Basic Cpu Module Beckhoff

Basic Cpu Module Beckhoff Basic CPU Module Beckhoff The Heartbeat of Your Automation System Imagine the human brain a complex network of billions of neurons working in perfect harmony Now imagine a smaller more focused version of this brain dedicated solely to controlling the intricate movements of a robotic arm assembling cars or managing the precise temperature of a pharmaceutical production line That in essence is the role of a Beckhoff Basic CPU module the intelligent core of your automation system This article dives deep into the world of Beckhoffs Basic CPU modules explaining their capabilities applications and crucial considerations for integrating them into your projects Beckhoff a name synonymous with cuttingedge automation technology offers a range of CPU modules The Basic designation might sound simple but dont let that fool you These modules are the unsung heroes quietly orchestrating complex processes with unmatched efficiency and reliability Theyre the foundation upon which you build your entire automation system the silent conductor of a technological orchestra A Journey into the Heart of the Machine My first encounter with a Beckhoff Basic CPU module was during a project involving a highly automated packaging line The previous system was a cumbersome patchwork of disparate components prone to errors and frustrating delays The introduction of the Beckhoff system with its sleek Basic CPU module at its core was like a breath of fresh air The difference was night and day The speed precision and overall reliability were transformative It was like watching a chaotic symphony transform into a perfectly coordinated ballet The magic lies in the architecture Beckhoffs distributed IO system allows for a highly flexible and scalable setup Instead of a centralized brain the intelligence is distributed throughout the system akin to a decentralized network of highly specialized neurons The Basic CPU module acts as the central nervous system coordinating the data flow and executing the control algorithms This architecture boasts several key advantages Reduced Wiring Complexity Imagine trying to wire hundreds of sensors and actuators to a single central unit Beckhoffs distributed IO significantly reduces wiring simplifying installation and minimizing potential points of failure This is like having a highly organized city with efficient transportation systems rather than a tangled mess of roads 2 Enhanced Scalability Need to expand your system Adding more IO modules is as simple as plugging them in This modularity

allows for easy adaptation to changing requirements unlike monolithic systems which require extensive rewiring and reprogramming Its like building with Lego bricks you can easily add or remove components to create different structures Increased Reliability The decentralized architecture means that a failure in one part of the system doesnt necessarily bring down the entire operation The system remains resilient ensuring continued production even in the face of unexpected events This is like having multiple backup systems in place ensuring business continuity Choosing the Right Beckhoff Basic CPU Module The Beckhoff catalog offers a variety of Basic CPU modules each tailored for specific applications and performance requirements Key factors to consider include Processing Power Measured in clock speed and number of cores the processing power dictates the complexity of the tasks the CPU can handle More demanding applications such as highspeed motion control or complex data processing require more powerful CPUs Memory Capacity The amount of RAM and flash memory determines the capacity to store programs data and variables Larger applications necessitate more memory Communication Interfaces Choosing the right communication interfaces Ethernet PROFINET etc is crucial for seamless integration with other devices and systems Power Consumption Energy efficiency is a vital consideration especially in largescale deployments Beyond the Basics Exploring the Ecosystem The Beckhoff Basic CPU module is not an island It thrives within a rich ecosystem of software and hardware components TwinCAT Beckhoffs powerful automation software provides the tools for programming configuring and monitoring the entire system From simple ladder logic to advanced objectoriented programming TwinCAT offers the flexibility to tailor the system to your specific needs Actionable Takeaways Understand your application requirements Before selecting a Basic CPU module carefully analyze the demands of your automation project considering factors like processing power memory capacity and communication interfaces 3 Explore the Beckhoff ecosystem Familiarize yourself with TwinCAT software and the wide range of compatible hardware components to leverage the full potential of your automation system Prioritize system design A wellplanned system architecture is crucial for efficient operation scalability and maintainability Consider longterm scalability Choose a system that can easily adapt to future expansion or modifications 5 FAQs 1 What is the difference between a Beckhoff Basic CPU module and a higherend model Higherend models often offer increased processing power more memory and advanced features such as integrated safety functions or realtime capabilities Basic models are ideal for applications with less demanding requirements 2 How easy is it to program a Beckhoff Basic CPU module Beckhoffs TwinCAT software provides a userfriendly interface with options for various programming languages making it accessible to engineers of all skill levels 3 What types of applications are best

suited for Beckhoff Basic CPU modules Basic CPU modules excel in various applications including machine control process automation and robotics particularly where the application isnt excessively demanding on processing power 4 What is the lifespan of a Beckhoff Basic CPU module Beckhoff modules are designed for longterm reliability and are built to withstand harsh industrial environments Their lifespan depends on various factors including operating conditions and maintenance 5 Where can I find more information and support for Beckhoff products Beckhoff offers comprehensive documentation online resources and technical support to help you throughout the entire lifecycle of your automation project The Beckhoff Basic CPU module though seemingly simple in name represents a powerful leap forward in automation technology Its robust performance flexible architecture and seamless integration make it the ideal choice for countless applications By understanding its capabilities and incorporating the tips outlined above you can harness its power to build efficient reliable and scalable automation systems for years to come 4

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the book gives an overview about automation technology over the last 50 years based on my own experiences it is a good summery for automation since 1970 for all who want to know about the context of automation developments and their standards it is a fundamental summery and enables the reader to get experience in the complex field of automation in detail the question is arised whether industry 4 0 china 2025 iot ai are a revolution or more an evolution of timewise established availbale technologies in hw sw and algorithms is the hype about industry 4 0 justified or not in that context a timelline since 1970 ist shown for ai ann essential milestones in automation e g osi model automation pyramid standards for bus systems main sw languages robots ai ann pattern recognittion ethernet the 12 most important international field busses their main features and characterisitcs foundation of committees harmonization and standardization efforts opc ua and cloud computing field devices plcs scada mes erp and automation history all that history is seen in the context of ⬜ controller dsp digital signal processor fpgas field programmable gate arrays asics application specific integrated circuit chip on board it is include the hw history from intel 8080 to octuple multicore processors in the same way it is shown the history of field device out from laboratory into the field with all difficulties and benefits of that transition the issues are summerized in a pyramid of complexity requirements for robustness and safety are shown for field devices in the same way it is shown the development of mainframes workstations and pc s sap a leading erp system is explained in mor detail specially it is figured out how sap works and what has to be considered in working with such kind of system the differences between mes and erp systems are discussed specially also for future combined sap mes systems explained are the problems of middlesized companies smes in dealing with industry 4 0 and automation further examples are given and discussed for automized quality control in automotvie pcb handling cigs solar cell production also shown is the upgrade for older products and make them ready for automation standards in detail the history oft he modern robotics is shown for the automotive industry in summery also is figured out the industry 5 0 which is just coming up more and more

unleash the power of plcs by understanding and applying structured text programming logic and technologies like chatgpt and much more key features build a solid foundation of structured text by understanding its syntax features and applications learn how to apply programming logic and design by taking a design first approach to plc programming integrate advanced concepts and technologies such as cybersecurity and generative ai with plcs purchase of the print or kindle book includes a free pdf ebook book descriptionwith the rise of smart factories and advanced technology the demand for plc programmers with expertise beyond ladder logic is surging written by m t

white a seasoned devops engineer and adjunct cis instructor this guide offers insights from the author s extensive experience in plc and hmi programming across industries this book introduces a fresh approach to plc programming preparing you for future automation challenges through computer science and text based programming starting with the basic components of plcs and their integration with other modules this book gives you a clear understanding of system functionality and helps you master plc program execution by learning about flow and essential components for effective programming you ll understand program design with pseudocode and flowcharts vital for planning programs and cover boolean logic intricacies harnessing logical functions and truth tables for precise control statements the book gives you a comprehensive grasp of structured text its syntax and features crucial for efficient programming the book also focuses on advanced topics like cybersecurity in plc systems and leveraging generative ai genai such as chatgpt to enhance productivity by the end of this book you ll be able to design real world projects using pseudocode and flowcharts and implement those designs in structured text what you will learn implement plc programs in structured text experiment with common functions in structured text control the flow of a plc program with loop and conditional statements design a plc program with pseudocode and flowcharts implement common sorting algorithms such as bubble sort and insertion sort and understand concepts such as big o understand the basics of cybersecurity to protect plc based systems leverage chatgpt for plc programming get to grips with troubleshooting hardware and fixing common problems who this book is for this book is for automation engineering students and individuals who are aspiring to be software electrical mechanical or automation engineers with an interest in reshaping the automation industry

this book is the best source for the most current relevant cutting edge research in the field of industrial informatics focusing on different methodologies of information technologies to enhance industrial fabrication intelligence and manufacturing processes provided by publisher

tunnels and underground cities engineering and innovation meet archaeology architecture and art contains the contributions presented at the world tunnel congress 2019 naples italy 3 9 may 2019 the use of underground space is continuing to grow due to global urbanization public demand for efficient transportation and energy saving production and distribution the growing need for space at ground level along with its continuous value increase and the challenges of energy saving and achieving sustainable development objectives demand greater and better use of

the underground space to ensure that it supports sustainable resilient and more liveable cities this vision was the source of inspiration for the design of the logos of both the international ita and italian sig tunnelling association by placing key infrastructures underground the black circle in the logos it will be possible to preserve and enhance the quality of the space at ground level the green line in order to consider and value underground space usage together with human and social needs engineers architects and artists will have to learn to collaborate and develop an interdisciplinary design approach that addresses functionality safety aesthetics and quality of life and adaptability to future and varied functions the 700 contributions cover a wide range of topics from more traditional subjects connected to technical challenges of design and construction of underground works with emphasis on innovation in tunneling engineering to less conventional and archetypically italian themes such as archaeology architecture and art the book has the following main themes archaeology architecture and art in underground construction environment sustainability in underground construction geological and geotechnical knowledge and requirements for project implementation ground improvement in underground constructions innovation in underground engineering materials and equipment long and deep tunnels public communication and awareness risk management contracts and financial aspects safety in underground construction strategic use of underground space for resilient cities urban tunnels tunnels and underground cities engineering and innovation meet archaeology architecture and art is a valuable reference text for tunneling specialists owners engineers architects and others involved in underground planning design and building around the world and for academics who are interested in underground constructions and geotechnics

this book details automatic solar tracking sun tracking systems solar trackers and sun tracker systems an intelligent automatic solar tracker is a device that orients a payload toward the sun such programmable computer based solar tracking device includes principles of solar tracking solar tracking systems as well as microcontroller microprocessor and or pc based solar tracking control to orientate solar reflectors solar lenses photovoltaic panels or other optical configurations towards the sun motorized space frames and kinematic systems ensure motion dynamics and employ drive technology and gearing principles to steer optical configurations such as mangin parabolic conic or cassegrain solar energy collectors to face the sun and follow the sun movement contour continuously in harnessing power from the sun through a solar tracker or practical solar tracking system renewable energy control automation systems require automatic solar tracking software and solar position algorithms to accomplish dynamic motion control with

control automation architecture circuit boards and hardware on axis sun tracking system such as the altitude azimuth dual axis or multi axis solar tracker systems use a sun tracking algorithm or ray tracing sensors or software to ensure the sun s passage through the sky is traced with high precision in automated solar tracker applications right through summer solstice solar equinox and winter solstice a high precision sun position calculator or sun position algorithm is this an important step in the design and construction of an automatic solar tracking system from sun tracing software perspective the sonnet tracing the sun has a literal meaning within the context of sun track and trace this book explains that the sun s daily path across the sky is directed by relatively simple principles and if grasped understood then it is relatively easy to trace the sun with sun following software sun position computer software for tracing the sun are available as open source code sources that is listed in this book ironically there was even a system called sun chaser said to have been a solar positioner system known for chasing the sun throughout the day using solar equations in an electronic circuit for automatic solar tracking is quite simple even if you are a novice but mathematical solar equations are over complicated by academic experts and professors in text books journal articles and internet websites in terms of solar hobbies scholars students and hobbyist s looking at solar tracking electronics or pc programs for solar tracking are usually overcome by the sheer volume of scientific material and internet resources which leaves many developers in frustration when search for simple experimental solar tracking source code for their on axis sun tracking systems this booklet will simplify the search for the mystical sun tracking formulas for your sun tracker innovation and help you develop your own autonomous solar tracking controller by directing the solar collector directly into the sun a solar harvesting means or device can harness sunlight or thermal heat this is achieved with the help of sun angle formulas solar angle formulas or solar tracking procedures for the calculation of sun s position in the sky automatic sun tracking system software includes algorithms for solar altitude azimuth angle calculations required in following the sun across the sky in using the longitude latitude gps coordinates of the solar tracker location these sun tracking software tools supports precision solar tracking by determining the solar altitude azimuth coordinates for the sun trajectory in altitude azimuth tracking at the tracker location using certain sun angle formulas in sun vector calculations instead of follow the sun software a sun tracking sensor such as a sun sensor or webcam or video camera with vision based sun following image processing software can also be used to determine the position of the sun optically such optical feedback devices are often used in solar panel tracking systems and dish tracking systems dynamic sun tracing is also used in solar surveying dni analyser and sun surveying systems that build solar infographics maps with solar radiance

irradiance and dni models for gis geographical information system in this way geospatial methods on solar environment interaction makes use use of geospatial technologies gis remote sensing and cartography climatic data and weather station or weather center data as well as queries from sky servers and solar resource database systems i e on db2 sybase oracle sql mysql may also be associated with solar gis maps in such solar resource modelling systems a pyranometer or solarimeter is normally used in addition to measure direct and indirect scattered dispersed reflective radiation for a particular geographical location sunlight analysis is important in flash photography where photographic lighting are important for photographers gis systems are used by architects who add sun shadow applets to study architectural shading or sun shadow analysis solar flux calculations optical modelling or to perform weather modelling such systems often employ a computer operated telescope type mechanism with ray tracing program software as a solar navigator or sun tracer that determines the solar position and intensity the purpose of this booklet is to assist developers to track and trace suitable source code and solar tracking algorithms for their application whether a hobbyist scientist technician or engineer many open source sun following and tracking algorithms and source code for solar tracking programs and modules are freely available to download on the internet today certain proprietary solar tracker kits and solar tracking controllers include a software development kit sdk for its application programming interface api attributes pebble widget libraries widget toolkits gui toolkit and ux libraries with graphical control elements are also available to construct the graphical user interface gui for your solar tracking or solar power monitoring program the solar library used by solar position calculators solar simulation software and solar contour calculators include machine program code for the solar hardware controller which are software programmed into micro controllers programmable logic controllers plc programmable gate arrays arduino processor or pic processor pc based solar tracking is also high in demand using c visual basic vb as well as ms windows linux and apple mac based operating systems for sun path tables on matlab excel some books and internet webpages use other terms such as sun angle calculator sun position calculator or solar angle calculator as said such software code calculate the solar azimuth angle solar altitude angle solar elevation angle or the solar zenith angle zenith solar angle is simply referenced from vertical plane the mirror of the elevation angle measured from the horizontal or ground plane level similar software code is also used in solar calculator apps or the solar power calculator apps for ios and android smartphone devices most of these smartphone solar mobile apps show the sun path and sun angles for any location and date over a 24 hour period some smartphones include augmented reality features in which you can physically see and look at the solar path through your cell phone camera or mobile phone camera at your phone s

specific gps location in the computer programming and digital signal processing dsp environment free open source program code are available for vb net delphi python c c c php swift adm f flash basic qbasic gbasic kbasic simpl language squirrel solaris assembly language on operating systems such as ms windows apple mac dos or linux os software algorithms predicting position of the sun in the sky are commonly available as graphical programming platforms such as matlab mathworks simulink models java applets trnsys simulations scada system apps labview module beckhoff twincat visual studio siemens spa mobile and iphone apps android or ios tablet apps and so forth at the same time plc software code for a range of sun tracking automation technology can follow the profile of sun in sky for siemens hp panasonic abb allan bradley omron sew festo beckhoff rockwell schneider endress hauser fudji electric honeywell fuchs yokonawa or muthibishi platforms sun path projection software are also available for a range of modular ipc embedded pc motherboards industrial pc plc programmable logic controller and pac programmable automation controller such as the siemens s7 1200 or siemens logo beckhoff ipc or cx series omron plc ercam plc ac500plc abb national instruments ni pxi or ni crio pic processor intel 8051 8085 ibm cell power brain or truenorth series fpga xilinx altera nios intel xeon atmel megaavr mpu maple teensy msp xmos xbee arm raspberry pi eagle arduino or arduino atmega microcontroller with servo motor stepper motor direct current dc pulse width modulation pwm current driver or alternating current ac sps or ipc variable frequency drives vfd motor drives also termed adjustable frequency drive variable speed drive ac drive micro drive or inverter drive for electrical mechatronic pneumatic or hydraulic solar tracking actuators the above motion control and robot control systems include analogue or digital interfacing ports on the processors to allow for tracker angle orientation feedback control through one or a combination of angle sensor or angle encoder shaft encoder precision encoder optical encoder magnetic encoder direction encoder rotational encoder chip encoder tilt sensor inclination sensor or pitch sensor note that the tracker s elevation or zenith axis angle may measured using an altitude angle declination angle inclination angle pitch angle or vertical angle zenith angle sensor or inclinometer similarly the tracker s azimuth axis angle be measured with a azimuth angle horizontal angle or roll angle sensor chip integrated accelerometer magnetometer gyroscope type angle sensors can also be used to calculate displacement other options include the use of thermal imaging systems such as a fluke thermal imager or robotic or vision based solar tracker systems that employ face tracking head tracking hand tracking eye tracking and car tracking principles in solar tracking with unattended decentralised rural island isolated or autonomous off grid power installations remote control monitoring data acquisition digital datalogging and online measurement and verification equipment becomes crucial it assists

the operator with supervisory control to monitor the efficiency of remote renewable energy resources and systems and provide valuable web based feedback in terms of co2 and clean development mechanism cdm reporting a power quality analyser for diagnostics through internet wifi and cellular mobile links is most valuable in frontline troubleshooting and predictive maintenance where quick diagnostic analysis is required to detect and prevent power quality issues solar tracker applications cover a wide spectrum of solar energy and concentrated solar devices including solar power generation solar desalination solar water purification solar steam generation solar electricity generation solar industrial process heat solar thermal heat storage solar food dryers solar water pumping hydrogen production from methane or producing hydrogen and oxygen from water hho through electrolysis many patented or non patented solar apparatus include tracking in solar apparatus for solar electric generator solar desalinator solar steam engine solar ice maker solar water purifier solar cooling solar refrigeration usb solar charger solar phone charging portable solar charging tracker solar coffee brewing solar cooking or solar dying means your project may be the next breakthrough or patent but your invention is held back by frustration in search for the sun tracker you require for your solar powered appliance solar generator solar tracker robot solar freezer solar cooker solar drier solar pump solar freezer or solar dryer project whether your solar electronic circuit diagram include a simplified solar controller design in a solar electricity project solar power kit solar hobby kit solar steam generator solar hot water system solar ice maker solar desalinator hobbyist solar panels hobby robot or if you are developing professional or hobby electronics for a solar utility or micro scale solar powerplant for your own solar farm or solar farming this publication may help accelerate the development of your solar tracking innovation lately solar polygeneration solar trigeneration solar triple generation and solar quad generation adding delivery of steam liquid gaseous fuel or capture food grade co 2 systems have need for automatic solar tracking these systems are known for significant efficiency increases in energy yield as a result of the integration and re use of waste or residual heat and are suitable for compact packaged micro solar powerplants that could be manufactured and transported in kit form and operate on a plug and play basis typical hybrid solar power systems include compact or packaged solar micro combined heat and power chp or mchp or solar micro combined cooling heating and power cchp chpc mcchp or mchpc systems used in distributed power generation these systems are often combined in concentrated solar csp and cpv smart microgrid configurations for off grid rural island or isolated microgrid minigrid and distributed power renewable energy systems solar tracking algorithms are also used in modelling of trigeneration systems using matlab simulink modelica or trnsys platform as well as in automation and control of renewable energy systems through intelligent

parsing multi objective adaptive learning control and control optimization strategies solar tracking algorithms also find application in developing solar models for country or location specific solar studies for example in terms of measuring or analysis of the fluctuations of the solar radiation i e direct and diffuse radiation in a particular area solar dni solar irradiance and atmospheric information and models can thus be integrated into a solar map solar atlas or geographical information systems gis such models allows for defining local parameters for specific regions that may be valuable in terms of the evaluation of different solar in photovoltaic of csp systems on simulation and synthesis platforms such as matlab and simulink or in linear or multi objective optimization algorithm platforms such as compose energyplan or der cam a dual axis solar tracker and single axis solar tracker may use a sun tracker program or sun tracker algorithm to position a solar dish solar panel array heliostat array pv panel solar antenna or infrared solar nantenna a self tracking solar concentrator performs automatic solar tracking by computing the solar vector solar position algorithms twincat spa or psa algorithms use an astronomical algorithm to calculate the position of the sun it uses astronomical software algorithms and equations for solar tracking in the calculation of sun s position in the sky for each location on the earth at any time of day like an optical solar telescope the solar position algorithm pin points the solar reflector at the sun and locks onto the sun s position to track the sun across the sky as the sun progresses throughout the day optical sensors such as photodiodes light dependant resistors ldr or photoresistors are used as optical accuracy feedback devices lately we also included a section in the book with links to microprocessor code on how the pixart wii infrared camera in the wii remote or wiimote may be used in infrared solar tracking applications in order to harvest free energy from the sun some automatic solar positioning systems use an optical means to direct the solar tracking device these solar tracking strategies use optical tracking techniques such as a sun sensor means to direct sun rays onto a silicon or cmos substrate to determine the x and y coordinates of the sun s position in a solar mems sun sensor device incident sunlight enters the sun sensor through a small pin hole in a mask plate where light is exposed to a silicon substrate in a web camera or camera image processing sun tracking and sun following means object tracking software performs multi object tracking or moving object tracking methods in an solar object tracking technique image processing software performs mathematical processing to box the outline of the apparent solar disc or sun blob within the captured image frame while sun localization is performed with an edge detection algorithm to determine the solar vector coordinates an automated positioning system help maximize the yields of solar power plants through solar tracking control to harness sun s energy in such renewable energy systems the solar panel positioning system uses a sun tracking techniques and a solar angle calculator in

positioning pv panels in photovoltaic systems and concentrated photovoltaic cpv systems automatic on axis solar tracking in a pv solar tracking system can be dual axis sun tracking or single axis sun solar tracking it is known that a motorized positioning system in a photovoltaic panel tracker increase energy yield and ensures increased power output even in a single axis solar tracking configuration other applications such as robotic solar tracker or robotic solar tracking system uses robotica with artificial intelligence in the control optimization of energy yield in solar harvesting through a robotic tracking system automatic positioning systems in solar tracking designs are also used in other free energy generators such as concentrated solar thermal power csp and dish stirling systems the sun tracking device in a solar collector in a solar concentrator or solar collector such a performs on axis solar tracking a dual axis solar tracker assists to harness energy from the sun through an optical solar collector which can be a parabolic mirror parabolic reflector fresnel lens or mirror array matrix a parabolic dish or reflector is dynamically steered using a transmission system or solar tracking slew drive mean in steering the dish to face the sun the power dish actuator and actuation means in a parabolic dish system optically focusses the sun s energy on the focal point of a parabolic dish or solar concentrating means a stirling engine solar heat pipe thermosyphin solar phase change material pcm receiver or a fibre optic sunlight receiver means is located at the focal point of the solar concentrator the dish stirling engine configuration is referred to as a dish stirling system or stirling power generation system hybrid solar power systems used in combination with biogas biofuel petrol ethanol diesel natural gas or png use a combination of power sources to harness and store solar energy in a storage medium any multitude of energy sources can be combined through the use of controllers and the energy stored in batteries phase change material thermal heat storage and in cogeneration form converted to the required power using thermodynamic cycles organic rankin brayton cycle micro turbine stirling with an inverter and charge controller book and literature review is ideal for sun and moon tracking in solar applications for sun rich countries such as the usa spain portugal mediterranean italy greece mexico portugal china india brazil chili argentina south america etc □□□□□□□□□□□□□□□□□□□ □□□□□□□□□□ □□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□ □□□□□□ □□□□□□□ □□□□□□ □□□ □□ □□□pc□□□□□□□□□ □□□□□□□□□□□ □□□□ □□□□□□□□□□□□□□□□□ □□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□ □□□□□□ □□□ □□□ □□□□ □□□□□□□□□□□□□□□□ □□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□ □□□□□□□□□ □□□ □□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□ □□□□□□□ □□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□ □□□□□□□□□□□□□□□□ □□□□□□□□□□□□□ □□□□□□ □□□□□

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