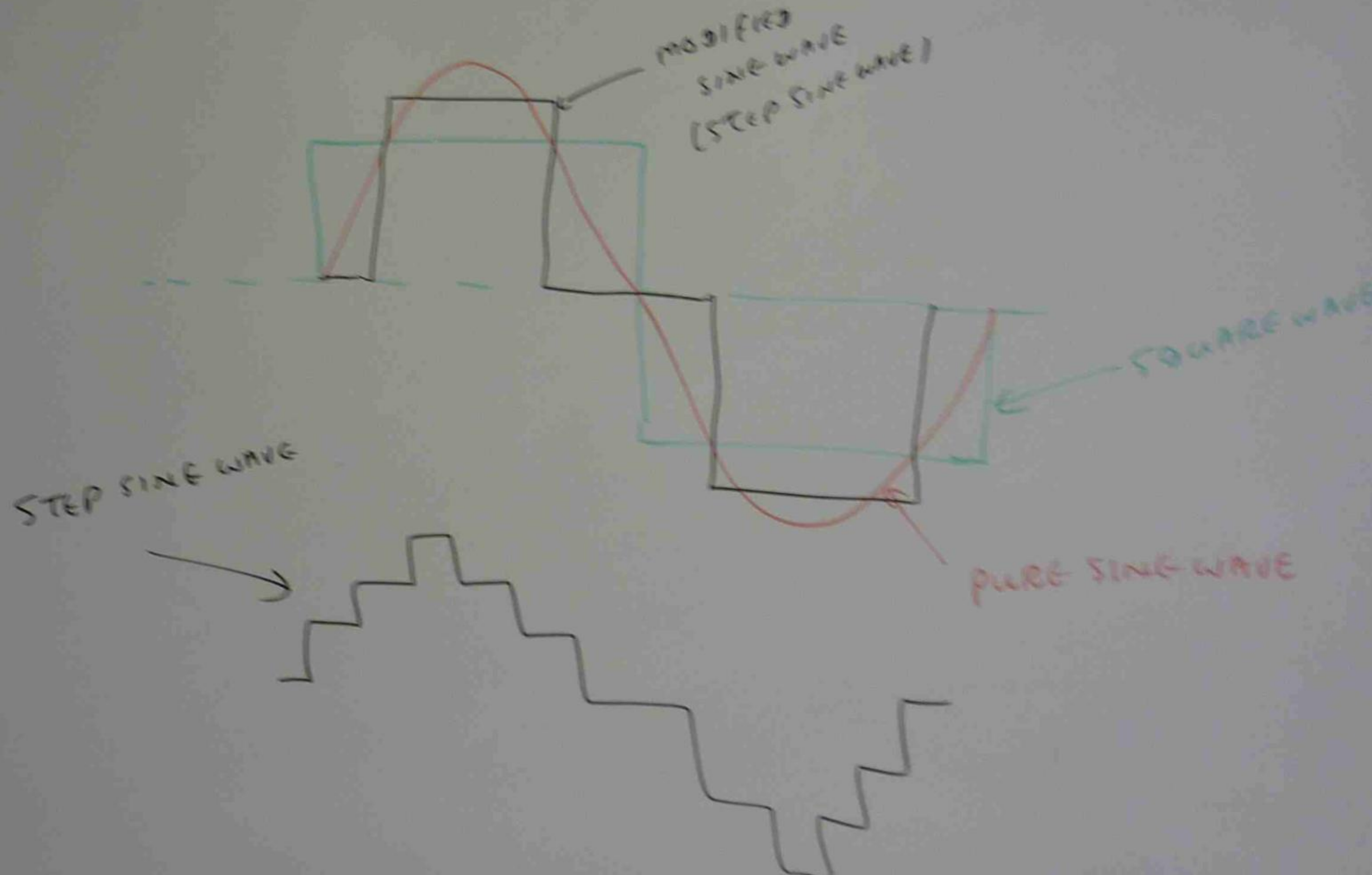
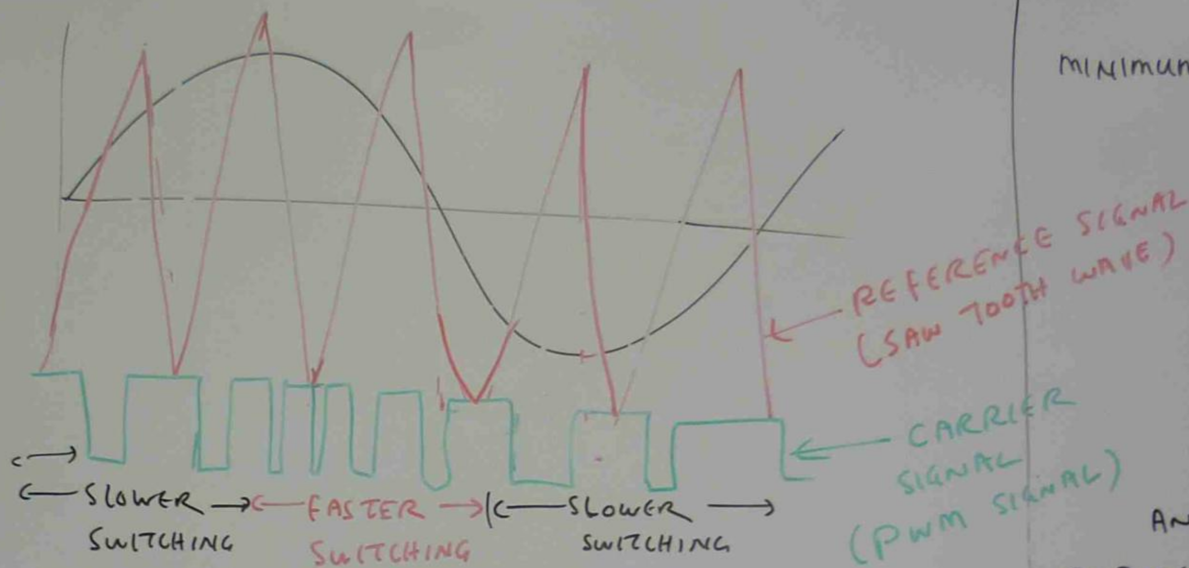
COMPARING SQUARE WAVE, MODIFIED SINE WAVE

AND PURE SINE WAVE



PULSE WIDTH MODULATION



ELECTRONIC SWITCHES (FET - FIELD EFFECT TRANSISTORS) ARE FORMING THE OUTPUT AC WAVE FORM.

SLOWER SWITCHING RATE PRODUCES LOWER MAGNITUDE WAVE AND FASTER SWITCHING RATE PRODUCES HIGHER MAGNITUDE WAVE.

SLOWER TO FASTER, THE

MINIMUM TO MAXIMU

REFERENCE SIGNAL

(SAW TOOTH WAVE)

ANALOG PWM CONT

REFERENCE AND CARRIE

WHICH CREATES OUTPUT

THE SIGNALS. THE RE

THE FREQUENCY OF T

WHEN THE CARRIER

COMPARATOR OUTPUT

THE REFERENCE IS

IT'S SECOND STATE

ERENCE SIGNAL
N TOOTH WAVE)

ARRIER
GNAL
M SIGNAL)

SLOWER TO FASTER, THEN TO SLOWER SWITCHING CREATES THE MINIMUM TO MAXIMUM RISING UP OF AC WAVE FORM.

REFERENCE SIGNAL (SAW TOOTH WAVE)	+	CARRIER SIGNAL (PWM WAVE)	=	SINUSOIDAL WAVE

ANALOG PWM CONTROL REQUIRES THE GENERATION OF BOTH REFERENCE AND CARRIER SIGNALS THAT FEED IN TO A COMPARATOR WHICH CREATES OUTPUT SIGNAL BASED ON THE DIFFERENCE BETWEEN THE SIGNALS. THE REFERENCE SIGNAL IS SINUSOIDAL AND AT THE FREQUENCY OF THE DESIRED OUTPUT SIGNAL.

WHEN THE CARRIER SIGNAL EXCEEDS THE REFERENCE, THE COMPARATOR OUTPUT SIGNAL IS AT ONE STATE, AND WHEN THE REFERENCE IS AT A HIGHER VOLTAGE, THE OUTPUT IS AT IT'S SECOND STATE.

HYBRID BRIDGE (H-BRIDGE) SWITCHING TECHNOLOGY IS UTILIZED TO PRODUCE PWM SIGNAL.

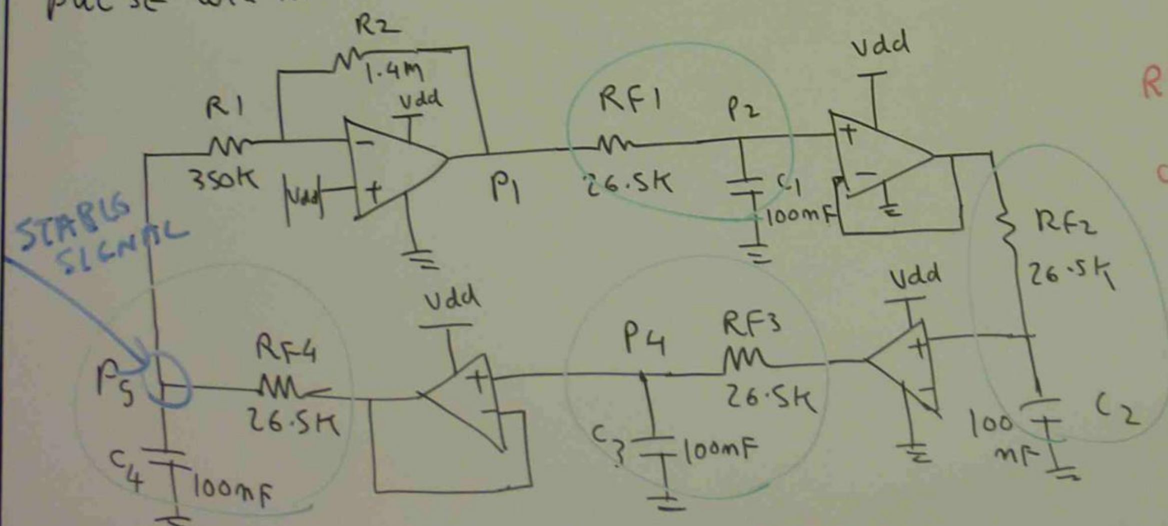
BUBBA OSCILLATOR

THE BUBBA OSCILLATOR IS A CIRCUIT THAT PROVIDES A FILTERED SINE WAVE OF ANY FREQUENCY THE USER DESIRES BASED UPON THE CONFIGURATION OF RESISTORS AND CAPACITORS IN THE CIRCUIT.

PULSE WIDTH ⟶ PHASE ANGLE ⟶ CHANGING ⟷ PHASE SHIFT OSCILLATOR

↕

RESISTOR + CAPACITOR CIRCUIT } 4 RC FILTER



4 RC FILTERS

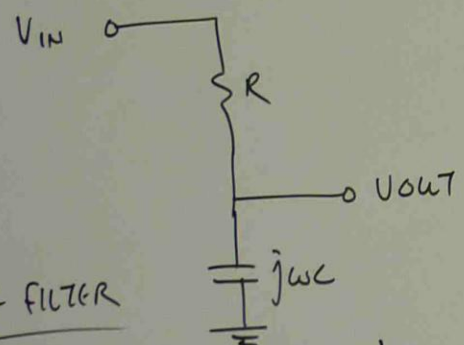
EACH PRODUCES 45 PHASE SHIFT

TOTALLING 180° PHASE SHIFT.

THE CIRCUIT completes THIS TASK WITH FOUR OPERATIONAL AMPLIFIERS THAT EITHER BUFFER OR AMPLIFY THE SIGNAL.

OTHER PHASE SHIFT OSCILLATORS REQUIRE 90° PHASE SHIFT. BUBBA OSCILLATOR REQUIRES 45° PHASE SHIFT IN ORDER TO FUNCTION.

BUBBA OSCILLATOR PROVIDES FREQUENCY STABILITY WITH A low DISTORTION OUTPUT.



RC FILTER

$$V_{OUT} = V_{IN} \times \frac{\frac{1}{j\omega c}}{R + \frac{1}{j\omega c}}$$

$$V_{out} = V_{IN} \times \frac{\frac{1}{j\omega c}}{\frac{j\omega cR + 1}{j\omega c}}$$

$$V_{out} = V_{IN} \times \frac{1}{j\omega c} \times \frac{j\omega c}{1 + j\omega cR}$$

$$V_{OUT} = V_{IN} \times \frac{1}{1 + j\omega cR}$$

$$\omega CR \simeq 1$$

$$V_{OUT} = V_{IN} \times \frac{1}{1 + j1}$$

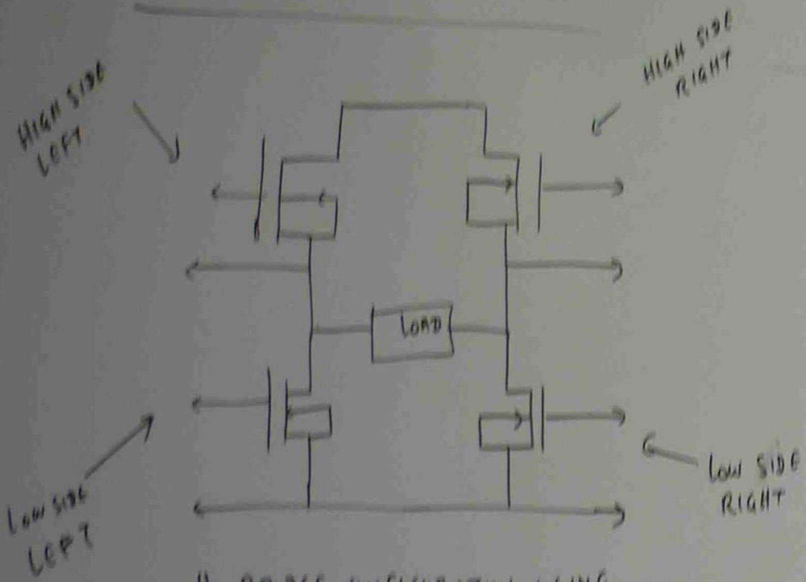
$$= \frac{V_{IN}}{\sqrt{1^2 + 1^2}\ \angle \tan^{-1}\frac{1}{1}}$$

$$V_{OUT} = \frac{V_{IN}}{1.4142 \angle 45^\circ}$$

$$V_{OUT} = V_{IN} \angle -45^\circ$$

45° PHASE SHIFT

H - BRIDGE CONFIGURATION

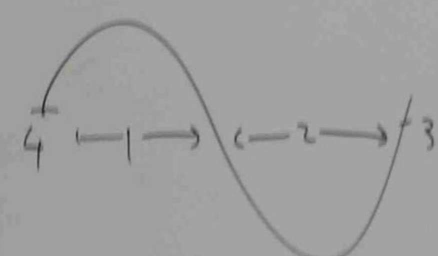


H- BRIDGE CONFIGURATION USING

N - CHANNEL MOSFETS.

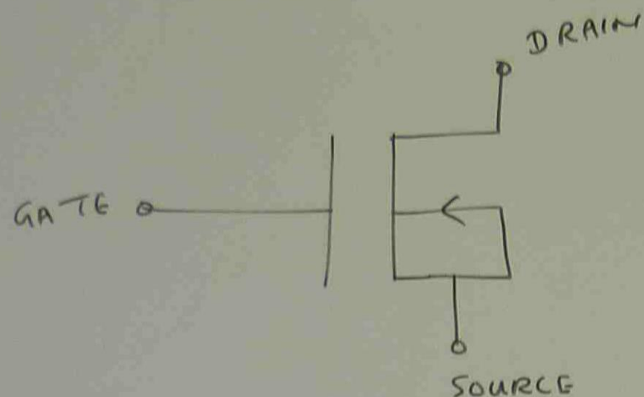
H - BRIDGE SWITCHING STATES

	HIGH SIDE LEFT	HIGH SIDE RIGHT	LOW SIDE LEFT	LOW SIDE RIGHT	VOLTAGE ACROSS LOAD
1	ON	OFF	OFF	ON	POSITIVE
2	OFF	ON	ON	OFF	NEGATIVE
3	ON	ON	OFF	OFF	ZERO
4	OFF	OFF	ON	ON	ZERO



MOSFET DRIVERS

WHEN UTILIZING N-CHANNEL MOSFETS TO SWITCH A DC VOLTAGE ACROSS THE LOAD, THE DRAIN TERMINALS OF THE HIGH SIDE MOSFET ARE OFTEN CONNECTED TO THE HIGHEST VOLTAGE IN THE SYSTEM.

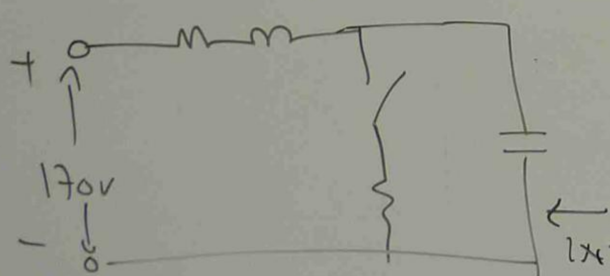


THE GATE TERMINAL MUST BE APPROXIMATELY 10V HIGHER THAN THE DRAIN TERMINAL FOR THE MOSFET TO CONDUCT.

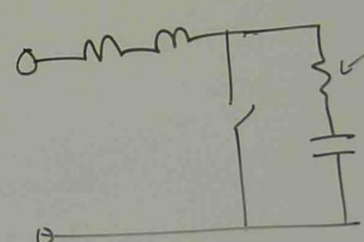
CIRCUIT PROTECTION AND SNUBBERS

ONE OF THE MAJOR FACTORS IN ANY ELECTRONIC DEVICE IS ITS ABILITY TO PROTECT ITSELF FROM SURGES THAT COULD DAMAGE THE CIRCUITRY.

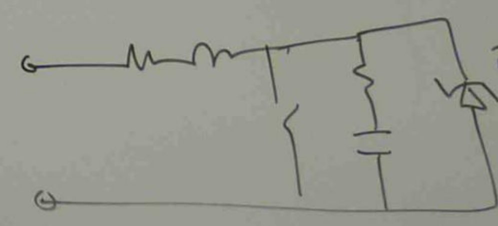
IN THE CASE OF THE INVERTER, INDUCTIVE LOADS CAN CAUSE SPECIAL PROBLEMS BECAUSE AN INDUCTOR CAN NOT INSTANTLY STOP CONDUCTING CURRENT. IT MUST BE DAMPENED (OR) DIVERTED SO THAT THE CURRENT DOES NOT TRY TO FLOW THROUGH OPEN SWITCH.



INDUCTIVE LOAD CIRCUIT



SNUBBER TO RESTRICT THE CURRENT FLOWS INTO CAPACITOR



ZENAR DIODE TO CONTROL REFERENCE VOLTAGE