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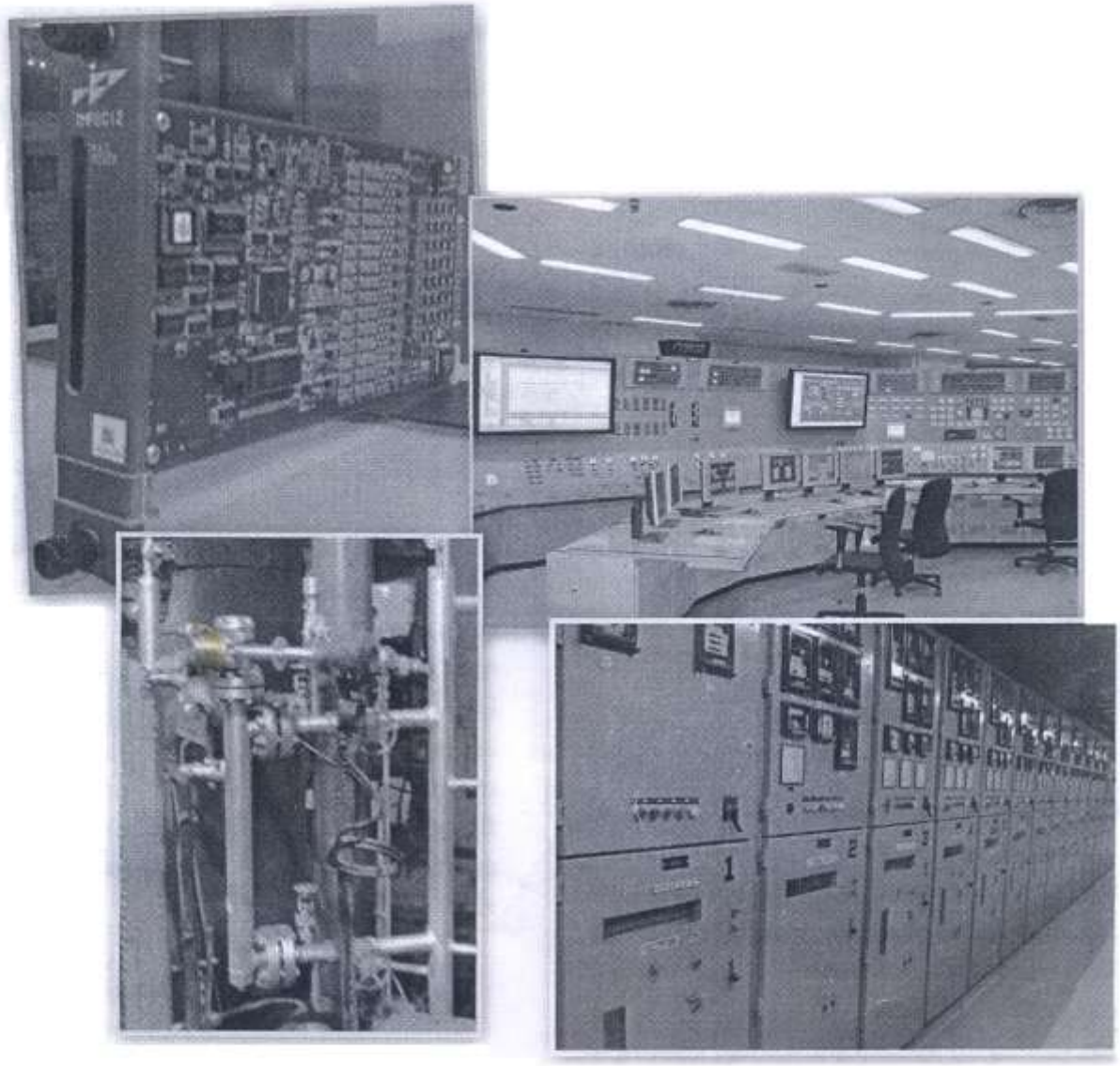

TECH & APPS

TRENDS 'N' INS

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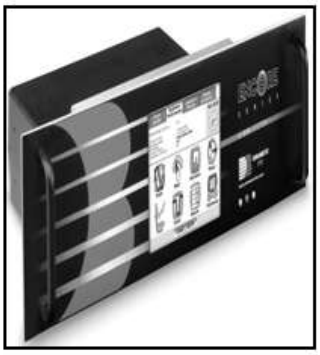

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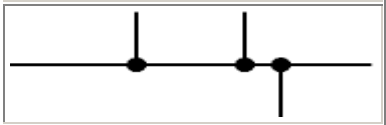
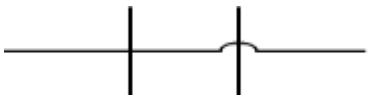
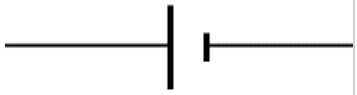
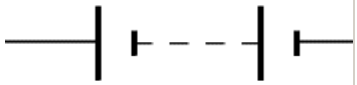
Wires joined	
Wires not joined	
Cell	
Battery	
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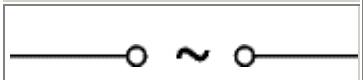
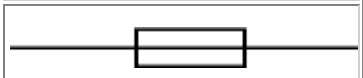
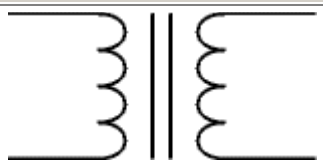
AC supply	
Fuse	
Transformer	
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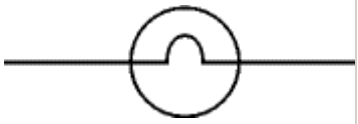
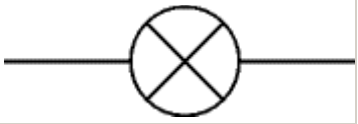
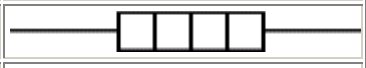
Lamp (lighting)	
Lamp Indicator	
Heater	
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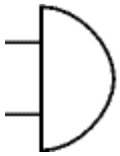
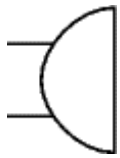
Bell	
Buzzer	
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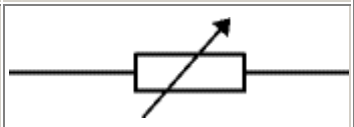
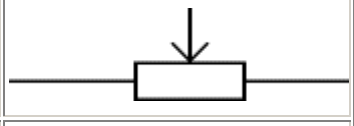
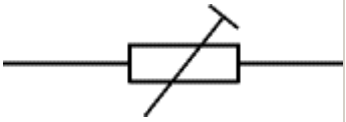
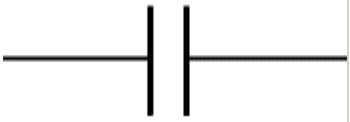
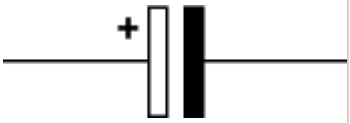
Variable Resistor (Rheostat)	
Variable Resistor (Potentiometer)	
Variable Resistor	
Capacitor	
Capacitor, polarised	
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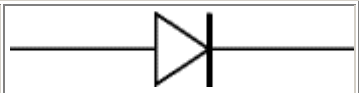
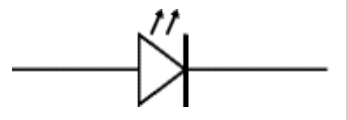
Diode	
LED Light Emitting Diode	
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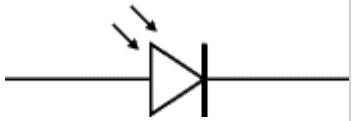
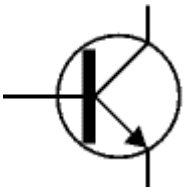
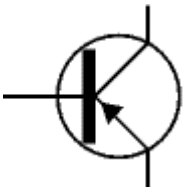
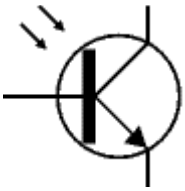
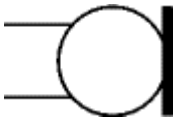
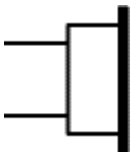
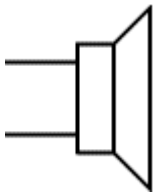
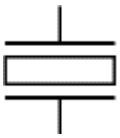
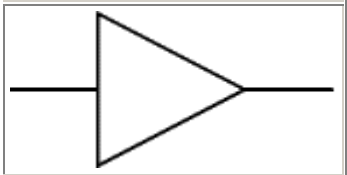
Photodiode	
Transistor NPN	
Transistor PNP	
Phototransistor	
Microphone	
Earphone	
Loudspeaker	
Piezo Transducer	
Amplifier	
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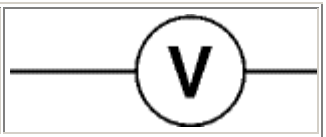
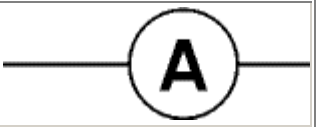
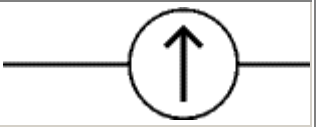
Voltmeter	
Ammeter	
Galvanometer	
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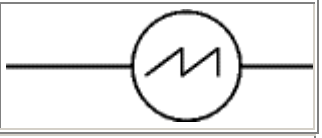
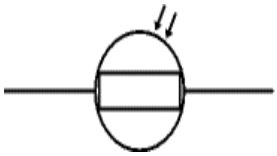
Oscilloscope	
LDR	
Thermistor	

By
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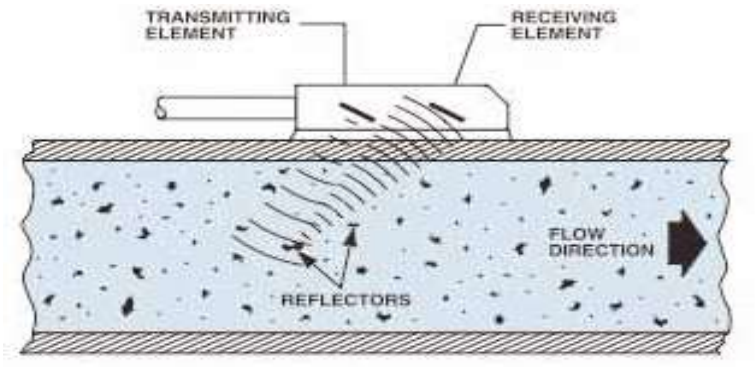
Sounding Out the Flow How Ultrasonic Flowmeters Work

In 1842, Christian Doppler discovered that a stationary observer perceives a sound to have shorter wavelengths as its source approaches, longer wavelengths as its source recedes. The Doppler effect explains why one hears rising pitch in the blowing horn of an approaching car. When the car zooms away, the pitch seems to drop. Ultrasonic Doppler flowmeters put this frequency shift to work in so-called dirty liquids containing acoustical discontinuities—suspended particles, entrained gas bubbles or turbulence vortexes. When transmitted into a pipe that contains flowing liquid with such discontinuities, an ultrasonic pulse or beam reflects from them with a change in frequency that is directly proportional to the liquid's flow rate. Thus, the ultrasonic Doppler flowmeter calculates flow rate from the velocity of the discontinuities, rather than from the velocity of the liquid. It suits liquids such as certain wastewaters, slurries, sludges, crude oils, phosphates and pulp stocks. Although the Doppler flowmeter generally works well with mining slurries, high-density polyethylene (HDPE) pipes may cause inaccuracies because their flexure changes the diameter of the measurement area. If flexure is great enough, it may break the coupling between an exterior-mounted transducer and the pipe's outside surface.

Proper signal reflection typically requires suspended solids or bubbles of 100 microns or larger in a concentration of 100 parts per million or higher. Doppler-shift measurement doesn't work in liquids with particulate concentrations exceeding 45 percent by weight or with high concentrations of very fine bubbles. Discontinuities at these extremes attenuate the reflected signal until it is indistinguishable from pipe background noise. Acoustically absorbent slurries, such as lime and kaolin, may also attenuate the signal below usable strength. A 100 micron/100 parts per million liquid equates to a 1 MHz transducer frequency. For every foot per second of velocity, the reflected signal shifts about 6 Hz from the transmitted signal, making ultrasonic metering impractical for flow velocities significantly less than one-half foot per second. As for the upper limit of detectable flow velocity, it has yet to be established, though it surely surpasses 50 feet per second, since successful installations at that velocity are well documented.

Typically, an ultrasonic Doppler flowmeter consists of a transmitter/indicator/totalizer and a transducer. The user selects a configuration appropriate to the application, taking into account the liquid, the size and concentration of solids or bubbles, the pipe dimensions and the pipe lining. The transmitter's signal threshold usually adjusts to filter out mechanical and electrical noise.



Ultrasonic Doppler Flow Sensor

A high-frequency oscillator in the transmitter drives the transducer, which, in the popular clamp-on design, mounts on the pipe exterior. The transducer generates an ultrasonic signal that passes through the pipe wall into the flowing liquid; the transmitter converts the difference between its output and input frequencies to electronic pulses. Processed, scaled and totalized, the pulses provide a measurement of flow.

Ultrasonic Doppler flowmeters that clamp onto the outside of a pipe operate non-invasively, without moving parts. They cause no pressure drop, risk no damage from the process liquid and entail little maintenance. If properly calibrated, they can have ±1% accuracy, however, the pipe wall and any air space between the wall and the liquid can generate signal interference. Moreover, a stainless steel pipe wall might conduct the transmitted signal to the extent that the reflected signal will seem to undergo a major shift. With concrete-lined, plastic-lined and fibreglass-reinforced pipes, the problem is built-in acoustical discontinuities that can scatter the transmitted signal or seriously attenuate the reflected signal. Many clamp-on meters simply won't operate with lined pipes. Those that will may have an accuracy of ±20% at best.

In-line, or wetted, transducers using Doppler-shift or transit-time (also known as "time of flight") signalling circumvent the limitations that pipe walls and linings impose. An ultrasonic cousin of the Doppler flowmeter, the transit-time flowmeter measures a signal travelling between two transducers, one upstream and one downstream. The difference in elapsed time between the signal going with and against the flow determines liquid velocity, compensating for the liquid's density and temperature, which influence the speed of sound, or sonic velocity, within the liquid. If the sonic velocity causes a great enough shift in the signal's refraction angle, the signal can miss the downstream transducer altogether, a failure known as walk-away.

FDT100 Series In-Line Ultrasonic Flowmeter

Transit-time flowmeters come in single-path and multi-path designs, the former using one transducer pair to measure a small section of fairly uniform flow; the latter using multiple pairs to measure non-uniform flow along a length of large-diameter pipe or conduit of the type commonly found in utility applications. Multi-path designs are used in raw wastewater and storm water applications, and to measure stack gas flows in power plant scrubbers.

The new in-line, single-path FDT100 Series from Omega Engineering has many of the features that make transit-time flowmeters the preferred ultrasonic

the preferred ultrasonic design for use with so-called clean liquids (clean in the sense that they lack acoustical discontinuities).Intended for consumable and industrial water applications, FDT100 models run on batteries, have no moving parts, boast a wide measurement range, require no filtration, come in two flange styles (150-pound ANSI and DIN) and in various sizes, and offer a choice of integral or remote electronics that display flow rate or totalized flow at the push of a button.

There are transit-time flowmeters that can handle very hot (e.g., liquid sulfur and molten metals), very cold (e.g., liquid nitrogen and other cryogenic liquids as cold as -300°C [-508°F]) or low-flow applications. Axial and coaxial transit-time flowmeters, for in-line use with pipes as small as 0.5 inches, offer extra low-flow sensitivity because they can measure flow sections significantly longer than the pipe's diameter.

Transit-time flowmeters also work well with viscous liquids if the Reynolds number at minimum flow is under 4,000 (laminar flow) or over 10,000 (turbulent flow). Serious non-linearity's preclude their use in the transitional flow region. (A Reynolds number expresses the velocity profile of a flowing liquid as a single, dimensionless ratio of inertial and viscous force.) A third ultrasonic flowmeter employs cross-correlation between upstream and downstream transducer pairs to compute flow. Some flowmeters of this design use microprocessors to switch automatically between "clean" and "dirty" modes based on correlation factors.

A single cross-correlation hybrid flowmeter could, for example, monitor flow of either activated or digested sludge. Carefully engineered applications using such flowmeters have had reported installed accuracy within 0.5% of reading. Until recently, clean liquids and Doppler flowmeters were incompatible. A user working with, say, drinking water could have gotten around the problem only by aerating the flow, which adds acoustical discontinuities in the form of bubbles. Still, a Doppler flowmeter would be useless in such an application if the bubbles measured smaller than 30 microns or if their concentration fell below 25 parts per million.

With a new breed of multi-liquid Doppler flowmeter, users can dispense with improvised aeration. Omega's FD-7000, for example, handles emulsions and slurries by mounting on a straight run of pipe and operating like typical Doppler flowmeters. When used with clean liquids, however, it senses ultrasonic waves reflecting off turbulent swirls. A flow analyzer in the transmitter/indicator/totalizer tells a user which of the two metering modes to employ.

In applications containing insufficient particle or bubble reflectors for conventional Doppler measurement, the FD-7000's mating-flow transducers should be mounted on the pipe at a point where non-symmetrical hydraulic turbulence exists, the best position being one to three pipe diameters downstream from a 90° elbow. A digital filtering system and signal recognition circuitry transform the turbulence reflections to linear data. Operating in this mode, the FD-7000 is one of the few flowmeters that do not require a straight upstream pipe run.

FD7000 Series Ultrasonic Flowmeter

By
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BLUETOOTH

Bluetooth is a proprietary open wireless protocol for exchanging data over short distances (using short length radio waves) from fixed and mobile devices, creating personal area networks (PANs). It was originally conceived as a wireless alternative toRS-232 data cables. It can connect several devices, overcoming problems of synchronization

Name and Logo

The word Bluetooth is an anglicised version of Danish Blåtand, the epithet of the tenth-century king Harald I of Denmark and parts of Norway who united dissonant Danish tribes into a single kingdom. The implication is that Bluetooth does the same with communications protocols, uniting them into one universal standard. Although blå in modern Scandinavic languages means blue, during the Viking age it also could mean black. So a historically correct translation of Old Norse Harald Blátönn could rather be Harald Blacktooth than Harald Bluetooth.The Bluetooth logo is a bind rune merging the Germanic runes ᚼ (Hagall) and ᛒ (Berkanan).

Implementation

Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands of 1 MHz width in the range 2402-2480 MHz. This is in the globally unlicensed Industrial, Scientific and Medical (ISM) 2.4 GHz short-range radio frequency band. In its basic rate (BR) mode, the modulation is Gaussian frequency-shift keying (GFSK). It can achieve a gross data ratedata rate of 1 Mbit/s. In extended data rate (EDR) π/4-DQPSK and 8DPSK are used, giving 2, and 3 Mbit/s respectively.Bluetooth is a packet-based protocol with a master-slave structure. One master may communicate with up to 7 slaves in a piconet; all devices share the master's clock. Packet exchange is based on the basic clock, defined by the master, which ticks at 312.5 µs intervals. Two clock ticks make up a slot of 625 µs; two slots make up a slot pair of 1250 µs.

In the simple case of single-slot packets the master transmits in even slots and receives in odd slots; the slave, conversely, receives in even slots and transmits in odd slots. Packets may be 1, 3 or 5 slots long but in all cases the master transmits will begin in even slots and the slave transmits in odd slots.Bluetooth provides a secure way to connect and exchange information between devices such as faxes, mobile phones, telephones, laptops, personal, printers, Global Positioning System (GPS) receivers, digital cameras, and video game consoles.

The Bluetooth specifications are developed and licensed by the Bluetooth Special Interest Group (SIG). The Bluetooth SIG consists of companies in the areas of telecommunication, computing, networking, and consumer electronics. To be marketed as a Bluetooth device, it must be qualified to standards defined by the SIG. Bluetooth is a standard communications protocol primarily designed for low power consumption, with a short range (power-class-dependent: 100m, 10m and 1m, but ranges vary in practice; see table below) based on low-cost transceiver microchips in each device. Because the devices use a radio (broadcast) communications system, they do not have to be in line of sight of each other. In most cases the effective range of

class 2 devices is extended if they connect to a class 1 transceiver, compared to a pure class 2 network. This is accomplished by the higher sensitivity and transmission power of Class 1 devices.

Class	Maximum Permitted Power		Range (approximate)
	mW	dBm	
Class 1	100 mW	20 dBm	~100 metres
Class 2	2.5 mW	4 dBm	~10 metres
Class 3	1 mW	0 dBm	~1 metres

Version	Data Rate
Version 1.2	1 Mbit/s
Version 2.0 + EDR	3 Mbit/s

Bluetooth profiles

In order to use Bluetooth, a device must be compatible with certain Bluetooth profiles. These define the possible applications and uses of the technology.

List of applications

- Wireless control of and communication between a mobile phone and a hands-free headset. This was one of the earliest applications to become popular.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being themouse, keyboard and printer.
- Transfer of files, contact details, calendar appointments, and reminders between devices with OBEX.
- Replacement of traditional wired serial communications in test equipment, GPS receivers, medical equipment, bar code scanners, and traffic control devices.
- For low bandwidth applications where higher USB bandwidth is not required and cable-free connection desired.
- For controls where infrared was traditionally used.
- Sending small advertisements from Bluetooth-enabled advertising hoardings to other, discoverable, Bluetooth devices.
- Three seventh-generation game consoles, Nintendo's Wii and Sony's PlayStation 3 and PSP Go, use Bluetooth for their respective wireless controllers.
- Dial-up internet access on personal computers or PDAs using a data-capable mobile phone as a wireless modem like Novatel mifi.

Health concern

Bluetooth uses the microwave radio frequency spectrum in the 2.402 GHz to 2.480 GHz range. Maximum power output from a Bluetooth radio is 100 mW, 2.5 mW, and 1 mW for Class 1, Class 2, and Class 3 devices respectively, which puts Class 1 at roughly the same level as mobile phones, and the other two classes much lower. Accordingly, Class 2 and Class 3 Bluetooth devices are considered less of a potential hazard than mobile phones, and Class 1 may be comparable to that of mobile phones: the maximum for a Class 1 is 100 mW for Bluetooth but 250 mW for UMTS W-CDMA, 1W for GSM1800/1900 and 2W for GSM850/900 for instance.

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Alessandro Volta

Alessandro Giuseppe Antonio Anastasio Volta

Born	February 18, 1745 Como, Duchy of Milan
Died	March 5, 1827 (age 82) Como, Kingdom of Lombardy–Venetia
Nationality	Italian
Fields	Physics & Chemistry
Known for	Invention of the electric cell Discovery of methane

Count Alessandro Giuseppe Antonio Anastasio Volta (18 February 1745 – 5 March 1827) was an Italian physicist known especially for the development of the first electric cell in 1800.

Early life and works

Volta was born in Como, taught in the public schools there. In 1774 he became a professor of physics at the Royal School in Como. A year later, he improved and popularized the electrophorus, a device that produces a static electric charge. His promotion of it was so extensive that he is often credited with its invention, even though a machine operating in the same principle was described in 1762 by Swedish professor Johan Wilcke.

In 1776-77 Volta studied the chemistry of gases, he discovered methane by collecting the gas from marshes. He devised experiments such as the ignition of methane by an electric spark in a closed vessel. Volta also studied what we now call electrical capacitance, developing separate means to study both electrical potential (V) and charge (Q), and discovering that for a given object they are proportional. This may be called Volta's Law of capacitance, and likely for this work the unit of electrical potential has been named the Volt. In 1779 he became professor of experimental physics at the University of Pavia, a chair he occupied for almost 25 years. In 1794, Volta married Teresa Peregrini, with whom he raised three sons, Giovanni, Flaminio and Zanino

Volta and Galvani

Volta began to study, around 1791, the "animal electricity" noted by Luigi Galvani when two different metals were connected in series with the frog's leg and to one another. Volta realized that the frog's leg served as both a conductor of electricity (we would now call it an electrolyte) and as a detector of electricity. He replaced the frog's leg by brine-soaked paper, and detected the flow of electricity by other means familiar to him from his previous studies. In this way he discovered the electrochemical series, and the law that the electromotive force (emf) of a galvanic cell, consisting of a pair of metal electrodes separated by electrolyte, is the difference between their two electrode potentials. (Thus, two identical electrodes and a common electrolyte give zero net emf.) This may be called Volta's Law of the electrochemical series. In 1800, as the result of a professional disagreement over

the galvanic response advocated by Galvani, he invented the voltaic pile, an early electric battery, which produced a steady electric current.[5] Volta had determined that the most effective pair of dissimilar metals to produce electricity was zinc and silver. Initially he experimented with individual cells in series, each cell being a wine goblet filled with brine into which the two dissimilar electrodes were dipped. The voltaic pile replaced the goblets with cardboard soaked in brine.

First battery

In announcing his discovery of the pile, Volta paid tribute to the influences of William Nicholson, Tiberius Cavallo and Abraham Bennet. An additional invention pioneered by Volta, was the remotely operated pistol. He made use of a Leyden jar to send an electric current from Como to Milan (~50 km or ~30 miles), which in turn, set off the pistol. The current was sent along a wire that was insulated from the ground by wooden boards. This invention was a significant forerunner of the idea of the telegraph which also makes use of a current to communicate. The battery made by Volta is credited as the first electrochemical cell. It consists of two electrodes: one made of zinc, the other of copper. The electrolyte is sulphuric acid or a brine mixture of salt and water. The electrolyte exists in the form $2H^+$ and SO_4^{2-}. The zinc, which is higher than both copper and hydrogen in the electrochemical series, reacts with the negatively charged sulphate. (SO_4^{2-}) The positively-charged hydrogen ions (protons) capture electrons from the copper, forming bubbles of hydrogen gas, H_2 . This makes the zinc rod the negative electrode and the copper rod the positive electrode.We now have two terminals, and the current will flow if we connect them. The reactions in this cell are as follows:

zinc
$Zn \rightarrow Zn^{2+} + 2e^-$
sulphuric acid
$2H^+ + 2e^- \rightarrow H_2$

The copper does not react, functioning as an electrode for the reaction.

However, this cell also has some disadvantages. It is unsafe to handle, as sulphuric acid, even if dilute, is dangerous. Also, the power of the cell diminishes over time because the hydrogen gas is not released, accumulating instead on the surface of the zinc electrode and forming a barrier between the metal and the electrolyte solution. The primitive cell is widely used in schools to demonstrate the laws of electricity and is known as the lemon battery.

By
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ULTRASONIC MOVEMENT DETECTOR

Check all the components against the parts list. It is generally easier to solder in the lowest height components first - the resistors and diodes. Make sure to get the diodes in the correct way. The black circle or band on the diodes must match the bar of the diode symbol on the overlay. There are a lot of resistors. Use the resistor color code printed on the back of the header card to work out each value. The 40 kHz crystal can be inserted either way. Holes have been provided to secure its case to the PCB. Use one of the leads cut from the resistors. You can also quickly solder the wire to the case of the crystal. The ultrasonic transmitter has a T suffix on the number stamped underneath it. The receiver has an R suffix. Each may be soldered either way around on the pads under the PCB. Make sure to get them both pointing straight out at 90□ from the PCB.

CALIBRATION

Battery operation is not recommended for this detector. As the battery potential decreases the sensitivity will change. This is particularly so if the unit is triggered often (as in detecting a door opening.) It is better to use a power supply. Use 9V to 12V DC. You could go to a maximum of 15V but you may have to replace the 78L05 by a 7805. Immediately after you connect the power let the unit stand for at least 20 seconds so whole circuit will settle down electrically. The schematic shows that the setting of the trimpot value is critical to the operation of the detector. We provide a 1M trimpot. Set it to about 400K by eye. We have found that below about 300K the detector is too sensitive and will self-trigger. Trial and error will show the best setting for your particular requirement. Note that this circuit is very sensitive. Even air moving (hot air rising, wind blowing) will trigger it when the trimpot is set near the most sensitive position. That is why we say to set it for your particular need.

CIRCUIT DESCRIPTION

The transmitter sends out a steady ultrasonic tone at 40kHz. At this frequency the wavelength is about 6 mm. Any reflected sound is detected by ultrasonic receiver. The signal is then amplified by IC1:A and IC1:B. IC1:A is self biasing via C2 & R5. The time constant of the first amplifier is set to let the 40kHz signal through. Between the first & second amplifier there is a negative peak detector (diode D1 & R8) which follows the envelope of the 40kHz signal. If there is no movement the envelope is just a straight line. The time constant of IC1: B is much slower so that it will follow this envelope. All the amplifiers are AC coupled to prevent DC bias problems. Then the signal is fed through a window detector IC1: C which detects both positive and negative pulses.

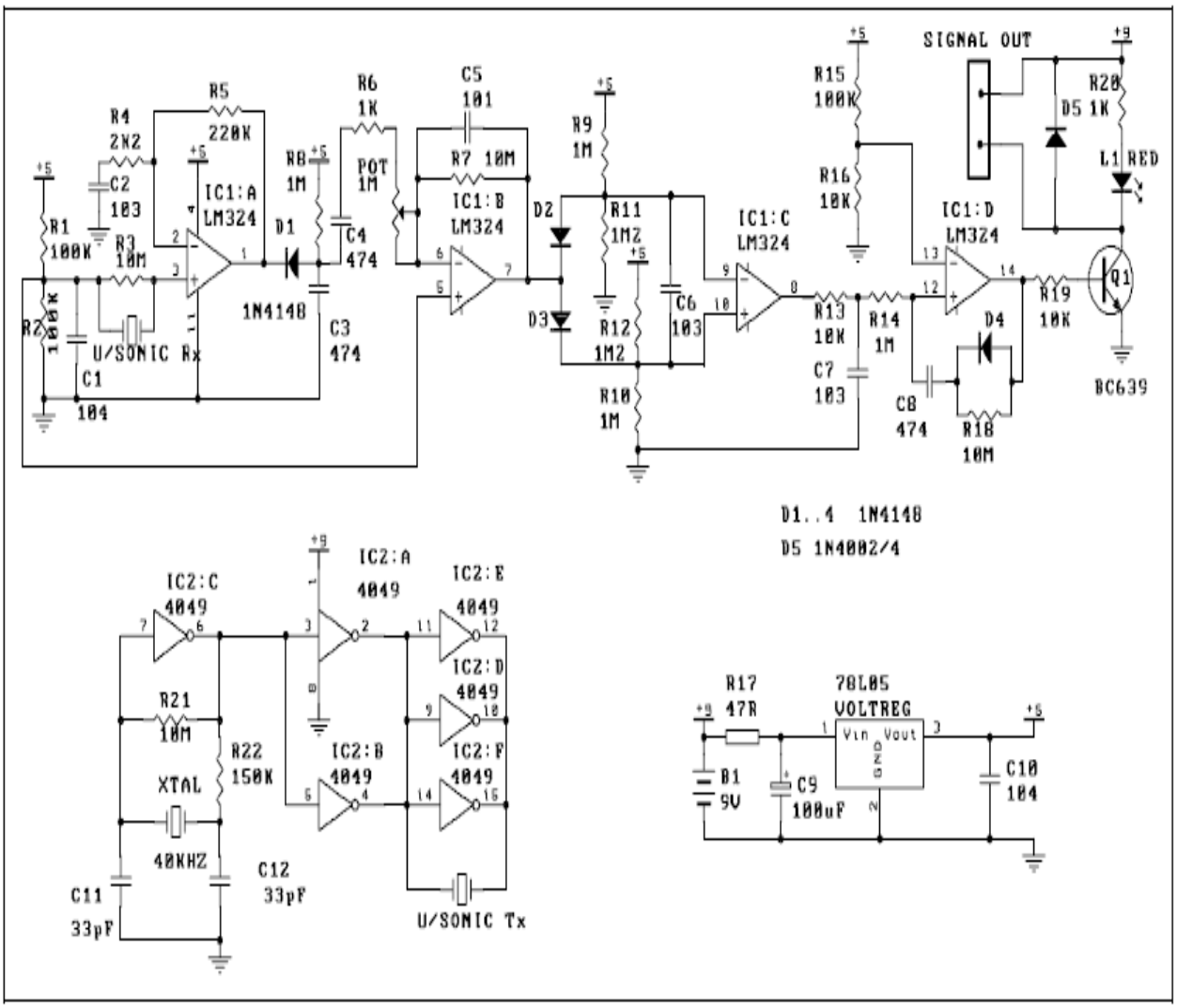
When there is no movement the potential at pin 7 sits at half the supply potential and neither D2 nor D3 can conduct. The potential at pin 8 is low. If the signal rises D3 conducts causing the output to go high. If the signal falls then D2 conducts which also causes the output to go high. Thus the name window detector circuit because it detects potentials which move both below and above a given range. A low pass filter screens out unwanted spurious signals, then an amp IC1:D set up as a monostable flip flop converts any signal that gets through the filter into a substantial pulse to turn on the BC639. This turns on the LED and provides a Signal Out to drive a separate relay or any other device you may wish to signal to. The time constant of the monostable flip-flop is about half a second and is set by C8 & R10. D4 is used to separate the charge & discharge time

constants. It lets the circuit switch on immediately movement is detected but allows about a ½ second delay for the reset.

WHAT TO DO IF IT DOES NOT WORK

Poor soldering is the most likely reason. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Thirdly, follow the track with a voltmeter to check the potential differences at various parts of the circuit. Other items to check; are the IC's in the correct way. Check no IC pins are bent up. Are the diodes, transistors and the electrolytic capacitor in the correct way. Did you mix up the 78L05 with the BC639? Check the values of the resistors.

ULTRASONIC MOVEMENT DETECTOR



By
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Aptitude Questions

1. By selling a pen for Rs. 15, a man loses one-sixteenth of what it cost him. The cost price of the pen is
(a)Rs. 16 (b) Rs. 18
(c) Rs .20 (d) Rs. 21

2. A train moves with a speed of 108 Kmph. Its speed in meters per second is:
(a) 10.8 (b) 18 (c) 30 (d) 38.8

3. What decimal of an hour is a second?
(a) 0.0025 (b) 0.0256
(c) 0.00027 (d) 0.000126

4. What is 25% of 25% equal to?
(a) 0.00625 (b) 0.0625
(c) 0.625 (d) 6.25

5. A is 30% more efficient than B. how much time will they, working together, take to complete a job which A alone could have done in 23 days?
(a) 11days (b) 13 days
(c) 20 days (d) none of these

6. The largest 5-digit number exactly divisible by 91 is
(a) 99921 (b) 99918
(c) 99981 (d) 99971

7. Find the highest common factor of 36 and 84
(a) 4 (b) 6 (c) 12 (d) 18

8. How pieces of 85 cm length may be able to be cut from a rod 42.5 meters long?
(a)30 (b) 40 (c) 60 (d) none of these

9.if the radius of a circle is doubled,its area is increased by ?
(a)100% (b) 200% (c) 300% (d) 400%

10.What will be the area of a semi-circle of 14m diameter ?
(a) $22m^2$ (b) $77m^2$ (c) $154m^2$(d) $3m^2$

- The Answers will be published in the next issue.
- The winners name will also be published.
- Prices will also be awarded for the correct answers.

You can send your Answers TO:
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By
Abey mon.K
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Technical Questions

1. Commonly used standard capacitor is?

(a) Concentric cylinder type
(b) parallel plate type
(c) Concentric plate type
(d) none

2. A Switched mode power supply operating at 29 kHz to100 kHz range uses as the main switched element.

(a) Thyristor (b) MOSFET
(c) TRIAC (d) UJT

3. The MOSFET switch in its on-state may be considered equivalent to

(a) Resistor (b) Inductor
(c) Capacitor (d) Battery

4. A differential amplifier has a differential gain of 20,000. CMRR= 80 dB. The common mode gain is given by

(a) 2 (b) 1 (c) 1/2 (d) 0

5. A carry look ahead adder is frequently used for addition because

(a) is faster
(b) is more accurate
(c) Uses fewer gates
(d) costs less

6. Number of switching function of 3 variables is

(a) 8 (b) 64 (c)128 (d) 256

7. An integrating DVM measures

(a) true average value (b) rms value
(c) peak values (d) peak to peak value

8. A Phase lag compensation will

(a) Improve relative stability
(b) increase the speed of response
(c) Increase bandwidth
(d) increase overshoot

9. Sinusoidal oscillators are

(a) stable
(b) unstable
(c) marginally stable
(d) conditionally stable

10. R-S latch is a

(a) Combination circuit
(b) synchronous sequential circuit
(c) one bit memory element
(d) one clock delay element

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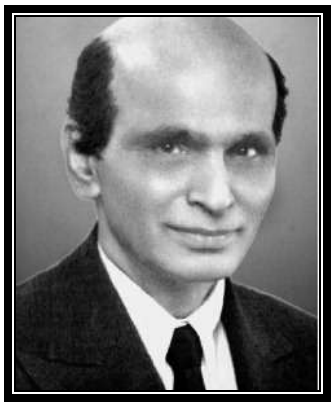
PHOTO FIND



Clue: He is the first person to bring the motors in India.
Native: Coimbatore.

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