FEEDBACK AMPLIFIERS

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PROJECT FOR

BE

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FEEDBACK AMPLIFIERS

- Feedback amplifier,
- Negative feedback ,
- Voltage series,
- Voltage shunt
- Current series
- Current shunt feedback

FEEDBACK

- In the feedback process a part of output is sampled and fed back to the input.
- The fed back signal can be in phase with or out of phase with the original input signal.

Definition of feedback:

- Feedback is defined as the process in which a part of output signal (voltage or current) is returned back to the input.
- The amplifier that operates on the principle of feedback is known as feedback amplifier.

TYPES OF FEEDBACK

1. Positive feedback
2. Negative feedback.

If the original input signal and the feedback signal are in phase, the feedback is called as positive feedback.

However if these two signals are out of phase then the feedback is called as negative feedback.

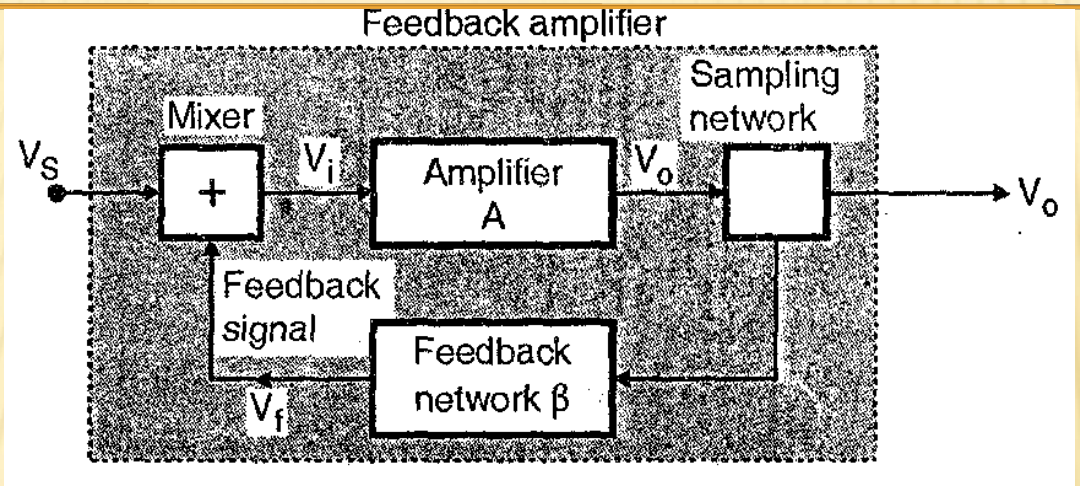
AMPLIFIER WITHOUT FEEDBACK

- The most important thing to understand from Fig. is that the output and input terminals of this amplifier are not connected to each other in any way.
- Therefore the amplifier of Fig. is an amplifier without any feedback,

Gain without feedback.

$$A = \frac{V_o}{V_i}$$

AMPLIFIER WITH FEEDBACK

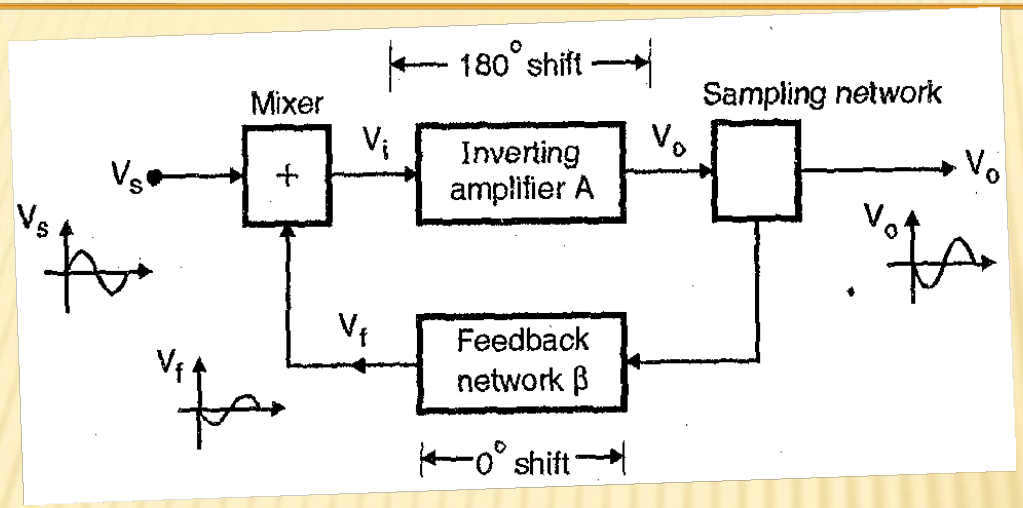


- Refer to Fig. Here the same amplifier with a gain A is being used along with a mixer network, sampling network and a feedback network.
- The voltage gain of the feedback amplifier is given by,

Gain with feedback

$$A_f = \frac{V_o}{V_s}$$

AMPLIFIER WITH A NEGATIVE FEEDBACK



- The block diagram of an amplifier with a Negative Feedback Fig.

$$V_f = \beta V_0$$

Where V_f = Feedback signal (output of the feedback network)

$$\text{Feedback factor } \beta = \frac{V_f}{V_0}$$

TYPES OF NEGATIVE FEEDBACK:

- Depending on the type of sampling and mixing networks, the feedback amplifiers are classified into four categories:

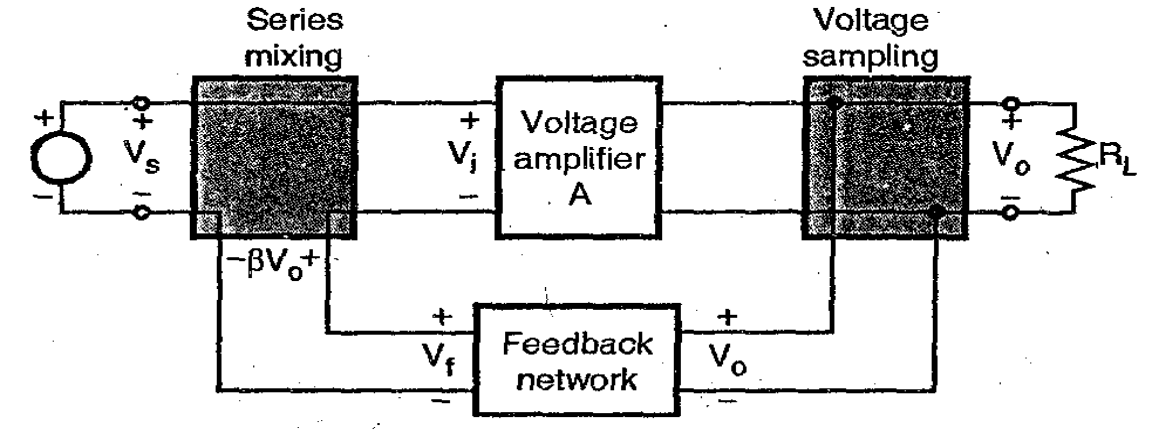
- Voltage series feedback
- Current series feedback
- Current shunt feedback
- Voltage shunt feedback

VOLTAGE SERIES FEEDBACK

Therefore,

voltage series feedback = voltage sampling + series mixing

The voltage series feedback is present in the voltage amplifiers.



A transistor amplifier which uses the voltage series feedback is the common collector or emitter follower amplifier:

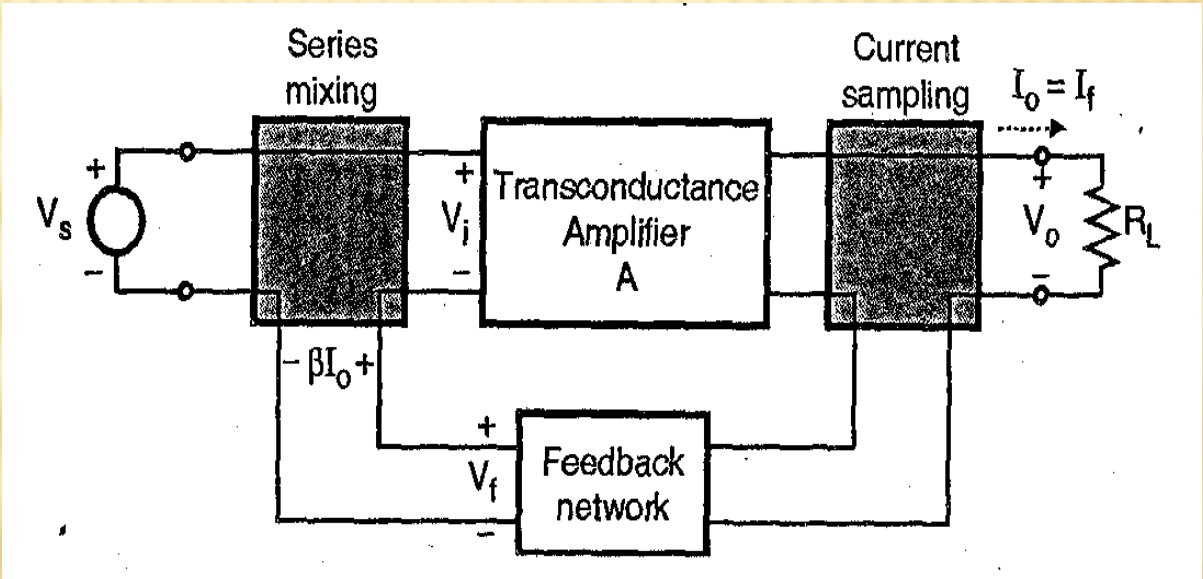
1. A common collector (or emitter follower) amplifier using BJT.
2. A common drain (or source follower) amplifier using FET.

CURRENT SERIES FEEDBACK

Therefore

Current sampling + Series mixing.

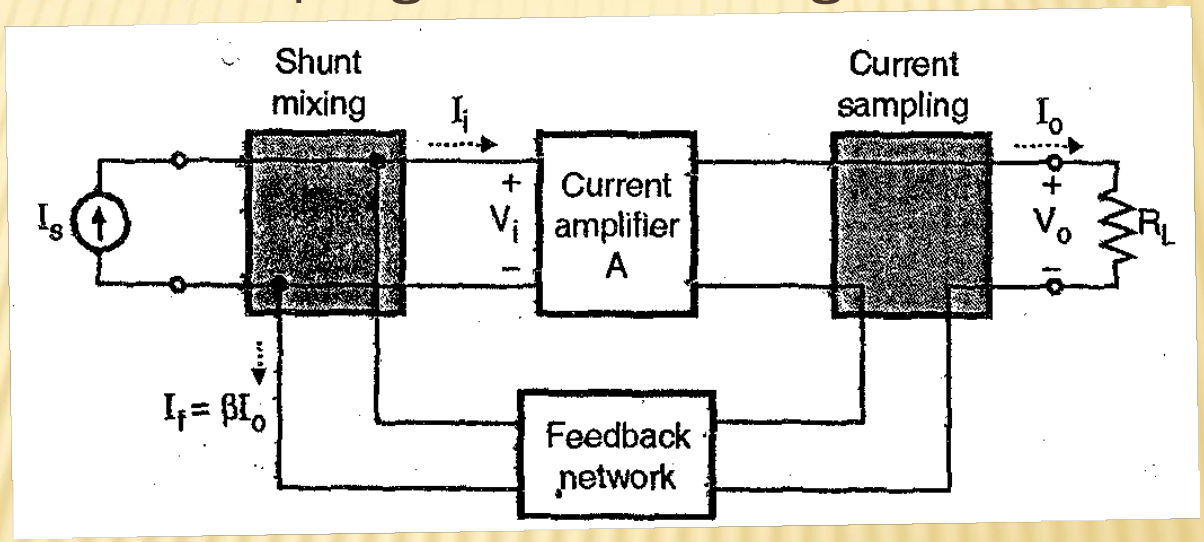
- Current series feedback is present in the transconductance amplifiers.



CURRENT SHUNT FEEDBACK:

- This is a combination of current sampling and shunt mixing. The block diagram of a feedback amplifier with current shunt feedback is shown in Fig.

Current sampling + Shunt mixing



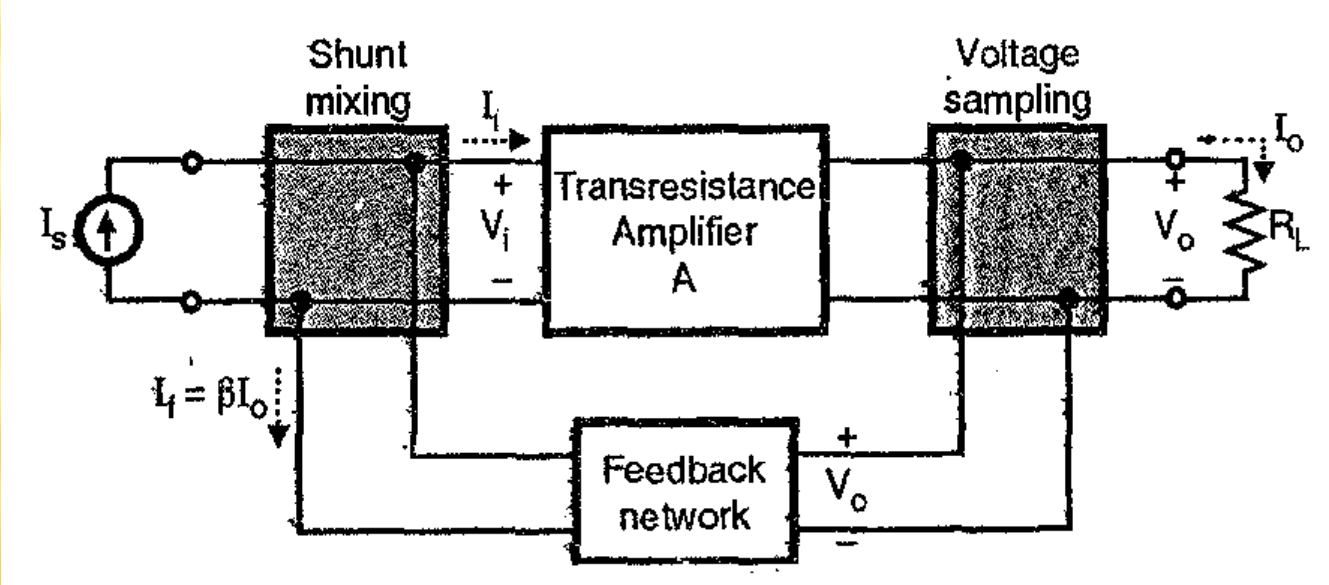
- Current shunt feedback is present in the current amplifiers.

VOLTAGE SHUNT FEEDBACK

- The block diagram of an amplifier with voltage shunt feedback amplifier is shown in Fig.

  Voltage Shunt Feedback = Voltage Sampling + Shunt Mixing.

- The voltage shunt feedback is present in the transresistance amplifier.



ADVANTAGES & DISADVANTAGES

Advantages

- Negative feedback stabilizes the gain of the amplifier.
- Input resistance increases for certain feedback configurations.
- Output resistance decreases for certain feedback configurations.
- Operating point is stabilized.

Disadvantages

- Reduction in gain.
- Reduction in input resistance in case of voltage shunt and current shunt type amplifiers.
- Increase in output resistance in case of current shunt and current series feedback amplifiers.

Applications of negative feedback

- In a1most all the electronic amplifiers.
- In the regulated power supplies.
- In wideband amplifiers (amplifiers having a large bandwidth)