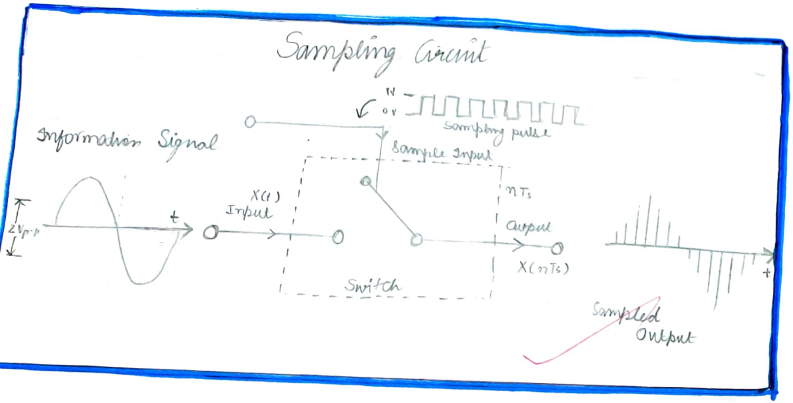
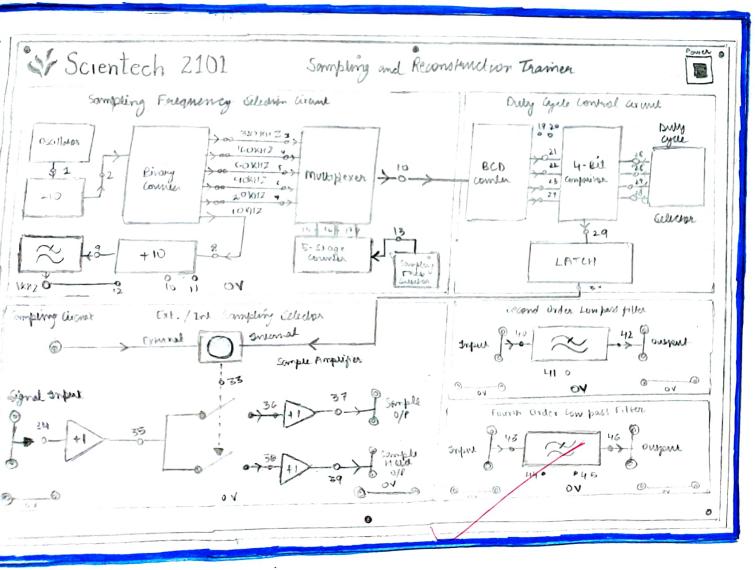




Date 16-09-2021

Expt. No. 1 Page No. 1

Experiment - 1

Aim : To study signal sampling and reconstruction techniques

Objectives : Study of sampling and reconstruction of signal
Study effect of sample/Hold sample on reconstructed waveform
Comparison of frequency response of 2nd and 4th order low pass filter

Equipments Required : Scientech 2101 with power / supply cords
CRO with connecting probe
connecting cords

Theory :

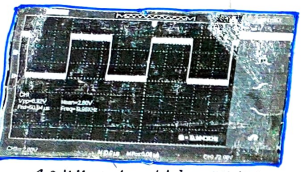
Signals we use in real world, such as our voice are called as "analog" signal. To process these signals in digital communication we need to convert analog to digital signals.

Analog signals are continuous in time and amplitude while digital signal is discrete time signal and has both - time and amplitude discrete. SAMPLING is the process to convert continuous time signal to discrete time signal. The value of signal is measured at certain intervals in time which are called as Sample.

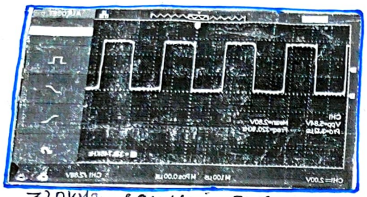
Sampling theorem states that a continuous signal band limited to fm Hz, can be completely represented by and reconstructed from the samples

Teacher's Signature :

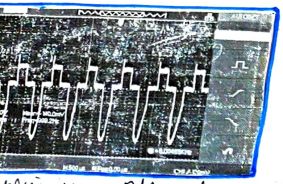
[SIGNAL WAVE FORM VISUALIZATION O/P]



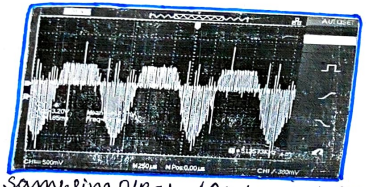
20 KHz sampling Frequency I/P signal waveform



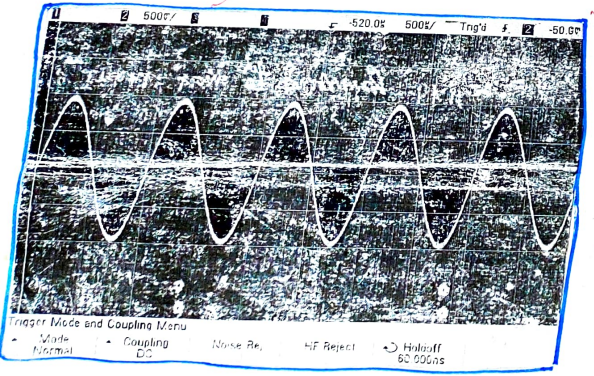
320 KHz sampling Frequency I/P signal waveform



pling wave O/P at uency 20KHz



Sampling O/P at sampling wave frequency 320 KHz



I/P wave of 1KHz

Date _____

Expt. No. _____ Page No. 2

per sec. Minimum frequency is called "Nyquist Rate" thus for faithful reconstruction of information signal from its samples it is necessary that the sampling rate $F_s > 2 F_{max}$ Hz

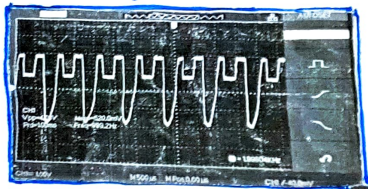
If the information signal is sampled at a rate lower than that stated by Nyquist criterion, then there is overlap between information signal and side bands of harmonics. Thus the lower and higher frequency components get mixed and cause unwanted signals to appear at the demodulator output. This phenomenon is termed as aliasing or Fold-over distortion.

Procedure:

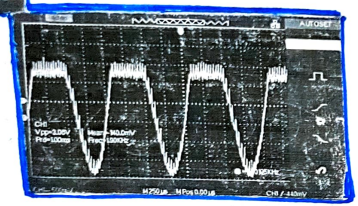
1. Duty cycle selector switch was set to 5 (50% duty cycle) and sampling selector switch was set to internal.
2. 1KHz sine wave was given as input and Oscilloscope was used to observe the wave. Readings were taken at 320 KHz and 20 KHz sampling rates.
3. For the respective sampling rates sample O/P wave forms were visualized.
4. Sample input was connected to 2nd and 4th order low pass filter.
5. We observed sample output lower frequencies introduced distortion which was caused as filter did not attenuate unwanted frequency component significantly.
6. As we increased duty cycle selector, We observed linear relationship with amplitude.
7. Same procedure was repeated for sample and hold waveforms.
8. Outputs for different duty cycles were observed too.

Teacher's Signature : _____

[SAMPLE AND HOLD O/P]

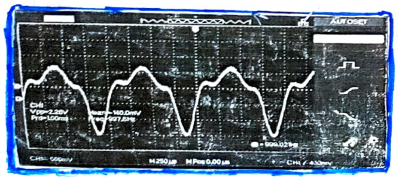


Sample and hold O/P wave for sampling wave of frequency 20KHz

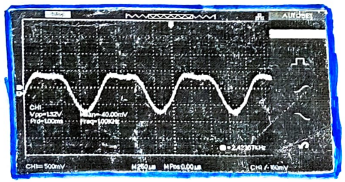


Sample and hold O/P for sampling wave of frequency 320KHz

[OUTPUT WAVE WHEN SAMPLE OUTPUT PASSED THROUGH 4TH ORDER LOW PASS FILTER (LPF)]



sample and hold O/P when passed through 4th order LPF for sampling frequency 20KHz



Sampling O/P when a wave I/P passed through 4th order LPF for the sampling frequency 320KHz I/P

Date

Expt. No. _____ Page No. 3

there was no change in amplitude in hold case

Result :

It was observed from various cases that :

- As sample frequency increases, the output of sample part has more no. of samples of applied signal
- For transmitting the signal if a sample and hold amplifier is used just before transmission channel, the signal suffered from distortion as compared to when only sample amplifier was used
- As the order of LPF is increased at O/P, the recovered signal will be reconstructed more like transmitted signal

To further verify when sample and sample and hold amplifiers were connected to II and IV order LPF Signal sampling was generated and various reconstruction techniques are verified and observed

VIVA VOCE QUESTIONS

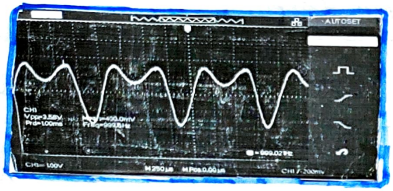
Ques 1. what do you mean by sampling ?

Ans. To convert continuous time signal to discrete time signal, a process is used and this process is called sampling

Ques 2. what is sampling theorem ?

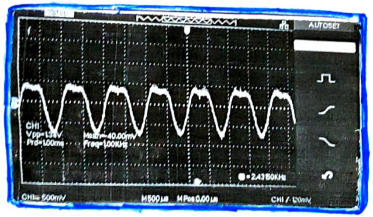
Teacher's Signature : _____

OUTPUT WAVE WHEN SAMPLE AND HOLD WAVE IS PASSED THROUGH 4 TH ORDER LOW PASS FILTER



when sampling wave of frequency 20 kHz is given at input

In case of sampling wave of frequency 320 kHz



Date

Expt. No. _____ Page No. 4

Ans The sampling theorem states that a signal can be exactly reproduced if it is sampled at a frequency Fs

where $Fs > 2Fmax$: Fmax - maximum frequency in signal

Ques 3. What is Nyquist frequency?

Ans The frequency $2 \times Fmax$ is called Nyquist sampling ratio rate.

Half of this value Fmax is sometimes called as Nyquist frequency

Ques 4. List different sampling techniques?

Ans There are 3 types of sampling techniques:

1) Ideal sampling or Instantaneous sampling or Impulse sampling
2) Natural sampling
3) Flat top sampling.

Ques 5. How aliasing is removed?

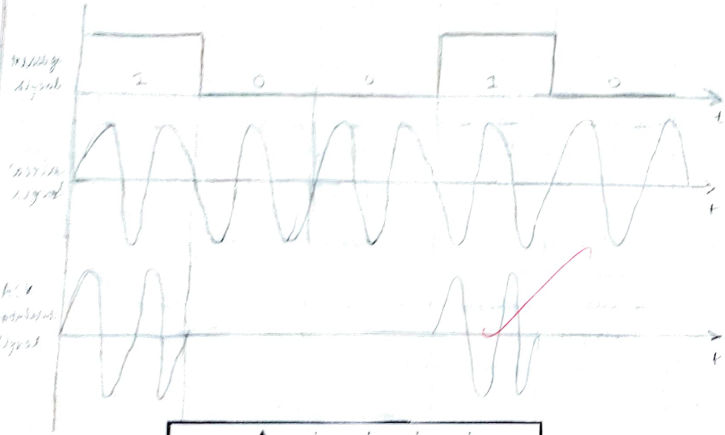
Ans Aliasing is removed by sample filtering out of all high frequencies components before sampling.

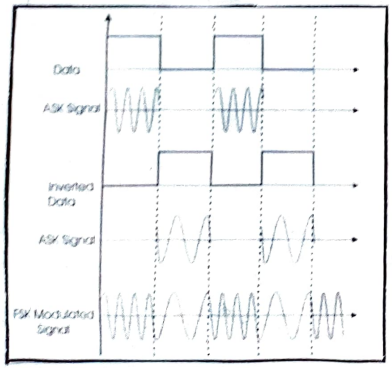
Ques 6. What is under sampling?

Ans When sampling rate is lower than or equal to Nyquist rate, a condition defined as under sampling. It is impossible to rebuild the orignal signal according to sampling theorem.

Teacher's Signature : _____

Amplitude Shift keying modulation waveform





Date 23-09-2021

Expt. No. 2 Page No. 5

Experiment - 2

Aim : Study of Amplitude shift keying modulation and demodulation

Equipments Required : ST2156 and ST2157 with power supply cord, CRO / Oscilloscope with connecting probe, Connecting cords

Theory :

ASK technique is the simplest method of modulating a carrier with a digital data stream is to change the amplitude of the carrier wave every time the data changes. This modulation technique is known as Amplitude Shift keying.

The simplest way of achieving ASK is by switching "ON" the carrier whenever data bit '1' and switching it "OFF" whenever the data bit is "0" i.e the transmitter output the carrier for a "1" and totally suppresses the carrier for a "0" This technique is also known as ON-OFF keying

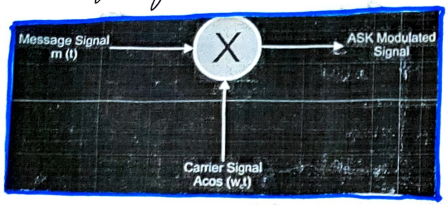
Data = 1 carrier transmitted

Data = 0 carrier supressed

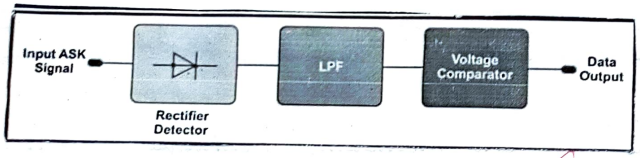
The ASK waveform is generated by a balanced modulator circuit, also known as a linear multiplier. The device multiplies the instantaneous signal at its two inputs The O/P voltage being product of two I/P voltages at any instance of time. One of the I/P is AC coupled "carrier" wave of high

Teacher's Signature : _____

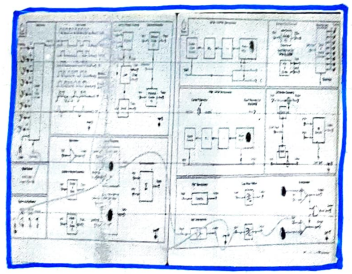
Amplitude Shift keying modulator



Amplitude Shift keying demodulator



CIRCUIT DIAGRAM



Date

Expt. No. Page No. 6

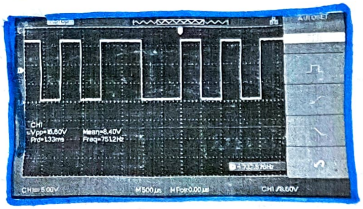
frequency. Generally, the carrier wave is a sinusoidal signal since any other waveform would increase bandwidth without providing any advantages. The other I/P which is the information signal to be transmitted, is DC coupled. It is known as modulating signal. The data stream applied is unipolar i.e. 0 volts for logic '0' & +5 volts for logic '1'. The O/P of balanced modulator is a sine wave, unchanged in phase when a data bit '1' is applied to it and is 0 when data bit '0' is applied. The ASK modulation result in great simplicity at the receiver. The method to demodulate the ASK waveform is to rectify it, pass it through the filter & 'shape up' the resulting waveform. The O/P is the original data stream.

Procedure:

1. Power supplies of Scientech 2156 and 2157 were connected and connections were made according to given figure.
2. 'Clock In' of CH1 and 'Data In' of CH2 were connected and waveforms were observed.
3. Oscilloscope CH1 was connected to 'NRZ(L)' and CH2 to 'Output' of modulator circuit of Scientech 2156 and waveforms were observed.
4. Gain potentiometer of modulator circuit on Scientech 2156 was varied to adjust amplitude of ASK waveform.
5. On Scientech 2156 was connected to oscilloscope CH1 to 'NRZ(L)' and CH2 to 'Output' of comparator on Scientech 2157 and waveforms were observed

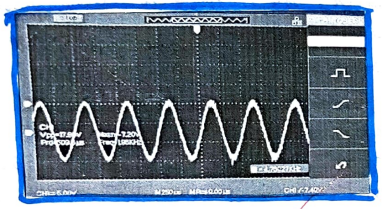
Teacher's Signature :

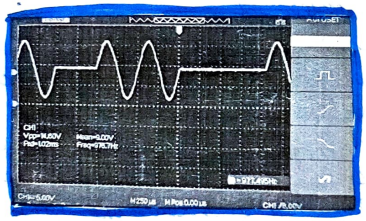
Waveforms of ASK Modulation



Data
(Data at Input)

Carrier signal





ASK signal

Date

Expt. No. _____ Page No. 7

Observations :

1. The output at "Data In" is repeating sequence of bits generated by Data Source.
2. The output at Modulator circuit (1) is the ASK waveform which contains carrier transmitted for Data "1" and carrier suppressed data "0".
3. The output at comparator on sciemech 2157 is the same as "Data In" on sciemech 2156.

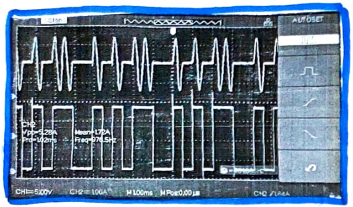
Conclusion :

1. Amplitude Shift Keying is fairly simple to implement in practice, but it is less efficient, because the noise inherent in the transmission channel can deteriorate the signal so much that the amplitude changes in the modulated carrier wave due to noise addition, may lead to the incorrect decoding the receiver.
2. The technique is not widely used in practice. Application wise, it is however used in diverse areas and old as emergency radio transmission and fiber-optic communications.

VIVA VOCE QUESTIONS

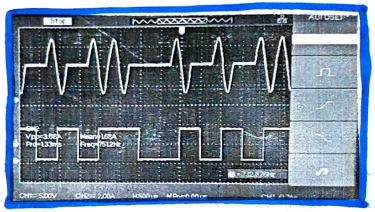
Ques 1. What are the types of Digital Modulation techniq
Ans Digital Modulation techniques is classified int

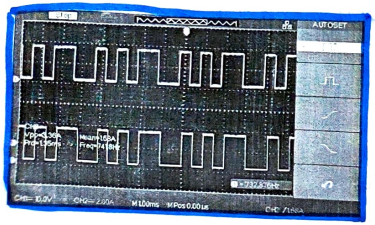
Teacher's Signature : _____



data vs ASK signal
(↑ frequency)

ASK signal
vs
Output data
(zoomed in)





[data at the input
vs
data at output]

[modulated signal obtained and signal to be modulated]

Date

Expt. No. _____ Page No. 8

coherent or non-coherent techniques depending on whether the receiver is equipped with a phase recovery circuit or not.

Ques 2. Define coherent Digital Modulation Technique?

Ans Coherent Digital Modulation techniques employs coherent detection technique in which local carrier generated at the receiver is phase locked with the carrier which is used in transmitter section. It is a synchronous detection method

Ques 3. State ~~maximum~~ the bandwidth requirement in ASK system?

Ans Maximum Bandwidth is $2f_b$ Hz in ASK System.

Ques 4. What are advantages of digital communication?

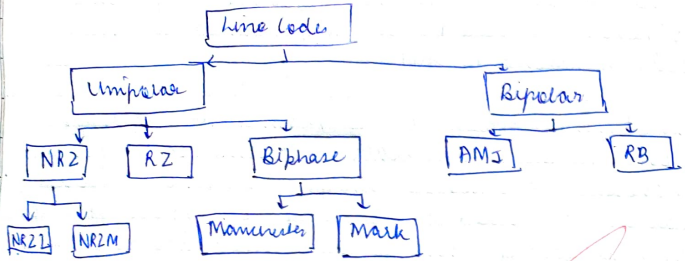
Ans · Reliable, Noise effect is very less, power consumption is very less, various Digital ICs are available so circuit is not complex, cheap Error detection and correction is also possible

Ques 5. How to convert an analog to digital signal?

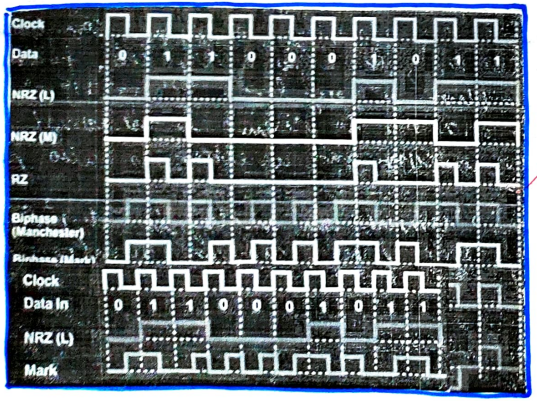
Ans Anti aliasing filter, sampler, Quantizer, Encodi

Teacher's Signature : _____

Classification of line codes :



Various data formatting techniques :



Date 30-09-2021

Expt. No. 3 Page No. 9

Experiment - 3

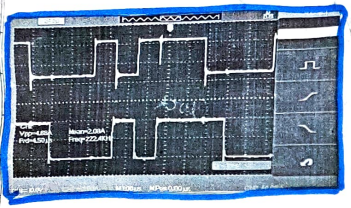
Aim : To perform different line codes - NRZ-L, NRZ-M, RZ, Biphase (Manchester), Biphase (Mark) and AMI

Equipments Required : ST2156 and ST2157 with power supply cord
CRO with connecting probe
Connecting cords

Theory :
Line coding and decoding consists of representing the digital signal to be transported by an amplitude and time discrete signal that is optimally tuned for specific properties of physical channel. The waveform pattern of line is called line encoding are of voltages and current to represent 1's and 0's of digital signal on a transmission line called line encoding.
It is commonly used in computer communication networks over short distances.
Various advantages and disadvantages - Minimize transmission hardw
- Facilates synchronization
- Ease error detection & correction
- Minimize spectral content
- Eliminates a dc compon
The manchester code is quite popular. It is known as

Teacher's Signature : _____

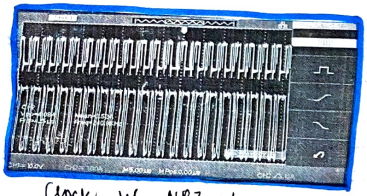
Different data formatting Techniques



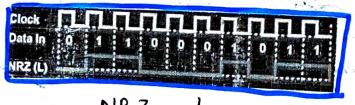
Input Clock
vs
Clock observed

data = 1 0 1 0 0 0 1 1

NRZ – L (Clock vs NRZ-L waveform observed)



Clock vs NRZ-L



NRZ – L

Date

Expt. No. _____ Page No. 16

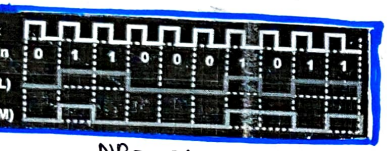
a self clocking because there is always transition during bit intervals. Consequently long strings of zeros or ones do not cause clocking problems.

Different Data formatting techniques :

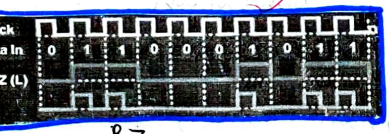
1. Non return to zero level (NRZ-L) :
   - Representation : +5 V for data bit 1 and 0V for 0
   - Bandwidth : Low Bandwidth
   - DC level : High DC component
   - Time information : No info (for long streams of 1s & 0s
2. Non-return to zero-level (NRZ-M) :
   - Representation : level transition for bit 1 and unchange
   - Bandwidth : Low bandwidth
   - DC-level : High DC component
   - Timing Information : No timing info (for long stream of 0s)
3. Return to zero (RZ) :
   - Representation : 0V for bit 0 for bit 1, for half bit duration (+5 V) and rest as 0 V
   - Bandwidth : Twice as required for NRZ
   - DC level : High DC component
   - Timing Information : No timing info (for long stream of 0
4. Biphase (Manchester)
   - Representation : for 1 +5 V for first half bit and 0V for second half bit for 0 ; 0V in first half and +5 V for rest
   - Bandwidth : Twice as required for NRZ
   - DC level : No DC component
   - Timing info : Good clock recovery
5. Biphase (Mark)

Teacher's Signature : _____

vs NRZ-M for I/P clock)



NRZ-M



RZ

Date

Expt. No. Page No. 11

Representation : for any bit, first half +5V and rest 0 and inverse first half during next half bit. Bit 0 pattern remains same. Bit 1 Phase Reversal

Bandwidth : Twice as required for NRZ

DC level : No DC component

Timing info : Good clock Recovery

6. Return to Bias (RB) :

Representation : During the first half a period, +ve for bit 1 and then negative for bit 0 and during the second half of bit time both returns to the bias level.

Bandwidth : Twice as required for NRZ

DC Level : depends on string of 1's and 0's

Timing info : Good clock recovery (Self clocking)

7. Alternate Mark Inversion (AMI)

Representation : Like RB, AMI returns to bias level during second half and during first half level can be +ve or -ve for a bit 1 either and changes alternatively

Bandwidth : Twice as required for NRZ

DC Level : No DC component

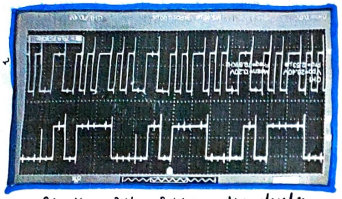
Timing info : No info (for long sequence of 0s)

Procedure :

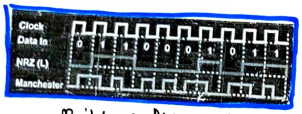
1. Scientech 2156 was connected to power supply and the connections were made.
2. Powered was switched on and various observations were made by visualizing waveforms at various pins.

Teacher's Signature :

Biphase Manchester

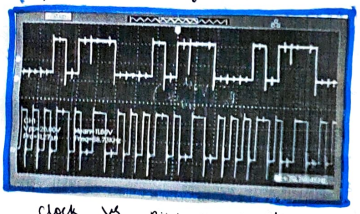


Clock vs Biphase Manchester



Biphase Manchester

Biphase Mark



Clock vs Biphase Mark

Date _____

Expt. No. _____ Page No. 12

3. Oscilloscope is connected to clock in, NRZ(L), NRZ(M), RZ, Biphase (manchester), Biphase (Mark), RB, AMI and waveforms were observed.

Observations:

1. The output at 'Data in' is a repeating sequence of bits generated by parallel to serial converter.
2. The NRZ(L) is same as 'Data in' but it is one bit shifted
3. Verified all formatting techniques according to examples patterns given on the Scientech 2156 board.

Conclusion:

1. NRZ(L) waveform simply goes low for one bit time to represent data '0' and high for one bit time to represent a data '1'.
2. In NRZ (M) line coding the present level is related to the previous level when logic '1' is to be transmitted change in level occurs and for logic '0' the level remains unchanged.
3. In RZ line codes, the maximum signal frequency is 'RZ' signal occurrence when alternate '1's is transmitted change in level. It's equivalent to sending 2 logic levels in each clock period. Thus bandwidth required is twice as required for the NRZ waveform
4. The biphase manchester codes always contain atleast one transition per bit time irrespective of data being transmitted. Hence, the maximum frequency of the biphase system is equal to data clock rate when a

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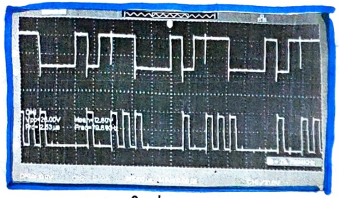
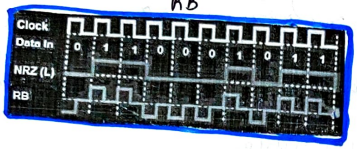
RB (Return to Bias)

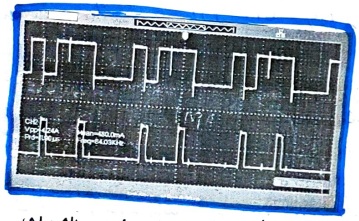


clock vs RB waveform

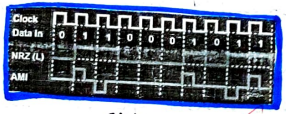
RB



Alternate Mark Inversion (AMI)



clock vs AMI waveform



AMI

Date

Expt. No. _____ Page No. 13

stream of consecutive data e/g 8 '0' is transmitted.

5. e Biphase Mark has sequence transmitted level constant in case of 0 but for 1 sequence transmitted levels have phase reversal from one 1 to another.

6. The Biphase mark code being very similar to Biphase e Manchester) requires same bandwidth as double by NRZ(L).

7. The maximum signal frequency in RB code is equal to data frequency, the bandwidth required is same as that for NRZ, biphase codes and doubles that for NRZ codes.

8. The maximum transition rate for AMI can occur only during a stream of all e1s thus bandwidth required is twice as for NRZ codes.

Result:
Different line coding techniques were observed and verified.

VIVA VOCE QUESTIONS

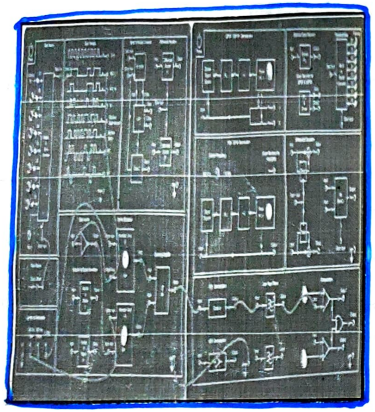
Ques 1. What is 'Equalization'?

Ans Equalization is the reversal of distortions occurred by a signal transmitted through a channel.

They are used to render frequency response for various instances.

Teacher's Signature : _____

Circuit Diagram



Date _____

Expt. No. _____ Page No. 14

Ques 2. What is Baseband binary data transmission system?

Ans Baseband transmission system transfer digital signals in the form of a train of pulses. Signals transferred in baseband signal are not moved from their original frequency bands as no sinusoidal carrier modulation is used.

Ques 3. What do you mean by Eye diagram?

Ans It an oscilliscope display in which digital signal from receiver is repetatively sampled and applied to the vertical inputs, while the data rate is used to trigger horizontal sweep.

Ques 4. What are other names of Bipolar and Manchester coding?

Ans Bipolar → AMI (Alternate pulse inversion)

Manchester → phase Encoding

Ques 5. What are some coding techniques?

Ans pulse code demodulation, differential pulse code modulation, delta modulation, adaptive delta modulation.

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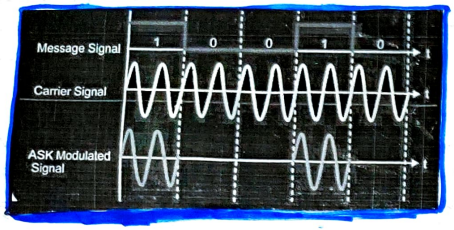
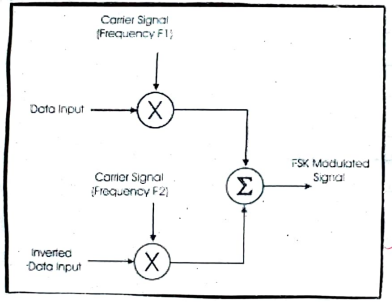
Generation of FSK waveform from the sum of two ASK waveforms



Frequency Shift keying modulator



Date 07-10-2021

Expt. No. 4 Page No. 15.

Experiment - 4

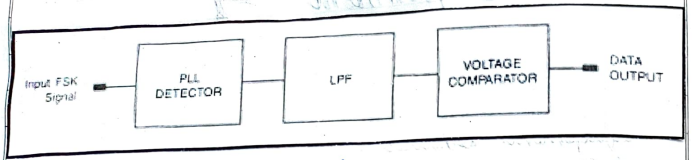
Aim: To perform frequency shift keying modulation and demodulation.

Equipments required:
→ ST 2156 and ST 2157 with power cords
→ CRO with connecting probes
→ Connecting cords

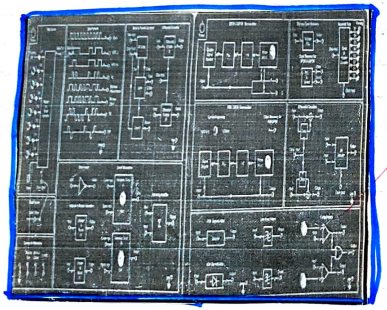
Theory:
FSK waves are apparent it's sum of two ASK waves thus the functional block of FSK requires 2 ASK modulator each and have different carrier frequencies but digital data is inverted in one of the modulator. These 2 ASK modulated signal are applied to the summing amplifier to get FSK modulated signal.
The modulation of FSK can be carried out by phase lock loop As known to it locks I/P frequency by generating corresponding voltage to be fed at voltage controlled oscillator, if any frequency deviation is its input encountered. thus PLL detector is followed by frequency changes and generates proportional O/P voltages. It contains carrier waves/components. Therefore signal is passed through low pass filter to remove them. The resulting wave is used for data processing.

Teacher's Signature : _____

Frequency Shift keying demodulator



Circuit Diagram



Date

Expt. No.

Page No. 16

The amplitude level may be very low due to channel attenuation. The signal is coupled VP by feeding it to the voltage comparator. The functional block diagram of FSK demodulator is displayed.

Procedure:

1. Scientech 2156 and 2157 were connected to the power supplied and connections were made.
2. The leads were connected as displayed in the circuit diagram and power supply was turned 'ON'.
3. On Scientech 2156 oscilloscope CH1 was connected to the 'Clock In' and CH2 to 'Data In' and waves were observed.
4. On Scientech 2156, oscilloscope CH1 was now connected to 'NRZ(L)' and CH2 to O/P of the summing amplifier on Scientech 2156 and waveforms were observed.
5. modulator was adjusted to adjust amplitude of FSK from summing amplifier O/P.
6. On Scientech 2156 oscilloscope CH1 was connected to (NRZ(L)) and CH2 to 'Output' of comparator and waveforms were observed.

Observation:

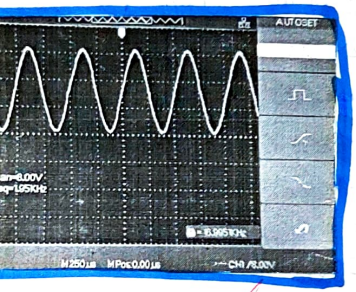
The output at summer amplifier is the FSK waveform, data bit '0' at FSK signal was at lower frequency and data bit '1' the FSK signal was at high frequency.

Teacher's Signature :

& demodulation

data

modulation and)
on



FSK signal

Date

Expt. No. _____ Page No. 17

The output comparator on scientech is same as the data inputted.

Conclusion:
The amplitude change in FSK waveform does not matter, therefore FSK modulation technique is very reliable even in noisy and fading channel.

Result:
FSK modulation and demodulation was observed and understood.

VIVA VOCE QUESTIONS

Ans 1. What is the bandwidth of BFSK?
Ans 2 fb

$B_T = 2\Delta f + 2B$

$B = R_b$ [Bandwidth of rectangular pulse]

$B_T = 2(\Delta f + R_b)$

if RC shaping,

$B_T = 2\Delta f + (1+\alpha) R_b$

Ans 2. What is meant by orthogonal BFSK?
Ans. Orthogonality is the property which

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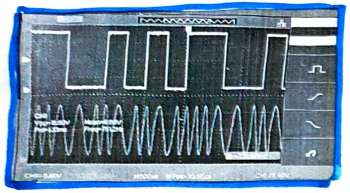
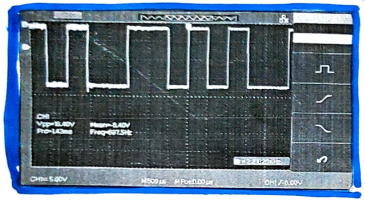
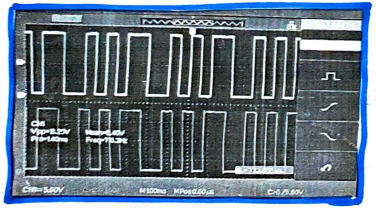


data vs FSK signal

data output at comparator (demodulated signal obtained)





Data vs data obtained (Data Output)

Date _____

Expt. No. _____ Page No. 18

results in 0 ~~or~~ dot product of 2 vectors.
It's extension of concept of ⊥ vector to any space dimension.
So there is ~~lock~~ want to lock the balanced orthogonal signals onto carrier ~~no~~ frequency.
& lock in amplifier.

Ques 3. What kind of receiver is used in BFSK and FSK ?
Ans FSK - Conventional frequency demodulator for BFSK detection we use synchronous detector.

Ques 4. What is advantage of FSK over ASK ?
Ans → It has a low probability
→ Easy to implement
→ High data rate
→ better noise immunity than ASK so probability of error-free reception is high
→ Easy to decode
→ high SNR
→ operate in virtually any wires
→ Easier implementation of transmitter and receiver for low data rate applications
→ Good sensitivity
→ Low noise
→ Power requirement is constant.

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Date _____

Expt. No. _____ Page No. 19

Ques 5. What is Binary Phase shift keying (BPSK)?

Ans For each one bit of binary data (0 and 1) carrier phase will be changed (two different shifts: 0, 180)

Ques 6. Compare ASK, PSK and FSK?

Ans

Bandwidth	ASK < PSK < FSK
Power	ASK < PSK = FSK
Probability of error	ASK > PSK > FSK
SNR	ASK < PSK = FSK

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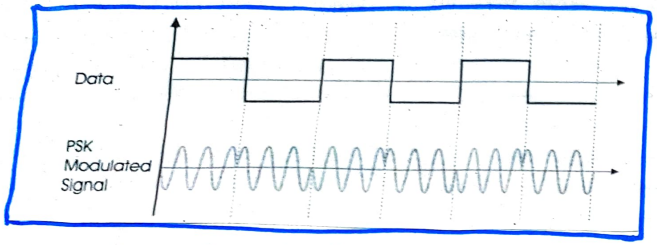
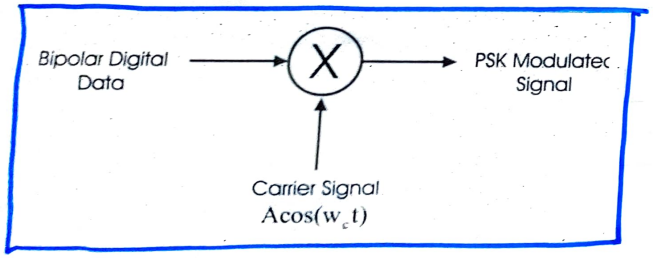
Diagrams and Waveforms :



Phase Shift Keying Waveform



Phase Shift Keying Modulator

Date 21-10-2021

Expt. No. 5 Page No. 20

Experiment - 5

Aim : To perform Phase shift keying modulation and demodulation

Equipment Required : ST2156 and ST2157 with power supply
CRO with connecting probe
connecting cords

Theory :
Phase shift keying involves the phase change of the carrier wave between 0° and 180° in accordance with the data levels to be transmitted. Phase shift keying is also known as phase reversal keying (PRK). The PSK waveform for a given data is as shown in figure.
For Binary PSK

$S_0(t) = A\cos(\omega t)$ represents binary '0'

$S_1(t) = A\cos(\omega t + \pi)$ represents binary '1'

Functionally, the PSK modulator is very similar to the ASK modulator. Both uses balanced modulator to multiply the carrier with the modulating signal. But in contrast to ASK technique, the digital signal applied to the modulation input for PSK generation is bipolar i.e have equal positive and negative voltage levels. When the modulating input signal is positive the output of modulator is a sine wave in phase with the carriers input. where as for the negative voltage levels, the output

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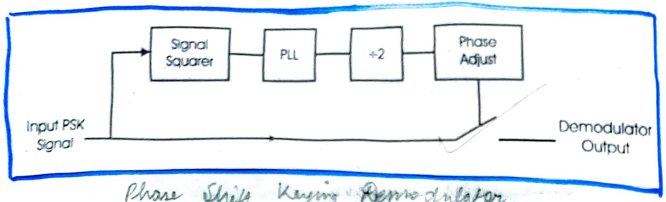
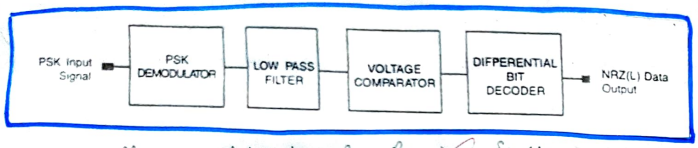
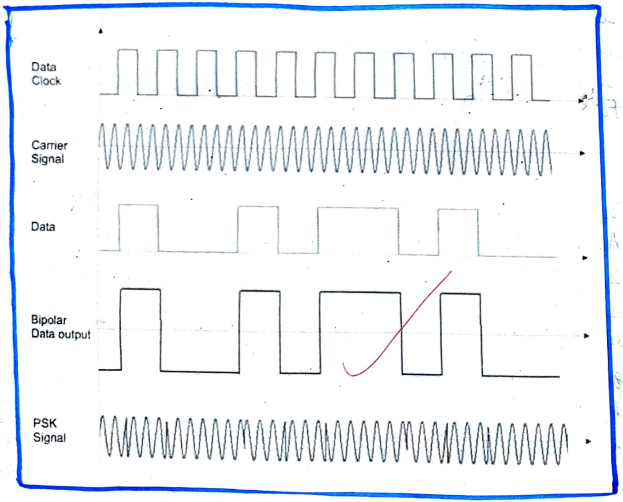


Phase Shift Keying Demodulator



Phase Shift Keying Receiver System



Waveforms of PSK Modulation

Date _____

Expt. No. _____ Page No. 21

of modulator is a sine wave which is shifted out of phase say 180° from the carrier input. This happens because the sinusoidal input is now multiplied by negative constant level. The functional block representation of the PSK modulator.

Procedure :

1. Connected the power supplies of scientech 2156 and scientech 2157 but do not turn on the power supplies until connections are made for this experiment.
2. Made the the connections as per the circuit diagram
3. The circuit was turned 'ON' and scientech 2156 oscilloscope was connected to CH1 to 'Clock In' and CH2 to 'Data In' and observed the waveforms
4. Scientech 2156 was connected CH1 oscilloscope 'NRZ(L)' and CH2 to 'Output' of modulator circuit (1) on scientech 2156 and observe the waveform.
5. Adjust the 'Gain' potentiometer of modulator circuit (1) on scientech 2156 to adjust the amplitude of PSK waveform at O/P of modulator circuit on scientech 2156.
6. Various comparisons and waveforms were observed and verified.

Observations :

1. The output at 'Data In' is repeating sequence of bits generated by Data Source.
2. The 'output' of modulator circuit (1) is Phase Shift Keying modulated signal.

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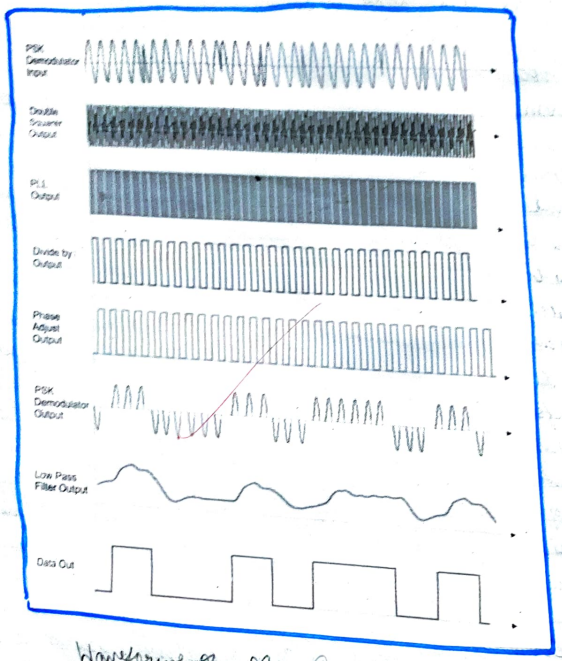

Waveforms of PSK Demodulation

Date

Expt. No. _____ Page No. 22

3. The output of double squaring circuit is sinusoidal signal (carrier signal) but frequency is four times higher than that of carrier used for modulation.
4. The output of Phase Lock loop (PLL) is clock signal of same frequency as that of the output of double squaring circuit and output of divide by two (÷2) is clock signal of frequency two times less than the output of PLL signal
5. The output of PSK demodulator is a signal having group of positive half cycles and group of negative half cycles of the carrier signal.
6. A low pass filter removes high frequency component from demodulated PSK signal and it makes the signal smooth.
7. The variation in reference voltage potentiometer offers the data, to recover data correctly potentiometer adjustment is necessary
8. The phase adjust potentiometer on Scientech 2157 matches the phase of regenerated clock and carrier with input clock and carrier signal.

Conclusion:

Now we can observe that the final data stream can be either the original data stream or its inverse, this is because the sine wave is symmetrical, the receiver has no way of detecting whether the incoming phase of the signal is 0° or 180°. This phase ambiguity create 2 possibilities for the receiver output i.e.

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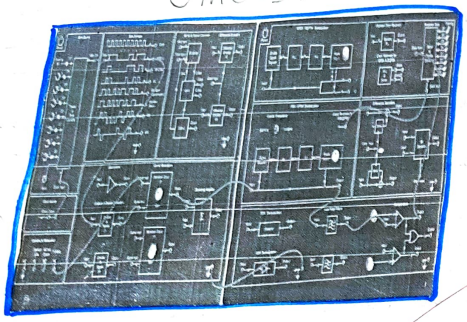
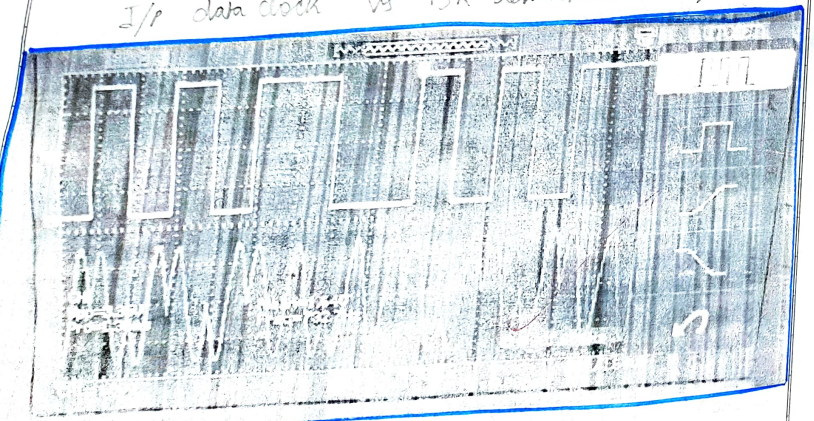
CIRCUIT DIAGRAM



⇒ OBSERVED WAVEFORMS

I/p data clock vs PSK demodulated O/P



Date _____

Expt. No. _____ Page No. 23

final data stream can be either the original data stream or its inverse.

Result : PSK ... modulation and demodulation was observed and verified.

VIVA QUESTIONS

Ques 1. What is the bandwidth of BPSK ?

Ans Binary Phase shift keying is a digital modulation scheme that conveys data by changing or modulating two different phases of a reference signal (the carrier wave). The constellation points chosen are usually positioned with uniform angular space.

$BW = fc + f_b - fc - f_b)$

= highest frequency − lowest frequency

$= fc + f_b - (fc - f_b)$

$BW = 2f_s = 2f_b$

Ques 2. What is the role of bit synchronizer in BPSK receiver ?

Ans A highly integrated ultra-low-power binary phase shift keying receivers are used for short-range wireless communications. These receivers consists of a power divider, two injection locked RC oscillators with limiting buffers, and an XOR output stage

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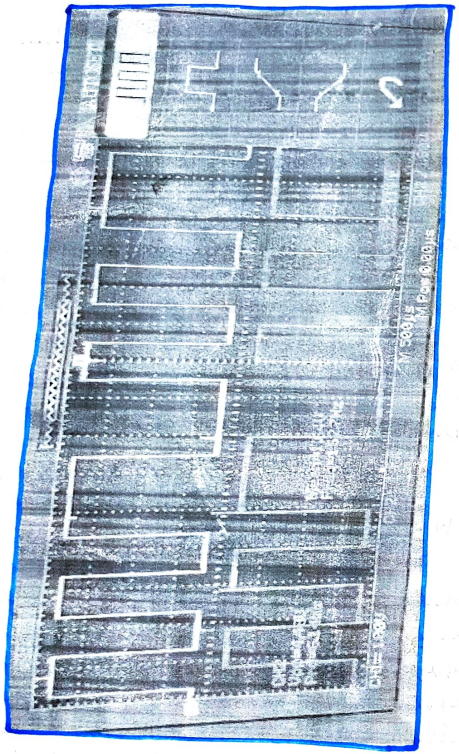
OBSERVED WAVEFORM



I/p data vs Output Data obtained after PSK demodulation.

Date

Expt. No. _____ Page No. 24

Ques 3. What is the disadvantages of BPSK receiver?

Ans 1. One bit is carried by one single analog carrier. Hence data rate in bits per second is same as the symbol rate. This half comparison to QPSK modulation technique and many thus less compare to other higher modulation techniques such as 16QAM, 64QAM, etc.

2. Due to above reasons, BPSK is not bandwidth efficient technique compared to other modulation types.

Ques 4. What type of receiver is used for BPSK detection?

Ans Synchronous detectors are used.

To detect the original binary sequence of 0s and 1s, the BPSK signal at channel output is applied to a receiver that consists of:

→ Product modulator
→ Low pass filter
→ Sampler
→ Decision making device

Ques 5. What is the basic difference between coherent and non-coherent BPSK?

Ans In coherent detection the local carrier generated at the receiver is phase locked with the carrier at the transmitter. Hence it is also called synchronous detection. In non-coherent detection the local carrier generated at the receiver is may not be phase.

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