I'm not a bot

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The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. ,the free encyclopedia that anyone can edit.117,937 active editors 7,001,149 articles in EnglishThe English-language Wikipedia thanks its contributors for creating more than seven million articles! Learn how you can take part in the encyclopedia's continued improvement.GL Mk.II transmitter vanRadar, Gun Laying, MarkI, or GL Mk.I for short, was an early World WarII radar system developed by the British Army to provide information for anti-aircraft artillery. There were two upgrades, GL/EF (elevation finder) and GL Mk.II (pictured), both improving the ability to determine a target's bearing and elevation. GL refers to the radar's ability to direct the guns onto a target, known as gun laying. The first GL sets were developed in 1936 using separate transmitters and receivers mounted on gun carriages. Several were captured in 1940, leading the Germans to believe falsely that British radar was much less advanced than theirs. The GL/EF attachment provided bearing and elevation measurements accurate to about a degree: this caused the number of rounds needed to destroy an aircraft to fall to 4,100, a tenfold improvement over early-war results. The Mk.II, which was able to directly guide the guns, lowered the rounds-per-kill to 2,750. About 410 Mk.Is and 1,679 Mk.IIs were produced. (Fullarticle...)Recently featured: Andrea NavageroNosy KombaMcDonnell Douglas Phantom in UK serviceArchiveBy emailMore featured articlesAboutLieke Klaver ahead in the women's 400 metres final... that a 400-metre race in 2025 (pictured) was won by Lieke Klaver, who pretended that an absent competitor was running in front of her?... that the land snail Drymaeus poecilus is notable for the striking variety of colors and patterns on its shell?... that a forensic investigation of Signalgate has determined how a journalist was included in a group chat about Operation Rough Rider?... that two of the players involved in the 2005 Vietnamese football match-fixing scandal did not accept payment because they felt ashamed?... that a rebellion against a peace treaty with the Yuan dynasty operated out of the Historic Site of Anti-Mongolian Struggle on Jeju Island?... that Nathan Frink fled the United States with enslaved children to settle in Canada, where he was elected as a Member of the Legislative Assembly and caught in a smuggling conspiracy?... that Seattle's women's ice hockey team has an expected rival, despite not even having played their first game?... that Cave Johnson Couts was separately acquitted for shooting his foreman, firing on funeral mourners, and whipping a native laborer to death?... that characters' scars in an episode of The Last of Us were made with a paste-based appliance and a food mixer?ArchiveStart a new articleNominate an articleNgg wa Thiong'oKenyan writer and activist Ngg wa Thiong'o (pictured) dies at the age of 87.In sumo, nosato Daiki is promoted to yokozuna.In association football, Liverpool win the Premier League title.In motor racing, lex Palou wins the Indianapolis 500.Ongoing: Gaza warM23 campaignRussian invasion of UkrainetimelineSudanese civil wartimelineRecent deaths: Phil RobertsonMary K. GaillardPeter DavidAlan YentobGerry ConnollySebastio SalgadoNominate an articleMay 30: Statehood Day in Croatia (1990)Johann Sebastian Bach1431 Hundred Years' War: After being convicted of heresy, Joan of Arc was burned at the stake in Rouen, France.1723 Johann Sebastian Bach (pictured) assumed the office of Thomaskantor in Leipzig, presenting the cantata Die Elenden sollen essen in St.Nicholas Church.1922 The Lincoln Memorial in Washington, D.C., featuring a sculpture of the sixteenth U.S. president Abraham Lincoln by Daniel Chester French, opened.1963 Buddhist crisis: A protest against pro-Catholic discrimination was held outside the National Assembly of South Vietnam in Saigon, the first open demonstration against President Ng nh Dim.2008 The Convention on Cluster Munitions, prohibiting the use, transfer, and stockpiling of cluster bombs, was adopted.Ma Xifan (d.947)Colin Blythe (b.1879)Norris Bradbury (b.1909)Wynonna Judd (b.1964)More anniversaries: May 29May 30May 31ArchiveBy emailList of days of the yearAboutSeventeen performing "Oh My!" in 2018South Korean boy band Seventeen made their debut on May 26, 2015, when they performed a showcase for their debut EP 17 Carat in front of a crowd of 1,000 people. Since then, the group have held 9 concert tours, 13 fan meetings, and have performed at a number of music festivals and awards shows. Their concert tours include the Right Here World Tour, which sold over one million tickets, and the Follow Tour, which was noted by Billboard as being the top grossing K-pop tour of 2023. In 2024, Seventeen made their first appearances at festivals in Europe, when they were the first South Korean act to perform at Glastonbury Festival's Pyramid Stage and as headliners for Lollapalooza Berlin. Seventeen's live performances are well regarded by fans and critics alike, and garnered them the award for Top K-pop Touring Artist at the 2024 Billboard Music Awards. (Fulllist...)Recently featured: Accolades received by Top Gun: MaverickNational preserve76th Primetime Emmy AwardsArchiveMore featured listsIgnace Tonen (1840 or 1841 15 March 1916), also known as Nias or by his Ojibwe name Maiagizis ('right/correct sun'), was a Teme-Augama Anishnabai chief, fur trader, and gold prospector in Upper Canada. He was a prominent employee of the Hudson's Bay Company. Tonen was the elected deputy chief before being the lead chief and later the life chief of his community. In his role as deputy, he negotiated with the Canadian federal government and the Ontario provincial government, advocating for his community to receive annual financial support from both. His attempts to secure land reserves for his community were thwarted by the Ontario premier Oliver Mowat. Tonen's prospecting triggered a 1906 gold rush and the creation of Kerr Addison Mines Ltd., although one of his claims was stolen from him by white Canadian prospectors. This photograph shows Tonen in 1909.Photograph credit: William John Winter; restored by Adam CuerdenRecently featured: Australian white ibisHell Gate BridgeAnemonoides blandaArchiveMore featured picturesCommunity portal The central hub for editors, with resources, links, tasks, and announcements.Village pump Forum for discussions about Wikipedia itself, including policies and technical issues.Site news Sources of news about Wikipedia and the broader Wikimedia movement.Teahouse Ask basic questions about using or editing Wikipedia.Help desk Ask questions about using or editing Wikipedia.Reference desk Ask research questions about encyclopedic topics.Content portals A unique way to navigate the encyclopedia.Wikipedia is written by volunteer editors and hosted by the Wikimedia Foundation, a non-profit organization that also hosts a range of other volunteer projects: CommonsFree media repository MediaWikiWiki software development Meta-WikiWikimedia project coordination WikibooksFree textbooks and manuals WikidataFree knowledge base WikinewsFree-content news WikiquoteCollection of quotations WikisourceFree-content library WikispeciesDirectory of species WikiversityFree learning tools WikivoyageFree travel guide WiktionaryDictionary and thesaurusThis Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles DeutschEspaolFranaisItalianoNederlandsPolskiPortugusSvenskaTing Vit 250,000+ articles Bahasa IndonesiaBahasa MelayuBn-lm-gCataletinaDanskEestiEsperantoEuskaraMagyarNorsk bokmlRomnSimple EnglishSloveninaSrpskiSrpskohrvatskiSuomiTrkeOzbekcha 50,000+ articles AsturianuAzrbaycancaBosanskiFryskGaeilgeGalegoHrvatskiKurdLatvieuLietuviNorsk nynorskShqipSlovenina Retrieved from " 2EP by Seventeen17 CaratEP by SeventeenReleasedMay29,2015(2015-05-29)GenreK-popdance-pophip hopLength16:48LanguageKoreanLabelPledis EntertainmentLOEN EntertainmentSeventeen chronology17 Carat(2015)Boys Be(2015)Singles from 17 Carat "Adore U"Released: May 29, 201517 Carat is the debut extended play (EP) by South Korean boy group Seventeen. It was released on May 29, 2015, by Pledis Entertainment and distributed by LOEN Entertainment. "Adore U" serves as the lead single for the EP.17 Carat features five tracks written, co-written, and co-produced by Seventeen's group members. "Adore U" was chosen as the lead single for the EP and was performed on multiple music shows by the group. "Shining Diamond" was used as a pre-single on the group's reality debut show. The group stated that the tracklist was chosen to reflect Seventeen's core concept of "boys' passion".[1] The album has two physical versions: one with a "black" themed photo card set, and the other with a "white" themed photo card set. All copies include a CD containing the songs and a fold-up poster/lyric sheet."Adore U" is the lead single of the extended play. It was written by Woozi, S.Coups, and Yeon Dong-geon.[2] The Korea Herald states "'Adore U' is a funky pop song about a teenage boy trying to navigate through puppy love."[3] It marks the beginning of the group's trilogy composed of the singles Adore U, Mansae, and Pretty U about a boy meeting, falling in love and asking out a girl. The track was composed and arranged by Woozi, Bumzu, and Yeon Dong-geon. The music video for the single was released on May 29, 2015, and was directed by Dee Shin. The dance choreography accompaniment to the song was choreographed by Hoshi and focuses on "storytelling, and on highlighting each member's strengths onstage".[4] The single has sold more than 38,000 digital copies and peaked at number 13 on the Billboard US World Chart.The EP has sold over 82,972 copies in South Korea.[5] It peaked at number 4 on the Korean Gaon Album Chart[6] and number 8 on the US World Billboard Chart.[7]Year-end listsCritic/publicationListRankRef.BillboardThe 10 Best K-pop Album of 2015Placed[8]Hoshi participated in the choreography of "Adore U" and "Shining Diamond", Dino choreographed "Jam Jam".[9]Official track list[10]No.TitleLyricsMusicArrangementsLength1."Shining Diamond"WooziVernonS.CoupsKim Min-jeongWooziMasterKeyRishiMasterKeyRishi3:242.""Adore U"" (; Akkinda)WooziVernonS.CoupsBumzuWooziBumzuYeon Dong-geonWooziBumzuYeon Dong-geon3:073."Ah Yeah" (Hip-Hop unit)S.CoupsVernonWonwooMingyuCream DoughnutRishiCream DoughnutRishi3:294."Jam Jam" (Performance unit + Vernon)WooziHoshiDinoVernonWooziCream DoughnutCream Doughnut3:255."20" (Vocal unit)WooziWooziWon Yeong-heonWon Yeong-heonDong Ne-hyeong3:23Weekly chart performance for 17 CaratChart (2015-2023)PeakpositionJapanese Albums (Oricon)[11]46South Korean Albums (Gaon)[12]4US World Albums (Billboard)[13]8Year-end chart performance for 17 CaratChart (2015)PeakpositionSouth Korean Albums (Gaon)[14]47^ "Seventeen hopes to shine like diamonds with '17 Carat'". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ "Adore U". Color Coded Lyrics. 29 May 2015. Retrieved 29 November 2016.^ "Seventeen hopes to shine like diamonds with '17 Carat". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ "Seventeen hopes to shine like diamonds with '17 Carat'". The Korea Herald. 26 May 2015. Retrieved 30 November 2016.^ Cumulative sales of 17 Carat:"2015 Album Chart."."2016 12 Album Chart."."2017 11 Album Chart".^ "2015 Albums". Gaon Music Chart. Korea Music Content Industry Association. Archived from the original on September 10, 2016. Retrieved November 29, 2016.^ "June 27, 2015". Billboard. Retrieved 29 November 2016.^ Benjamin, Jeff; Oak, Jessica (December 12, 2015). "The 10 Best K-Pop Albums of 2015". Billboard. Archived from the original on September 18, 2021. Retrieved October 31, 2021.^ , (18 June 2015). "[My Name] (3) - , , , | ". (in Korean). The Korea Economic Daily. . Retrieved 18 July 2021.^ "SEVENTEEN 1st Mini Album '17 CARAT'".^ " 20230710" [Weekly album ranking as of July 10, 2023]. Oricon News (in Japanese). Archived from the original on July 5, 2023. Retrieved February 18, 2024.^ "2015 27 Album Chart". Gaon Chart (in Korean). Archived from the original on August 7, 2016. Retrieved February 18, 2024.^ "Seventeen Chart History (World Albums)". Billboard. Retrieved February 17, 2024.^ "2015 Album Chart". Gaon Chart (in Korean). Archived from the original on May 7, 2017. Retrieved February 17, 2024.Retrieved from " 3The following pages link to 17 Carat External tools(link counttransclusion countsorted list) See help page for transcluding these entriesShowing 50 items.View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Main Page (links | edit)Pledis Entertainment discography (links | edit)List of 2015 albums (links | edit)2015 in South Korean music (links | edit)Seventeen (South Korean band) (links | edit)S.Coups (links | edit)Vernon (rapper) (links | edit)Wonwoo (links | edit)List of awards and nominations received by Seventeen (links | edit)Seventeen discography (links | edit)Love & Letter (links | edit)Joshua (singer) (links | edit)Seventeen TV (links | edit)17 carat (redirect page) (links | edit)Going Seventeen (links | edit)List of Seventeen live performances (links | edit)Teen, Age (links | edit)Al1 (links | edit)Bumzu (links | edit)Boys Be (EP) (links | edit)You Make My Day (links | edit)You Made My Dawn (links | edit)Jun (Chinese entertainer) (links | edit)List of Stray Kids live performances (links | edit)The8 (links | edit)An Ode (links | edit)Seungkwan (links | edit)Fallin' Flower (links | edit)Heng:gar (links | edit)Semicolon (EP) (links | edit)Your Choice (links | edit)Going Seventeen (web series) (links | edit)Not Alone (Seventeen song) (links | edit)Attacca (EP) (links | edit)Rock with You (Seventeen song) (links | edit)Woozi (links | edit)Hoshi (South Korean singer) (links | edit)Don't Wanna Cry (Seventeen song) (links | edit)Darl+ing (links | edit)Face the Sun (links | edit)Left & Right (Seventeen song) (links | edit)24H (EP) (links | edit)We Make You (links | edit)Hot (Seventeen song) (links | edit)Dream (Seventeen EP) (links | edit)BSS (band) (links | edit)FML (EP) (links | edit)Super (Seventeen song) (links | edit)Always Yours (album) (links | edit)Seventeenth Heaven (links | edit)View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Retrieved from " WhatLinksHere/17_Carat" Relay logic basically consists of relays wired up in a particular fashion to perform the desired switching operations. The circuit incorporates relays along with other components such as switches, motors, timers, actuators, contactors etc. The relay logic control works efficiently to perform basic ON/OFF operations by opening or closing the relay contacts but it involves a humongous wiring. Here we will learn about Relay Logic Control Circuit, its symbols, working and how they can be used as Digital Logic Gates. Working of a Relay Relay act as switch which is operated by a small amount of current. The relay has two contacts- Normally open (NO) Normally Close (NC) In the figure given below, you can see there are two sides of a Relay. One is primary coil which acts as a electromagnet on passing current through it and other one is secondary side having NO and NC contacts. When the contact position is Normally Open, the switch is Open and hence the circuit is Open and no current flows through the circuit. When the contact position is Normally Close, the switch is closed and the circuit is completed and hence current flows through the circuit. When the contact position is Normally Close, the switch is closed and the circuit is completed and hence current flows through the circuit. This change of state in the contacts occur whenever a small electrical signal is applied i.e. whenever a small amount of current flows through the relay, the contact changes. This is explained through the figures below- Above figure shows the switch in NO contact position. In this figure, primary circuit (coil) is not completed and hence no current flows through the electromagnetic coil in that circuit. Therefore, the connected bulb remains off as the relay contact remains open. Now the above figure shows the switch in NC contact position. In this figure, primary circuit (coil) is closed, so there is some current through the coil connected in that circuit. Due to the current flowing in this electromagnetic coil, a magnetic field is created in its vicinity and due this magnetic field, the relay is energised and hence closes its contacts. Therefore, the connected bulb turns ON. You can find the detailed article on Relay here and learn how relay can be used any circuit. Relay Logic Circuits - Schematic/Symbols A relay logic circuit is a schematic diagram which shows various components, their connections, inputs as well as outputs in a particular fashion. In relay logic circuits, the contacts NO and NC are used to indicate Normally Open or Normally Close relay circuit. It contains two vertical lines, one on the extreme left and the other on the extreme right. These vertical lines are called rails. The extreme left rail is at the supply voltage potential and is used as an input rail. The extreme right rail is at zero potential and is used as the output rail. Particular symbols are used in relay logic circuits to represent different circuit components. Some of the most common and widely used symbols are given below- 1. NO contact The given symbol indicates a Normally Open contact. If the contact is Normally open, it would not allow any current to pass through it and hence there will be an Open circuit at this contact. 2. NC contact This symbol is used to indicate Normally Close contact. This allows the current to pass through it and acts as a short circuit. 3. Push Button (ON) This push button allows current to flow through it to the rest of the circuit as long as it is pressed. If we release the push button, it becomes OFF and no longer allows the current to flow. This means in order to carry the current the push button has to remain in the pressed state. 4. Push Button (OFF) The OFF push button indicates an open circuit i.e. it does not allow the flow of current through it. If the push button is not pressed, it stays in OFF state. It can transit into ON state to carry the current through it once it is pressed. 5. Relay coil The relay coil symbol is used to indicate control relay or motor starter and sometimes even contactor or timer. 6. Pilot Lamp The given symbol denotes Pilot Lamp or simply a bulb. They indicate the machine operation. Relay Logic Circuit Examples and Working The working of a relay logic circuit can be explained through the given figures- This figure shows a basic relay logic circuit. In this circuit, Rung 1 contains one Push button (initially OFF) and one control relay. Rung 2 contains one Push button (initially ON) and one Pilot lamp. Rung 3 contains one NO contact and one Pilot lamp. Rung 4 contains one NC contact and one pilot lamp. Rung 5 contains one NO contact, one pilot lamp and a sub-rung with one NC contact. To understand the working of the given relay logic circuit, consider below figure In rung 1, the push button is Off and hence it does not allow the current to pass through it. Therefore, there is no output through rung 1. In rung 2, the push button is On and therefore, current passes from the high voltage rail to the low voltage rail and the Pilot Lamp 1 glows. In rung 3, the contact is Normally Open, therefore Pilot lamp 2 remains Off and there is no flow of current or output through the rung. In rung 4, the contact is normally Close, thereby allowing the current to pass through it and giving an output to the low voltage rung. In rung 5, no current flows through the main rung as the contact is normally Open but due to the presence of the sub-rung, which contains a normally close contact, there is a flow of current and hence the pilot lamp 4 glows. Basic Logic Gates Using Relay Logic Basic digital logic gates can also be realised using relay logic and have a simple construction using the contacts as given below- 1. OR Gate Truth table for OR gate is as shown A B O/P 0 0 0 0 1 1 1 0 1 1 1 1 This table is realised using the relay logic circuit in the following manner In this, the Pilot lamp will turn On whenever any one of the inputs becomes one which makes the contact associated with that input as normally close. Otherwise, the contact remains Normally open. 2. AND Gate Truth table for AND gate is given as A B O/P 0 0 0 0 1 0 1 0 0 1 1 1 Relay logic realisation of AND gate is given by The contacts are connected in series for AND gate. This means that the pilot lamp will turn ON if and only if both the contacts are Normally close i.e. when both the inputs are 1. 3. NOT Gate Truth table for NOT gate is given by The equivalent relay logic circuit for the given NOT gate truth table is as follows The pilot lamp lights up when the input is 0 so that the contact remains normally close. As the input changes to 1, the contact changes to normally Open and hence the pilot lamp doesnt light up giving the output as 0. 4. NAND Gate The NAND gate truth table is as follows A B O/P 0 0 1 0 1 1 1 0 1 1 1 0 The relay logic circuit as realised for the given truth table is as As two Normally close contacts are connected in parallel, the pilot lamp lights up when one or both the inputs are 0. However, if both the inputs become 1, both the contacts become Normally Open and hence the output becomes 0 i.e. the pilot lamp doesnt light up. 5. NOR Gate The truth table for NOR gate is given by the following table A B O/P 0 0 1 0 1 0 1 0 0 1 1 0 The given truth table can be implemented using the relay logic as follows Here, two normally close contacts are connected in series which means the pilot lamp will light up only if both the inputs are 0. If any one of the input becomes 1, that contact changes to normally open and hence the flow of current is interrupted, thereby causing the pilot lamp not to light up, indicating 0 output. Disadvantages of RLC over PLC Complex wiring More time to implement Comparatively less accuracy Difficult to maintain Fault detection is hard Provide less flexibility Relay logic basically consists of relays wired up in a particular fashion to perform the desired switching operations. The circuit incorporates relays along with other components such as switches, motors, timers, actuators, contactors etc. The relay logic control works efficiently to perform basic ON/OFF operations by opening or closing the relay contacts but it involves a humongous wiring. Here we will learn about Relay Logic Control Circuit, its symbols, working and how they can be used as Digital Logic Gates. Working of a Relay Relay act as switch which is operated by a small amount of current. 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NOR Gate The truth table for NOR gate is given by the following table A B O/P 0 0 1 0 1 0 1 0 0 1 1 0 The given truth table can be implemented using the relay logic as follows Here, two normally close contacts are connected in series which means the pilot lamp will light up only if both the inputs are 0. If any one of the input becomes 1, that contact changes to normally open and hence the flow of current is interrupted, thereby causing the pilot lamp not to light up, indicating 0 output. Disadvantages of RLC over PLC Complex wiring More time to implement Comparatively less accuracy Difficult to maintain Fault detection is hard Provide less flexibility Relay logic is a hard wired control system using instrumentation, switches, timers, relays, contactors, motors and actuators. Traditional machine and process automation was accomplished using relay logic. Automating a machine using relay logic requires a mass of wiring and magnitude of devices to perform even the simplest of tasks. Some of the other problems with implementing relay logic are: Requires a lot of switchboard space. Installation is very labor intensive. Trouble shooting is extremely difficult. Modifications to the control functionality are complicated and seriously tedious. Relay Logic Vs Ladder Logic Relay Logic PanelThe advent of the microprocessor meant that relay logic control functionality could be programmed and stored in a computer. In the late 1960s some really brainy people realized this and pressed ahead to create a device called a Programmable Logic Controller (PLC).Relay logic in a PLC is the method of formulating logical expressions in order to automate machinery and processes in industrial applications. The programming language that is used to create relay logic in a PLC is called Ladder Logic.This was a massive breakthrough in the industrial automation industry which would eventually render relay logic control systems near redundant.In an automated control system the main advantages of a PLC over relays are:Easier to develop complex logical expressions with ladder logic software.Increased reliability with PLC life easily reaching +10years,Easier and cheaper to modify or expand the control system at a later date. Reduced design, installation and component costs.Virtually maintenance free compared to relays.Superior monitoring and reporting functionality making process trouble shooting and optimization easier. Relay Logic Vs Ladder Logic PLC Ladder LogicTo understand the difference between relay logic and ladder logic its really important that you understand relay logic and how a relay works. Understanding relay logic is a good stepping stone to understanding ladder logic. After all, ladder logic was originally derived from relay logic. Makes sense, right?How Do Relay Logic Systems Work?Relay logic systems are a network of hard wired electrical components. The relay is the fundamental component and it works by switching electric circuits on and off to form logic operations that in turn provide process control to the system. You can think of relay logic systems as a mechanical computer that does computation with 1s and 0s by switching relays instead of using a silicon chip.The fundamental component of a relay logic is the relay. So lets look at how relays work in a little more detailWhat Is A Relay?A relay is an electromechanical device that consists of two basic components, a relay coil and relay contact. The relay contact is used to switch a circuit on or off and the relay coil is used to change the state of the relay contact. The three main types of relays are spring return relays, latching relays and multipole relays.Why Are Relays Used In Control Circuits?Relays are used because they allow electric isolation between the switching circuit (contact) and control signal circuit (coil) via means of electromagnetics. That means relays can be used to connect circuits with different voltage and current levels to control equipment like motors and actuators. A relay can also switch multiple circuits with different states at the same time making them ideal for logic control circuits in industrial automation.What Functions Does A Relay Perform?Relays perform 3 main functions in an electric circuit:Allowing control circuits to switch a load circuit even if the voltages of both circuit are different.Able to switch a high current device using a low current electronic control signal.Relays can be wired in combination to perform logical operations using a network of electric circuits known as relay logic.How a Relay WorksA relay is an electromechanical device that consists of two basic components.Relay coil.Relay Contact.A relay coil is essentially copper wire wound around a chunk of iron that is used to produce an electromagnetic field that can attract metal. Think of a junk yard crane that is used to pick up scrap metal. It uses the same principle to generate a magnetic field that attracts metal.A relay contact is basically a switch that is used to turn an electric circuit on or off.Hang on a minute! If the contacts of a relay turn an electric circuit on or off why do we need the coil?Well, the relay coils purpose is to change the state of the relay contacts. Just like your finger is used to change the state of a light switch from off to on. So, we are changing the state of the contacts using an electrical signal instead of your using your finger.Electromechanical RelayTo energize the coil we need to connect it to a voltage source, which is sometimes called a relay input.Some common DC voltage relays are 5V relay, 12V relay and 24V relay. Some common AC voltage relays are 120VAC relay and 240VAC relay.The voltage rating is usually written on the casing of the relay. The coil voltage rating needs to be adhered to otherwise the relay coil may fail to change the state of the contacts or overheat and burn out.When we energize the relay coil with its rated voltage it allows current to flow within the relay coil and produces and electromagnetic field. This electromagnetic field is used to attract the relay contact towards the relay coil, thus changing the state of the relay contacts.The relay contacts are either configured normally open (NO) or normally closed (NC). Quite often a relay will have changeover contacts.So what is a changeover contact?A changeover contact is the combination of both normally open (NO) and normally closed (NC) contacts in the same contact block. The changeover contact allows selection of either the normally open (NO) or the normally closed (NC) contact depending on the way it is wired. It is sometimes called a double throw contact.The contact voltage and current rating is usually written on the casing of the relay. The contact voltage and current rating needs to be adhered to otherwise the relay contact may overheat and burn out.If the relay coil voltage rating and contact voltage and current rating are not written on the relay casing then check the relay base. Sometimes its a combination of both the case and base. If all else fails then consult the data sheet.Relay Coil With Contact Voltage & Current RatingRelay OperationIf a relay is wired to a normally open (NO) contact and the relay is energized then the contact will change state from OPEN to CLOSED..Basic Relay Operation with Normally Open (NO) ContactIf a relay is wired to a normally closed (NC) contact and the relay is energized then the contact will change state from CLOSED to OPEN..Basic Relay Operation with Normally Closed (NC) ContactIf a relay with changeover contacts is wired in a normally open (NO) configuration and the relay is energized then the contact will change state from OPEN to CLOSED..Basic Relay Operation with Changeover Contacts wired Normally Open (NO)If a relay with changeover contacts is wired in a normally closed (NC) configuration and the relay is energized then the contact will change state from CLOSED to OPEN. Notice that the wiring of the contacts has changed sides..Relay Operation with Changeover Contacts wired Normally Closed (NC)Types of RelaysThere are several types of relays each with their specific characteristics and uses. The 3 types that are used frequently in industrial applications are spring return relays, latching relays and multipole relays.Spring Return RelayThe most common relays are spring return relays. They have one relay coil and use a spring to return the relay contact back to its normal state after the relay coil is de-energized and the electromagnetic field has collapses.The relay coil must be energized at all times in order for the state of the relay contact to remain in its changed state. As soon as the coil is de-energized then the relay contact returns back to its normal state.Can you see the spring in the Electromechanical Relaypicture above? The spring is at the very top of the relay.Latching RelayA latching relay is a type of relay that can change and maintain the state of the contact without the need for the coil to be constantly energized. It utilizes two separate coils, each of which are responsible for a certain state of the contact either open or closed. A short voltage pulse to energize either coil in the latching relay is all that is required to change the state of the contact.Multi Pole RelayA multi pole relay is any type of relay with more than one contact. Each relay contact is called a pole. So a relay with two contacts will be called a two pole relay and a relay with four contacts will be called a four pole relay.When using multi pole relays multiple coils are not required to change the state of the contacts. The state of all the relay contacts is changed at the same time by a single relay coil.Two Pole RelayIn short, the operation of a single pole relay is the same as a multi pole relay, we just have more contacts to play with!This is handy when we are activating more than one device. Especially when the devices need different voltage levels or the combined current draw of multiple devices exceeds the current rating of a single contact. Its also handy having multi pole relays when the process control logic gets complex.How do you connect a Relay?In order to connect a relay we need to wire the coil to a voltage supply (generally switched) and the contacts to the load device like a light, motor, solenoid valve or another relay. This can be done by connecting the relay coil and contact wires to the terminals of a relay base. The relay base terminal allocation for connection is usually drawn on the relay casing, labelled on the relay base or detailed in the relay data sheet.How to connect a RelayThe common on a relay is the terminal associated with the part of the contact that does not switch when the relay coil is energized. In a relay with a changeover contact it is the terminal common to both the NO and NC contacts. When the common is wired correctly it is connected to the load supply voltage.Common On A RelayRelay Logic CircuitsThe fundamental elements of relay logic circuits are.Power supply.Relay components.Connection wires.The power supply voltage needs to match the rated relay coil voltage. Also, the power supply needs to be big enough to accommodate the current draw of all the relays when they are energized.The relays are selected according to the power supplys output voltage, functionality and current rating of the contacts required.Because relay logic is a hard wired system some sort of wiring diagram or relay schematic diagram is required to make sense of it all.Now please take note, there are many ways to draw an electric circuit. Depending on which country you are from will determine which standard relay wiring diagram you will need to use. The way circuits are laid out and the component symbols will vary from one drawing standard to the next. Also, some drawing standards arrange their control circuits from left to right and some use top to bottom. Check out the sample drawings below.Power and Relay Schematic Diagram ExamplesFor the purposes of this explanation a left to right arrangement will be used because it ties in with ladder logic diagrams later on.A relay schematic diagram consists of a supply voltage rail on the left hand side and a zero voltage rail on the right hand side drawn as vertical lines.The relay components and other devices are packed in between connected by wires, drawn as horizontal lines, to form a circuit.Relay Logic SymbolsThe relay coil and relay contacts can be drawn as per the relay logic symbols diagram below.Relay Logic Vs Ladder Logic Relay Logic SymbolsHow to Read a Relay SchematicThe most basic of relay logic circuits uses a power supply, a relay, a switch and a device that needs to be switched ON or OFF all wired together as shown in the simple relay diagram below.Relay Logic Vs Ladder Logic Relay Logic Circuit ExampleThe above relay logic circuit example shows a lamp (Lamp No.1) being switched on via a relay (Relay No.1).The first line has a rotary switch connected to the coil of Relay No.1 with the relay coil labelled as R1.The second line has a normally open contact from Relay No.1 also labelled R1 which is connected to Lamp No.1.To aid in understanding relay schematics the sequence of events is read from the first horizontal line downwards and from the left hand side power rail to the right hand side power rail.We read from left to right because the potential difference between the left and right hand side power rails creates current flow in that direction. In the example relay schematics a green line is used to highlight current flow in the circuit.So, in the first line we start at the left hand side power rail and follow the horizontal line until we get to the normally open Rotary Switch.If the rotary switch is in the OPEN state there is an open circuit and current cannot flow to the right hand side of the circuit. So the relay coil (R1) stays de-energized.If we go to the second line we notice that the normally open relay contact (R1) stays OPEN because Relay No.1 coil (R1) is de-energized. Therefore there is also an open circuit on the second line so no current can flow to the lamp and it stays OFF.Basic Relay Logic Circuit Example With Rotary Switch OffWhat happens when we turn the Rotary Switch on?When the Rotary Switch is turned ON its state changes from OPEN to CLOSED.If we look at the first line and start at the left hand side power rail then follow the horizontal line until we get to the Rotary Switch we can observe that it is in the CLOSED state and current can flow to the right hand side of the circuit.So in this case the relay coil (R1) is energized and then we reach the end of the right hand side rail.Now lets go to the left hand side of the second line where we notice that the normally open relay contact (R1) has also changed state to CLOSED because the relay coil is energized.Therefore there is a closed circuit on the second line so current can flow to the right hand side of the circuit and Lamp No1 turns ON.Basic Relay Logic Circuit Example With Rotary Switch OnLets spice it up and add another line to the relay logic circuit.This time well use a second relay contact from Relay No1 and wire it as a normally closed contact. Then well add a second lamp (Lamp No2) to the new circuit.In this case the operation of that lamp will be reversed. So when the Rotary Switch is OFF, Lamp No.2 is ON and when the Rotary Switch is ON, Lamp No.2 is OFF.Wait, what????Dont believe me then check out the relay logic circuit below.Relay Reverse Logic With Rotary Switch OffThe new relay contact in the third line is now a normally closed instead of normally open.When Relay No.1 coil is de-energized its normally closed