may require more power while smaller ones may require less. The Power Allocation Section provides the means to setting these power levels. However there are certain limitations.

- **The total power available to channels 1-4 is 200W$_{rms}$**
- **The total power available for channels 5-8 is 200W$_{rms}$**
- **No channel may be allocated more than 125W$_{rms}$**

Note that only channels 7 and 8 of the MXZ Model are low impedance. However, the total power available for channels 5-8 is still 200W$_{rms}$. Subtract the total allocated power for channels 7 and 8 from 200W to determine the maximum tapped wattage for *all* high impedance speakers attached to channels 5 and 6.

To adjust the power allocated to a channel, select the desired power level from the dropdown list. Proceed through all channels making certain that the total allocated power in group 1 (channels 1-4) is less than or equal to 200W and that the total allocated power in group 2 (channels 5-8) is also less than or equal to 200W.

Note that for the – MXZ model, only channels 7 and 8 have the power allocation feature. Please ensure that the total tapped power for channels 5 and 6 *plus* the power allocated to channels 7 and 8 does not exceed 200W.

For the – CV model, there is no power allocation section. However, any

channel can support a maximum to 100W total tapped power as long as the total tapped power for each *group* (channels 1-4 and channels 5-8) does not exceed 200W. In practice it is advisable to keep the total tapped power for the group and the total tapped power for any single channel to 70-80% of the maximum.

7.2.3 Event Log Tab

The following events are recorded in the Event Log.

1. Entering Standby mode
2. Entering Run mode
3. Device/channels renamed
4. Channels x & y enabled
5. Channels x and y disabled
6. Entering Sleep mode
7. Entering Wake mode
8. Speaker impedance changed
9. Power allocation changed
10. IP Address/mode changed
11. Overcurrent warning
12. Overtemp warning

The system clock is set whenever the application program makes a connection to the device. There is no internal battery (and thus no internal real-time clock), so the power up time defaults to 01/01/2000 00:00:00. The Event Log file may be cleared, saved, or printed by pressing the appropriate button.

7.2.4 Load Test Tab

The MC850 control and reporting application provides a convenient method of testing the amplifier output loads. It does not continuously monitor load impedance; nor does it measure impedance during the test process. It is intended to detect significant changes in loads that would indicate a failed speaker or failed speaker connection. It works by muting the input audio program and injecting an 18kHz test tone, and comparing the current load on each channel to a set of reference values the user can establish at any time. This process takes about 3 seconds.

To use this function, connect all low impedance loads, and tap all high impedance speakers to the desired values. Since there is some temperature dependence, allow the amplifier to temperature stabilize for best results. Press the “Take Reference Values” button on the Load Test tab. You will hear several clicks as the channels are cycled through. You will also hear an 18kHz tone. During this process, the application records the amplifier current draw for each channel. Once these values are set, pressing the “Load Test” button will rerun the same sequence and report on the variance relative to the reference values. The repeatability is better than 1%. Taking temperature variation into account, the repeatability is better than 3%.

Note that certain level controls for high impedance speakers (such as those manufactured by Atlas and Lowell) adjust volume by changing the load impedance. In this case, changing the volume will result in a variance reported by the application.

New reference values can be established at any time, and are recommended whenever a change to the load on any channel is changed. However, once a new set of reference values is established, the previous values cannot be restored. For that reason a message pops up when “Take Reference Values” is selected to verify that this is your intent.

8 Specifications

Max. Output Power[1] (all channels driven)		
MC850 LZ-D		▪ $50W_{RMS}$ x 8 @ 4/8Ω
MC850 CV-D		▪ $50W_{RMS}$ x 8 @ 70.7V/100V (selectable)
MC850 MXZ–D		▪ $50W_{RMS}$ x 2 @ 4/8Ω ▪ $50W_{RMS}$ x 6 @ 70.7V/100V (selectable) with channel-by-channel power allocation
Performance		
Frequency Response (+0, -3dB)		▪ 20Hz – 20kHz 4/8 Ω, ▪ 100Hz – 20kHz 70.7V/100V
THD + N 20Hz – 20kHz @1W @ 8Ω		▪ <0.1%
THD + N 1kHz and full power @8Ω		▪ <0.1%
THD + N 100Hz – 20kHz @1W @70.7V/100		▪ <0.1%
THD + N 1kHz and full power @70.7V/100V		▪ <0.1%
Signal to Noise Ratio		▪ >95dB
Channel-to-Channel Isolation (Crosstalk)----------		▪ >95dB
Audio Sampling Rates		▪ 44.1, 48, 88.2, 96, 176.4, 192 ksps
Power Draw	Power Saving Mode	▪ 4.1W (standby)
	Idle	▪ 28W (operational)
	1/8 Power	▪ 103W
	Full Power	▪ 585W
Amplifier Class----------		▪ D
Control and Status----------		▪ RS-232 and Ethernet
Dante™ Network Audio Input Connectors ----------		▪ RJ-45 x 2 (switched or redundant)
		▪
Output Connectors----------		▪ 5mm Euroblock
LED Indicators ----------		▪ Power, Fault, Signal (x 8)
Power Supply Input ----------		▪ 100-240VAC 50/60Hz (PFC Universal Input)
Construction ----------		▪ Aluminum Chassis
Mounting ----------		▪ 19” Rack Mount
Cooling ----------		▪ Convection (no fan)
Dimensions (excluding rack mounts) ----------		▪ CV and MXZ models: 1.74” H x 17.3” W x 14.5” D (44 x 440 x 369mm) ▪ LZ model: 1.74” H x 17.3” W x 11.0” D (44 x 440 x 280mm)
Weight----------		
	MC850-LZ-D	▪ 5 lbs. (2.3kg)
	MC850-CV-D	▪ 13 lbs. (5.9kg)
	MC850-MZ-D	▪ 12 lbs. (5.5kg)
Warranty----------		▪ 3 years

[1] Please refer to Section 6.1.4.1 Channel-by-channel power allocation for additional information.

9 Troubleshooting

The Power LED is not illuminated

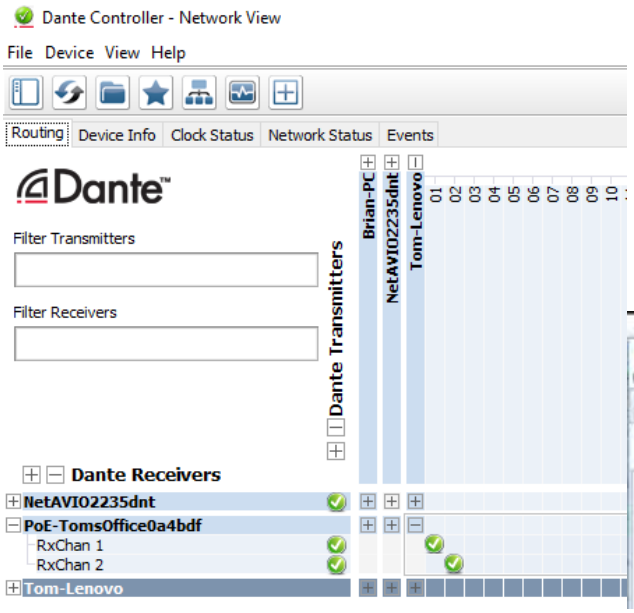
- Verify the integrity of the AC power cable and that it is fully plugged into both a live AC receptacle and the power inlet.

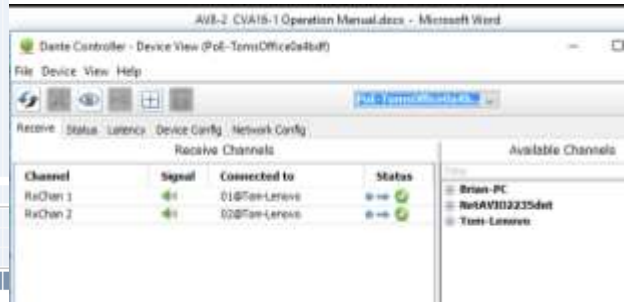
The LEDs on the RJ-45 jack are not illuminated

- Verify the integrity of the Cat5e/6 cable and that there are no broken wires.
- Verify that the Cat5e/6 cable is connected to an active switch or router.

The Power LED and the LEDs on the RJ-45 jack are illuminated, but there is no sound

- Verify that one or more Dante™ transmitters are routed to the amplifier and that there is audio coming from the transmitter. A green checkmark at the intersection of the transmitter and MC850 amplifier receiver in the Network View screen indicates that a Dante™ subscription has been established. In the Device View screen for the MC850 amplifier, the speaker symbols should be green (not gray) when a signal is routed to those receive channels and the channels have audio present. See the Dante Help for more detailed information.





The amplifier (or certain channels) cycles on and off or clicks

- Check speaker connection for loose connections, broken wires or shorts, or a loudspeaker connection to ground.

In normal operation, the DC voltage on the speaker output connectors is approximately 24VDC. Do not connect any speaker output to ground or to the amplifier chassis. Do not connect speakers across speaker outputs. (Bridge mode is not supported.)

- Verify that the total tapped wattage of all loudspeakers on a single channel does not exceed 100W and that the sum of the tapped power for channels 1-4 and 5-8 does not exceed 200W.

Amplifier overheats and/or shuts off.

- Review section 5.3.2 on proper cooling procedures.

Output sound is distorted or cracking.

- Check all cables for damage or loose connections. Replace the cables and loudspeakers temporarily to see if this resolves the problem. If problem still exists, contact your Authorized Dealer for service.

10 Warranty Information

10.1 Warranty Summary

All Stewart Audio amplifiers and accessories, unless excluded in this summary, are covered by a 3-year limited warranty on parts and labor from the data of purchase. In order to be eligible for warranty repairs, the amplifiers and accessories must have been purchased through an authorized Stewart Audio dealer and submitted by the original purchaser. This warranty is only valid in the country in which the amplifier was purchased.

10.2 Eligibility Requirements

Stewart Audio warrants against all malfunctions which come as a result of component or manufacturer defect. The amplifier is also covered from all failures which arise during the warranty period (3 years from date of purchase) that are not a result of misuse. The following actions will void your warranty:

- The power cord or AC plug has been damaged through misuse.
- The amplifier has been exposed to moisture or extreme temperatures.
- The amplifier has been dropped, items have been dropped on the amplifier, or the enclosure has been damaged.
- The amplifier has been opened by the operator.
- The amplifier was improperly packaged when sending to the factory for repair, resulting in damage.
- Any of the precautions or instructions found in this manual were not followed.

Damages resulting to the amplifier which are not covered under this warranty can be factory-repaired at cost to the customer. Use the contact information below to initiate the repair process.

10.3 Non-warranty Repairs

An estimate for all non-warranty repairs will be provided to the customer once the unit has been shipped to the factory. The customer is responsible to approve this estimate within 7 days. If the repairs are not approved within 14 days, Stewart Audio reserves the right to consider the unit scrap and may discard it. Payment for non-warranty repairs must be submitted to Stewart Audio before the product will be returned to the customer.

11 Return Procedure

All returns to the factory for service must be accompanied by a Return Authorization (RA) number. One can be obtained by contacting Stewart Audio at (209) 588-8111 or via e-mail at support@stewartaudio.com.

NOTE: Any defective products received without an RA number will be returned to sender at their expense.

If Stewart Audio is unable to contact the sender in 14 days, the merchandise will be considered scrap and may be disposed of.

11.1 Shipment Instructions

- If Stewart Audio requests that you ship the defective product back to their service center, please refer to the guide below. To ensure prompt warranty service, be sure to follow all instructions.
- Return Authorization (RA) is required for product being sent to the factory for service.
- See packing instructions in **Section 9.2.**
- Ship the defective product using a method which provides for order tracking or order confirmation. The service center is located at the following address:

  Stewart Audio
  14335 Cuesta Court Suite C
  Sonora, CA 95370

- Use a bold black marker and write the RA number on three sides of the box.

Record the RMA number for future reference. The RA number can be used to check the repair status.

11.2 Packaging Instructions

Should Stewart Audio request that you ship your product to their service center, these instructions must be followed in order to ensure safe delivery. If they are not followed, Stewart Audio assumes no responsibility for damaged goods and/or accessories that are sent with your unit.

1. Please write the RA number on three sides of the box. Include the Stewart Audio RA number inside the box and a brief description of the problem.
2. You will be advised during the RA process what accessories should be included with the amplifier (power supplies, connectors, cords, etc.). This is dependent on the failure assessment.
3. When shipping your amplifier, it is important that it has adequate protection. We recommend you use the original packing material when returning the product for repair. If you do not have the original box, see number 4.

4. If you provide your own shipping pack, use materials adequate to prevent damage during transit. Make certain that the amplifier is NOT free to move within the package, as this is the most common cause of damage.
5. Securely seal the package with an adequate carton sealing tape.
6. Do not use light boxes or “peanuts”.

NOTE: Damage caused by poor packaging will not be covered under warranty.

12 Appendix A—Maximum Speaker Cable Length Tables

Because speaker wires have a finite resistance per unit length, long cables will affect SPL. This is more important for low impedance speakers, since a few tenths of Ohms corresponds to a larger fraction of the speaker impedance, but should still be considered for high impedance systems.

The following tables can be used as a rule-of-thumb to determine the maximum speaker cable length (in feet) for various systems. First, consult the appropriate table for the type of system; low impedance, 25V, 70.7V or 100V. Find the column corresponding to the average power level to be delivered to the speakers. (For 25V, 70.7V and 100V systems, the tables assume the entire load is located at the maximum distance.) Scan down the column until you reach the required cable length, and scan across to find the appropriate wire gauge. This will result in an approximately 0.5dB loss in SPL.

4Ω, 8Ω and16Ω Speaker Lines (length in feet)			
Wire gauge	4Ω Speaker load (W)	8Ω Speaker load (W)	16Ω Speaker load (W)
10	120	240	480
12	75	150	300
14	50	100	200
16	30	60	120
18	20	40	80
20	12.5	25	50
22	8	16	32

25V Speaker Line (length in feet)									
Wire gauge	7.5W Load	15W Load	30W Load	60W Load	100W Load	125W Load	250W Load	400W Load	500W Load
10	2500	1250	625	313	188	138	69	46	34
12	1550	775	388	194	118	94	47	29	23
14	950	475	238	119	75	56	28	18	14
16	600	300	150	75	46	36	18	11	X
18	375	188	94	47	29	23	11	X	X
20	240	120	60	30	19	14	X	X	X
22	150	75	38	19	12	X	X	X	X

70.7V Speaker Line (length in feet)									
Wire gauge	7.5W Load	15W Load	30W Load	60W Load	100W Load	125W Load	250W Load	400W Load	500W Load
10	20,000	10,000	5,000	2,500	1,500	1,100	550	365	275
12	12,400	6,200	3,100	1,550	940	750	375	230	185
14	7,600	3,800	1,900	950	600	450	225	140	110
16	4,800	2,400	1,200	600	370	290	145	90	X
18	3,000	1,500	750	375	230	180	90	X	X
20	1,920	960	480	240	150	110	X	X	X
22	1,200	600	300	150	95	X	X	X	X

100V Speaker Line (length in feet)									
Wire gauge	7.5W Load	15W Load	30W Load	60W Load	100W Load	125W Load	250W Load	400W Load	500W Load
10	40,000	20,000	10,000	5,000	3,000	2,200	1,100	730	550
12	24,800	12,400	6,200	3,100	1,880	1,500	750	460	370
14	15,200	7,600	3,800	1,900	1,200	900	450	280	220
16	9,600	4,800	2,400	1,200	740	580	290	180	X
18	6,000	3,000	1,500	750	460	360	180	X	X
20	3,840	1,920	960	480	300	220	X	X	X
22	2,400	1,200	600	300	190	X	X	X	X

Shaded cells indicate a violation of the Maximum Current Rating in the National Electrical Code (NEC) and must not be used.

13 Appendix B—Ethernet Communications Interface (API) – Rev 1.0

The MC85- Series of amplifiers can be accessed by up to 10 IP-based devices simultaneously. These can be any combination of IP-based controllers and PCs. This functionality is supported for firmware versions 0.41 and above. Communications occurs over ports 50000-50009. The Device Status screen of the Stewart Audio MC850 Control and Reporting application indicates the IP address and port number used by that PC. When connecting from an IP-based controller, scan the available ports for an unused port.

This programming is intended to mimic an RS-232 controller in functionality. We have also added a command to place the amplifier into Standby or return the amplifier to its normal operating condition. Please note the following:

- All data is sent in binary, not ASCII format.
- Each command is started by a Start-of-Message byte with a value of 0x1E.
- The next two bytes are the integer length of the payload section, sent little-endian format.
- The next byte is a one-byte command code, followed by the appropriate number of data bytes for that command.
- The final byte of the packet, after any required payload, is a one-byte checksum. This checksum is the 8-bit sum of the bytes starting with the first byte of the payload length field, through the end of any payload data.
- Every command returns a response.

Commands

1. INVALID COMMAND RESPONSE
   Command code: 0x02
   Description: returned if the board receives a command with an unrecognized command code
   Input parameters – never sent by host - response only

   MC850 sent data
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x01 *low byte of payload length (1-byte message in this case)*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x02 *command code*
   Byte 4 = 0x03 *8-bit checksum of bytes 1 through 3*

2. INVALID PARAMETER RESPONSE
   Command code: 0x03
   Description: returned in the board receives a command packet with bad parameters
   Input parameters – never sent by host - response only

MC850 sent data
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x01 *low byte of payload length (1-byte message in this case)*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x03 *command code*
Byte 4 = 0x04 *8-bit checksum of bytes 1 through 3*

3. SET CHANNEL MUTE
   Command code: 0x10
   Description: command used to mute/unmute a specified channel
   Input parameters –
   Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel
   Parameter 2 – 8-bit desired mute state, 0 = unmute, 1 = mute

   Example Host sent data
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x03 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x10 *command code*
   Byte 4 = 0x07 *channel number 7*
   Byte 5 = 0x01 *turn mute on*
   Byte 6 = 0x1B *8-bit checksum of bytes 1 through 5*

   MC850 Response
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x10 *command code*
   Byte 4 = 0x01 *command accepted response, 0 if error*
   Byte 5 = 0x13 *8-bit checksum of bytes 1 through 4*

4. GET CHANNEL MUTE
   Command code: 0x11
   Description: command used to get the mute status for a specified channel
   Input parameters –
   Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

   Example Host sent data

Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x11 *command code*
Byte 4 = 0x07 *channel number 7*
Byte 5 = 0x1A *8-bit checksum of bytes 1 through 4*

MC850 Response
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x03 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x11 *command code*
Byte 4 = 0x07 *channel number 7*
Byte 5 = 0x01 *mute state is on*
Byte 6 = 0x1C *8-bit checksum of bytes 1 through 5*

5. SET SYSTEM STANDBY
   Command code: 0x15
   Description: command used to set system to run/standby mode
   Input parameters –
   Parameter 1 - 0 = run mode, 1 = standby mode

   Example Host sent data
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x15 *command code*
   Byte 4 = 0x01 *set system to standby state*
   Byte 5 = 0x18 *8-bit checksum of bytes 1 through 4*

   MC850 Response
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x15 *command code*
   Byte 4 = 0x01 *command accepted response, 0 if error*
   Byte 5 = 0x18 *8-bit checksum of bytes 1 through 4*

6. DECREASE ATTENUATION 3 dB

Command code: 0x2E
Description: command used to decrease system attenuation by 3 dB
Input parameters –
Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

Example Host sent data
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x2E *command code*
Byte 4 = 0x04 *channel number 4*
Byte 5 = 0x34 *8-bit checksum of bytes 1 through 4*

MC850 Response
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x2E *command code*
Byte 4 = 0x01 *command accepted response, 0 if error*
Byte 5 = 0x31 *8-bit checksum of bytes 1 through 4*

7. INCREASE ATTENUATION 3 dB
Command code: 0x2F
Description: command used to increase system attenuation by 3 dB
Input parameters –
Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

Example Host sent data
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x2F *command code*
Byte 4 = 0x00 *master channel*
Byte 5 = 0x31 *8-bit checksum of bytes 1 through 4*

MC850 Response
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*

Byte 3 = 0x2F *command code*
Byte 4 = 0x01 *command accepted response, 0 if error*
Byte 5 = 0x32 *8-bit checksum of bytes 1 through 4*

8. DECREASE ATTENUATION 1 dB
   Command code: 0x30
   Description: command used to decrease system attenuation by 1 dB
   Input parameters –
   Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

   Example Host sent data
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x30 *command code*
   Byte 4 = 0x01 *channel number 1*
   Byte 5 = 0x33 *8-bit checksum of bytes 1 through 4*

   MC850 Response
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x30 *command code*
   Byte 4 = 0x01 *command accepted response, 0 if error*
   Byte 5 = 0x33 *8-bit checksum of bytes 1 through 4*

9. INCREASE ATTENUATION 1 dB
   Command code: 0x31
   Description: command used to increase system attenuation by 1 dB
   Input parameters –
   Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

   Example Host sent data
   Byte 0 = 0x1E *start of message character*
   Byte 1 = 0x02 *low byte of payload length*
   Byte 2 = 0x00 *high byte of payload length*
   Byte 3 = 0x31 *command code*
   Byte 4 = 0x00 *master channel*
   Byte 5 = 0x33 *8-bit checksum of bytes 1 through 4*

MC850 Response
Byte 0 = 0x1E *start of message character*
Byte 1 = 0x02 *low byte of payload length*
Byte 2 = 0x00 *high byte of payload length*
Byte 3 = 0x31 *command code*
Byte 4 = 0x01 *command accepted response, 0 if error*
Byte 5 = 0x34 *8-bit checksum of bytes 1 through 4*

10. SET DISCRETE ATTENUATION
    Command code: 0x32
    Description: command used to set the system attenuation to a specified value
    Input parameters –
    Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel
    Parameter 2 - 8-bit integer value for desired attenuation.
    Sending a value of 60 will set the attenuation to -60dB.

    Example Host sent data
    Byte 0 = 0x1E *start of message character*
    Byte 1 = 0x03 *low byte of payload length*
    Byte 2 = 0x00 *high byte of payload length*
    Byte 3 = 0x32 *command code*
    Byte 4 = 0x00 *master channel*
    Byte 5 = 0x3C set attenuation to *-60dB (0x3C = +60 decimal)*
    Byte 6 = 0x71 *8-bit checksum of bytes 1 through 5*

    MC850 Response
    Byte 0 = 0x1E *start of message character*
    Byte 1 = 0x02 *low byte of payload length*
    Byte 2 = 0x00 *high byte of payload length*
    Byte 3 = 0x32 *command code*
    Byte 4 = 0x01 *command accepted response, 0 if error*
    Byte 5 = 0x35 *8-bit checksum of bytes 1 through 4*

11. GET CHANNEL ATTENUATION
    Command code: 0x33
    Description: command used to get the attenuation for a specified channel
    Input parameters –
    Parameter 1 - 8-channel number, 0 = master channel, 1..8 is single channel

Example Host sent data

Byte 0 = 0x1E *start of message character*

Byte 1 = 0x02 *low byte of payload length*

Byte 2 = 0x00 *high byte of payload length*

Byte 3 = 0x33 *command code*

Byte 4 = 0x02 *channel number 2*

Byte 5 = 0x37 *8-bit checksum of bytes 1 through 4*

MC850 Response

Byte 0 = 0x1E *start of message character*

Byte 1 = 0x03 *low byte of payload length*

Byte 2 = 0x00 *high byte of payload length*

Byte 3 = 0x33 *command code*

Byte 4 = 0x07 *channel number 7*

Byte 5 = 0x32 *attenuation is -50dB (0x32 = 50 decimal)*

Byte 6 = 0x6F *8-bit checksum of bytes 1 through 5*