Horizontal Sync Restorer Theory Of Operation.

THIS INFORMATION IS FOR EDUCATIONAL PURPOSES ONLY. IF USED TO DESCRAMBLE PAY–TV SIGNALS YOU COULD BE PROSECUTED. THEFT OF SERVICES IS CONSIDERED A CRIMINAL ACT BY THOSE WHO TRANSMIT PAY–TV SIGNALS.

This circuit recovers the sync by recovering the colour burst, amplifying it, processing it and inserting it into the video signal. You need a source of clean demodulated video and a modulator to insert it back into your TV. A VCR is ideal for this as is a "Monitor" TV Set with video in and out jacks.

I.C.I, the MC1350 is a gated video amplifier with two tuned networks, tuned to 3.58 MHz. The Germanium diode, D4, which <u>must</u> be germanium, not silicon, detects the signal which is converted into nice clean pulses by I.C.3D. This pulse is of the wrong width and not in the right place. The monostable multivrator, I.C.4A places the pulse at the correct place and I.C.4B makes it the correct width. This pulse is them applied to the base of Q4 which inserts it into the video at the base of QI which then passes it to the output.

Now we have a picture but the vertical will not lock in. This is because the sync is also being generated at random during the vertical interval, being applied to the video and in the case of most sets, screwing up the vertical sync. Q2, Q3, I.C.3A and I.C.3C recover the vertical sync. I.C.5A & B position it properly and give you the correct width. I.C.3B inverts this pulse and uses it to disable the horizontal sync during the vertical interval. The switch on the base of Q4, shunting it to ground disables the sync restorer for normal TV operation.

What does I.C.2 do you ask. Well, when we detect the burst during the horizontal sync interval, we also get the colour signal during the line interval. This would completely screw up our desired result. Hence, when I.C.3D picks up the burst on the first line and since the burst always comes before the line, this pulse is used to trigger I.C.2, a 555 monostable multivibrator which shuts down the MC1350 via its AGC pin. The timer is set so it restores the gain of the MC1350 just as the line ends. Adjustment of this timer is the most critical control in the entire circuit and should be a front panel control. It is so touchy, the circuit is arranged to have a fine and coarse control. It usually needs a slight adjustment when switching from one channel to another.

VCR CAMERA/TUNER SWITCH

CAMERA IN

REST OF VCR
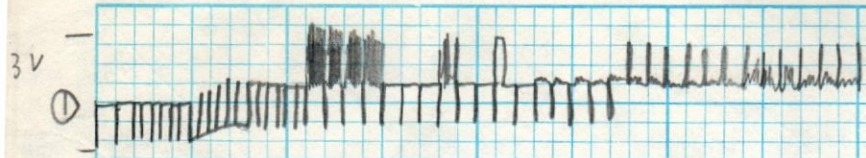
VCR DEMODULATOR

SYNC RESTORER IN OUT

To connect the circuit, open up your VCR and find the Camera/Tuner switch. Determine which wire has video on it when the switch is in the camera position. With no camera there will only be one, assuming you have the thing turned on and tuned to an appropriate test channel. Cut the wire going to this contact and run a length of RG–174U or other RF rated coax to the outside of the machine. If over 2 Metres in total length you will get picture deterioration. I used RCA jacks on the ends, a male on one and a female on the other to make it convenient to bypass the sync restorer when necessary. By the way, radio work is what the RCA connector was designed for. It got used for audio as an afterthought.

Your video signal now goes from the demodulator in the VCR to the restorer and back to the switch and on to the rest of the VCR. See, simple, though you can kiss your VCR warranty goodbye. Warranty expired? Great.
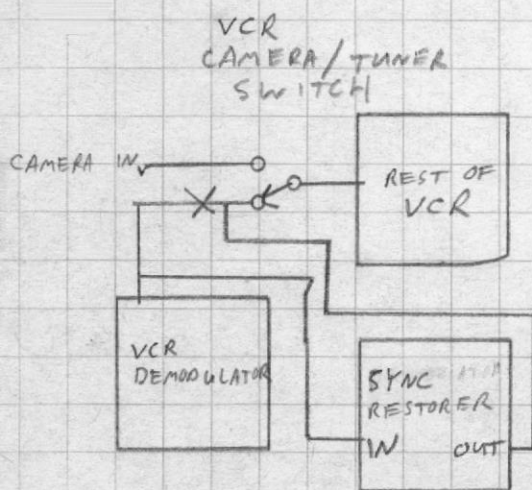
To align the critter, first make sure the circuit has its stable 12 volts and is not drawing too much current. The 7812 does need a bit of heatsinking as it dissapates about ½Watt. With one probe of your dual trace triggered sweep scope on point I, the input you should lock onto a waveform that looks somewhat like that on the graph page labelled #1. This is scrambled video with suppressed sync. Note that sync is present during the vertical interval and for the first few lines of video but has been shifted in level during the picture interval. Next, take a clip lead and short pin 5 of I.C.I to ground. Now with your other probe apply it to point 3, the input to I.C.3D, pin 9. Adjust C3 and 7 for maximum signal.
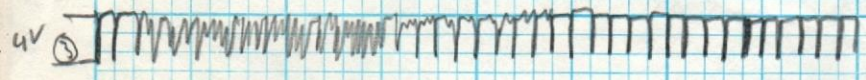
Now, unground pin 5 of I.C.5. With P2, the 10K pot on the front panel set to mid rotation, adjust PI, the 100K trimmer so that you get the waveform on the graph for point 3. What it does during the vertical interval is irrelevant but you should have a nice row of steady pulses during the picture interval of the frame. If you set PI too high, pulses will be skipped. If too low, the picture will jitter. P9 may also need setting to
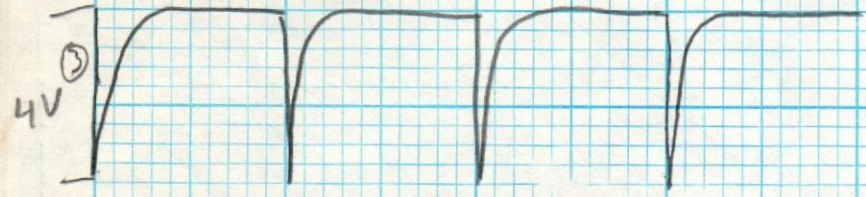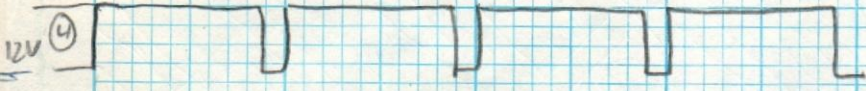
3V ① FRAME CIRCUIT
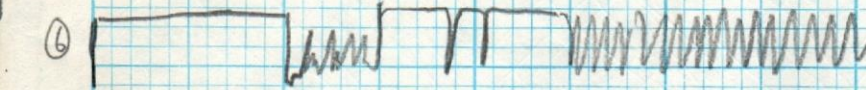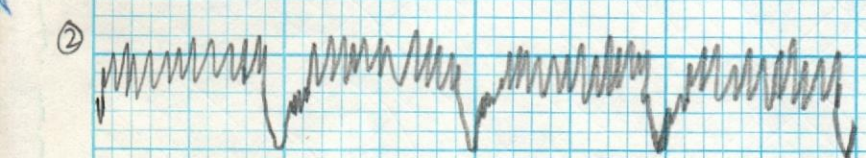RATE INPUT

3V ② CORRECT OUTPUT
SIGNAL WITH SYNC

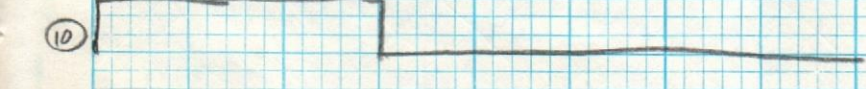4V ③ DETECTED BURST

4V ③ LINE RATE
DETECTED BURST

12V ④

① INPUT AT LINE
RATE

②

12V ⑤

⑥ FRAME
RATE

⑦

⑧

⑨

⑩

C3-7
PIHER 10/60
TRIM CAPS.
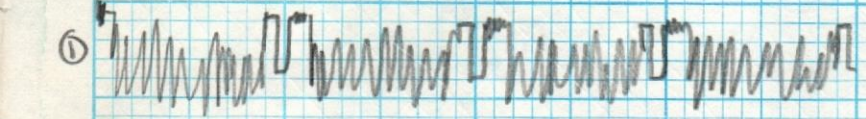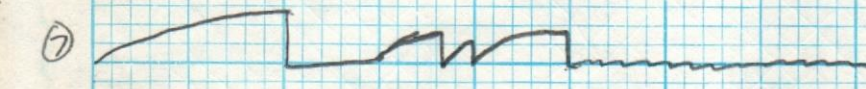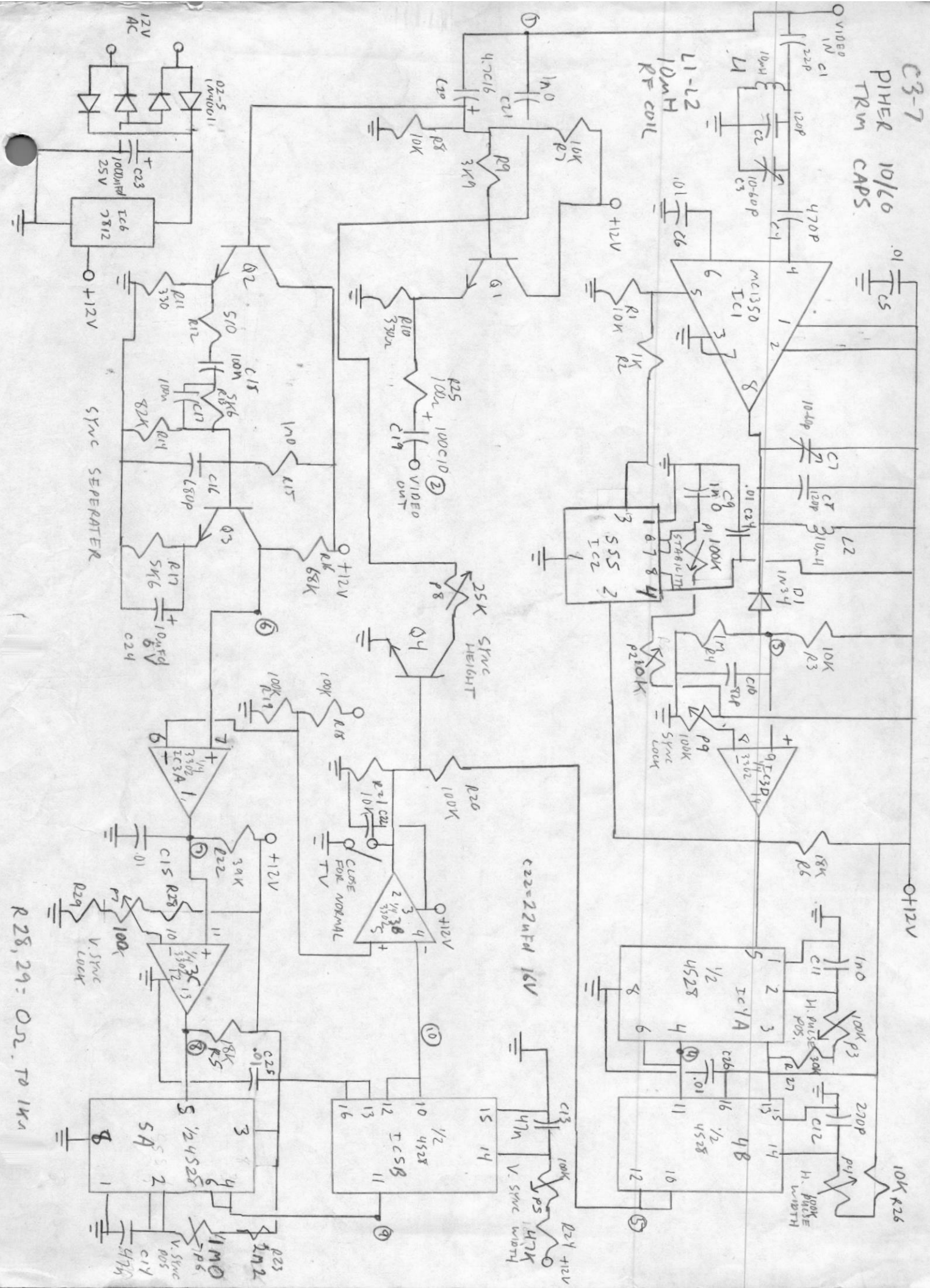
UPA-2
Power
Amp. V+

Fraser
Elec.

4
1982

Made In
Canada