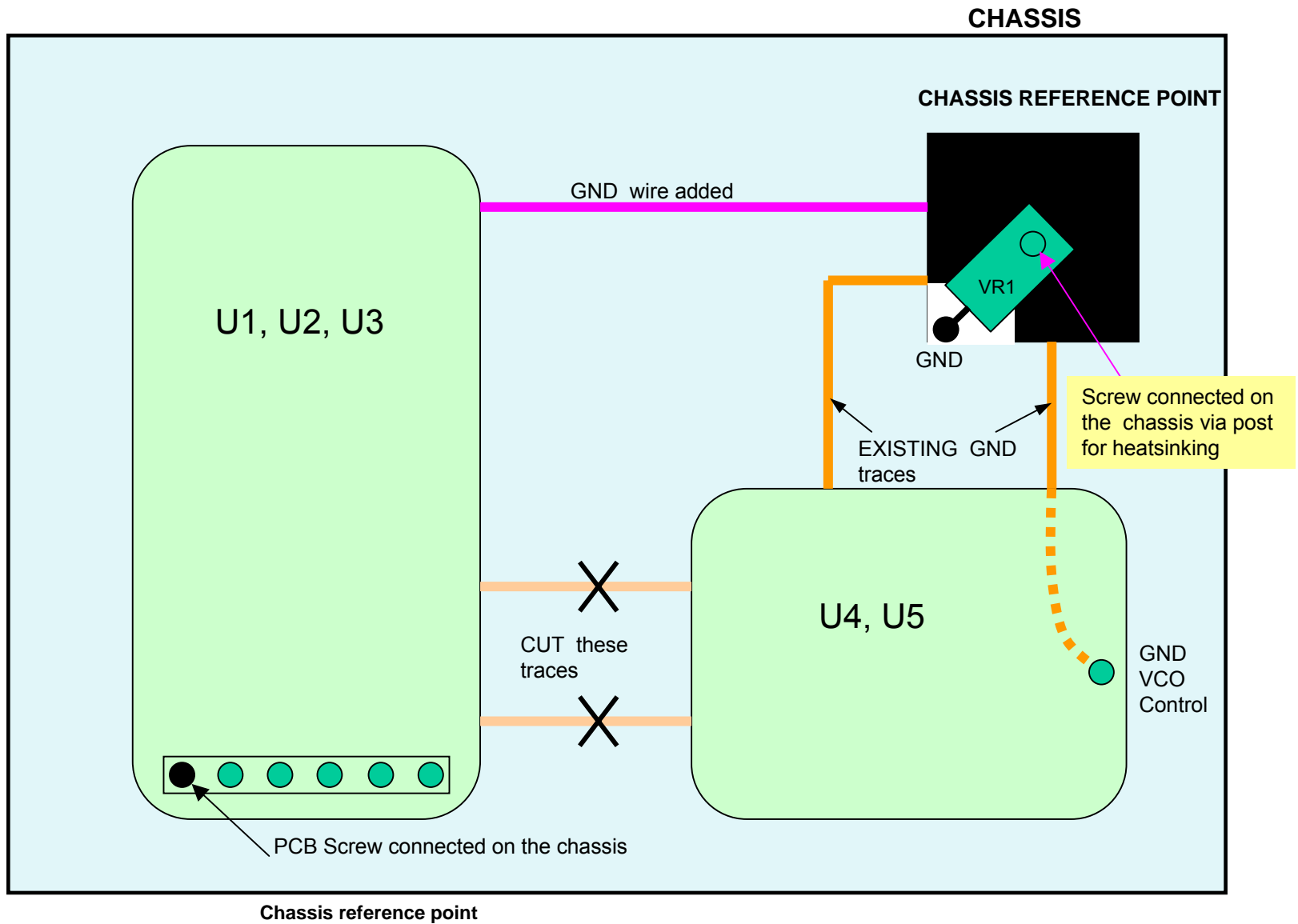
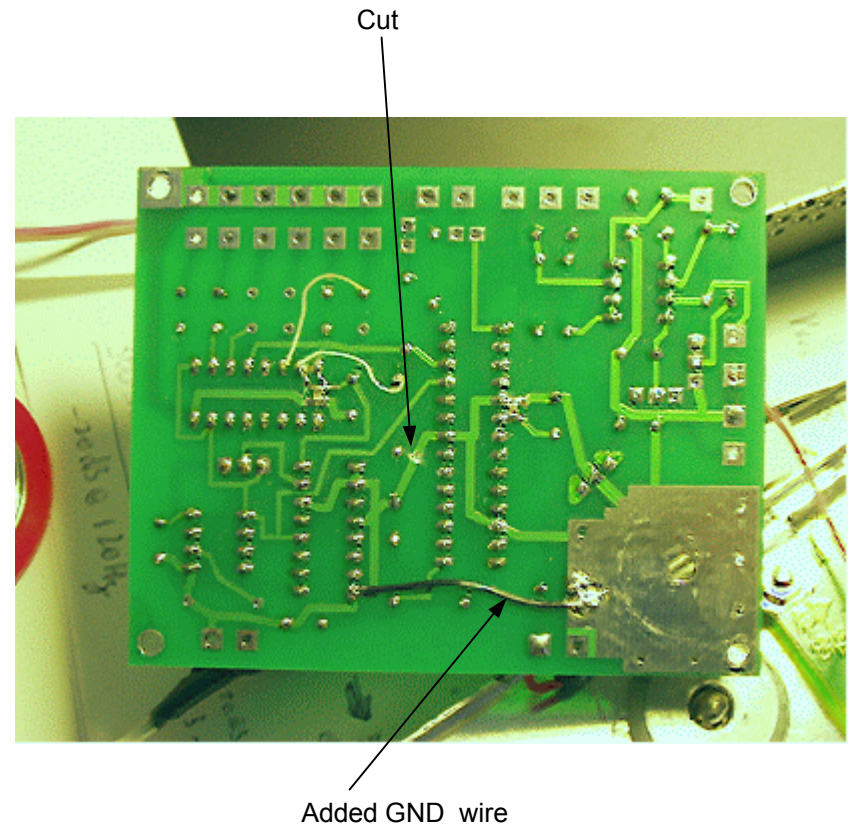
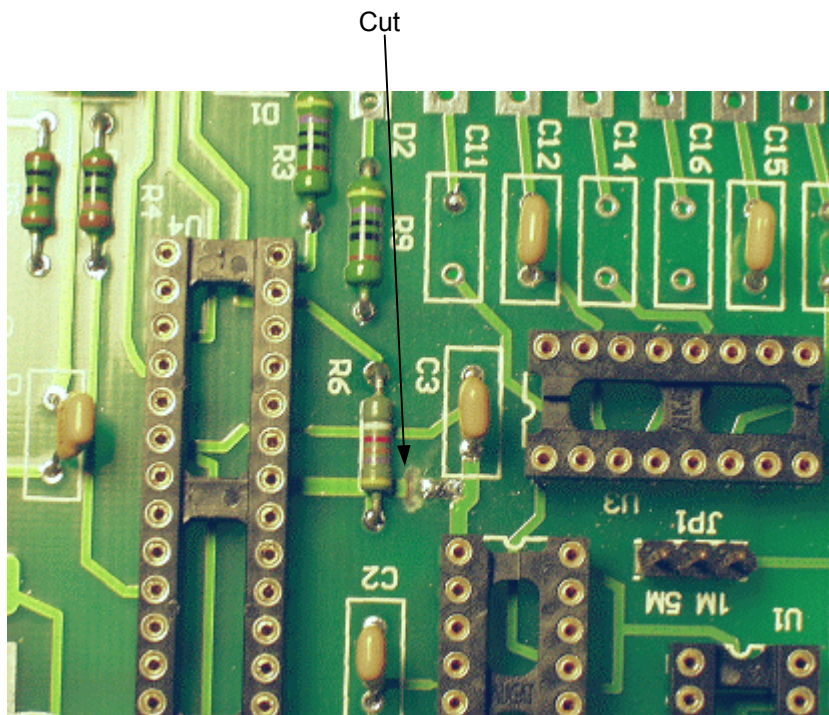
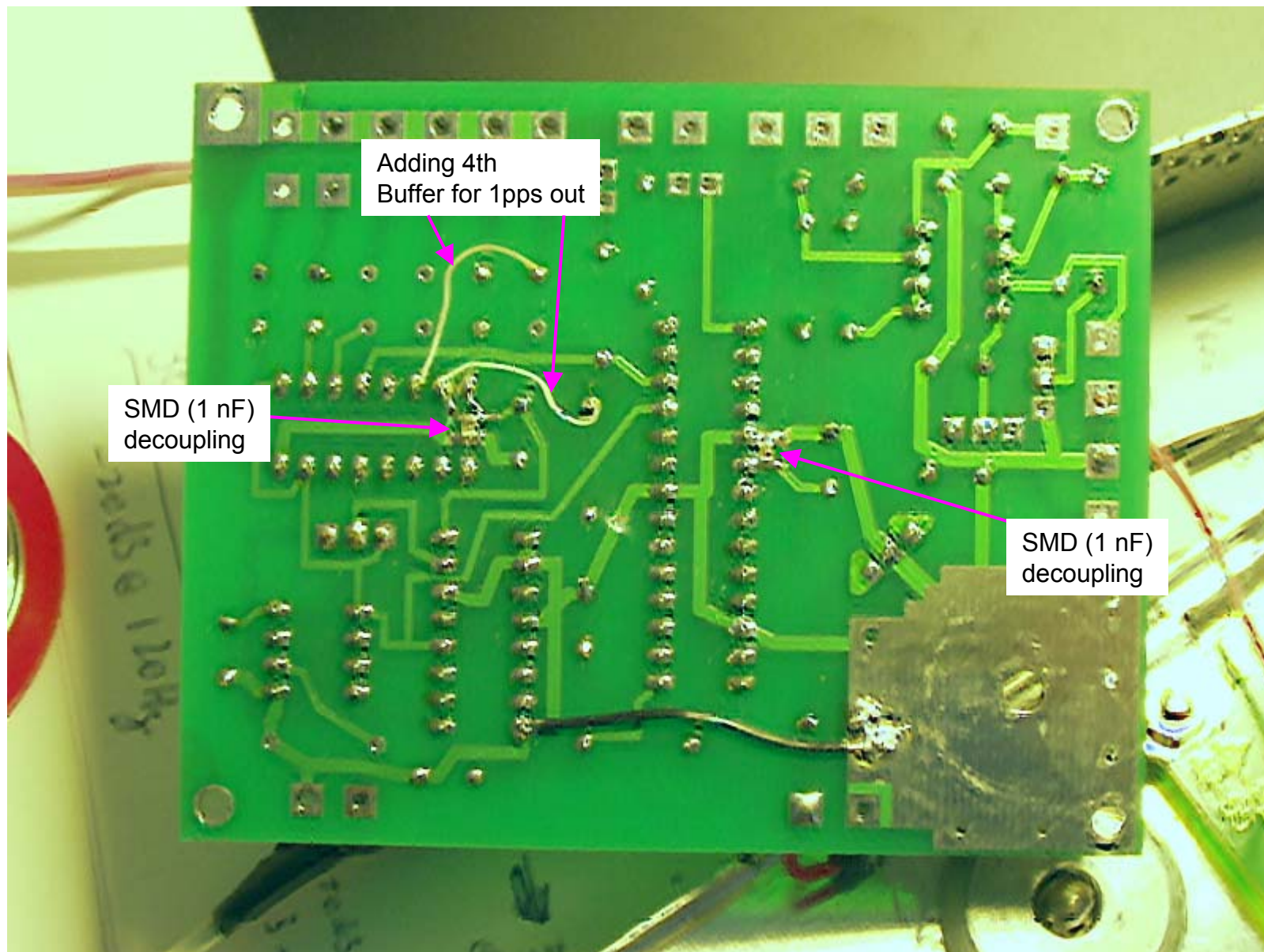


# Modifications to reduce ground loops



## PCB modifications





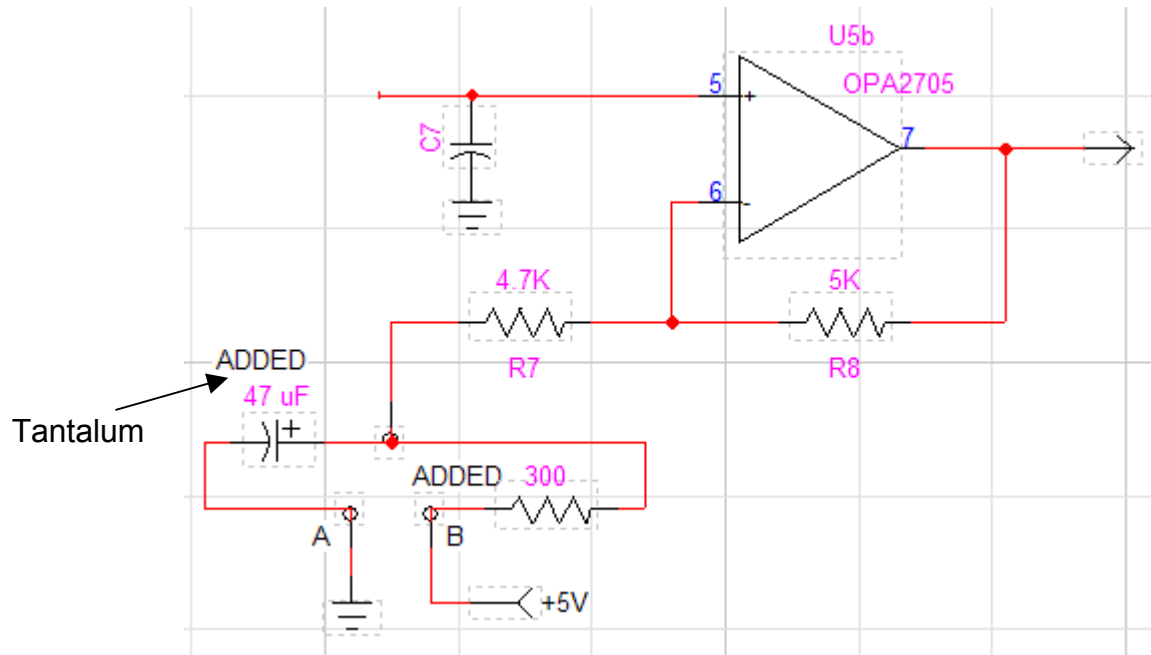
Adding 4th  
Buffer for 1pps out

SMD (1 nF)  
decoupling

SMD (1 nF)  
decoupling

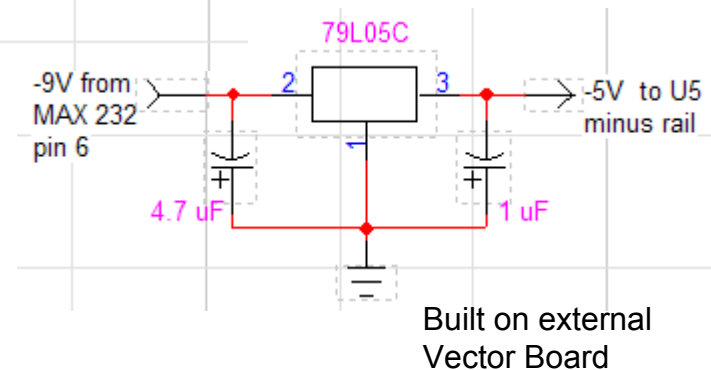
## Added Components (Refer to schematic)

Note: U5 is powered from +/- 5 V, allowing bipolar drive of the HP OCVCXO



**NOTE:** The 300 Ω resistor and the 47 µF cap are inserted in the A and B vias, JP3 jumper area.

These 2 components form a low pass filter that reduce the level of 60 Hz /120 Hz fed to U5b and to the OCVCXO control line.





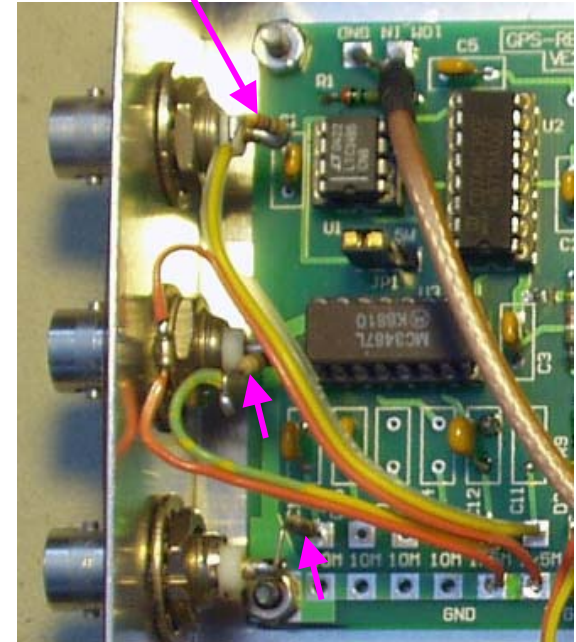
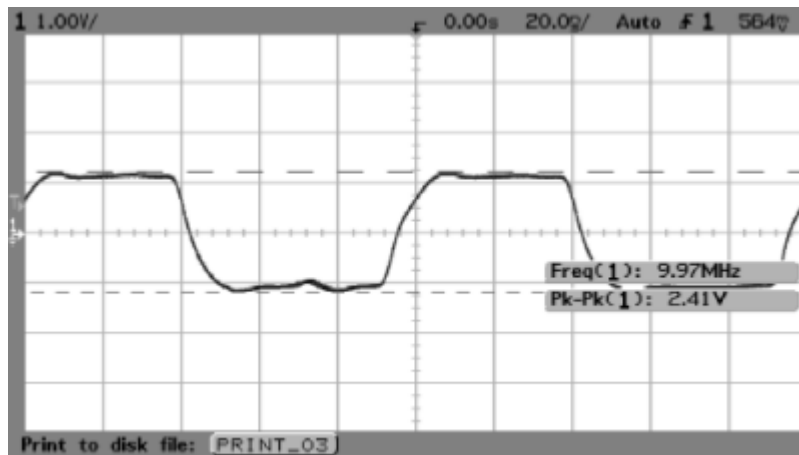
# BUFFER OUTPUT IMPEDANCE

22  $\Omega$  RESISTORS HAVE BEEN ADDED IN SERIES WITH EVERY OUTPUT

THIS IMPROVES WAVEFORM FIDELITY WHEN THE RECEIVING SIDE OF THE COAX LINE IS NOT TERMINATED IN 50  $\Omega$ .

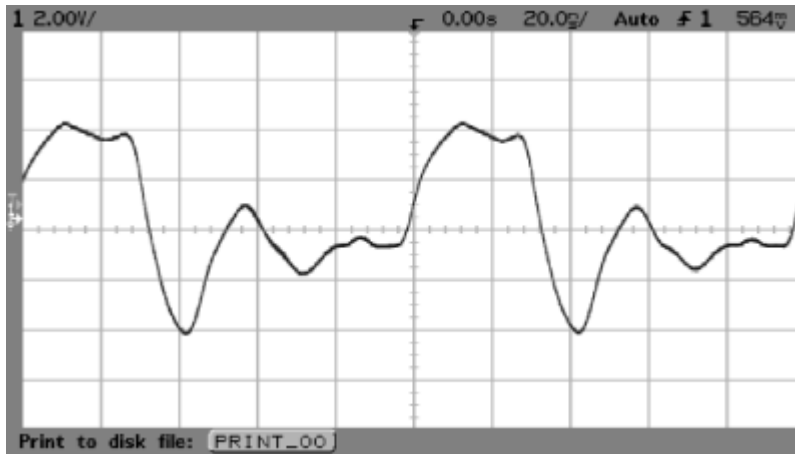
THE BUFFER IMPEDANCE WAS FOUND TO BE  $\sim 16 \Omega$ .  
ADDING 22  $\Omega$  GIVES AN OUTPUT IMPEDANCE OF 38  $\Omega$ ,  
CLOSE ENOUGH TO 50  $\Omega$ .

THIS 22  $\Omega$  RESISTOR WILL LOWER THE OUTPUT VOLTAGE WHEN THE RECEIVING SIDE IS TERMINATED.

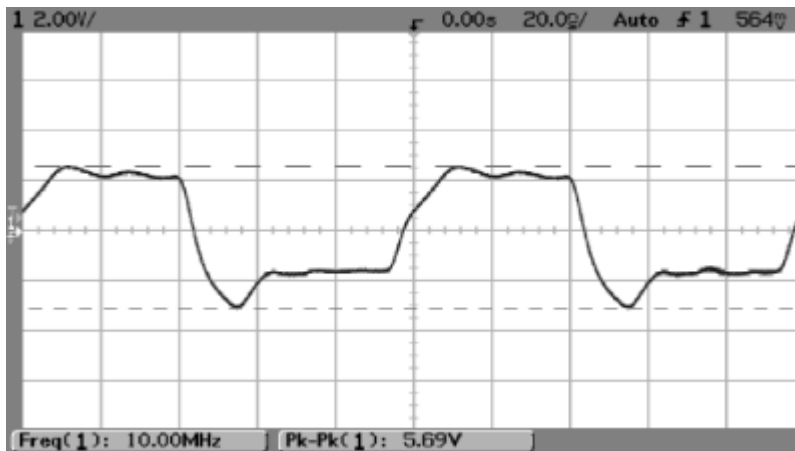


Waveform recorded with 22  $\Omega$  in series at the 10 MHz buffer output, with the scope input terminated into 50  $\Omega$ , at the scope.

10 MHz waveforms recorded at the end of a  
44 in. length of RG-58 coax.  
NO TERMINATION AT THE SCOPE INPUT IN BOTH CASES



No 22  $\Omega$  resistor in series, giving an  
output impedance of 16  $\Omega$



With the 22  $\Omega$  resistor in series, giving an  
output impedance of 38  $\Omega$