PU-18 Colour Mod

Description

This document describes how to modify a PU-18 (Normally SCPH-550x) PlayStation to produce correct video output in both PAL and NTSC modes.

Overview

The original design of the PlayStation GPU provided for separate PAL and NTSC clock signals, at slightly different frequencies. Since the retail units had regional protection, they were by design only capable of running games from one region and hence one video standard.

Consequently, Sony decided to only fit a single reference oscillator in the console and connect the output to both the PAL and NTSC clock inputs. The oscillator installed in any given unit was chosen to provide the correct output frequencies in the video mode for region the console was sold for.

The result of this is that when the console is used with software for the "wrong" region, all the video related timing is slightly off – the actual effect is about 1%, which makes little difference in gameplay terms (unless you are heavily into 2D fighters), but is a huge error as far as the colourburst is concerned, and will prevent most TV's or monitors from locking on to it at all. This is why it's generally recommended that you use an RGB cable for playing out of region games on a modded PlayStation.

There are also various other modifications to address the colour encoding issue which generally consist of forcing the video encoder into PAL mode and providing a constant 4.433MHz subcarrier to the encoder clock input pin – this results in the console generating PAL in PAL mode and PAL-60 in NTSC mode, which is generally a good arrangement for European TVs – but it doesn't address the issue that the actual video rate is slightly off

Required hardware

First of all, a PlayStation with a PU-18 board in it – the surest bet for this is a machine with a SCPH-550x part number, or the PAL SCPH-5552 – it doesn't matter if it's a PAL or NTSC machine, although this will obviously determine the video mode in the boot screens and the CD Player / Memory card manager.

You also need some other components – the most critical is the oscillator from another console with the other video mode, this can be a PU-7, PU-8 or PU-18 – but not a PU-20, PU-22, PU-23 or PSone, because Sony changed the clock generation circuitry and the parts are not compatible[1]. You also need a few passive components – a 220R resistor, a pair of caps (1n and 100n) and a ferrite bead. In my case, I just

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[1] You might be tempted to try and buy a suitable oscillator, but you need to be careful – most of the "custom frequency" oscillators on the market now are of the field programmable type and they tend to have much higher phase noise than conventional fixed frequency xtals, and this is a critical spec for this application.
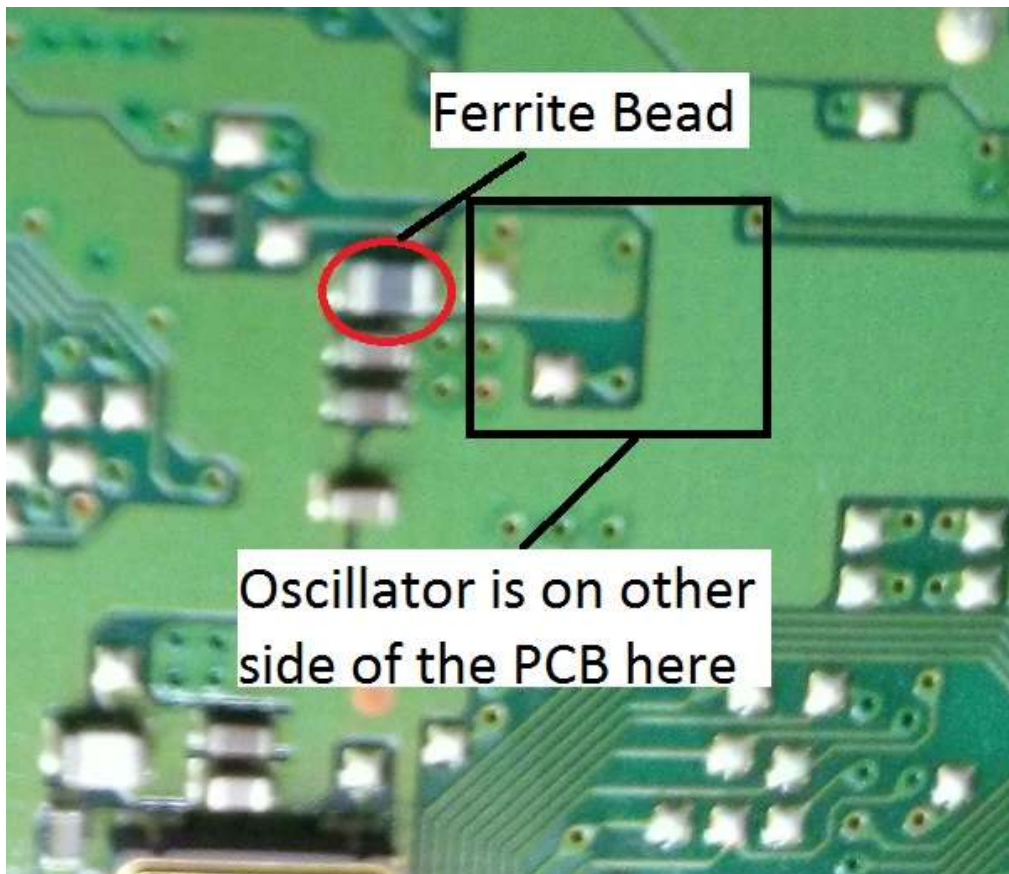
took the parts from the same board I removed the oscillator from. If you remove the RF screening from the board, you will be able to see the oscillator – this first photo is on a NTSC board:


This one is PAL:

 Note that in both cases the reference designation (X201) is the same; it's just the frequency that changes. If you are taking the parts from another PU-18 board (which is what this guide is assuming) , the locations are shown in the next two photos:

Labels in the top image:
- MC141685FT JBX9813B
- 1996 S / Enter / JAP / D10
- C615
- 220R resistor
- 1n + 100n Caps
- X201
- M53.693 KDS.804
- 12
- 28
- 208
- 28
- 208
- IC108
- OKI JAPAN M5IV4805D-6 82253599A9
- OKI JAPAN M5IV4805D 82253599

Ferrite Bead

Oscillator is on other side of the PCB here

The next step may or may not be necessary depending on which type of console you have – you need to install the NTSC oscillator in the X201 position – obviously, if you are using an NTSC board this is already the case, but if you are using a PAL board, you need to desolder the PAL oscillator, and install the 53.693MHz oscillator in the X201 position. After that, cut the trace shown in the following photo:


At this point, you should have a loose PAL (53.20MHz) oscillator and the passive components. Assemble them on a piece of dot board as follows:
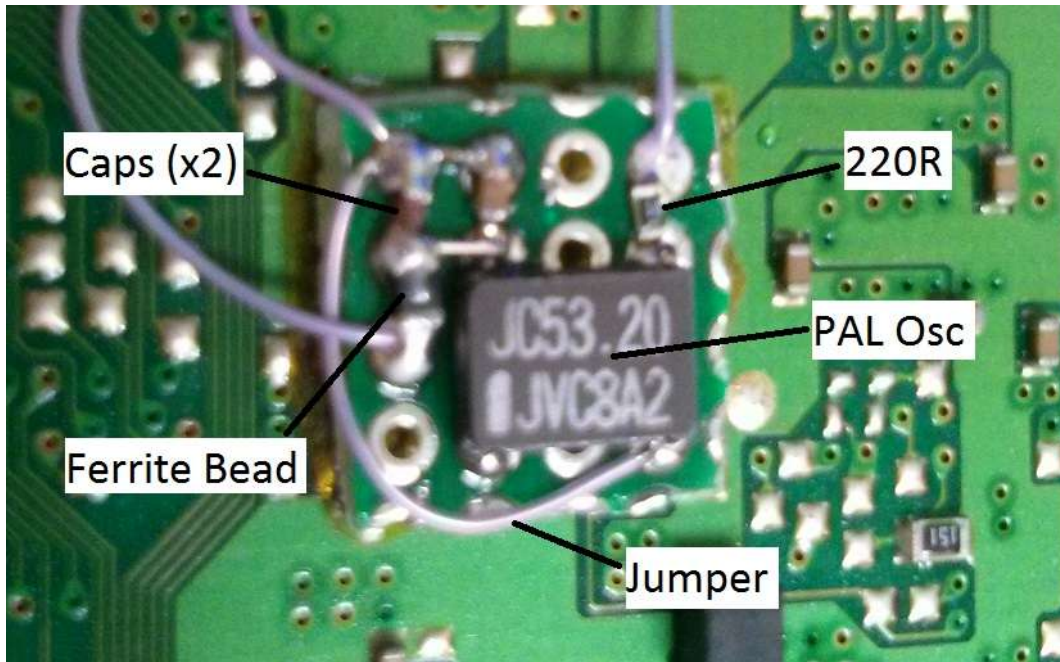
The caps are just wired in parallel with jumper wires and connected to the VCC and ground pins on the oscillator module. The back of the board is then insulated (Kapton tape) and the board stuck in place.

The mounting location is near the existing oscillator, but on the other side of the board.
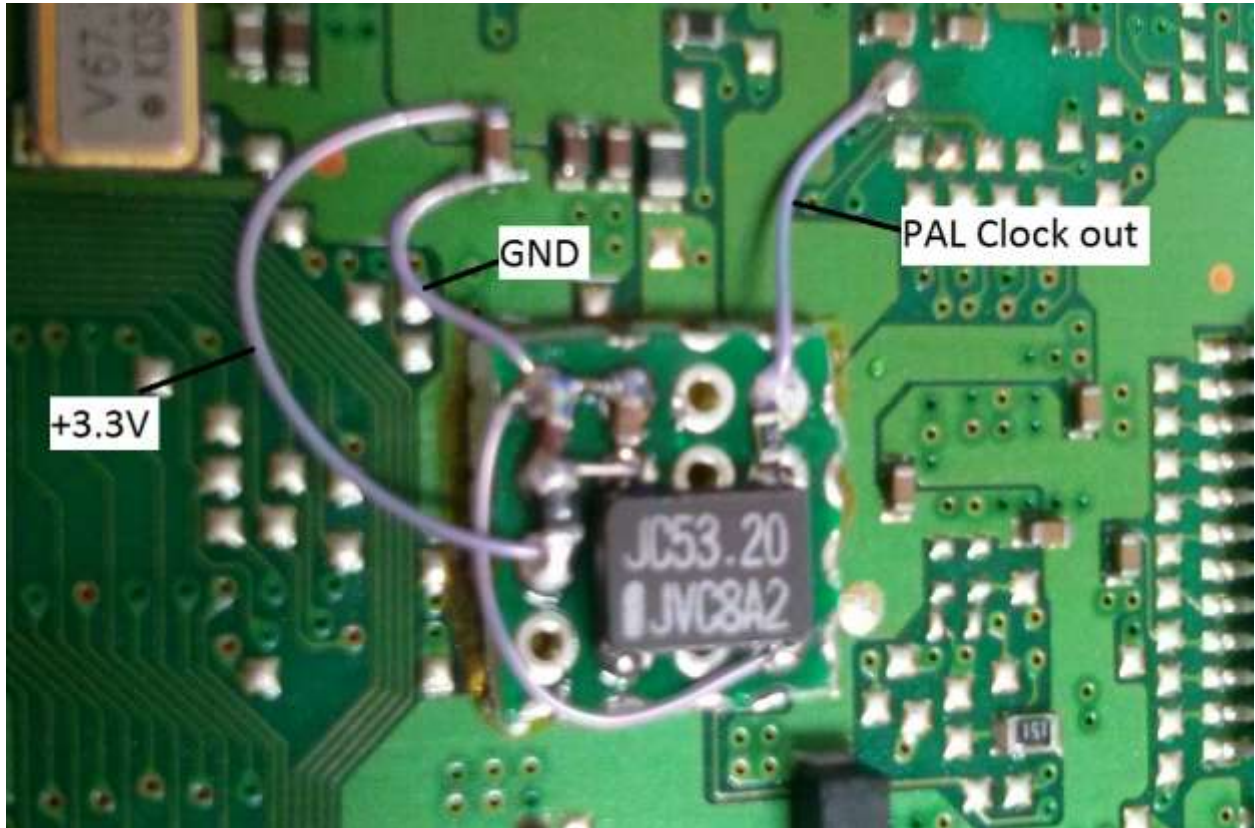
After installation, it was insulated (more Kapton tape) and the console reassembled.