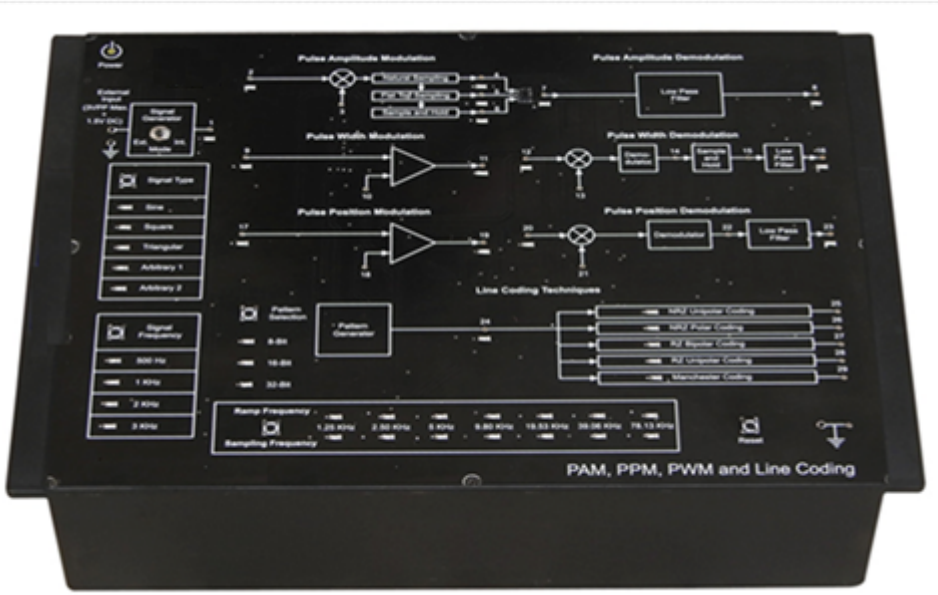
PAM, PPM, PWM and Line Coding Techniques

KS/COMM/PAM-PPM-PWM-LC

VLSI based
Detailed Study & analysis of respective topic.
Transmitter and Receiver on same board.
Variable sampling rates.
Clock generation from 20MHz crystal Oscillator.
On-board DDS signal generators for five different signals.
Selectable Ramp frequency (by push button or control circuit) On board 2nd order Butterworth low pass filter with cut-off frequency of 5kHz for respective technique.
It shall have internal signal generator with Direct Digital Synthesizer with Sine, Square, Triangle, Arbitrary signals having frequency 500Hz, 1KHz, 2KHz 3KHz, Shall have external signal generator with Sine, Square, Triangle, Arbitrary signals having frequency range 500Hz to 3.5KHz and input voltage of 3Vpp (Max.) +1.5V DC offset
it shall have the sampling frequency range from 1.25KHz. 2.50KHz, 5KHz. 9.80KHz. 19.53KHz. 39.06KHz. 78.13KHz
Selection Mode Push switches, Random Data: 8 Bit/ 16 Bit/ 32 Bit (For line Coding), Data Frequency 500Hz, 1KHz, 2KHz, 3KHz.
Test Points 25 nos, Low Pass Filter Cut-off frequency-5KHz, power supply: 110V- 250V AC 65Hz



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Kalpana Scientific

PCM, DPCM, CVSD Modulator and Demodulator

VLSI based **KS/COMM/PCM-DPCM-CVSD**

Detailed Study & analysis of respective topic.

Modulation Technique: Pulse Code Modulation and Demodulation. Differential Pulse Code Modulation and Demodulation Continuously Variable Slope Delta Modulation and Demodulation

Transmitter and Receiver on same board.

Variable sampling rates with respective line speed.

Clock generation from 8MHz crystal Oscillator.

On-board DDS signal generators for five different signals.

On board 2nd order Butterworth low pass filter with cut-off frequency of 5kHz.

On board Channel effect for Channel analysis

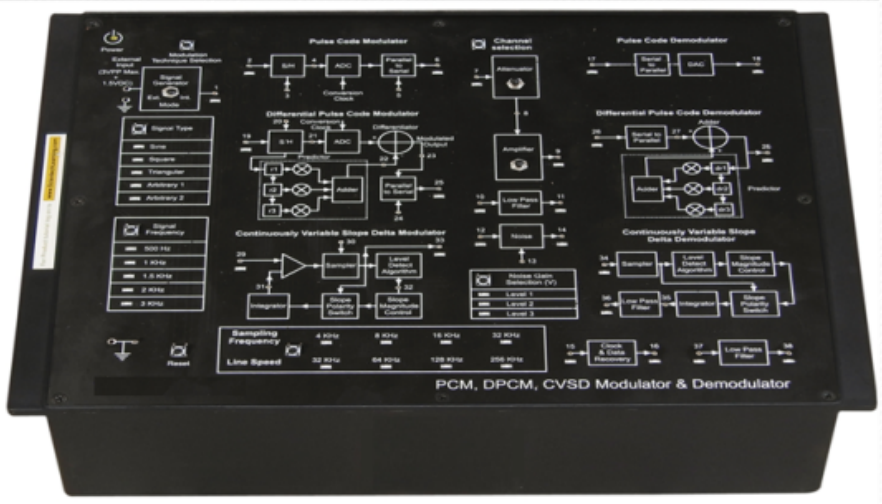
•Crystal Frequency:8MHz

•Signal Generator. Sine, Square, Triangle, arbitrary signal etc.

•Test Points: 35

•Channel Effect: Channel as a low-pass; Channel as a attenuator; Channel as a noise

•Power Supply: 110-220 V, ±10%, 50 Hz



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Kalpana Scientific

Delta, Adaptive Delta, Sigma Delta Modulator & Demodulator

KS/COMM/DEL-ADEL-SIGDEL

VLSI based
Detailed Study & analysis of respective topic.
Modulation Technique: Delta Modulation and Demodulation, Adaptive Delta Modulation and Demodulation, Sigma Delta First Order Modulation and Demodulation, Sigma Delta Second Order Modulation and Demodulation
Transmitter and Receiver on same board.
Variable sampling rates.
Clock generation from 8MHz crystal Oscillator.
On-board DDS signal generators for five different signal.
Selectable integrator gain setting (by switch or control circuit)
On board 2nd order Butterworth low pass filter with cut-off frequency of 5KHz.
On board Channel effect .
•Signal Generator: Sine, Square, Triangle & arbitrary signal
•Noise Gain: Variable
•Integrator (step size): 1&3
•Test Points: 45
•Channel Effects: Channel as a low-pass-filter, Channel as a attenuator; Channel as a noise

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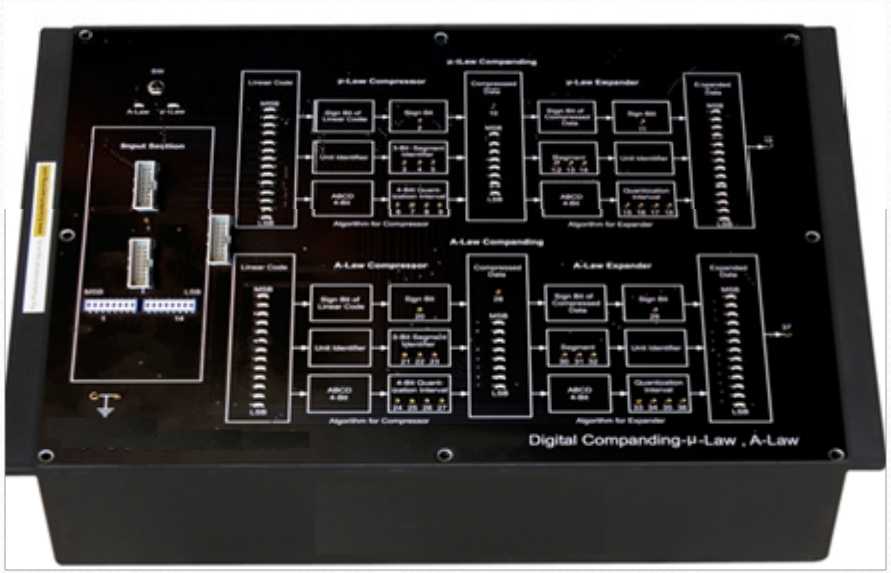
Kalpana Scientific

Digital Companding A-Law and µ-Law

KS/COMM/DIGCOMA&µLAW

VLSI based
Detailed Study & analysis of respective topic.
Modulation Technique: A-Law Compression and Decompression.; u-Law Compression and Decompression.
Transmitter and Receiver on same board.
Clock generation from 8MHz crystal Oscillator.
On-board DDS signal generators.
•Signal Generator: Manual selection through dip switch.
•Power Supply: 110-220 V, ±10%, 50 Hz



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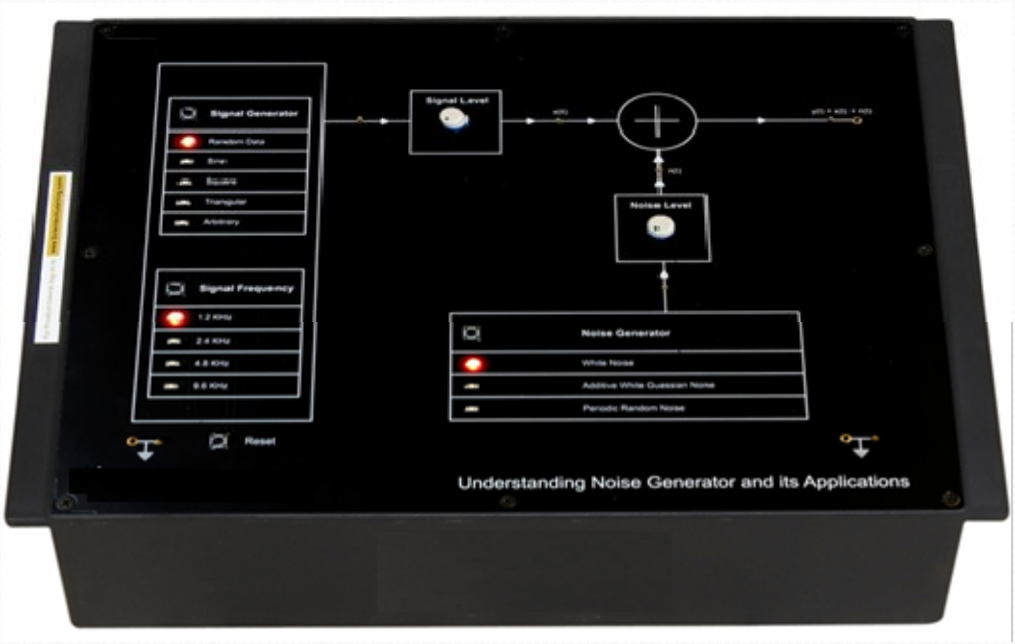
Kalpana Scientific

Understanding Noise Generator and its applications

KS/COMM/NOISEGEN

Study of different types of Noise and their frequency spectrum
Additive White Gaussian Noise
Pseudo Random Noise
Practical implementation of mathematical equation : y(t) = x(t) + n(t)
Study and analysis of eye pattern with and without Noise.



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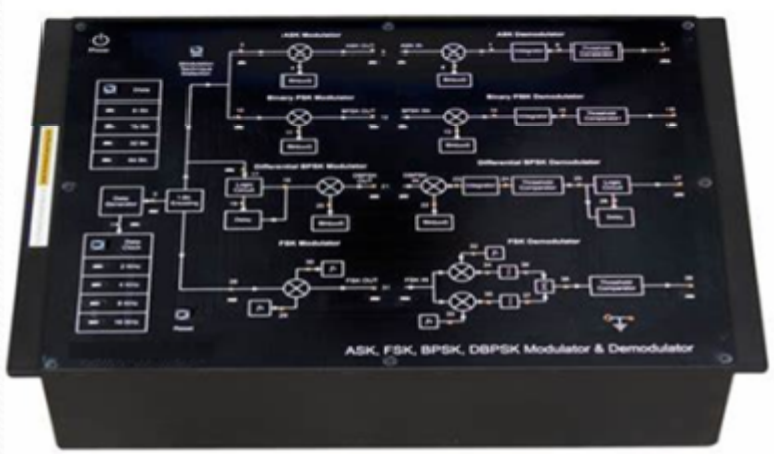
Kalpana Scientific

ASK, FSK, BPSK, DBPSK Modulator & Demodulator

KS/COMM/ASK-FSK-BPSK-DBPSK

Modulator and Demodulator on same board
On-board Data Generator with various Data patterns.
Selectable Data frequencies and data Patterns.
DDS technology based carrier generator
SMD LED indicators Can be issued just like a book for hands-on learning's
Instruments shall support ASK, FSK, BPSK, DBPSK modulation techniques
Shall have Internal Data Generator with 8-Bit, 16-Bit, 32-Bit, 64-Bit, Frequency 2KHz. 4KHz, 8KHz, 16KHz, Direct Digital Synthesized Internal, Sine Wave Carrier Signal 20 nos. SMD LED Indicators for Digital Data Selection, Data frequency selection, Technique selection, 30 more test points, 8MHz Crystal Frequency, Push switches for Selection Mode, 110V-260V AC, 50Hz Power Supply



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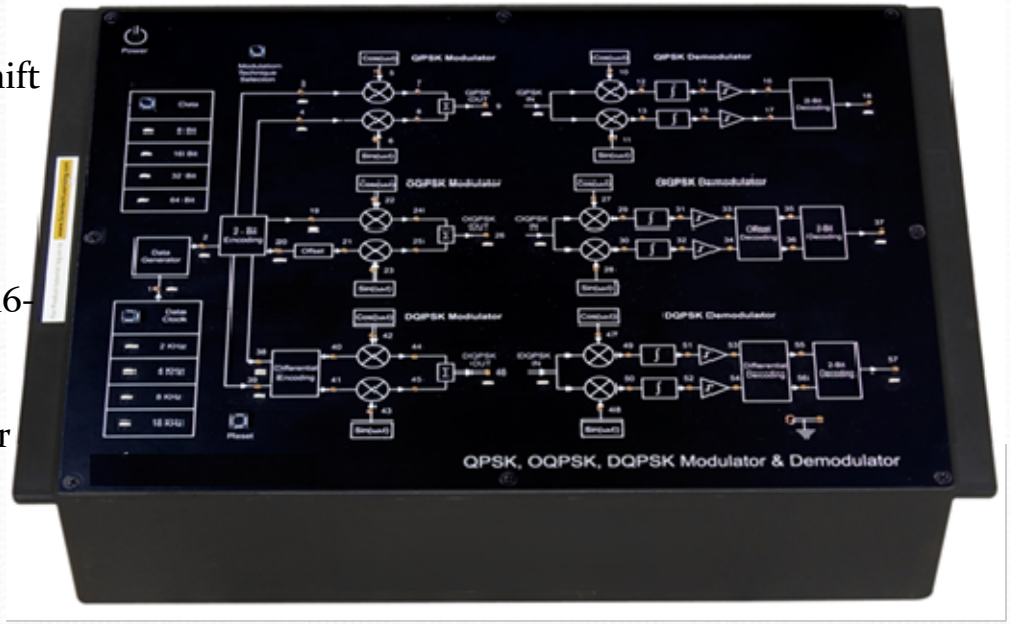
Kalpana Scientific

QPSK, OQPSK, DQPSK Modulator & Demodulator

KS/COMM/QPSK-OQPSK-DQPSK

Detail study & analysis of respective topic.
Modulator and Demodulator on same board.
On-board four Variable line speed rates and single bit data pattern.
On board DDS technology based carrier generator.
SMD LED indicators.
Can be issued just like a book for hands-on learning's
Instruments shall support QPSK (Quadrature Phase Shift Keying), Frequency Shift Keying (FSK), oQPSK (Offset Quadrature Phase Shift Keying), DQPSK (Differential Quadrature Phase Shift Keying)Modulation & Demodulation techniques.
It shall have Internal Digital Data Generator for B-Bit, 16-Bit, 32-Bit 64-Bit data, 2KHz, 4KHz. 8KHz, 16KHz frequency.
Direct Digital Synthesized internal carrier generator for sine and cosine carrier signal,
20 nos test points for Digital Data Selection,
Data frequency selection.,
Technique selection 50 test points,
8MHz crystal frequency,
Push switches for mode selection,
110V-250V AC, 50Hz power supply



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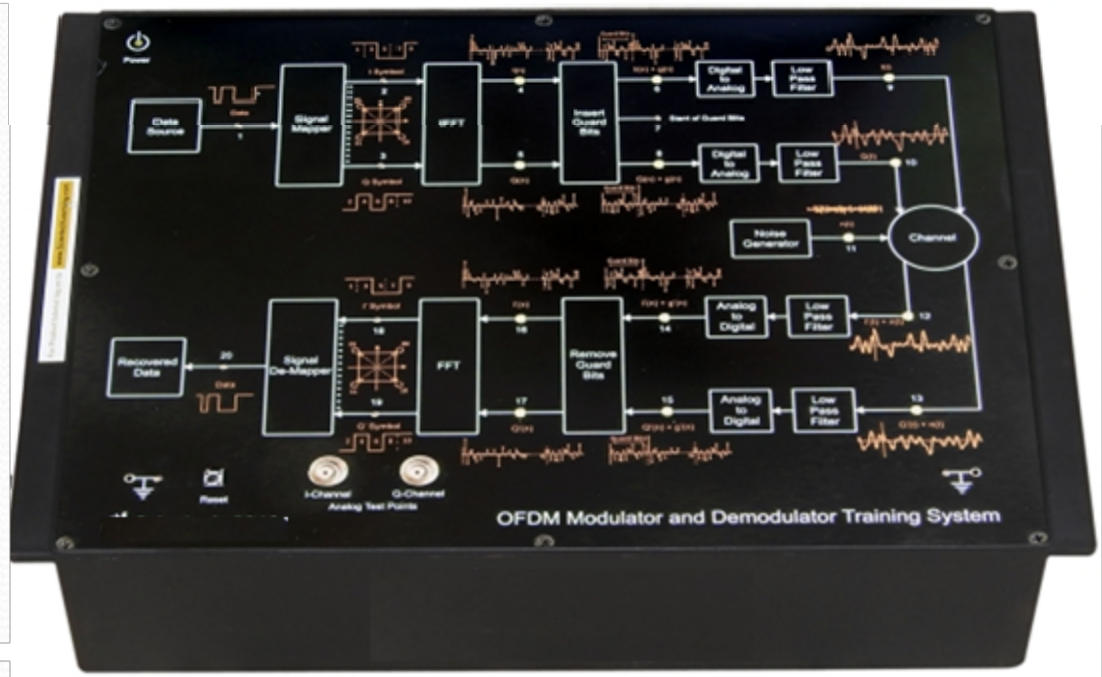
Kalpana Scientific

OFDM Modulator and Demodulator Training System

KS/COMM/OFDM

OFDM Modulator and Demodulator system in a handy TechBook.
User friendly real-time interactive control and acquisition software for detail study of OFDM.
Software control built-in data pattern generator 64 point IFFT & FFT with Baseband QPSK modulation & Demoudulation Techniques.
Built-in Mixed signal oscilloscope to analyze in time domain at various stages of OFDM.
Built-in noise generator for analysis of noise gain effect on the signal.
On-board BNC connector for OFDM baseband I-Q signal analysis on external DSO.
LED indications on TechBook.
Interface USB

OFDM Modulator and Demodulator Experimentation with and without noise gain Signal Analysis at various stages like, Transmit data & Received data, IFFT & FFT, Symbol mapper & de-mapper per channel, and Cyclic prefix & its removal.



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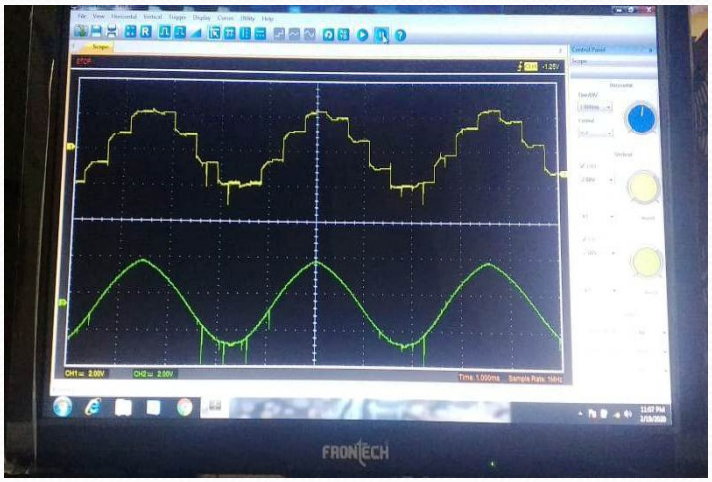
Kalpana Scientific

Sampling & Reconstruction

KS/COMM/SAM&RECONS

Crystal controlled pulse generator
Demonstrates sampling and reconstructed as per Nyquist criterion.
On-board synchronized analog signal generator.
Six, switch selectable sampling frequencies.
Sampling pulse duty-cycle selectable.
Internal/ External sampling signal selectable
Separate sample and sample/hold outputs available



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Kalpana Scientific

Understanding CDMA-DSSS Communication System with BER Measurement

KS/COMM/CDMA-DSSS

Separate CDMA-DSSS(Direct Sequence Spread-Spectrum).
Modulator and Demodulator Customized realtime software.
Analysis in Digital time, Analog time, and Frequency domain.
More than 25 nos. of test point.
On-board BNC connector for Analog I-Q signal analysis.
Software based variable Chip rate up to maximum 10Mchip/s.
User selectable different types of Gold code
User selectable different types of Maximum Length Sequences
User selectable different types of Barker code
User can design his own Gold / MLS code. I-Q Spreaded Signals QPSK Constellation RF Spectrum of Spread Spectrum with Filter QPSK Constellation with Doppler
Time and Frequency domain analysis and measurement of baseband BPSK, QPSK and OQPSK Modulation with output spectral shaping I-Q filter.
Measurement of BER with internal data which is being transmitted
Measurement of BER with different SNR

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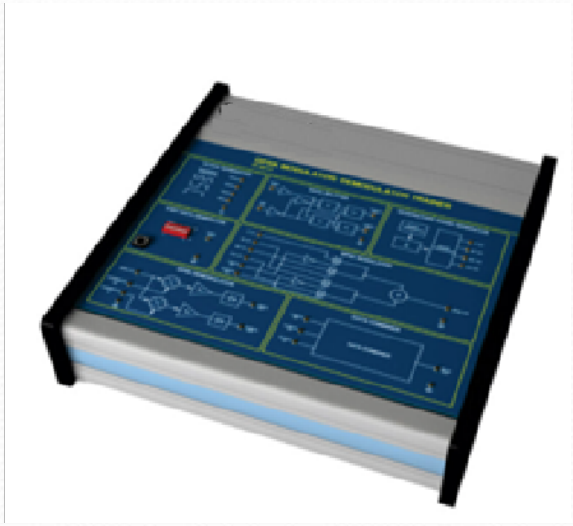
Kalpana Scientific

16 QAM (Quadrature Amplitude Modulation) Training System

KS/COMM/QAM

On board generator, complete study & analysis of Modulator-Demodulator.
VLSI Based.
Encoding: 4bits encoding with Symbol Mapper.
Modulation: 16-QAM Modulation with I&Q Channel.
Constellation(Vector /XY) View.
User Selectable Hardware/Real-Time Software Mode.
User selectable Step variable clock frequency.
User Selectable 8 / 16 / 32 / 64 bit Data
More than 25 Test Points, Exhaustive learning material
On board Digitally Synthesized Sine and Cosine wave Generator with Variable Step Frequencies
On board Clock Generator with Step Variable Frequencies (150Hz, 300Hz, 600Hz, 1.2 KHz, 2.4 KHz, 4.8 KHz and 9.6 KHz and 19.2 KHz).
On board Data generator with Step Variable data length (8, 16, 32, 64bits)
Numerical Control Oscillator (on board NCO for demodulator)
Decoding Techniques (4 bits decoding with Symbol Demapper, Binary to Gray Decoder)
Power Supply : 110-220 V ±10%, 50 / 60 Hz



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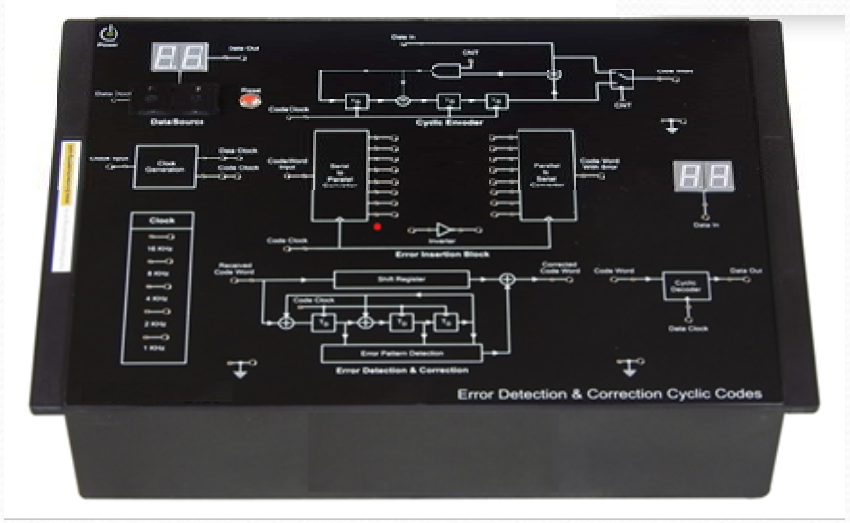
Kalpana Scientific

Error Detection and Correction-Cyclic Code

KS/COMM/EDCCC

On-board Data and Code clock generation.
On-board data generator,
BCD rotary switches for Data Selection.
LED Numeric display
Multiple data rate and code rate selection.
Seven bit code for four bit running or Static data
Crystal Frequency :4.096 MHz
Data Rates: 16 KHz, 8 KHz, 4 KHz, 2 KHz and 1 KHz
Code Rates: 32 KHz, 16 KHz, 8 KHz, 4 KHz and 2 KHz
Word Length : 4 bits
Code Length : 7 bits code and 1 stuffed bit
Data Format : NRZ (Not Return to Zero)
Test Points: 45 nos.
Interconnections : 2 mm Sockets
Internal Operating Voltage : + 5V DC



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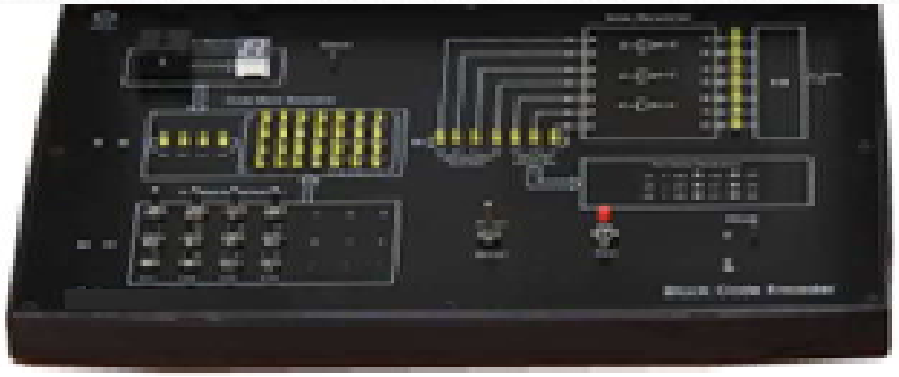
Kalpana Scientific

Understanding Block Code Encoder

KS/COMM/BCE

On-board clock generation for Data and Code.
On-board data generator.
On board error generator block
BCD rotary switches for Data Selection.
LED Numeric display.
Single bit error detection and correction.
Default and manual H-matrix selection
Exhaustive learning material
Crystal Frequency : 11.059 MHz
Word Length: 4 bits
Codeword Length: 7 bits code
Data Format: NRZ (Not Return to Zero)
Interconnections : 2 mm sockets
Test points: 5 nos
Power Supply :: 110-220 V ±10%, 50/60 Hz



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Kalpana Scientific

Understanding Block Code Decoder

KS/COMM/BCDC

On-board clock generation for Data and Code.
On-board data generator.
On board error generator block
BCD rotary switches for Data Selection.
LED Numeric display.
Single bit error detection and correction.
Default and manual H-matrix selection
Exhaustive learning material
Crystal Frequency : 11.059 MHz
Word Length: 4 bits
Codeword Length: 7 bits code
Data Format: NRZ (Not Return to Zero)
Interconnections : 2 mm sockets
Test points: 5 nos
Power Supply :: 110-220 V ±10%, 50/60 Hz

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Kalpana Scientific

Multiplexer / De multiplexer - Coder / Decoder

KS/COMM/MUXDEMUX

On board sine wave & digital signal generator
16-channel time division multiplexing and demultiplexing for digital signal
4- channel time division multiplexing /demultiplexing for analog signal
Crystal Frequency :4.096 MHz
Analog Input Channels : 4 nos
Digital Input Channels : 16 nos
On Board Analog Signals : 250 Hz, 500 Hz, 1 KHz, 2 KHz (Adjustable Amplitude)
On Board Digital Outputs : 16 Square wave frequencies(1 KHz - 2 MHz) Clock Generator 8 bit data
Modulation : Pulse Position Modulation
Multiplexing : Time Division Multiplexing (4 Channel Analog and 16 Channel Digital)
Coding: Manchester Coding and Decoding
Test Points: 27 nos
Interconnections : 2mm sockets
Power Supply: 230 V, ± 10%, 50 Hz / 60 Hz

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Email id : kalpanascientifickolkata@gmail.com

Kalpana Scientific

Iron Almirah

KS/MIS/ALMIRAH

Size: Width (cm) 81, Depth (cm) 43, Height (cm) 137, Weight (Kg) 36
Tough powder-coated CRCA sheet construction
Four equal compartments
Sleek knock-down design with heavy-duty welded legs

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ISO 9001:2015 CERTIFIED

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Website: www.kalpanascientific.com Call: 7029894454

Technical Compliance sheet of SITC of Analog and Digital Communication Kit

Sl. No	Item Name	Features & Specifications	Make & Model No.	Compliance (Yes/No)
1	PAM, PPM, PWM and Line Coding Techniques. Pulse Amplitude Modulation, Pulse Position Modulation, Pulse Width Modulation	• VLSI based • Detailed Study & analysis of respective topic. • Transmitter and Receiver on same board. • Variable sampling rates. • Clock generation from 20MHz crystal Oscillator. • On-board DDS signal generators for five different signals. • Selectable Ramp frequency (by push button or control circuit) On board 2nd order Butterworth low pass filter with cut-off frequency of 5kHz for respective technique.	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/PAM-PPM-PWM-LC**	YES
2	PCM, DPCM, CVSD Modulator and Demodulator Pulse Code Modulation, Differential Pulse Code Modulation, Contineous Variable Slope Delta	• VLSI based • Detailed Study & analysis of respective topic. Transmitter and Receiver on same board. • Variable sampling rates with respective line speed. • Clock generation from 8MHz crystal Oscillator. • On-board DDS signal generators for five different signals. • On board 2nd order Butterworth low pass filter with cut-off frequency of 5kHz. • On board Channel effect for Channel analysis	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/PCM-DPCM-CVSD**	YES
3	Delta, Adaptive Delta, Sigma Delta Modulator & Demodulator	• VLSI based • Detailed Study & analysis of respective topic. • Transmitter and Receiver on same board. • Variable sampling rates. • Clock generation from 8MHz crystal Oscillator. • On-board DDS signal generators for five different signal. • Selectable integrator gain setting (by switch or control circuit) • On board 2nd order Butterworth low pass filter with cut-off frequency of 5KHz.	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/DEL-ADEL-SIGDEL**	YES

		• On board Channel effect .		
4	Digital Companding A-Law and μ-Law	• VLSI based • Detailed Study & analysis of respective topic. • Transmitter and Receiver on same board. • Clock generation from 8MHz crystal Oscillator. • On-board DDS signal generators.	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/DIGCOMA&μLAW**	YES
5	Understanding Noise Generator and its applications	• Study of different types of Noise and their frequency spectrum • Additive White Gaussian Noise • Pseudo Random Noise • Practical implementation of mathematical equation : y(t) = x(t) + n(t) • Study and analysis of eye pattern with and without Noise.	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/NOISEGEN**	YES
6	ASK, FSK, BPSK, DBPSK Modulator & Demodulator	• Modulator and Demodulator on same board • On-board Data Generator with various Data patterns. • Selectable Data frequencies and data Patterns. • DDS technology based carrier generator • SMD LED indicators Can be issued just like a book for hands-on learning's	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/ASK-FSK-BPSK-DBPSK**	YES
7	QPSK, OQPSK, DQPSK Modulator & Demodulator	• Detail study & analysis of respective topic. • Modulator and Demodulator on same board. • On-board four Variable line speed rates and single bit data pattern. • On board DDS technology based carrier generator. • SMD LED indicators. • Can be issued just like a book for hands-on learning's	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/QPSK-OQPSK-DQPSK**	YES
8	OFDM Modulator and Demodulator Training System	• OFDM Modulator and Demodulator system in a handy TechBook. • User friendly real-time interactive control and acquisition software for detail study of OFDM. • Software control built-in data pattern generator 64 point IFFT & FFT with Baseband QPSK modulation & Demoudulation Techniques. • Built-in Mixed signal oscilloscope to analyze	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/OFDM**	YES

		in time domain at various stages of OFDM. • Built-in noise generator for analysis of noise gain effect on the signal. • On-board BNC connector for OFDM baseband I-Q signal analysis on external DSO. • LED indications on TechBook. • Interface USB		
9	Sampling & Reconstruction	• Crystal controlled pulse generator • Demonstrates sampling and reconstructed as per Nyquist criterion. • On-board synchronized analog signal generator. • Six, switch selectable sampling frequencies. • Sampling pulse duty-cycle selectable. • Internal/ External sampling signal selectable • Separate sample and sample/hold outputs available	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/SAM&RECONS**	YES
10	Understanding CDMA-DSSS Communication System with BER Measurement	• Separate CDMA-DSSS(Direct Sequence Spread-Spectrum). • Modulator and Demodulator Customized realtime software. • Analysis in Digital time, Analog time, and Frequency domain. • More than 25 nos. of test point. • On-board BNC connector for Analog I-Q signal analysis. • Software based variable Chip rate up to maximum 10Mchip/s. • User selectable different types of Gold code	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/CDMA-DSSS**	YES
11	16 QAM (Quadrature Amplitude Modulation) Training System	• On board generator, complete study & analysis of Modulator-Demodulator. • VLSI Based. • Encoding: 4bits encoding with Symbol Mapper. • Modulation: 16-QAM Modulation with I&Q Channel. • Constellation(Vector /XY) View. • User Selectable Hardware/Real-Time Software Mode. • User selectable Step variable clock frequency. • User Selectable 8 / 16 / 32 / 64 bit Data • More than 25 Test Points, Exhaustive learning material	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/QAM**	YES

12	Error Detection and Correction-Cyclic Code	• On-board Data and Code clock generation. • On-board data generator, • BCD rotary switches for Data Selection. • LED Numeric display • Multiple data rate and code rate selection. • Seven bit code for four bit running or Static data	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/EDCCC**	YES
13	Understanding Block Code Encoder	• On-board clock generation for Data and Code. • On-board data generator. • On board error generator block • BCD rotary switches for Data Selection. • LED Numeric display. • Single bit error detection and correction. • Default and manual H-matrix selection • Exhaustive learning material	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/BCE**	YES
14	Understanding Block Code Decoder	• On-board clock generation for Data and Code. • On-board data generator. • On board error generator block • BCD rotary switches for Data Selection. • LED Numeric display. • Single bit error detection and correction. • Default and manual H-matrix selection • Exhaustive learning material	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/BCDC**	YES
15	Multiplexer / De multiplexer - Coder / Decoder	• On board sine wave & digital signal generator16-channel time division multiplexing and demultiplexing for digital signal , 4- channel time division multiplexing /demultiplexing for analog signal	Make : KALPANA SCIENTIFIC Model No.: **KS/COMM/MUXDEMUX**	YES
16	Iron Almirah	• Size: Width (cm) 81, Depth (cm) 43, Height (cm) 137, Weight (Kg) 36 • Tough powder-coated CRCA sheet construction • Four equal compartments • Sleek knock-down design with heavy-duty welded legs	Make : KALPANA SCIENTIFIC Model No.: **KS/MIS/ALMIRAH**	YES

Installation & demonstration shall be provided.

Warranty: as per bid document.

KALPANA SCIENTIFIC DATE

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ISO 9001:2015

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LIST OF SERVICE CENTRE

SL NO	LOCATION	ADDRESS
1	KOLKATA	A-33/2 BIDISHA HOUSING KONNAGAR , HOOGLY , WEST BENGAL-712235 MOB:7029894454
2	PUNE	A-104, NATURES BLESSINGS, GORHE BK, PUNE-411025 MOB:7679774297
4	AMBALA	BENGALI MOHALLA NEAR POST OFFICE AMBALA CANTT, HARYANA-133001

Name of application specialist /Service Engineer who have the technical competency to handle and Support the quoted product during the warranty period.

Name of the organization	Name of Contact Person	Contact No.
KALPANA SCIENTIFIC	DR. S.NEOGI, M.SC, M.TECH, Ph.D	7679774297
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Now we have three service centre in INDIA. During the warranty period, I/we shall provide free ,after sale service, and the replacement of any part(s) of the Equipment /Item or rectification of defects of work of the Equipment /Item will be free of cost. The replacement of the parts shall be arranged by us, at our own cost and responsibility during warranty period.

For KALPANASCIENTIFIC

KALPANA SCIENTIFIC DATE Rima Chowdhury

RUMACHOWDHURY,
PROPRIETOR
CALL: 7679774297
PLACE: KONNAGAR,
DATE:13.02.2025