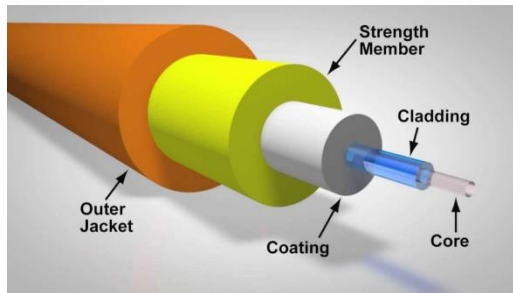## EXPERIMENT NO-01

OBJECT- Study the optical fiber cable.

EXPERIMENT- To identify optical fiber cable and there construction and functions.

THEORY-Optical fiber cable-

(a) Optical fiber is the type of transmission medium, carries data signal in the form of optical energy.
(b) The working of optical fibre is based on total internal reflection (TIR).

CONSTRUCTION - An optical fiber cable has mainly three parts-

(a) The inner conductor made of a solid metallic or solid tough plastic to provide mechanical strength and support to cable.
(b) Optical fiber arranged around the central member, single or in groups. The space in between the fibers can be empty (loosed buffer). It can be filled in fix position (tight buffer).
(c) Protective covering made of PVC or Teflon to prevent from atmospheric condition of temperature, humidity and dust.

FUNCTION OF CABLE-

(a) **Protection-** From temperature, dust, humidity, water, mouse etc.
(b) **Strength-** Mechanical forces like tension, compression, torsion, bending, vibration.
(c) **Stability of fiber characteristics** - The cable provides stability of fiber characteristics i.e. Numerical aperture, dispersion, power loses etc.
(d) **Color code**-Identification of fiber in the cable by color code.

RESULTS- By this experiment we have successfully studied the optical fiber cable.
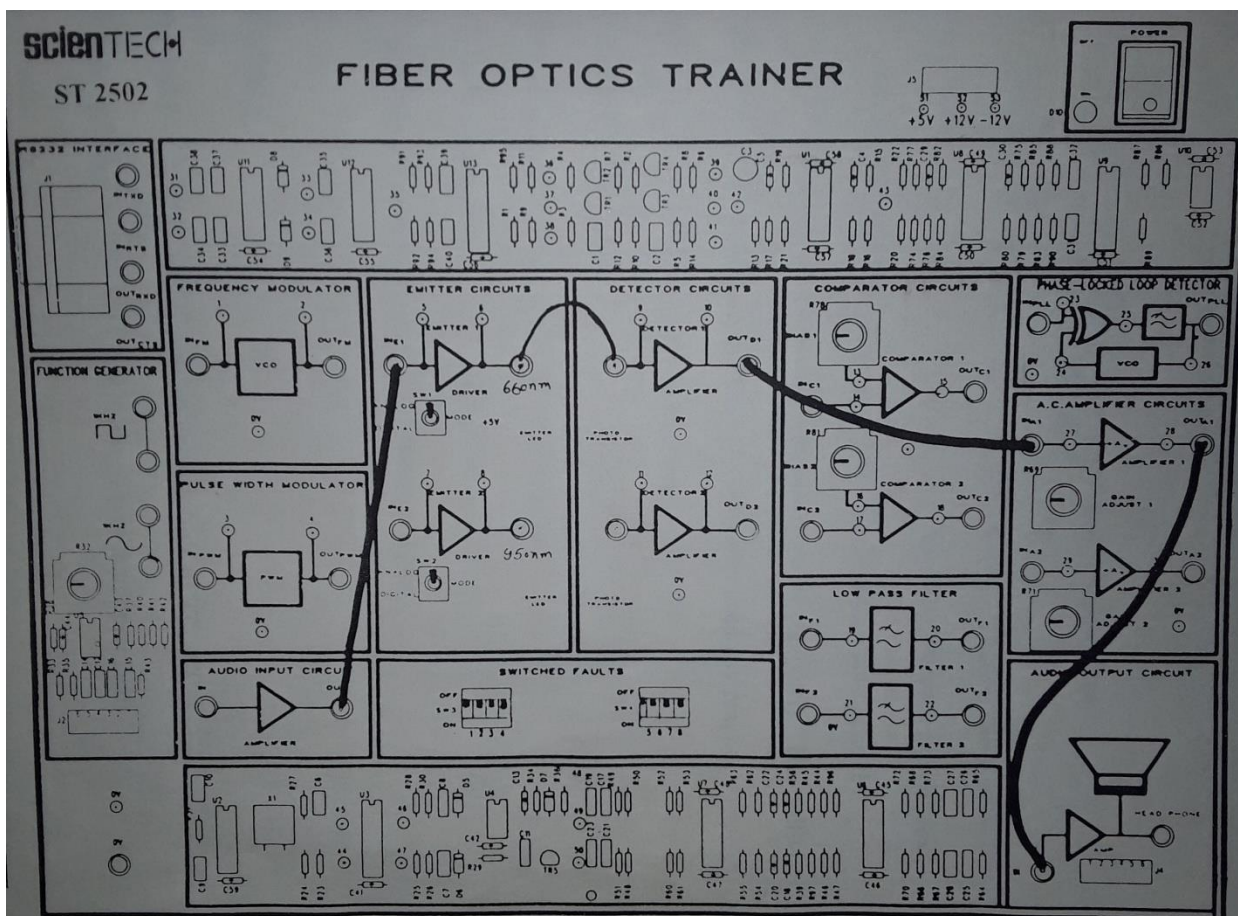
EXPERIMENT NO-02

OBJECT :- Study of intensity modulation techniques using AUDIO input signal.

PROCEDURE :-

1. Make the following connection (as shown in diagram)
    a) Connect microphone to audio input block.
    b) Connect the output of audio input block to emitter 1's input.
    c) A.C Amplifier's output to input of audio output block.
2. Switch ON the power supply.
3. Observe that same audio output is available on the speaker as fed to the microphone.

Circuit diagram :-

RESULTS- By this experiment we have successfully study the Audio transmission through optical fiber cable.

EXPERIMENT NO-02

**OBJECT**: - Study of intensity modulation technique using digital input signal.

THEORY:-

Digital Modulation:

With digital modulation, discrete change in light intensity are obtained (i.e. ON - OFF pulses) figure shows a block schematic of a typical digital optical fiber link.

 The LED drive circuit directly modulates the intensity of the light with encoded digital signal. Hence, a digital optical signal is launched into the optics fiber cable.

The photo transistor is used as a detector.

A comparator at the receiver of the fiber makes the waveform square again called 'cleaning it up'.
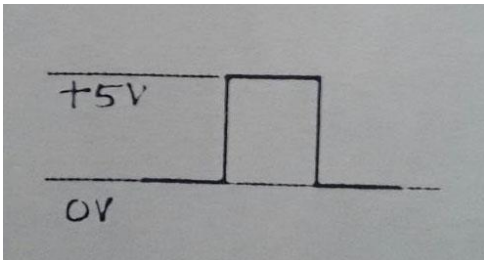

PROCEDURE :

(1) Connect the power supply to the board, Make the following connections (as shown in circuit diagram)

 (2) Connect the 1KHz square wave socket in function generator block to emitter 1 input.

 (3) Connect an optical fibre link between emitter 1 output & Detector 1 input with the help of connector provided.

 (4) Detector output to comparator 1's non inverting (+ve) input.

(5) Switch the mode switch in emitter block to **Digital mode**. This ensure that signal applied to the driver's input cause the emitter LED to switch quickly between ON & OFF states.

(6) Examine the input to emitter 1 on an oscilloscope. This 1KHz square wave is now being used to amplitude modulate emitter LED.

(7) Monitor both input to comparator 1 , and slowly adjust the comparator bias 1 preset untill the D.C. level on the negative input lies midway between the high & low level of the signal on the positive input . This d.c. level is comparator's threshold level.

(8) Examine the output of comparator 1. Note that the original digital modulating signal has been reconstructed at the receiver.

Circuit diagram :-
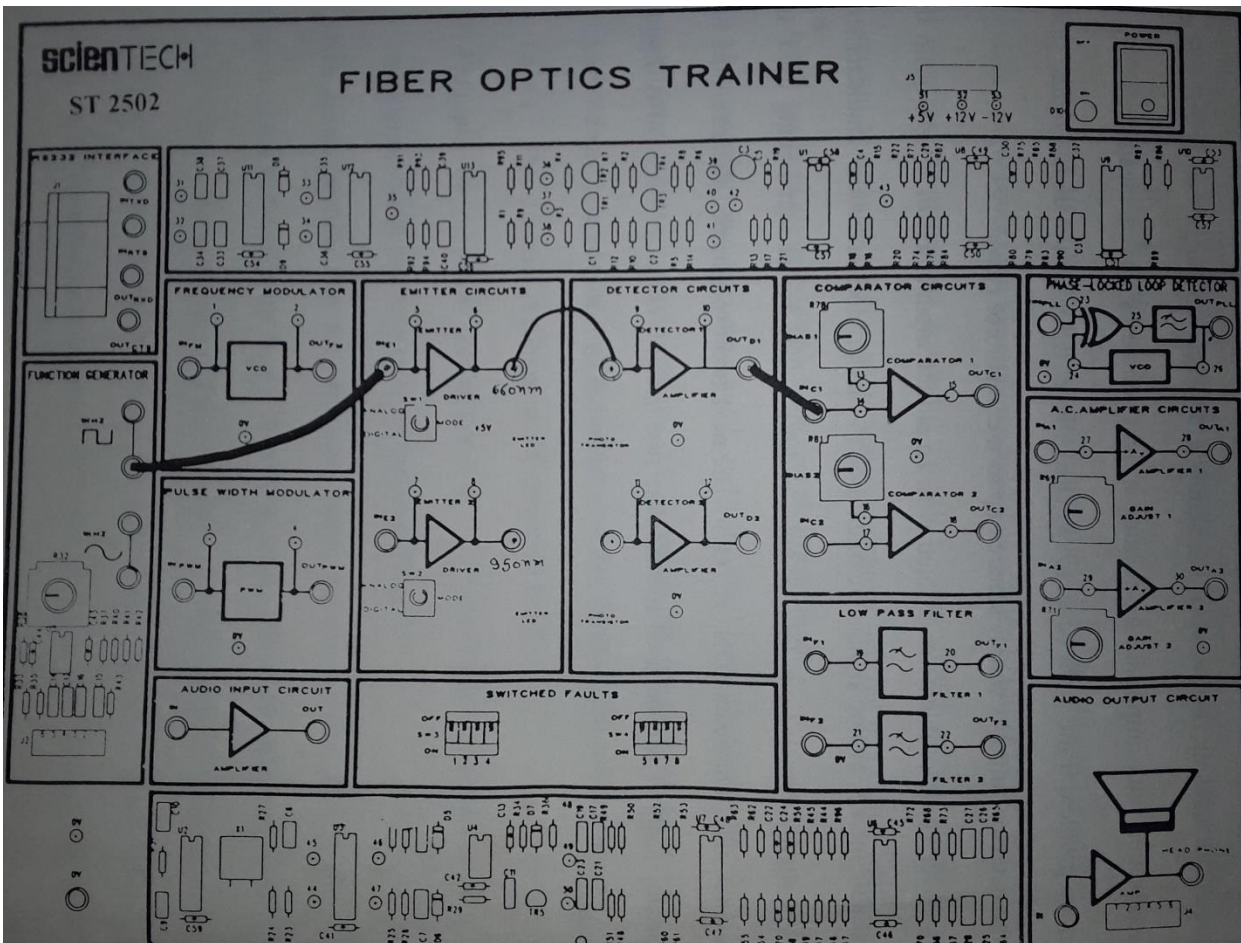
RESULTS- By this experiment we have successfully Digital Transmission study the optical fiber cable.

EXPERIMENT NO-04

Object :- To study PC to PC text communication using RS232 interface via Fiber Optical Link.

Theory :-There are 2 fiber optic links provided on ST2502 trainer. We shall utilize these two link to send and receive TEXT MESSAGE from one PC to other & vica-versa. That means it is a duplex system of communication using fiber optic link. The software STPL CHAT is provided by Scientech.

Material Required :-

1. Scientech Optical Fiber Trainer ST 2502
2. Personal computer - 2 Nos. with Pentium processor
3. RS 232 cables for connecting PC's to trainer - 2 Nos.
4. CD with STPL chat software

Procedure :-

1) Keep one PC toward left and another PC towards right of ST2502.
2) Install the software STPL CHAT in PC1 & PC2, with the help of the CD supplied.
3) Select COM1 port on each PC to connect the RS232 cables. Keep baud rate of both PC equals, say 57600 bauds.
4) Switch OFF both the PC's.
5) Make the following connections on the ST2502 trainer-
*   Connect Fiber Link on CH1 (emitter to detector).
*   Connect Fiber Link on CH2 (emitter to detector).
*   Connect output of detector1 to comparator1 input.
*   Connect output of detector2 to comparator2 input.
*   Connect 1KHz square wave to input of CH1 (emitter).
*   Keep mode switch of both channels to digital and all switched faults in OFF position.
*   Switch ON the trainer observe input to emitter1 and output of comparator1. **Adjust comparator1** for sq. wave output.
*   Switch 1KHz square wave from the input of CH1 to input of CH2 (emitter) and **adjust comparator2** for square wave output. Switch OFF the trainer.
*   Make connection as shown in diagram and switch ON trainer.
*   Now your ST2502 is ready for connection to PC1 and PC2.
*   Open STPL CHAT window on PC1 and PC2.
*   Type message in SEND WINDOW of PC1 and press SEND button. Message will appear in RECEIVE WINDOW of PC2.

Circuit diagram :-
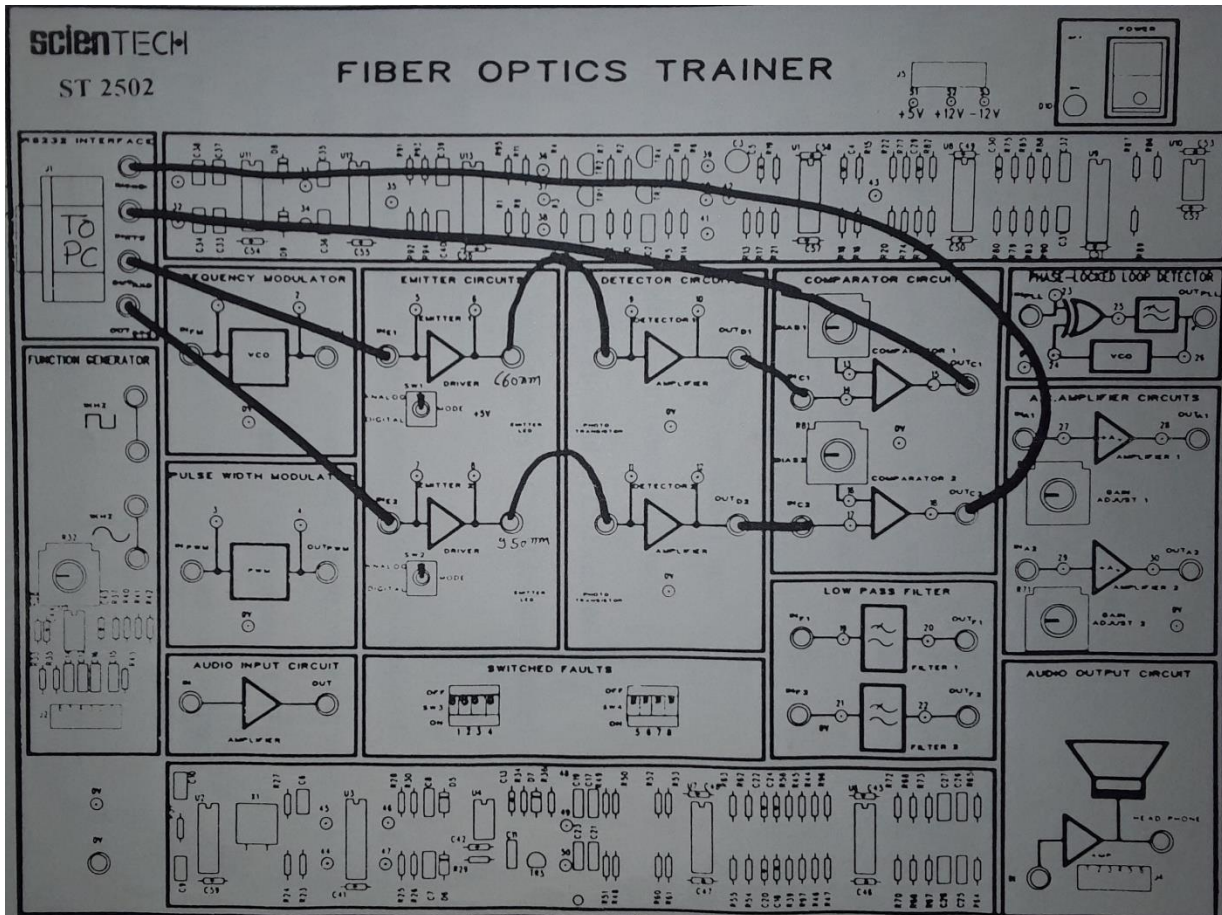
Conclusion: The TEXT MESSAGE is successfully transmitted over the optical fiber from one PC to other PC.

EXPERIMENT NO-05

OBJECT – To study and identify components of GSM Smart Phone Handset.

THEORY- Typically Mobile phone has display (LCD, touch screen), keypad, microphone, speaker, SIM card, battery, USB port, antenna, memory unit(RAM,ROM), camera, CODEC, RF part, DAC/ADC, baseband part (L1/Layer1/physical layer) running on DSP, Application/protocol layers running on CPU, ON/OFF switch and Bluetooth/GPS features. Mobile phone provides connectivity with laptop/other devices using WLAN, Bluetooth and GPS. All these features are based on specific standard specifications designed.

Following figure depicts components in a generic mobile phone irrespective to the technology on which they need to work such as GSM, CDMA, LTE and so on. We will understand Mobile Phone with respect to GSM standard here.
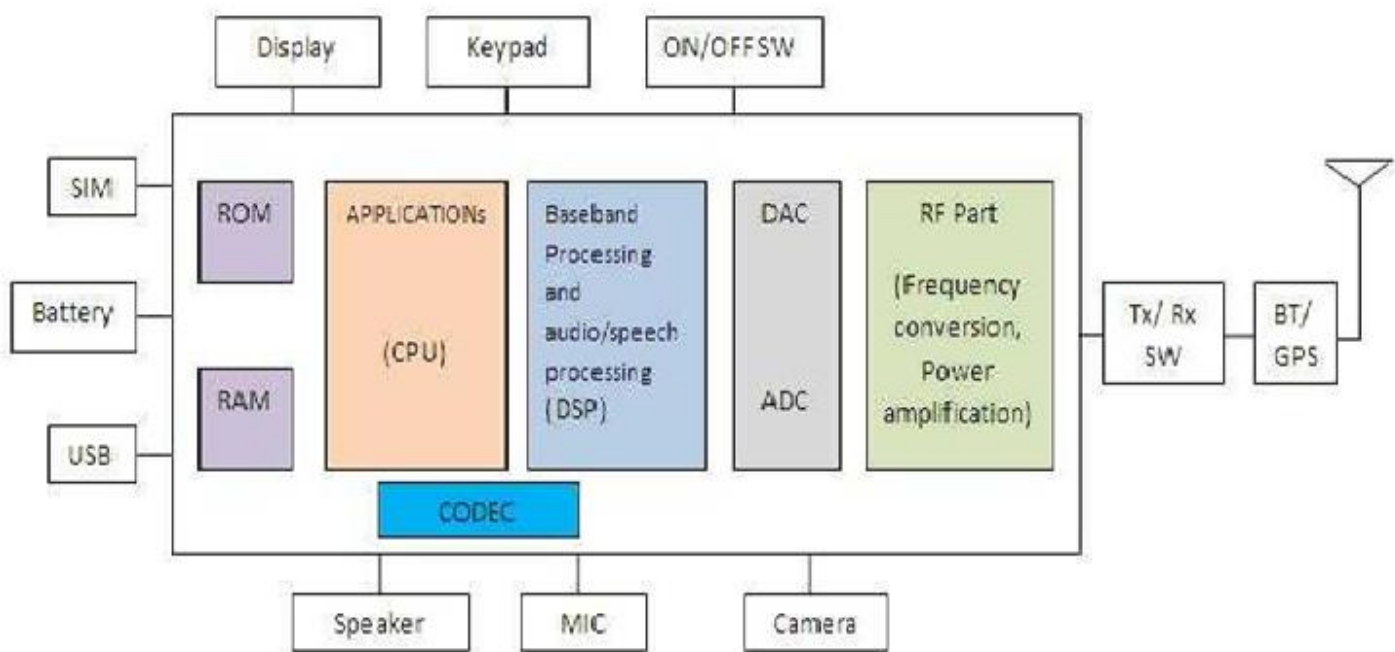
Fig.1 GSM mobile phone block diagram

RF Section

As shown in the figure, every mobile phone will have RF section which consists of RF frequency up-converter and RF frequency down-converter. For GSM system, up converter converts modulated baseband signal (I and Q) to RF frequency (890-915 MHz). RF down converter converts RF signal (935 to 960 MHz) to baseband signal (I and Q). There are two approaches employed in GSM Mobile phone receiver, i.e. heterodyne or homodyne. The basic component used for frequency conversion is RF mixer.

Antenna : Antenna is the metallic object which converts electro-magnetic signal to electric signal and vice versa. Commonly used antennas in the mobile phone are of various types such as **helix type, planar inverted F type, whip or patch type**. Microstrip based patch type of antennas are popular among mobile phones due to its size, easy integration on the PCB and multi frequency band of operation. Todays mobile phones support various GSM bands and also various technologies such as CDMA,LTE,WiMAX and also WLAN,Bluetooth and so on. In these scenario this type of patch antennas do the job.

Transmit/Receive Switch : As there is only one antenna used for both transmit and receive at different times, Tx/Rx Switch is used to connect both Tx path and Rx path with antenna at different times. Tx/Rx Switch is controlled automatically by DSP based on GSM frame structure with respect to the physical slot allocated for that particular GSM mobile phone in both downlink and uplink. For FDD(Frequency Division Duplexing) systems diplexer is used in place of switch which acts as filter to separate uplink and downlink frequency bands.

Baseband Section: This part basically converts voice/data to be carried over GSM air interface to I/Q baseband signal. This is the core part which changes modem to modem for various air interface standards viz.CDMA,Wimax, LTE,HSPA and more. It is often named as physical layer or Layer 1 or L1. It is ported usually on DSP (Digital Signal Processor) to meet latency and power requirements of mobile phone. For Speech/audio, codec is used to compress and decompress the signal to match the data rate to the frame it has to fit in. CODEC converts speech at 8 KHz sampling rate to 13 kbps rate for full rate speech traffic channel.

The baseband or physical layer will add redundant bits to enable error detection as well as error correction. Other than this interleaving is done for the data of one burst which helps in spreading the error over the time hence helps receiver de-interleave and decode the frame(consecutively data burst) correctly.

ADC and DAC: ADC (Analog to Digital Converter) and DAC(Digital to Analog Converter) is used to convert analog speech signal to digital signal and vice versa in the mobile handset. At Transmit path, ADC converted digital signal is given to speech coder

Application layer: It also runs on CPU. various applications run in GSM mobile phone. It include audio, video and image/graphics applications. It supports various audio formats such as mp3, mp4, wav, image formats jpeg are usually available. It supports video formats e.g.MPEG-1 to MPEG-5. Mobile phone supports CIF, QCIF video standard resolutions.

Operating system: Various operating systems are supported in mobile phone such as Symbian,java,android,RT-Linux,Palm. It runs on CPU of different manufacturers. For time critical applications RTOS (real-time operating system) is used.

Battery: It is the only major source of power to keep mobile phone functional. There are various types of batteries made of Nickel Cadmium (NiCd),Nickel Metal Hydride(NiMH), based on lithium,Li-ion and so on. The major factors for designers is to reduce battery size, last for more talk time, increase battery life. Battery comes usually with 3.6 or 3.7 voltage and 600mAh or 960 mAh ratings. Battery Charger is usually provided with mobile phone to charge the mobile phone battery. Battery charger is AC to DC converter.

Microphone: Microphone converts air pressure variations (result of our speech) to electrical signal to couple on the PCB for further processing. Usually in mobile phone mic of types condenser, dynamic, carbon or ribbon is used.

Speaker: It converts electrical signal to audible signal (pressure vibrations) for human being to hear. This is often coupled with audio amplifier to get required amplification of audio signal. It also tied with volume control circuit to change (increase or decrease) the amplitude of the audio signal.

Camera: Now-a-days with almost all the mobile phone camera feature is available for one to click pictures at various occasions.. There are various mega pixel camera for mobile phones are available such as 12 mega pixel, 14 mega pixel and even 41 mega pixel available in smartphones.This has become evident because of advancement in sensor technology.

Display: There are various display devices used in mobile phone such as LCD(liquid crystal display), TFT(Thin-film transistor) screen,OLED(organic light emitting diode),TFD(thin film diode), touch screen of capacitive and resistive type etc.

Keypad: Now-a-days keypad has been removed from the phone design and it has become part of mobile phone software. Keypad pops on the display screen itself which can be operated by user using touch of a finger tip. These has been designed for various applications such as accepting call, rejecting call, cursor movement(left, right, top, down) dialing number, typing name/sms/mms and so on.

USB Interface: It is used to connect the mobile phone with the computer or laptop.

Audio amplifier: An audio amplifier is an electronic amplifier of low power, having bandwidth between 20 to 20000 Hz suitable for driving the loudspeaker in the final stage in audio playback**.**

SIM(subscriber identity module: SIM is an integrated circuit provided by TSP. It stores the International Mobile Subscriber Identity ('IMSI') and the related key used to identity and authenticate subscriber and computers.

SD Card (secured digital card): SD card is a non volatile memory card format developed by the "SD card association"   (SDA) for use in portable devices.SD technology is used by more categories and more than 100 models.

Conclusion: All the parts and sections of Smart Phone are identified successfully.

EXPERIMENT NO-06

Object: To study function of Satellite Receiver

THEORY: The Satellite Receiver consists of the following sections:-

1. Parabolic collector and LNB (Low noise block converter)

2. Tuner section.

3. Video section

4. Sound section.

5. RF modulator section.

6. Signal indicator section.

7. Polarization section.

8. Power supply.

1. DISH ANTENNAE AND LNB SECTION:-

A satellite antenna is a parabolic collector of diameter 1m-1.5m.It collects extremely weak microwave transmission signal from a targeted satellite and reflect the signal to it local point where the feedhorn is placed. The feedhorn collects the signal and send it to LNB.

The function LNB (Low noise block converter) is to amplify the microwave signal received from feedhorn and convert the frequency band from upper band to lower band. The noise temperature of LNB is very low, therefore it has minimal internal noise.

It receives microwave signal of 3.7 to 4.7 GHZ and convert into a signal of frequency 350 to 1460 MHz with minimum noise.

2. TUNER SECTION:-

The down converted signal from LNB is given to tuner of receiver through coaxial no loss cable. The receiver signal is amplified by the RF amplifier and further converted in the mixer amplifier stage to feed the intermediate amplifier with local oscillator frequency. +18 V,+12V,+5V,supply is used in a section.

3. VIDEO AMPLIFER SECTION:-

The base signal is applied to video amplifier consisting of IC LM 3625, the section amplifier video signal and final amplified signal is given to the RF modulator and video out socket. It works on +12V supply.

4.RF MODULATOR:-

The work of RF modulator is to modulate audio and video output of audio and video section with the sound and picture frequency of corresponding of RF channel. RF modulator produce RF output corresponding to VHF signal.

5. SIGNAL INDICATOR SECTION:-

The signal is based on op-amp amplifier ICLM 358 (IC601).The function of this section is to provide visual indicator of tuning of channel. The section is used to indicate the signal strength of received signal to tuned signal.

6. POLARIZATION SECTION:-

Most of the closest satellites relay either horizontally or vertically polarized signal. The function of this section is to select horizontal or vertical polarization. To operate this process, polarizer with should be unfounded on dish antenna. It works on +5V power supply.

7. POWER SUPPLY:-

+12V	300mA
+18V	200mA
+5V	100mA
+24 V	100mA

8. RESULT:-

We have studied the function of each block of satellite receiver.

EXPERIMENT NO-07

OBJECT- Perform Voice and SMS communication on 3G mobile communication Trainer kit Scientech 2138.

THEORY-

Scientech 2138 Trainer kit is a 2G and 3G enabled integrated communication Kit.

PROCEDURE:

1. Switch On power supply.
2. Connect GSM antenna.
3. Push **Reset Modem** button. The LED must Blink.
4. Open 3G Terminal on Display.
5. Check for "Port Open" message.
6. Write ATA commands for Voice and SMS communication:

- ATD9425150978   To make Call
- ATA   To answer Call
- AT+CMGS   Send SMS Message
- AT+CMSS   Send SMS Message from Storage
- AT+CMGL   List SMS Message
- AT+CMGR   Read SMS Message

RESULTS -   Voice and SMS communication on 3G mobile communication was successfully completed on 3G mobile communication Trainer kit

EXPERIMENT NO-08

OBJECT- Get basic information about mobile set using Trainer kit Scientech 2138.

THEORY-

Scientech 2138 Trainer kit is a 2G and 3G enabled integrated communication Kit.

PROCEDURE:

7. Switch On power supply.
8. Connect GSM antenna.
9. Push **Reset Modem** button. The LED must Blink.
10. Open 3G Terminal on Display.
11. Check for "Port Open" message.
12. Write ATA commands to Get basic information about mobile set :

- AT+CGMI   Name of Manufacturer
- AT+CGMM   Model Number
- AT+CGSN   IMEI Number
- AT+CGMR   Software version
- AT+CNUM   MSISDN number
- AT+CIMI   IMSI number
- AT+CPAS   Mobile phone activity status
- AT+CREG   Mobile Network registration status
- AT+CSQ   Radio signal strength
- AT+CBC   Battery charge status

RESULTS - Basic information about mobile set using Trainer kit was successfully completed on 3G mobile communication Trainer kit

Advance Communication Lab manual
Developed by Dr. Jyoti Gupta, I/C HOD IT Deptt., Kalaniketan Polytechnic College, Jabalpur

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EXPERIMENT NO-09

OBJECT- Perform Data connection to Internet using Trainer kit Scientech 2138.

THEORY-

Scientech 2138 Trainer kit is a 2G and 3G enabled integrated communication Kit.

PROCEDURE:

13. Switch On power supply.
14. Connect GSM antenna.
15. Push **Reset Modem** button. The LED must Blink.
16. Open 3G Terminal on Display.
17. Check for "Port Open" message.
18. Internet setting for SIM
- Open "File Explorer"
- Etc
- Ppp
- Peers
- Conf_chat ------ "text"
19. Open "Internet app"
20. IP "internet" ------'bsnlwap"

RESULTS - Data connection to Internet using Trainer kit was successfully completed on 3G mobile communication Trainer kit