MACH3 LaserAce Installation Manual

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Introduction

T hankyou for purchasing the MACH3 Frame Number Injection Kit to accompany your LaserAce installation.

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The MACH3 Frame Number Injection Kit supports all games that use the MACH3 type board set. These include MACH3, Us. Vs. Them, and the Cobra Command conversion for MACH3.

Please take the time to read through this manual to take full advantage of your LaserAce and to ensure trouble free operation.

Retain this manual in an easily accessible location for future reference.

Parts supplied with MACH3 FNI

1. DIP20 to IDC20 cable assembly (MACH3 FNI Cable)

2. A length of wire wrap wire to make the two connections required on the MACH3 board

3. A length of solder to make the two connections required above on the MACH3 board

Why the MACH3 FNI is required

All LaserDiscs have a '24 bit Philips' code encoded into the video signal at the very start of each frame. It contains a digital representation of the frame number, and games that use one way communications (to Pioneer PR-8210, PR-8210A and LD-1100) have circuitry built into the game board to decode this frame number information. The game must know what the frame number is to allow gameplay and correct overlay of game board generated graphics.

On the MACH3 boardset this circuitry resides on two places:

- The Frame # Stripper on the A18 COLOR/SYNC BOARD ASSY.

- The Frame # Decoder on the A2 INTERFACE BOARD ASSY.

The MACH3 FNI is required for reliable and correct operation of these type games for two reasons:

1. The MACH3 Frame Number decoding circuitry is a piece of junk. It is poorly designed, unstable, difficult to adjust, and unreliable. There's not many functional MACH3's still around, and in our development we got tired of it playing up on many different MACH3 board sets. We are sure this circuit was one of the major causes of arcade operator heartache with this game.

2. Some LaserDisc Players that can be used as replacements unfortunately corrupt the 24 bit Philips code that comes out of their video output. They seem to do this as they are newer, bi-directional communicating players, and the circuitry to decode the frame number from the video stream is inside the player instead. Players that corrupt the frame number transmitted in the video include the Sony LDP-1450 (and maybe other Sony's), and the Pioneer LD-V4300D.

Installing the MACH3 FNI also bypasses the requirement to calibrate the infrared modulation signal (R22, JP14, JP15) as LaserAce reads the unmodulated communications directly from MACH3.

A very important note regarding the reliability of your MACH3:

> **The MACH3 linear power supply is also quite unreliable. If you would like to have continuous good service from your MACH3, we highly recommend replacing it with an arcade or PC style switching power supply at your earliest convenience.**

Installing the MACH3 FNI

Tools and components you will need to install the MACH3 FNI

Soldering Iron and Solder
The Solder is supplied with the MACH3 FNI.

You will require a soldering iron of suitable size o be able to solder onto IC pads on the underside of the MACH3 A2 INTERFACE BOARD ASSY.

Sidecutters
Required to strip and prepare the jumper wires and cut three legs on an IC on the MACH3 A2 INTERFACE BOARD ASSY.

Beginning the installation

1. Make a clean work area and have the tools and soldering iron ready
   Don't work in a dirty area, or on carpet. Anti-static precautions should be taken when working on any electronic circuit boards.

2. Locate the MACH3 A2 INTERFACE BOARD and remove it
   A picture of this board is in the previous section 'Identifying the MACH3 A2 INTERFACE BOARD ASSY.'

   Apart from the pictures in this document, there are more pictures in the Tech Center of the excellent Dragon's Lair Project web site here:

   http://www.d-l-p.com/tech/virtual/pages/mach3.asp

   Here is the INTERFACE BOARD shown with the MACH3 data bus cable attached.

   Remove it while taking careful note of the original cable locations and positions, so it's easy to reattach.
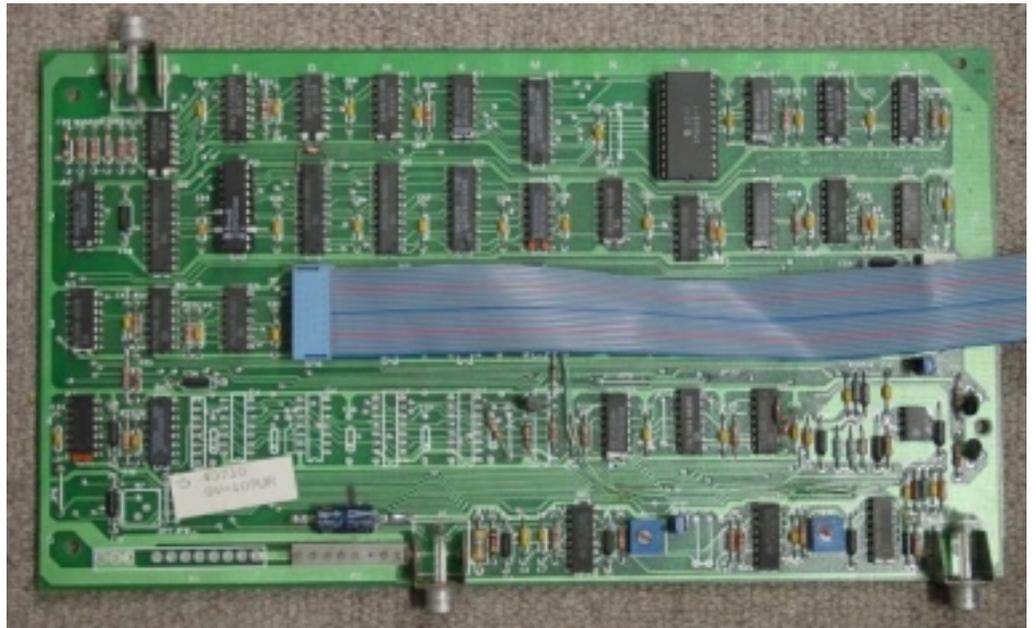
3. Solder the jumper wire from Pin1 of the 74LS244 at location E2, to pin 19 on the DIP20 socket at location G3

We chose to make these connections neatly on the underside of the board.
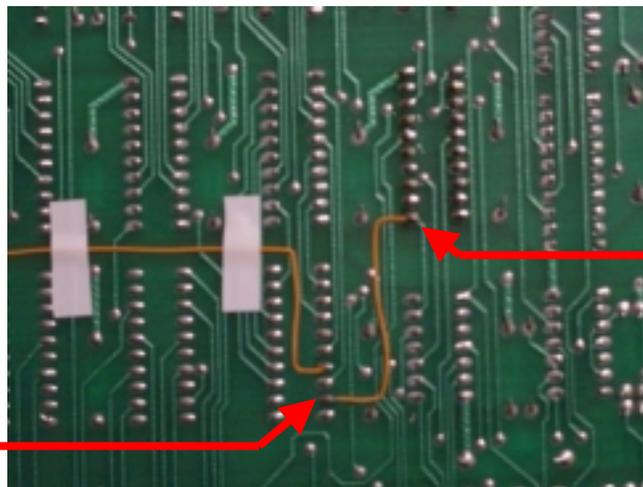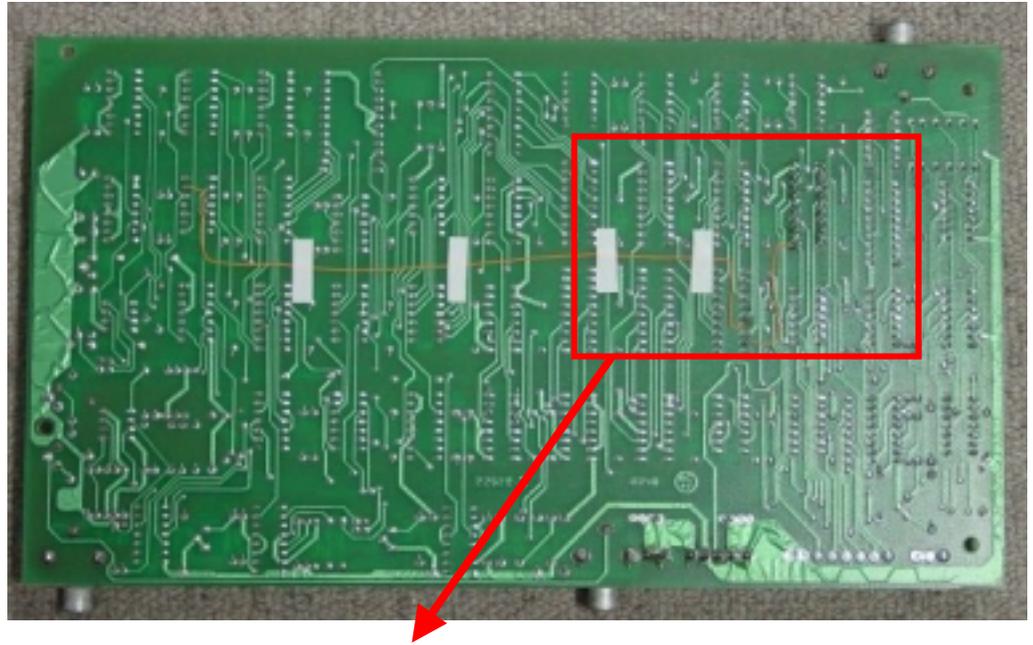
Pin 1 of the 74LS244 at location E2

Pin 19 of the DIP20 socket at location G3

Be careful to look at the identifying text and labels on the top of the board, to be sure that you solder to the correct IC and pins on the underside.

4. Solder the jumper wire from Pin6 of the 74LS74 at location W2, to pin 17 on the DIP20 socket at location G3

We chose to make these connections neatly on the underside of the board.

Pin 6 of the 74LS74 at location W2

Pin 17 of the DIP20 socket at location G3
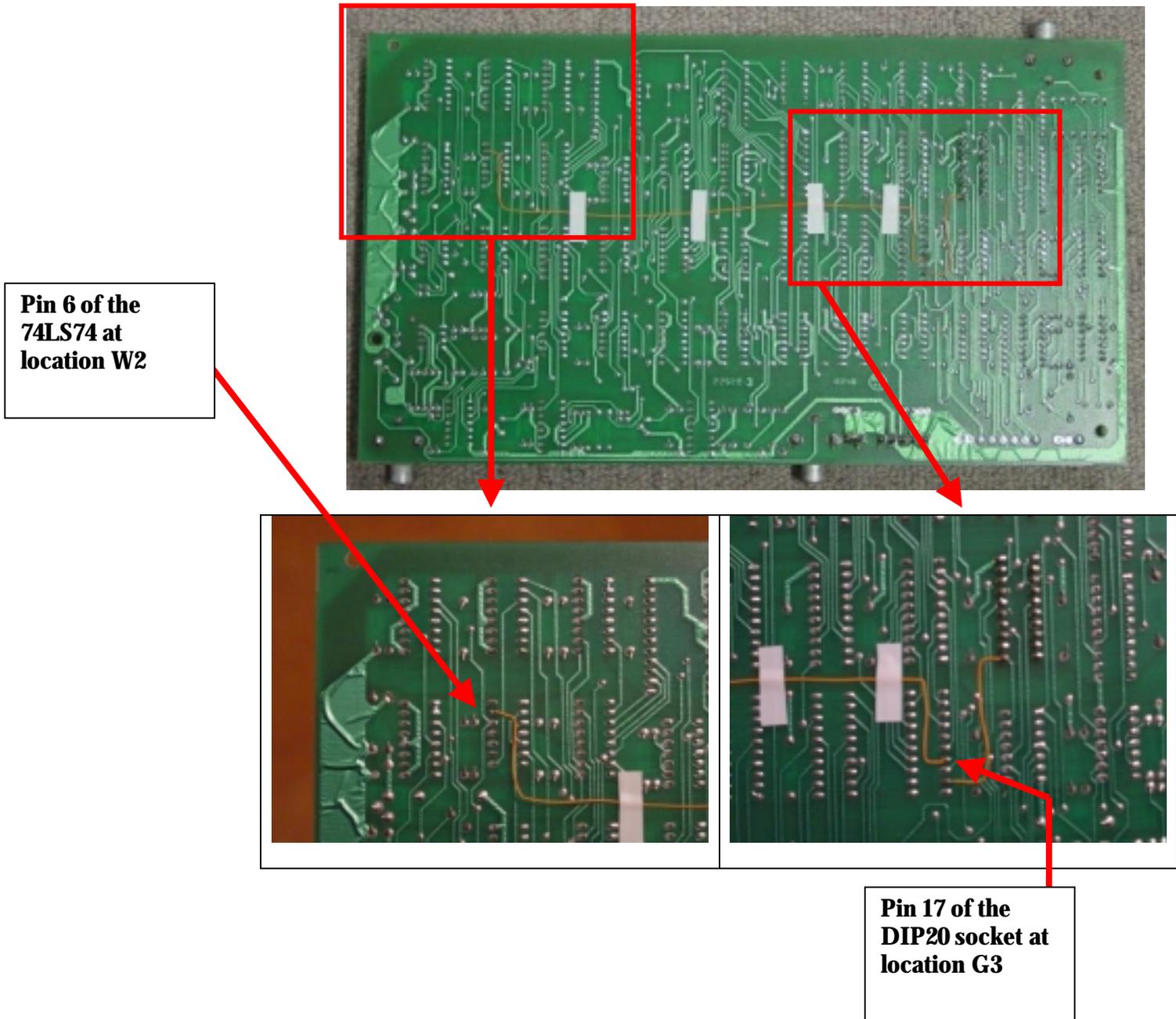
Be careful to look at the identifying text and labels on the top of the board, to be sure that you solder to the correct IC and pins on the underside.

5. Disconnect pins 3, 16, and 18 of the 74LS244 at location E2

Using Sidecutters cleanly snip off pins 3, 16 and 18 of the 74LS244 IC at location E2. This example shows our board, where we removed the IC and replaced it with a socket instead, and put a new IC in with the legs bent up instead. Either will do.
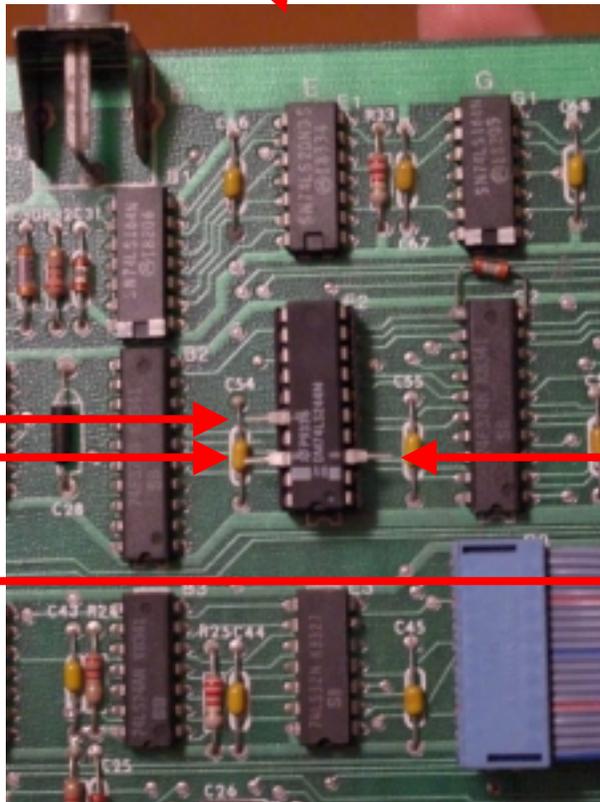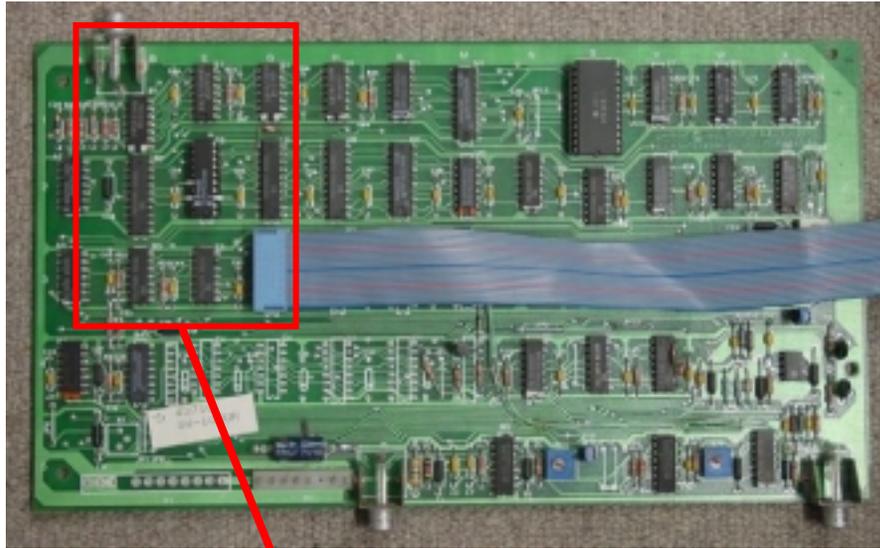
Cut or lift these pins 3, 16, and 18 from the 74LS244 IC at location E2

6. Inspect the work and hold the jumper wires down with tape if required

    We used small strips of insulation tape to hold down the long wire. You can use tape, glue, or whatever you like.

7. Reattach the MACH3 A2 INTERFACE BOARD to the game

    With the notes made from disconnecting the board, reattach it, and all the original cables back to the game.

8. Mount LaserAce and connect the Frame Number Injection cables

Mount LaserAce in a suitable location within the length constraints of the FNI cable. You may need spacers, screws or pcb mounting extenders to mount it near or above the MACH3 INTERFACE BOARD. Refer to the LaserAce manual for mounting tips and precautions.

Connect the Frame Number Injection cables as shown in the following pictures.

Be extra careful of the orientation and stripe location of these cables! Connecting them backwards will short out the +5 and GND rails in MACH3 and possibly damage the power supply and LaserAce. Marc has accidentally done this in the interests of testing. ☺
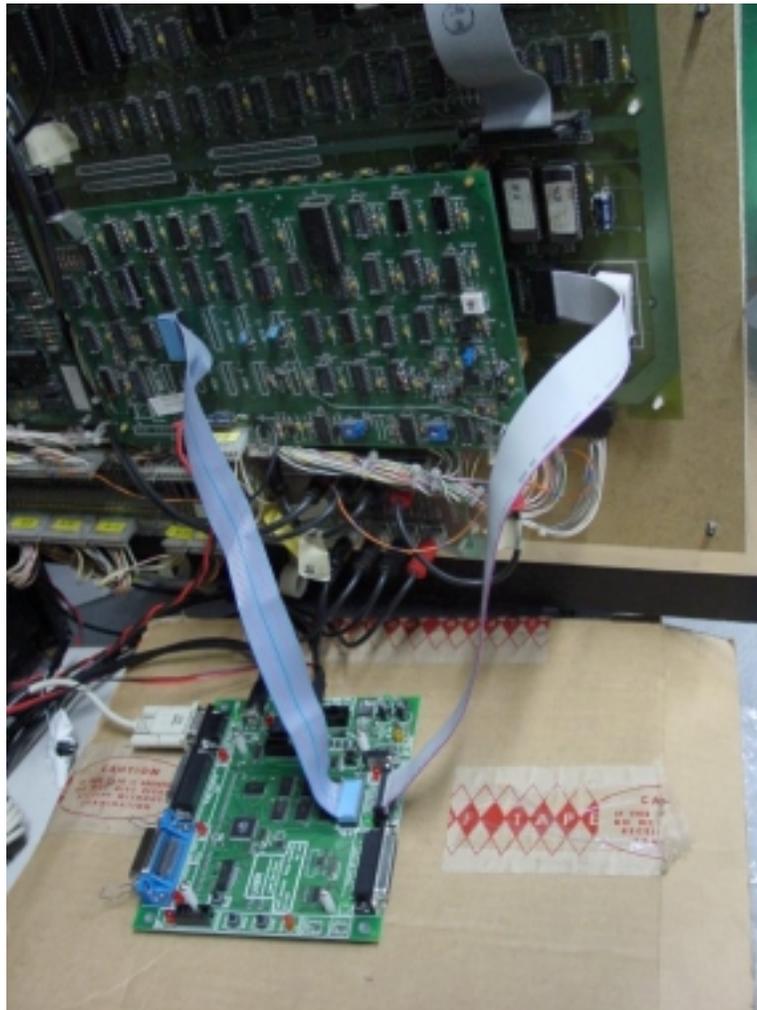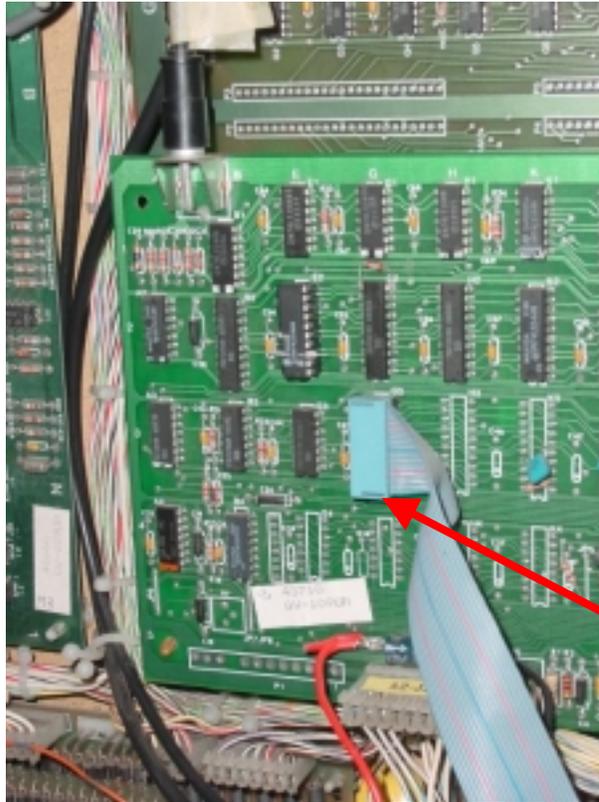
Pin 1 and cable stripe is here. Your cable may be crimped on the other side, use the Pin 1 and stripe location as the guide

Pin 1 and cable stripe is here. Your cable may be crimped on the other side, use the Pin 1 and stripe location as the guide

Pin 1 and cable stripe is here. Your cable may be crimped on the other side, use the Pin 1 and stripe location as the guide
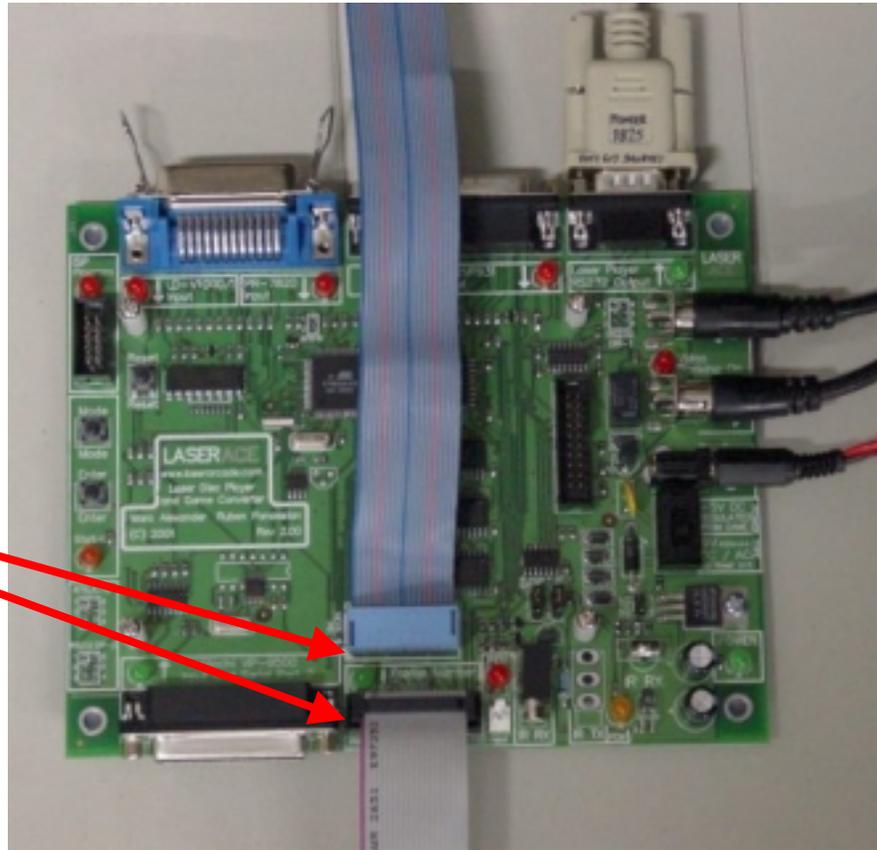
9. Check the Frame Number Injection cables, if backwards, damage will occur!
   The subject and previous information says it all.

10. Continue to the next section, 'Installing the other LaserAce cables'

Installing the other LaserAce cables

LaserAce RS232 control cable to replacement LDP

Original MACH3 data bus cable from MACH3 'FRAME INTERFACE' board

LaserAce FNI Cable to MACH3 main CPU board

VIDEO INPUT to LDP Video Out

VIDEO OUTPUT to MACH3 board

Power Input Cable to 5V DC regulated

Power Type Switch set to '+5V DC REGULATED FROM GAME'
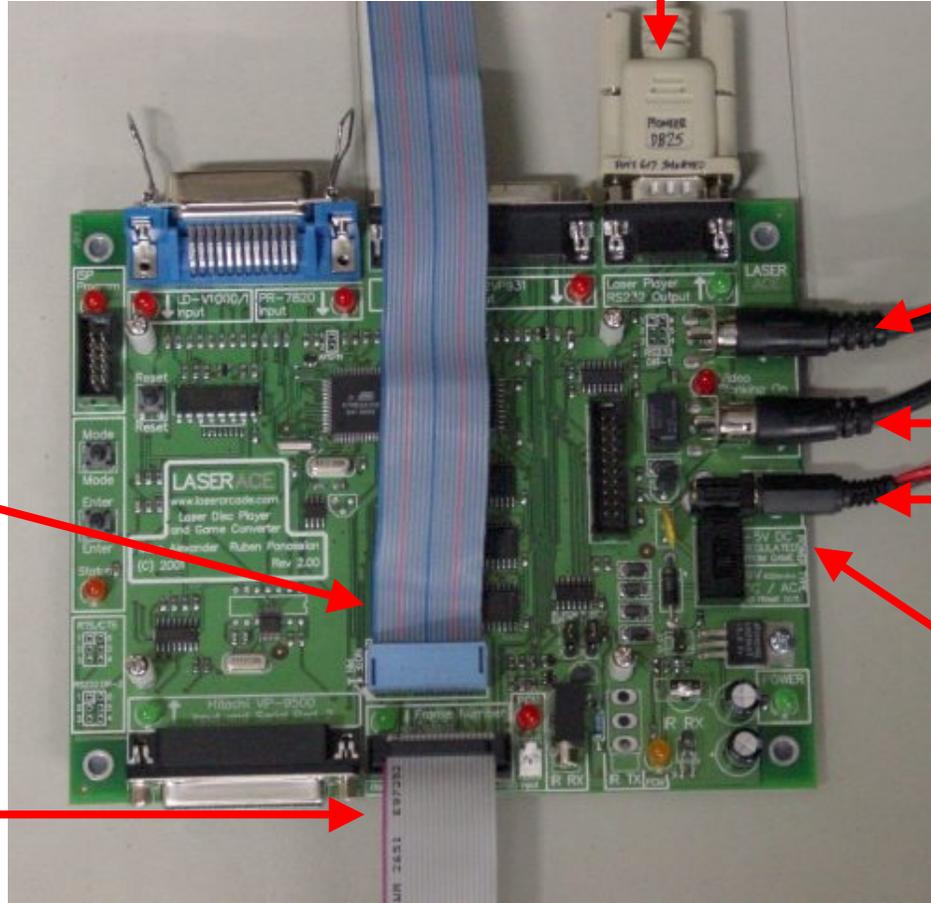
1. The Power Input cable and Power Type switch

As the Frame Number Injection system is being used, LaserAce must be directly connected to the game board +5V and GND rails.

We chose to connect to the +5V and GND that was present on the power supply filter capacitor on the MACH3 INTERFACE BOARD. Using the spare pads where this capacitor was mounted, and the legs themselves, carefully solder the LaserAce Power Input cable wires to this location.

| +5V
RED WIRE | GND
RED/BLACK WIRE |
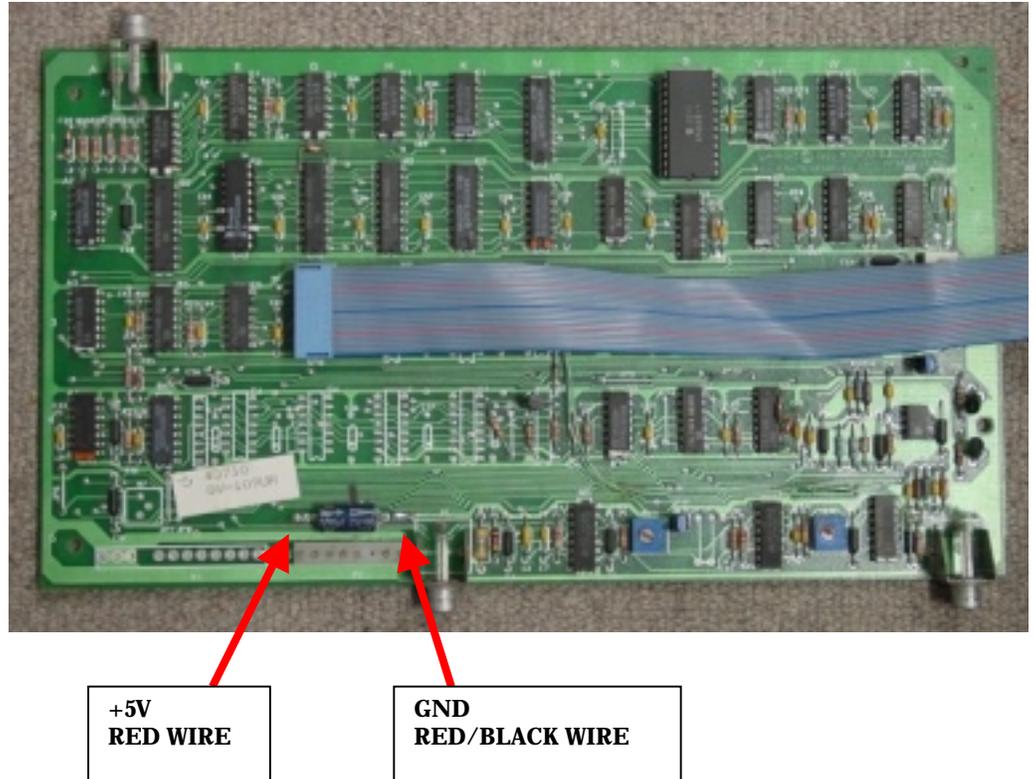
Inspect the work afterwards to ensure the wires are the right way around, and there are no shorts or solder shorts create by the attachment.

If you have trouble with LaserAce not powering up correctly, there may be less than 4.7V present at this location, and the Power Input cable may require relocation closer to, or on the MACH3 power supply, or the MACH3 power supply voltage turned up so that 5.0V DC is present on the main CPU board.

The Power Type Switch must always be in the '+5V DC REGULATED FROM GAME' position for MACH3.

2. The VIDEO INPUT and VIDEO OUTPUT

The MACH3 board set has a single RCA to TNC (threaded RF) cable for the original PR-8210 or LD-1100 video signal. Remove this and replace it with the supplied RCA cable as shown in the diagram below.

If you have a replacement LaserDisc Player that has only a BNC video output jack on the rear, you will need to get a BNC to RCA adaptor and place as shown.
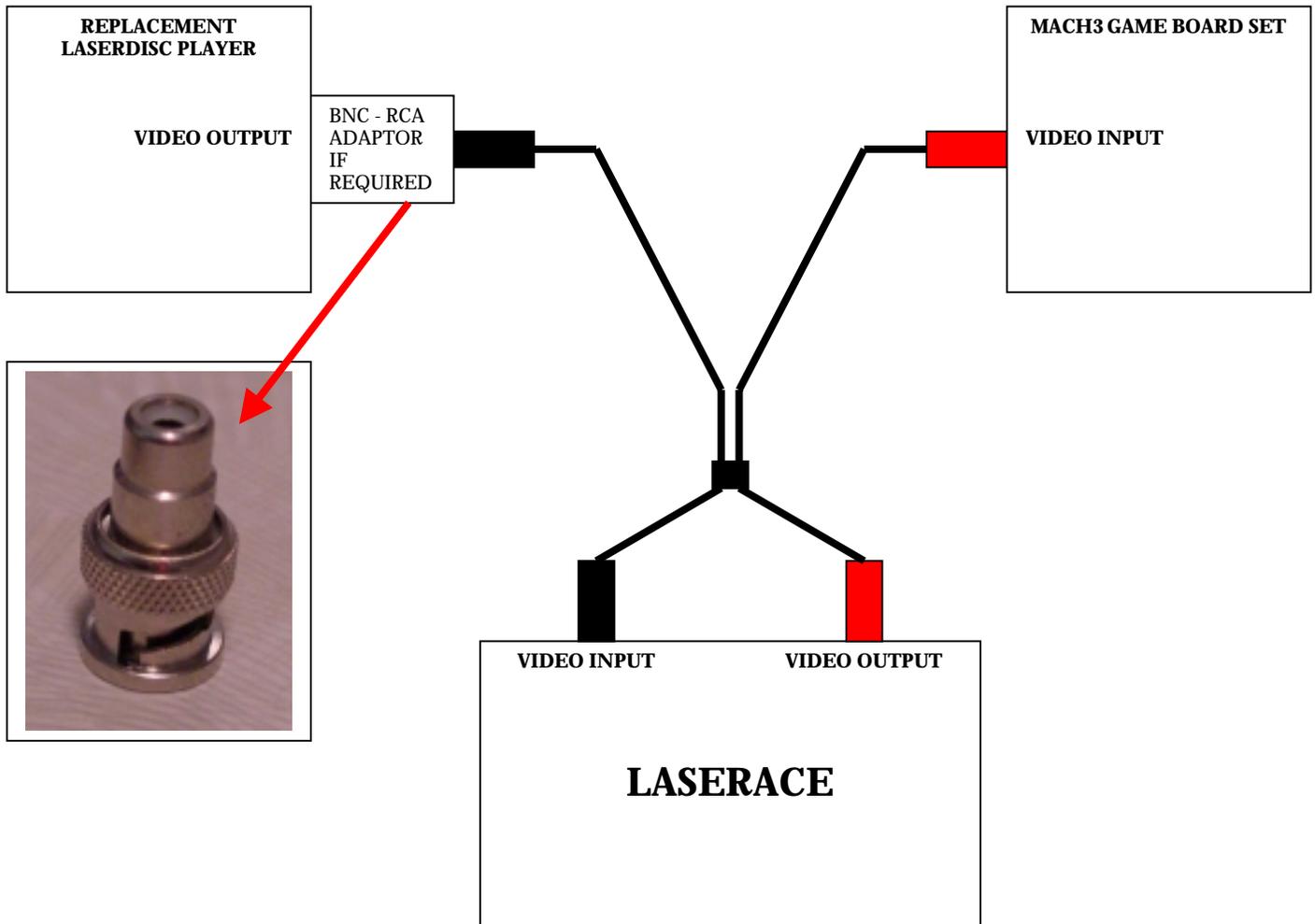
3. The Frame Number Injection Cables
   Inspect that these are correctly seated and oriented by the instructions and pictures in the previous sections.

4. The Output LD Player cable
   Connect to the LaserDisc player comms port, and LaserAce 'Laser Player RS232 Output'

5. The MACH3 Audio cables
   Though not connected to LaserAce, ensure that the MACH3 Audio cables to the Output LD Player are connected correctly. If your cables are original, the black RCA audio cable should go to 1/L (left) on the player, and the red RCA audio cable should go to 2/R (right) on the player.

Powering up MACH3 for the first time

After checking everything is in place, you can now turn on your MACH3!

Should the game not begin after the Output LD Player has been spun up and initialized, check all the normal items in MACH3 troubleshooting procedures.

This manual is intended for use with the LaserAce manual, please refer to the LaserAce manual for related troubleshooting procedures and information.

If you don't have the Mylstar Instruction Manual and Schematics for MACH3 already, we recommend downloading it from here http://www.d-l-p.com/tech/pages/mach3.asp and studying it.

The PCM LED

When MACH3 is transmitting a command to LaserAce, the PCM LED will flash on for the duration of the command.

In Game mode, the PCM LED should flash periodically.

In Test mode, the PCM LED will not flash, except when the machine is first turned on, or the user has selected a test function that requires a command to be sent to the LaserDisc Player.

MACH3 Test mode

MACH3 Test mode does not spin up the LaserDisc Player automatically, though unlike the original PR-8210, LaserAce deliberately spins up the Output LD Player regardless. **When entering MACH3 Test mode be sure to wait at least a minute for LaserAce to spin up the Output LD Player and be ready to receive commands.**

If you switch MACH3 from Test mode to Game mode while leaving the game powered up, the Output LD Player may still display the frame number on the video.

Frame Number Decoder and Injection

Correct operation of the Frame Number Injection kit can be inspected by using the 'STILL FRAME DECODER' and 'PLAY FRAME DECODER' in the 'VIDEO TESTS' section of the MACH3 self test menu.

Audio Track Decoder and adjustment

MACH3 also requires correct audio channel hookup to the Output LD Player, as one audio track of the disc contains in-game target information. Ensure that the MACH3 Audio cables to the Output LD Player are connected correctly. If your cables are original, the black RCA audio cable should go to 1/L (left) on the player, and the red RCA audio cable should go to 2/R (right) on the player.

The MACH3 Audio Track Decoder should not require adjustment unless it has been previously not working or have a fault. Details for testing and adjustment are in the Mylstar MACH3 Instruction Manual.

Troubleshooting

Unlike most LaserDisc games, MACH3 has a total reliance on the frame number decoding system hardware, and audio track decoding of encoded in-game targeting information present on the LaserDisc. This can make it a bit more detailed to troubleshoot should the game develop a fault.

LaserAce successfully bypasses the old frame number decoding hardware, reducing the chance of faults with the game.

MACH3 has a rather unreliable linear power supply, and is well known for connection and soldering faults on the 'filter' boards. These are the small boards down one end of the game board set and have connector strips along each edge with small ferrite bead and wire components in between. Some servicing work and upgrades to the power supply and filter boards can greatly increase the serviceable life of MACH3.

If you suspect that your game may be faulty, you can contact fellow collectors at http://www.d-l-p.com/community/board/ . Post a detailed list of specifications of your game, disc, player, installation, and clear descriptions of the faults, and both ourselves and other people can help you with the problem. We are active on this message board along with many other people.

If you believe LaserAce may have a fault after reviewing the information in both this manual and the LaserAce manual, please note down all information as above and contact us at enquiries@laserarcade.com .

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