EXPERIMENT NO. 2

TITLE: Verification of precision half wave rectifier and full wave rectifier using OP-AMP

OBJECTIVE: To verify the output voltage of precision half wave rectifier and full wave rectifier using OP-AMP.

THEORY: The major limitation of ordinary diodes is that it cannot rectify voltage below 0.6V, the cut-in voltage of the diode. The precision rectifier, which is also known as a super diode, is a configuration obtained with an operational amplifier in order to have a circuit behaving like an ideal diode and rectifier. It can be useful for high-precision signal processing.

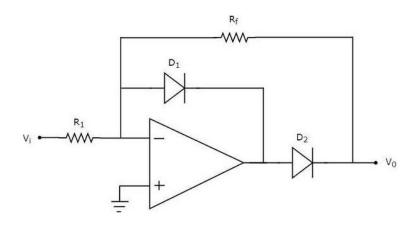
• Half Wave Rectifier:

A half wave rectifier is an electronic circuit. The rectifier circuit takes alternating current. from the wall outlet and converts it into a positive direct current (DC) output. The particular electronic device that accomplishes this task is a semiconductor called a diode. The diode like all semiconductors is a material which has a resistance in between that of a conductor wire and an insulator like that of a plastic.

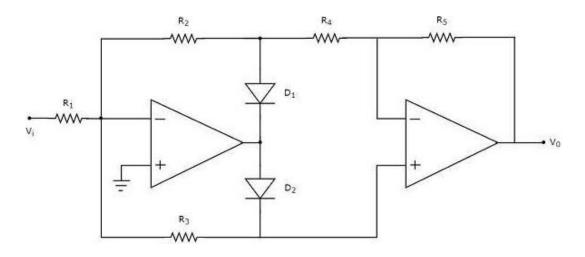
• Full Wave Rectifier:

A Full rectifier is a circuit which converts an ac voltage into a pulsating dc voltage using both half cycles of the applied ac voltage. It uses two diodes of which one conduct during one half cycle while the other conducts during the other half cycle of the applied ac voltage. During the positive half cycle of input voltage, diode D1 becomes forward biased and D2 becomes reverse biased. Hence D1 conducts and D2 remains OFF. The load current flows through D1 and the voltage drop across RL will be equal to the input voltage. During the negative biased. Hence D1 remains OFF and D2 conduct. The load current flows through D2 and the voltage drop across RL will be equal to the input voltage.

CIRCUIT DIAGRAM:

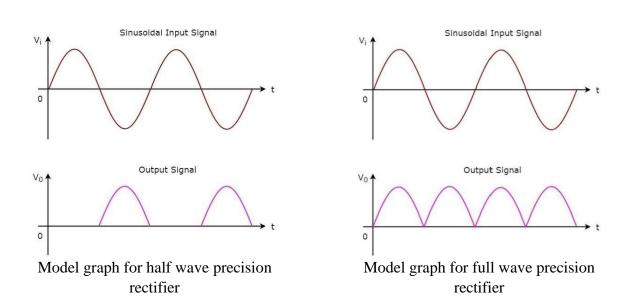


Precision Half Wave Rectifier



Precision Full Wave Rectifier

MODEL GRAPHS:

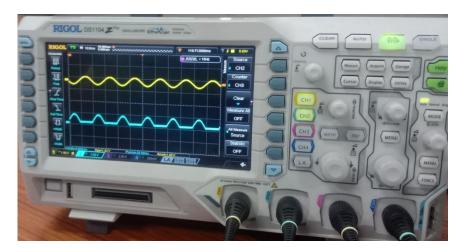


APPARATUS:

Sl. No.	Apparatus	Range	Quantity
1	Op-Amp	-	3
2	Resistors	-	7
3	Diodes	-	4
4	Bread Board	-	1
5	Variable DC Power Supply	10mV - 30V	1
6	Function Generator	-	1
7	Oscilloscope	-	1
8	Connecting wires	-	14

OBSERVATIONS:

23JE0145 Experiment - 02 Verification of precision half wave rectifier and full wave rectifier using DP-AMP. Circuit Diagram: Half-wave precision rectifier. Pull-wave precision rectifier. Vin Vout Very Comment - 02 No. 120 1 0.695 0.720 2 0.615 0.520 2 0.615 0.520 5.45 4 0.388 0.400 3.04 5 0.28 0.320 (5.1 Vin Vout Very Comment - 02 Vout Very Comment - 02 1 0.695 0.720 3.6 4 0.38 0.400 3.04 5 0.28 0.320 (5.1 Vin Vout Very Comment - 02 Very C	Aritra Bera	Evani		24 10 24					
Circuit Diagram: Half-wave precision exectifies. Half-wave precision exectifies. Full-wave precision rectifies. Nin Vout V. Esmar 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.45 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout V. Esmar 1 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	23JE0145	Expou	ment - 02	11					
Circuit Diagram: Half-wave precision exectifies. Half-wave precision exectifies. Full-wave precision rectifies. Nin Vout V. Esmar 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.45 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout V. Esmar 1 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	Vorugication of perecision half wave redifier								
Nin Vout Ve Esman Half-ware	and full wave rectified using of-AMT.								
Nin Vout Ve Esman Half-ware									
Half-wave perecision enectifies. Full-wave perecision rectifies. Nin Vout 9. Esman 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 (5.1) Nin Vout 9. Esman 1 0.695 8.76 9.3 Full-wave 2 0.69 0.680 15.2 3 0.520 0.520 0 4 0.411 0.490 15.1									
Full-wave perecision rectifier. Full-wave perecision rectifier. Nin Vout % Evenor 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Nin Nout % Evenor 1 0.695 0.76 9.3 5 0.520 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1									
Full-wave perecision rectifier. Full-wave perecision rectifier. Nin Vout % Evenor 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Nin Nout % Evenor 1 0.695 0.76 9.3 5 0.520 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	on N' Ax								
Full-wave perecision rectifier. Full-wave perecision rectifier. Nin Vout % Evenor 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Nin Nout % Evenor 1 0.695 0.76 9.3 5 0.520 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	No Vo								
Full-wave perecision rectifier. Nin Nout % Evenor 0.695 0.720 3.6 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Nin	90 10								
Full-wave perecision rectifier. Nin Nout % Evenor 0.695 0.720 3.6 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Nin	Malf-wave precision exectifier.								
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1	O TOTAL TOTA								
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1				ZIP V					
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1	R R R								
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1			\$	•(P \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1	- R	1-		A					
Full-wave perecision rectifier. Nin Vout % Emper 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Vout % Emper 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.411 0.480 15.1	0/6								
Nin Nout % Everage 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.45 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout % Everage 1 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1									
Nin Nout % Everage 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.45 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout % Everage 1 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	- R								
Nin Nout % Everage 1 0.695 0.720 3.6 Half-wave 2 0.615 0.640 4.16 3 0.55 0.520 5.45 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout % Everage 1 0.695 0.76 9.3 Full-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	Full-wave perecision rectifier.								
2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout % Everer 1 0.695 0.76 9.3 FUN-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1									
2 0.615 0.640 4.16 3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nout % Everer 1 0.695 0.76 9.3 FUN-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	1 Vin	Vout	% terror						
3 0.55 0.520 5.43 4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nont % Everar 1 0.695 0.76 9.3 FULL—wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1	The state of the s	01.00	-	Half-wave					
4 0.388 0.400 3.04 5 0.278 0.320 15.1 Vin Nont % Everor 1 0.695 0.76 9.3 Full—wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1		500							
5 0.278 0.320 15.1 Vin Nout % Everor 1 0.695 0.76 9.3 Full—wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1									
Vin Nout % Everor 1 0.695 0.76 9.3 FUN-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1									
1 0.695 0.76 9.3 FULL-wave 2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1			2						
2 0.59 0.680 15.2 3 0.520 0.520 0 4 0.417 0.480 15.1				Full-wave					
3 0.520 0.520 0 4 0.417 0.480 15.1		1							
4 0.417 0.480 15.1		9.00	0						
5 0.313 0.360 15.01 Rity Re-	The second secon								
20/19/20	5 0.313	0.360	15.01	Rity Ren					
		3		29/19/29					



Graph obtained for half wave precision rectifier



Graph obtained for full wave precision rectifier

RESULTS AND CONCLUSIONS:

Thus the half wave rectifier and full wave rectifier are constructed and the output waveforms are drawn.

The experiments confirm their effectiveness in converting AC signals to DC. Both designs outperform traditional diode rectifiers, validating their use in low-voltage applications and confirming their utility in various electronic circuits.