



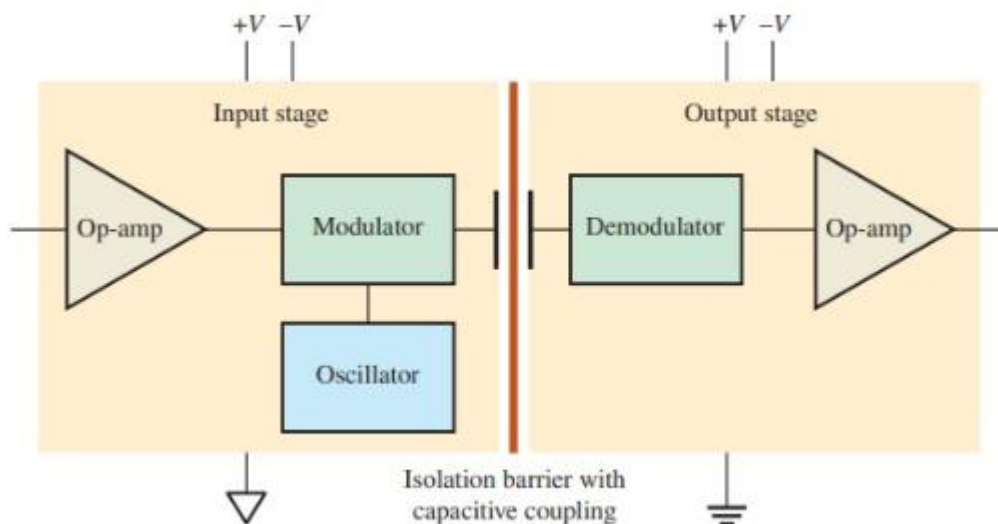
### DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

#### BM3491 Biomedical Instrumentation

#### UNIT-III BIOAMPLIFIERS

#### 3.4 Isolated DC amplifiers and AC carrier amplifier

##### 3.4.1 Isolated DC amplifier:



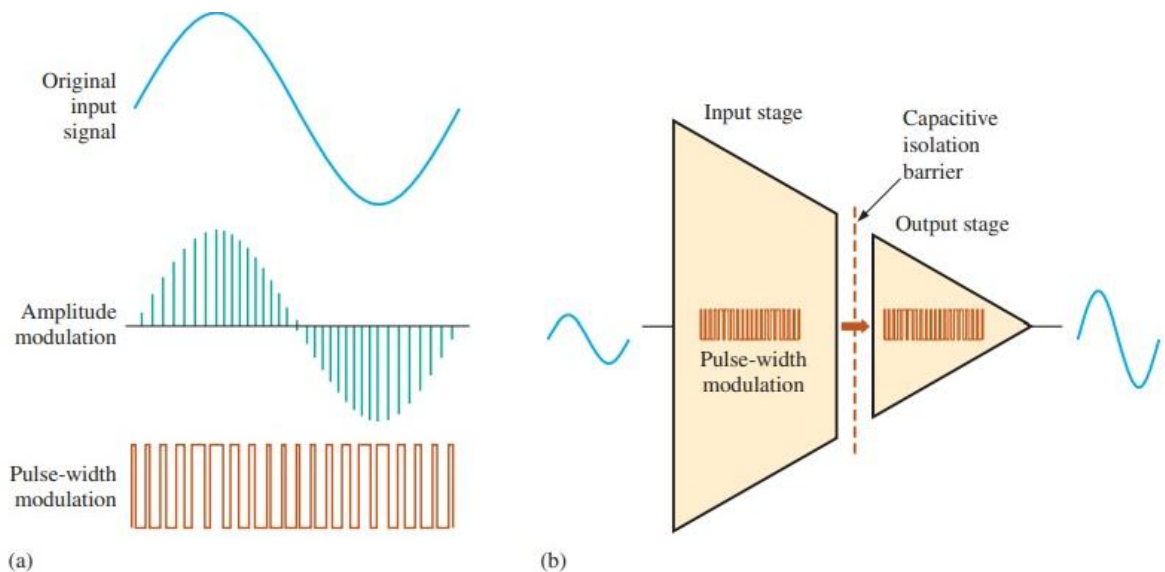
The isolation amplifier is a type of amplifier which used to offer dc separation among the input and output side. It is helpful in such an environment where dangerous power leakage or large voltage transients exist to provides protection to the people and sensitive elements linked with the circuits.

The common usage of this amplifier is in medical devices, different types of power plant devices, industries processing devices, and automated testing devices. In this post, we will discuss its circuit, operation, and some other factors. So let's get started with *Introduction to Isolation Amplifier*.

### **Capacitor-Coupled Isolation Amplifier**

- i. The **isolation amplifier** is such a module that comprises of 2 types of circuits or stages that are separated electrically.
- ii. These 2 stages are input and output that is isolated from one another through an isolation barrier which processed the signal to coupled about the isolation border.
- iii. In some types of isolation amplifiers, there is the optical coupling or transformer coupling is used to separate two circuits.
- iv. In some other types of isolation amplifiers, there is a capacitor is used for separation.
- v. Every circuit or stage comprises of its own power source and ground terminal due to this there is no common electric path among them.
- vi. In the below figure the normal figure of an isolation amplifier is shown.
- vii. You can see that there is 2 ground symbols are used for denoting the concept of stage isolation.
- viii. The input part or stage comprises of the amplifier circuit, oscillator and modulator circuit.
- ix. Modulation is the procedure through which a signal which comprises of data get a modification in another type of signal, like frequency, amplitude, therefore, data exists in the first signal is also existing in 2<sup>nd</sup>
- x. For this condition, the modulator comprises of square wave oscillator which generates large value frequency for modification of real signal.
- xi. The capacitor having less value of capacitance in the separation barrier is used for coupling the less value frequency modulated signal or dc voltage from the inner side to the outer side.
- xii. In the absence of modulation, there is a need of capacitor which has a large value of capacitance and it causes to decrement in the isolation among 2 stages.
- xiii. The outer stage comprises of demodulator which gets the real input signal from the modulated signal that converts the real signal in the original form.
- xiv. The large frequency oscillator output shown in the above figure can be of amplitude or pulse width modulated through the signal from the input amplifier.

- xv. In the case of amplitude modulation, the amplitude of oscillator output is changed resultantly to changes in the input signal which is shown in the below figure denoted as a.



## Modulation

- xvi. In this figure sinusoidal signal is used for description.
- xvii. In the case of pulse width modulation, the duty cycle of the oscillator output changed through varying the pulse width according to the changing in the input signal.
- xviii. The isolation amplifier using pulse width modulation is shown in the below figure denoted as b.
- xix. Though it uses a little bit complicated procedure interiorly the isolation amplifier is the only amplifier and is easy to usage.
- xx. If distinct dc power source and input signal are given an amplified signal at output is generated.

### 3.4.2 Carrier amplifier:

Carrier amplifiers are used with transducers which require an external source of excitation. They are characterized by high gain, negligible drift, extremely low noise and the ability to operate with resistive, inductive or capacitive type

transducers. They essentially contain a carrier oscillator, a bridge balance and calibration circuit, a high gain ac amplifier, a phase-sensitive detector and a dc output amplifier.

