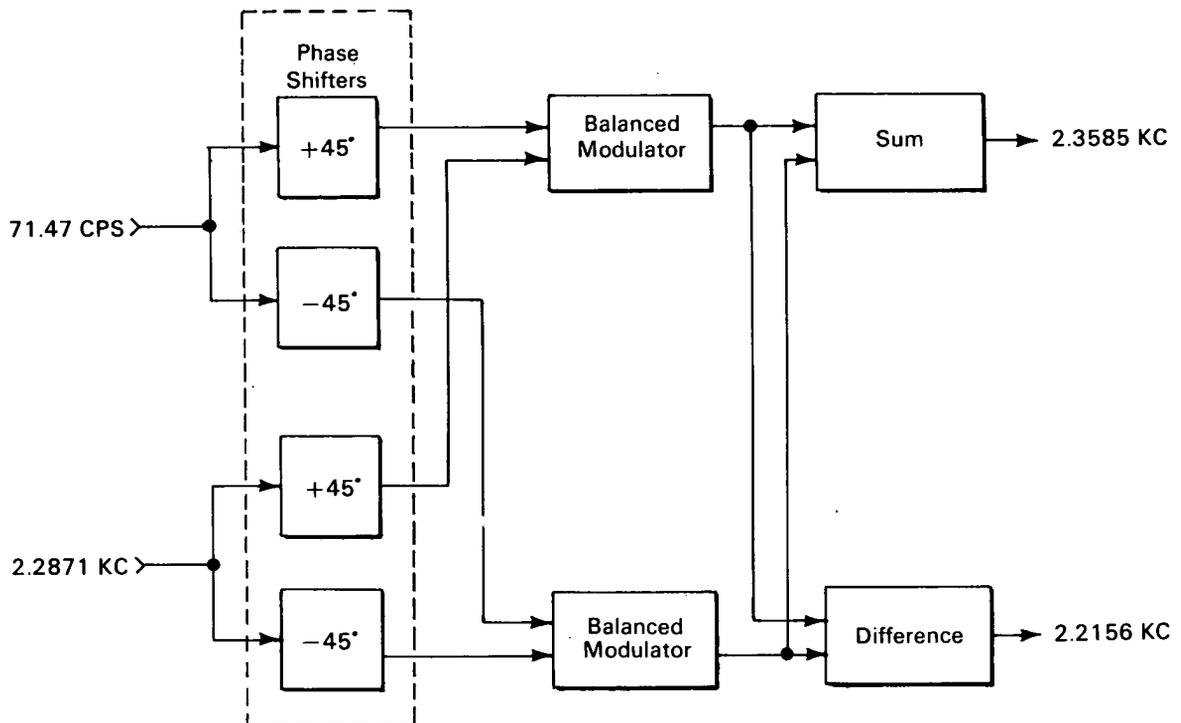


NASA TECH BRIEF



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Phase Shift Frequency Synthesizer Is Efficient, Small in Size



The problem: Producing sum and difference signals while suppressing all undesired frequencies. Space and weight considerations rule out the use of bulky and heavy reactive components and crystal filters usually employed to suppress unwanted frequencies.

The solution: A phase shift frequency synthesizer that produces suppressed-carrier signals at the sum and difference frequencies.

How it's done: Each of the 2 inputs to this circuit are divided and phase shifted to obtain signals with a $\pm 45^\circ$ phase relative to the respective input. These signals are then used to drive 2 identical balanced modulators. The balanced modulator outputs contain both

sidebands with the carrier suppressed. Relative phase of the sidebands are such that, if linearly added, the first sideband will be cancelled and the second reinforced; if differenced, the second sideband will be cancelled and the first reinforced. In this way two coherent signals, very close in frequency but isolated from each other, are obtained.

Notes:

1. In this circuit, the unwanted signals associated with each output were suppressed a minimum of 40 db below the signal of interest.
2. This circuit would be of value in any application where it is desired to synthesize frequencies from

(continued overleaf)

input signals, suppress undesired frequencies, and maintain small component and overall package weights and dimensions.

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama, 35812
Reference: B65-10169

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Space Technology Laboratories, Inc.
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