



# **MOTOR DRIVE AMPLIFIER**

## **4840393**

**AMPEX UPGRADE ELECTRONICS**

*Owner's Manual*

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RTZ Professional Audio, LLC  
Alpharetta, GA USA  
Web: <http://www.rtzaudio.com>  
Email: [rtzaudio@comcast.net](mailto:rtzaudio@comcast.net)

## 1. INTRODUCTION

Thank you for purchasing your new RTZ motor drive amplifier for Ampex MM-1200 studio recorders! All cards are hand built and individually tested prior to shipping. Before installing the card, please read this document thoroughly and retain it for future reference. Additional copies of this manual are available upon request or may be downloaded from our website at <http://www.rtaudio.com>.

All items are carefully packed to endure the rigors of shipping and handling. However, please inspect all contents and packaging immediately upon receipt. Please report any problems to us immediately. In the event of damage, retain all shipping and packaging materials for shipper damage claims inspection.

## 2. DESCRIPTION

The RTZ MDA (motor drive amplifier) replaces the original Ampex MDA for the MM-1200 and is designed for use in machines with three TO-3 motor driver output transistors on the MDA heatsink chassis. The RTZ MDA is optimized to work with the DTC-1200 digital transport controller, but can also be used with the standard Ampex transport controller as well.

The RTZ MDA includes torque offset adjustment trimmers that allow fine adjustment of the torque balance between reel motors. Balanced torque offset is critical for use with the DTC-1200 controller.

The RTZ MDA torque offset is calibrated by using the DTC-1200's zero torque adjustment diagnostic feature. The offset trimmers are adjusted until the motor just begins to develop torque at a known reference DAC level. The motor drive torque signal can be observed with an oscilloscope connected to test points on the MDA board as well.

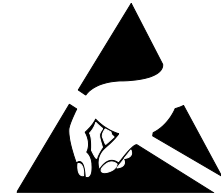
## 3. WARNING! - ELECTRICAL HAZARDS ARE PRESENT IN THE MDA AREA!

**THE MDA CIRCUIT AND ASSOCIATED COMPONENTS CONTAIN RECTIFIED AC MAINS VOLTAGE. HIGH VOLTAGE DC IS PRESENT ON THE MDA CARD AND EXTREME CAUTION SHOULD BE USED ANY TIME MEASUREMENTS OR ADJUSTMENTS**

**ARE BEING MADE. WHEN INSTALLING OR WORKING WITH THE MDA OR IT'S ASSOCIATED COMPONENTS, USE A QUALIFIED SERVICE TECHNICIAN. ALWAYS USE EXTREME CAUTION ANY TIME YOU ARE WORKING WITH THE MDA CARD!**

**NEVER DIRECTLY TOUCH THE MDA CARD OR ANY OF IT'S PCB COMPONENTS WHILE THE BOARD IS INSTALLED IN THE MACHINE. ALWAYS ASSUME THAT THE MDA BOARD AND ANY OF IT'S COMPONENTS CONTAIN LIVE VOLTAGES PRESENT WHILE INSTALLED IN THE MACHINE!**

**USE EXTREME CAUTION IF THE MDA CARD IS INSTALLED IN THE MACHINE ON AN EXTENDER CARD! MAKE ABSOLUTELY SURE THAT NO BODY PARTS, TOOLS, TEST CLIPS, WIRES OR OTHER OBJECTS COME INTO CONTACT WITH THE MDA BOARD OR ANY OF IT'S COMPONENTS AT ANY TIME!**



**A MOMENTARY SHORT TO THE CARD CAN CAUSE SPECTACULAR ARC-AND-SPARK ACTIVITIES AS WELL AS THE VERY REAL POSSIBILITY OF DAMAGING THE MDA CARD AND THE REST OF THE MACHINE!!!**

**DO NOT HOT SWAP THIS CARD! ALWAYS REMOVE POWER BEFORE INSERTING OR REMOVING THE MDA CARD FROM THE MACHINE!!!**

### DISCLAIMER

THE USER ASSUMES ALL RISK BY INSTALLING OR USING THIS MDA CARD. RTZ PROFESSIONAL AUDIO, LLC ASSUMES NO LIABILITY OR RESPONSIBILITY FROM USING THIS CARD. THE MDA CARD IS SOLD AS IS WITHOUT WARRANTY AND WITHOUT ANY MECHANABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

#### 4. CONFIGURATION JUMPER

Jumper JP1 must be correctly strapped before the MDA is installed in machine! The MDA card ships strapped for use with the DTC-1200 or default non-tension kit equipped machines. You must change the jumper setting if you plan to use this MDA card with a legacy Ampex tension equipped machine.

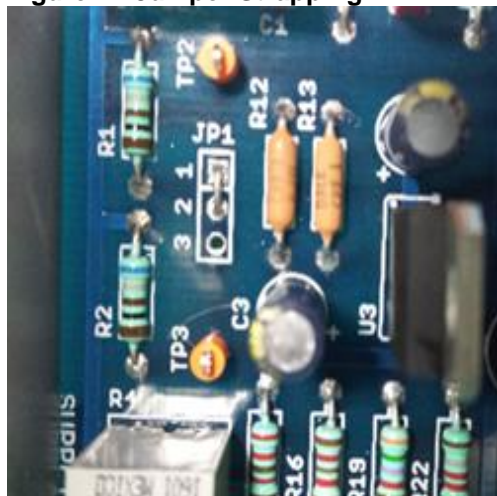
If the Ampex tension kit is used, jumper JP1 must be set to positions 2 & 3. Otherwise, set this jumper to the position 1 & 2 for use with the DTC-1200 controller or legacy Ampex controllers.

**Table 1 - Jumper Configuration**

JP1	Jumper Configuration
1 & 2	This jumper position must be strapped if the MDA is used with the DTC-1200 controller or the stock Ampex controller card on machines <u>not equipped</u> with the legacy Ampex tension kit.
2 & 3	This jumper position must be strapped if the MDA will be used with the legacy Ampex tension kit equipped machines only.

Refer to **Figure 1** to select the appropriate configuration required for your machine. Unless you plan to use the original Ampex tension kit, it's best solder this in position 1 & 2 to avoid any potential issues that might arise from use of a removable jumper.

**Figure 1 - Jumper Strapping**



#### 5. PROTECTIVE FUSES

The RTZ MDA card uses fuses to protect the MDA card in the event a TO-3 output power transistor fails/shorts, a power surge occurs or an over-current situation occurs that exceeds the time delay fuse limit. A large TVS spike protection diode is connected with the fuse such that the fuse will blow in the event of an over voltage or over current condition.

Check the TO-3 output transistors carefully should your MDA card ever blow a fuse. Replace the fuse with the same 500mA SLO-BLO type specified. Always replace the fuse with same type shown in Figure 2 below or with an equivalent replacement fuse type.

**Figure 2 – Fuse Replacement**

Manufacturer:	Bussmann / Eaton
Part Number:	BK/S506-500-R
Fuse Type:	Time Delay/Slow Blow
Current Rating:	500 mA
Fuse Size:	5 mm x 20 mm
AC Rating:	250 VAC

**ALWAYS REPLACE THE FUSE WITH THE SAME TYPE FUSE OF THE SAME RATING IN THE EVENT A FUSE EVER BLOWS.**

**ALWAYS CHECK THE LARGE TO-3 TRANSISTORS ON THE MAIN MD HEATSINK CAGE IN THE EVENT A MDA FUSE EVER BLOWS. TYPICALLY, A BLOWN MDA FUSE INDICATES A SHORTED TO-3 OUTPUT TRANSISTOR ON THE MDA HEATSINK.**

## **6. OFFSET TRIMMER ADJUSTMENT FOR USE WITH DTC-1200 DIGITAL TRANSPORT CONTROLLER**

Trimmers R3 and R4 are 10-turn precision trimmers that allow adjusting the input reference voltage to the op-amp motor drive servo loop. These trimmers allow adjusting the starting point at which the motors first begin to develop torque and begin to spin. This alignment procedure is best done with the DTC-1200 diagnostic MDA DAC zero alignment procedure available in the DTC TTY configuration console.

Open the DTC-1200 serial TTY configuration console window, select the diagnostic menu and then select option #5 "MDA DAC zero adjust" to output the DAC reference values. Make sure no tape is loaded on the machine before running this diagnostic procedure as the reel motors will spin.

Advance the DAC output level to 100 at the prompt and adjust each trimmer until the motor just begins to develop torque and spins as slowly as possible. Adjust each motor to spin closely to the same speed. Do not adjust the trimmers to either end stop extreme. In general, you should not need to adjust the trimmer in either direction more than 2-3 turns. This calibrates DAC level 100 as the starting torque point for the constant tension servo loop.

## **7. OFFSET TRIMMER ADJUSTMENT FOR USE WITH LEGACY AMPEX CONTROLLER**

The RTZ MDA card works with the original Ampex controller and is optimized to work with the RTZ DTC-1200 Digital Transport Controller card. It includes offset adjust trimmers to allow adjustment of the starting torque point for each reel motor.

The MDA inputs are 5mA current loop interfaces. The offset trimmers allow adjusting the point at which the motor first begins to develop torque for a given input current.

Adjust multi-turn trimmers R3 and R4 both to the mid-scale position (approximately 5-turns). You can measure the trimmer resistance (in circuit either meter polarity) with a DVM and adjust for 1.1K ohm center scale with the MDA card removed from the machine. Install the MDA card back into the machine and perform tape tension adjustments as normal. You may need to perform the overall gain trimmer adjustment procedures on the Ampex controller first.

If the motors turn with no torque applied from the transport controller, you may need to adjust the MDA trimmer a turn or so counter clockwise till motion nulls.

8. PCB COMPONENT LEGEND

