Experiment No.: 7

Title: Experimental study of generation and detection of Spread Spectrum System (DSSS).

Roll No.: _____ Batch: _____
Date of Performance: _____
Date of Assessment: _____

Particulars	Marks
Attendance (05)	
Journal (05)	
Performance (05)	
Understanding (05)	
Total (20)	
Signature of Staff Member	

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Title: Experimental study of generation and detection of Spread Spectrum System (DSSS).

Aim: To study and understand the working of direct sequence spread spectrum (DSSS) transmitter and receiver using a hardware trainer kit.

Prerequisites:

- Basic of digital communication system.
- Knowledge of modulation technique.
- Familiarity with PN sequence and spread spectrum concepts.

Objectives:

- To observe how data is spread and dispread in DSSS.
- To understand the generation of and role of PN codes.
- To analyze the transmitted and received signal using the hardware kit.

Theory:

This trainer kit has been designed with a view to provide practical / experimental knowledge of DSSS-Coherent PSK Modulation / Demodulation technique as practically implemented in digital communication systems on a single P.C.B.

DS-SS Coherent PSK:

Theory: - spread spectrum techniques originated in answer to the military communications. They are based on signaling schemes which greatly expands the transmitted spectrum relative to the data rate. Spread spectrum is useful when it is necessary for the system to resist external interference, to operate at low spectral energy, to provide multiple access capability without external control & to provide a secure channel inaccessible to the outside listeners.

The main principle of spread spectrum communication is that the bandwidth occupancy is much higher than usual. Because of this much larger bandwidth, the power spectral density is lower in the channel, the signal looks like a noise. The spreading is done by combining the data signal with code signal which is independent of the transmitted data message. The various types of

modulation techniques employed in spread spectrum are,

1] Direct Sequencing

2] Frequency Hoping

3] Time Hoping

4] Hybrid Methods.

5] CHIRP.

DIRECT SEQUENCE SPREAD SPECTRUM:

d' (t) = d(t)* g (1)

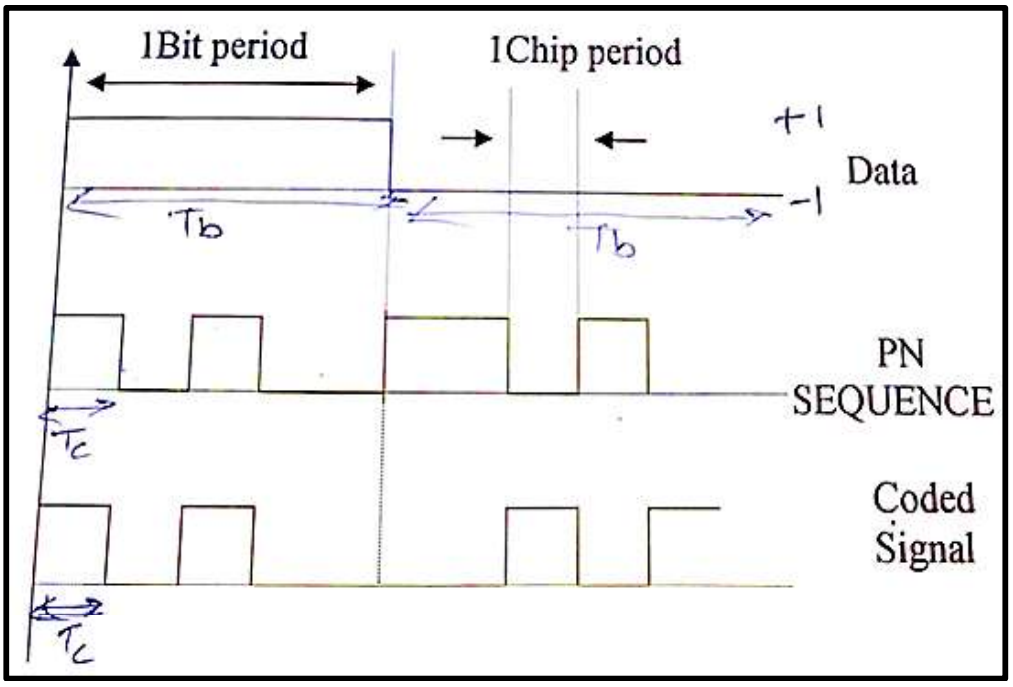
Where,

g (t) = random sequence signal

d (t) = signal to be spread

d' (t) = Spread signal

The bit rate fc of g (t) is usually much greater than the bit rate fb of d (t) so that g (t) is chops bits of d (t) into chips & so rate g (t) is called as chip rate fc & fd is the bit rate.



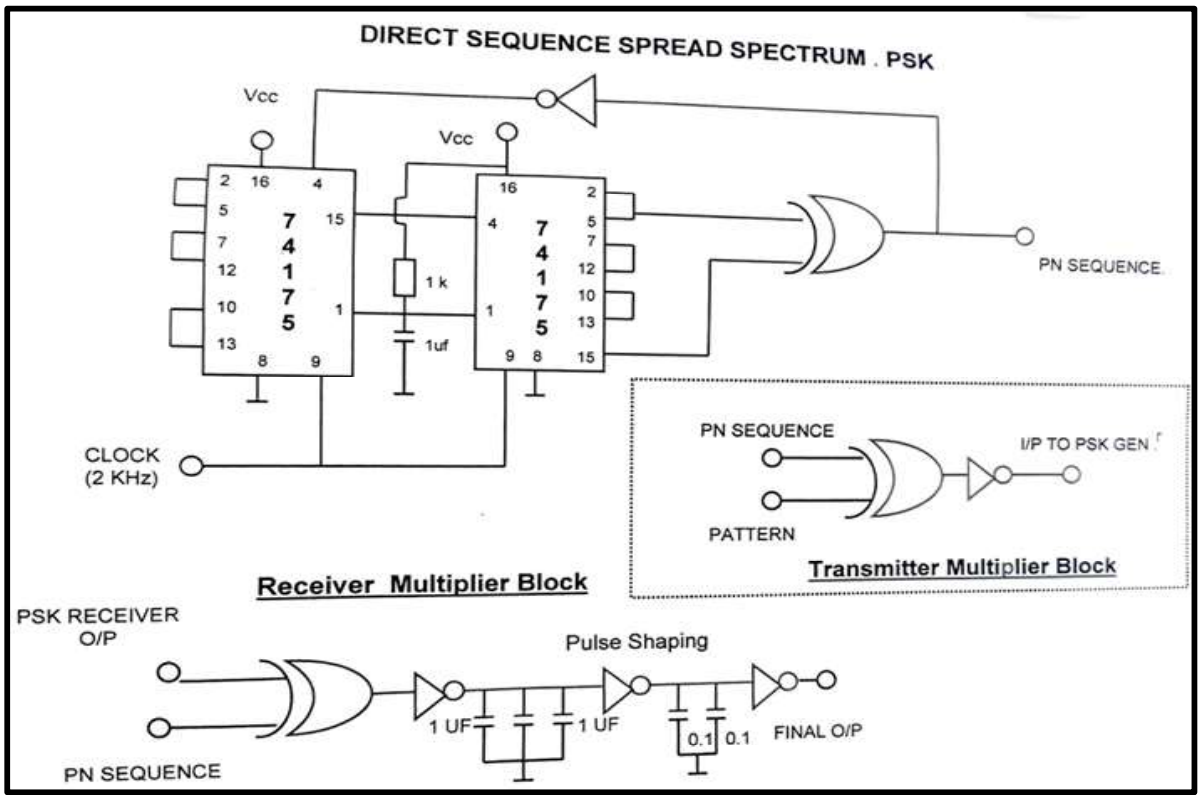
The spectrum is spread by ratio fc/fd.

In case of spread spectrum PN code is used. It is pseudo random signal. it means that that it appears to be random but in fact information is contained within it. The sequence is not entirely random only the length of apparently random bits is too long so that any unfriendly receiver cannot decode it hence the name pseudo random gen.

PHASE SHIFT KEYING:

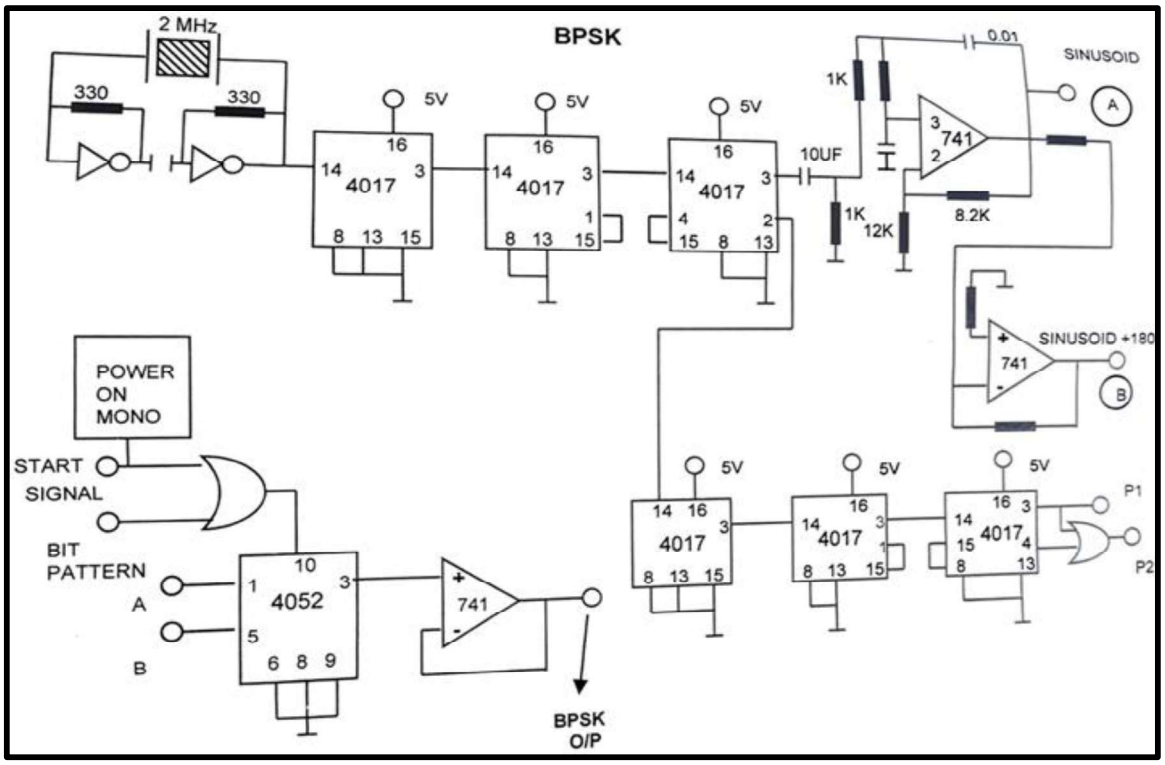
In binary PSK the transmitted signal is a sinusoid of fixed amplitude. It has one fixed phase when the data is at one level & when the data is at the other level the phase is different by 180. In our kit we have derived a sinusoid from a crystal clock using IC 4017's & frequency divider & 2nd order butter worth filter & for phase shifted wave form we have used OPAMP Inverter.

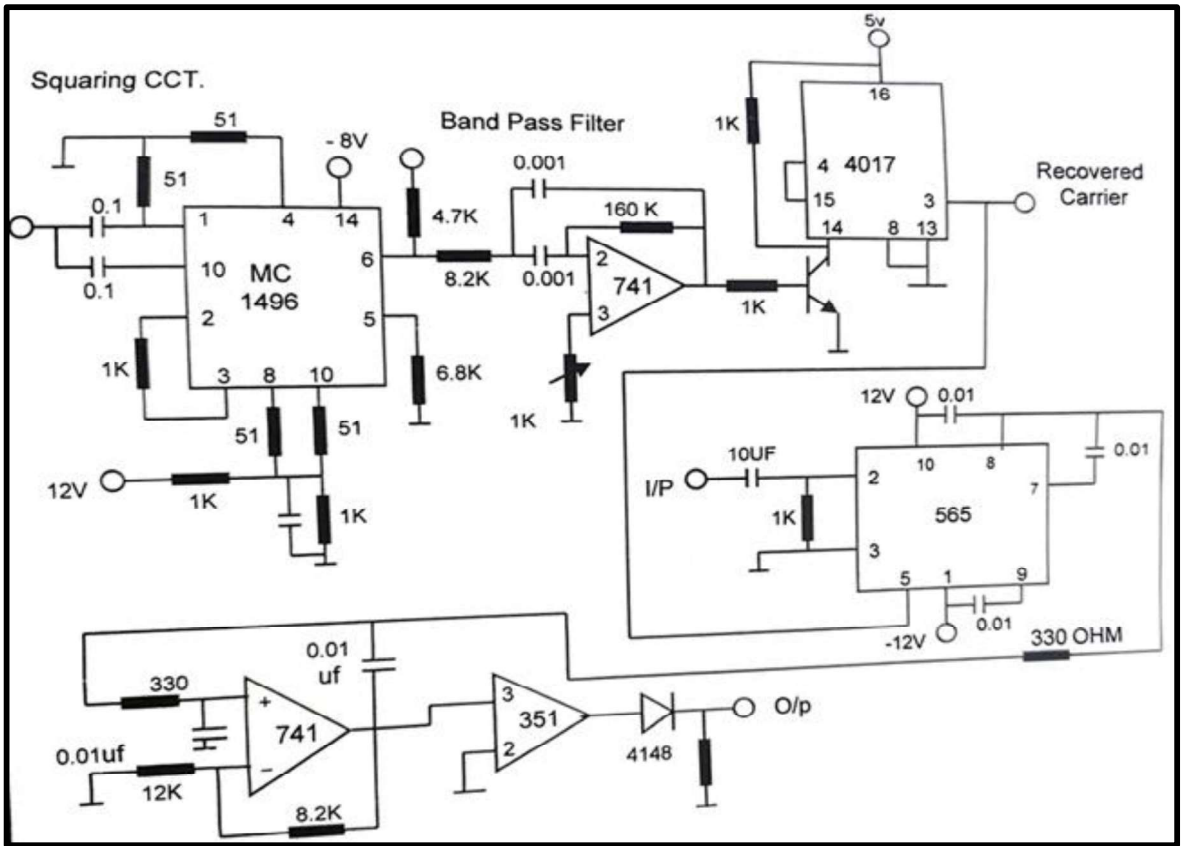
Also, two different bit patterns are also derived from a basic clock. For transmitter section we have used IC 4052 [Analog Switch]. A sinusoid & phase shifted sinusoid are two I/p's to analog Switch & bit pattern is connected to control I/p of 4052. O/p of 4052 is a required BPSK O/p also for synchronization purpose a start signal (Power on Mono) is sent. This signal is ORed. With bit pattern & then given to transmitter.



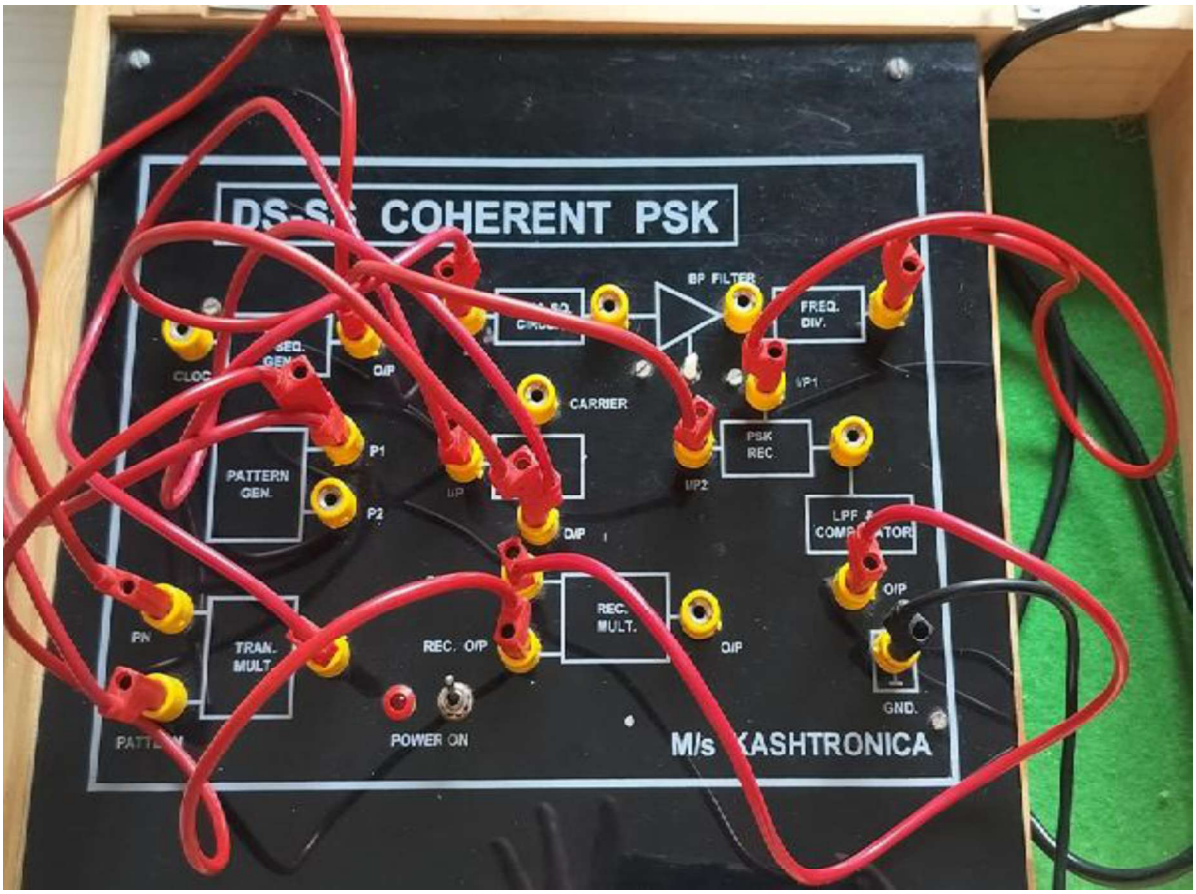
At receiver we have to derive carrier frequency from BPSK waveform. So, this wave-form is giving to squaring circuit (IC 1496 multiplier). At the O/p of 1496 we have 2 fc frequency. by using Band pass filter bwith center frequency '2fc & frequency divider (Division factor two). We get carrier frequency. for detection of data from BPSK signal, phase comparator section of PLL (565) is used. One I/p to PLL is BPSK Signal & Other I/p is recovered carrier. O/p of PLL is then given to filter. O/p of filter is either same as digital data or inverted one. Then with the help of start signal we get corrected data. We know that at the 'Power on' we have send

'1' as digital data. O/p of filter is latched at this instant. If it is '1' then we have got correct data. If this is '0' then receiver O/p is inverted & therefore we get correct data.





CONNECTION DIGRAM:



Procedure:

1] Switch on the Power supply.

2] Observe O/p of PN sequence Generator, P1, P2, on C.R.O.

i.e. P1 = 10000, P2 = 10100

3] Connect O/p of PN sequence generator to PN sequence I/p of transmitter multiplier Block.

4] Connect either P1 or P2 to pattern I/p of Tran. multiplier Block.

5] Observe O/p of transmitter multiplier Block which looks like a random signal.

6] Connect O/p transmitter multiplier Block to I/p of PSK transmitter.

7] Observe O/p of PSK tran. together with carrier of PSK transmitter on XY mode of CRO. You can observe two cross lines corresponding to 0 & 180 phases, i.e. BPSK signal.

8] Connect PSK transmitter O/p to I/p of 1496 squaring circuit & I/p2 of PSK receiver.

9] Observe O/p of 1496 squaring circuit & O/p Bandpass filter. Adjust it properly using pot

provided near B. P. Filter section.

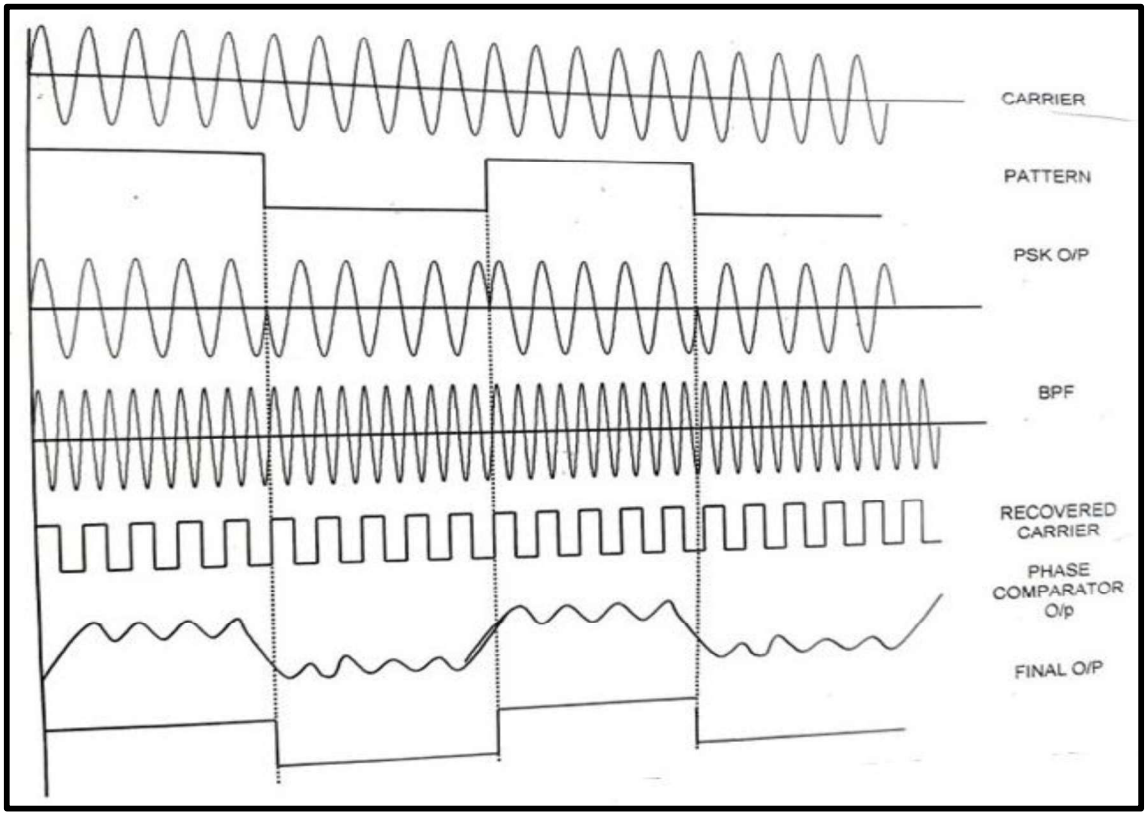
10] Connect O/p of frequency divider to I/p 1 of PSK receiver.

11] Observe O/p of PSK receiver & O/p of filter & comparator.

12] Connect O/p of filer & comparator to receiver multiplier Block & also connect PN Sequence to receiver multiplier Block.

13] Observe O/p of receiver multiplier Block which is our transmitted pattern.

EXPERIMENT:



Conclusion: