

Remote Facial Monitoring and GPS-Triggered Electrocuter for Motorcycle

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Abstract:

The project study is a remote facial monitoring and GPS-triggered electrocutor for a motorcycle, which is intentionally created to deter efforts to steal the vehicle. The project aimed to design, build, and find the acceptability of the project in terms of electrocution, GPS monitoring, and camera recording of the face of the stealer. This study used descriptive-developmental research. This research was examined for a number of days by different respondents, technicians, and specialists. The idea is an ignition system that incorporates a remotely actuated stun system and conductive handlebars that shock anyone who tries to touch them without permission. The GPS and camera have their own distinct source of power, which allows the system to be monitored and tracked at all times. The results indicates that the device was effectively conceptualized and built, integrating three main security features controlled remotely: an electrocution device on the handlebars, a GPS tracker with real-time location tracking, and a camera for capturing images and videos. The item worked fine. Each remote-control button did what it was supposed to do without interfering with other capabilities. So it was quite reliable and efficient. The user acceptability of GPS tracking was very high, and the safety system, video monitoring, and electrocutor were rated acceptable. Thus, the device can be operated and left for observation over a lengthy period of time to assess its endurance.

Keywords: Anti-Theft, Camera, Electrocuter, Motorcycles

1. Introduction

Motorcycle theft is becoming a serious issue for many owners in the Philippines, particularly in areas where it is rampant. Motorcycles are also important for transit and revenue, so the growing theft rate affects the financial and mental health of the victims. Motorcycle thefts, they say, are on the rise. The Highway Patrol Group of the Philippine National Police processes hundreds of cases a year. In January 2025, the PNP-HPG recovered 17 stolen motorcycles and arrested 45 persons. This data shows it is still difficult to reduce these crimes. The increase in motorbike thefts points to the need for stronger and more reliable security measures.

There were numerous methods to deter theft; many riders used padlocks, chains, and alarms for sensors. However, these tools occasionally prove ineffective against skilled thieves. Thieves can hotwire bikes using extra ignition switches in minutes, quickly bypassing alarms or cutting locks. Furthermore, the occurrence of theft in residential neighborhoods shows that being at home does not guarantee security. This highlights the shortcomings of existing security equipment and the need for stronger, tamper-proof,

and responsive solutions. These methods will assist owners in protecting their property and should prevent illegal access.

Technology has advanced. Today, anti-theft systems incorporate GPS tracking and security cameras with electronic tracking devices making it a lot easier to locate stolen vehicles because they tell you where they are immediately. Welsh & Farrington (2009) also claimed that surveillance technologies can be utilized to both prevent crime and assist police in investigating crimes by giving police recorded evidence. A high-tech motorbike security system should incorporate GPS and video systems since they make it easier to prevent thefts and respond to them once they happen.

The development of the proposed remote facial monitoring and GPS-triggered electrocutor for motorcycles has a broad basis in many fields related to motorcycle transportation, anti-theft devices, electrical safety, sensors, grounding systems, and intelligent security devices. One is the electric mosquito stunner technology that underlies the proposed non-lethal electrocutor. Recent studies suggest mosquito zappers use high-voltage but low-current electrical discharge, which may effectively disable small targets with a low probability of serious injury to humans under normal operating conditions (Merrill et al., 2005). The literature also underlines the necessity of the pulsed electrical discharge to manage the energy output and reduce the extended exposure, giving a scientific basis to adapt this technology to a motorbike anti-theft device.

Furthermore, Global Positioning System (GPS) technology proves its usefulness in real-time vehicle tracking and in the recovery of stolen motorcycles. The study of Abukari et al. (2024) proves that GPS can provide reliable location data, enabling the owner or authorities to find the stolen motorcycle. Similarly, GSM technology is an essential part of the car security systems, allowing remote communication via SMS notifications and remote ignition control (Du & Swamy, 2010 and Noman et al., 2018). These studies also indicate that GSM-based solutions are extremely dependent on the availability of the network and the quality of the signal, which might affect their efficiency in remote regions.

Surveillance cameras and facial monitoring in motorbike visibility discourage criminal activity by increasing the likelihood of detection (Baran et al., 2016), while camera systems provide vital real-time monitoring and record evidence during security incidents (Riyaz et al., 2020). The motion detection technology adds more value to the monitoring system by automatically notifying the owners in case of suspicious activity (Pachica et al., 2017). Various motorcycle safety measures, from disk locks to chain locks and alarm systems, are also assessed. The devices are designed to ensure a minimum level of theft protection; however, the present research shows either they are vulnerable to physical attacks or delay the theft but do not prevent the unauthorized usage of the motorcycle (Phoenix Motorcycle Training, 2020; EasyBlock SR, 2023). This situation means we need stronger combined anti-theft measures.

There were several sorts of sensors, like temperature, position, light, sound, proximity, infrared, ultrasonic, and touch sensors. The sensors turn the physical parameters into electrical signals, which can be interpreted by the intelligent electronic systems to detect changes in the environment and respond appropriately (Fraden, 2004). Touch sensors are especially intriguing because they can turn on a circuit when they come into contact with an object. The notion supports the suggested grounding and electrocutor system, which is supposed to be activated only when the unauthorized people contact the motorcycle handlebar. That's why protective grounding is so important to electrical safety. The resistance to the ground is important in the safe dissipation of electrical current and depends on the parameters of the surroundings (Kisielewicz, 2022). Supriyono and Amali (2024) also mentioned that the proper grounding

may improve the electrical stability, and the motorbike equipment can be operated remotely reliably. The results provide key engineering direction for the construction of a safe grounding mechanism for the proposed electrocutor.

Although there are many studies on GPS tracking, GSM alerts, surveillance systems, and grounding technologies, few of them are integrated into one motorcycle security system. There are many existing motorcycle security solutions that utilize mechanical locks, alarms, or tracking systems that can be bypassed or only assist in recovering the motorcycle after it has been stolen.

The general objective of the study is to fabricate a remote facial monitoring and GPS-triggered electrocutor for motorcycles. Specifically, it aims to: a) design and construct the Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle; b) test the Functionality of the Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle; c) determine the acceptability of the Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle in the aspect of electrocutor, GPS monitoring, camera monitoring, and safety.

2. Methodology

Research Design

A descriptive-developmental research design was used in the study. The descriptive part of the report detailed the planning, design, building, installation, and operation of the Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle. Meanwhile, the developmental part consists of designing, constructing, testing, amending and assessing the prototype. The development process involved design, construction and installation, testing and revision, and evaluation phases to enhance the functionality and acceptance of the device.

Samples and Data Gathering

The data collecting was carried out in a systematic manner. The survey questionnaire was designed and validated by the research panel. Secondly, the questionnaire was reviewed and approved by the Campus Research Ethics Committee. Third, a Certificate to Conduct Study was granted. Fourth, letters of approval were obtained from the research location. Fifth, the aims and procedures of the study were explained to the respondents. Sixth, questionnaires were administered to 50 technicians and mechanics of the 2nd Congressional District of Cotabato Province. Seventh, the finished surveys were gathered for analysis. During the testing phase, respondents also evaluated the design and functionality of the prototype and indicated the problems that served as the foundation for revision.

Data Analysis

The study systematically analyzes the data gathered from the respondents using descriptive statistics. To determine the average ratings on specific aspects of the device, the mean was computed for a central value of the respondents' perceptions. For items that require different levels of importance, the weighted mean is utilized to compute a truer reflection of overall responses. Lastly, the results of the mean and weighted mean were interpreted by the use of verbal descriptors such as "highly acceptable," "acceptable," "moderately acceptable," "not acceptable," and "highly not acceptable," making the numerical findings more meaningful and easily understood. These statistical tools guaranteed that the evaluation of the remote

facial monitoring and GPS-triggered electrocardiogram for motorcycles was objective, organized, and clearly presented.

3. Results and Discussion

Design of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle

The design of the Remote Facial Monitoring and GPS-Triggered Electrocuter for Motorcycle was conceptualized through various related literature, preceding arts, and existing motorcycle security systems. Various anti-theft technologies, GPS tracking devices, remote-controlled security systems, and surveillance cameras were examined by researchers to discover useful elements for incorporation into a single motorcycle security system. These past arts were references in the development of the general concept, functionality, and placement of the project components.

Based on the collected information and references, the researchers drew rough sketches and design layouts to conceptualize the appearance, location, and relationship of the parts inside the motorcycle. Several conceptual designs were developed to identify the right placement of the GPS module, camera module, wireless receiver, and electrocutor system, ensuring that safety, concealment, and functioning were maintained. The finalized design was chosen based on efficiency, accessibility, and compatibility with the motorbike structure.

There are three key security elements in the project, which are controlled by a wireless remote control. The first is the Electrocuter, which provides a controlled electric shock through the bars if there is an attempt at unlawful entry. The second is the GPS module, which is used to monitor the real-time location by the “DAGPS” application. The GPS module has its own power supply, and it can operate even when the motorcycle’s battery is low. Even with faulty connectivity, it will locate the motorcycle by texting the SIM card in the GPS module to get coordinates. Thirdly, the camera module uses the “VIIDURE” app to monitor, capture, and record videos to a TF SD card placed in the camera module.

Construction of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle

Primarily, gathering all the project materials, supplies, and components in place, such as the motorcycle battery, the wireless transmitter and receiver, the GPS module, the camera module with TF SD card, the electronic deterrent module, voltage regulators, step-down converters, and wiring cables. Based on the development of the design, a wireless receiver was selected as the main control unit to connect all the subsystems. A voltage compatibility and signal connection were checked so as not to damage the assembly. All systems were protected with electrical tape to be free from electrical failures and a fuse of the motorcycle’s 12V battery as well. A voltage requirement of the components was met using step-down converters, and the wireless receiver was installed, and it was synced with the transmitter for proper communication.

Moreover, the GPS module was connected to the control unit, and the antenna was placed in a suitable position to receive accurate signals while the module sent real-time location data to a smartphone. The camera module was then installed in a covert but efficient location along with a TF SD card to store the data. The camera is properly connected to ensure effective recording. Furthermore, the wireless receiver is connected to the electronic deterrent or immobilizer module that was fastened to the motorcycle frame and insulated so that it would not accidentally operate. All wiring was terminated by soldering or by connectors, while exposed wires were insulated with heat shrink tubing or electrical tape and routed to

avoid interference and damage during operation. All parts were installed inside the motorcycle under the passenger seat or side panels. Finally, all system performance was tested and calibrated. The GPS module was tested for location accuracy, the camera for video clarity and storage, the wireless system for signal stability, and the deterrent mechanism for safety.

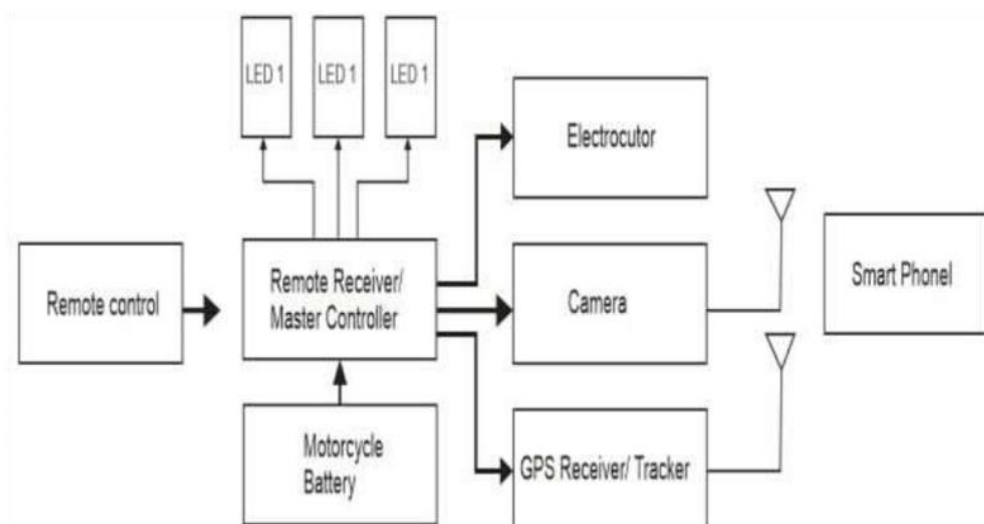


Fig. 1 Block Diagram



Fig. 2 Electrocutor in the handle grip



Fig. 3 Facial recognition installed in the side mirror



Fig. 4 GPS monitoring system mounted on the U-box

Functionality Testing of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle

Table 1 shows the remote facial monitoring and GPS triggered electrocutor (Fig. 1) block diagram for motorcycles using the remote control with 3 selected buttons. Each button is wired to an actuator and has its role in the security / monitoring of the system. The table shows the system response if you press the buttons once, twice, or not at all. This indicates the reliability and efficiency of the equipment.

Pressing button, A (assigned to the electrocutor) once turns on LED indicator 1 and switches on the handlebar grip actuator. The side mirror camera and phone map location are still disabled. The electrocution feature works fine except for components. This function is meant to immobilize or lock the motorcycle in case of unlawful use, as evidenced by the activation of the handlebar grip.

Press Button B (GPS Function) once to turn on the phone map finder. LED Indicator 2 was light up. The side mirror cam is still not working. The handlebar grip still not working. The results show that the GPS tracking technology works properly and can allow the owner to locate the motorcycle if needed. It also shows that only the selected function reacts to the command, and thus the other features are not disturbed. Similarly, pressing button C (camera system) once activates LED indicator 3 and activates the side mirror camera. Meanwhile, the handlebar grip and the phone map location are still off. It confirms the

functionality of the remote camera monitoring and could be used for visual surveillance of the motorbike's surroundings.

The table also shows that all LED indicators are off and all actuators are disabled when all buttons are pressed twice. That is, pressing the buttons twice is a system "deactivation" or reset command. It is effortless to disable all the functions when necessary.

In general, the results of Table 1 indicate that the remote-control system can fulfill its role. Each button turns on its component, appropriately without turning on any of the others. This implies that the device is a well-organized, reactive, and efficient motorcycle security and monitoring system.

Table 1. Functionality Testing

Remote control	Buttons	Actuators			
		LED Indicator	Handlebar grip	Phone map locator	Side mirror camera
A- Electricutor	1	1 - on	1	0	0
B - GPS	0	2 - off	0	0	0
C- Camera	0	3 - off	0	0	0
Interpretation			HG activated	All deactivated	All deactivated
A- Electricutor	0	1 - off	0	0	0
B - GPS	1	2 - on	0	1	0
C- Camera	0	3 - off	0	0	0
Interpretation			All deactivated	Activated	All deactivated
A- Electricutor	0	1 - off	0	0	0
B - GPS	0	2 - off	0	0	0
C- Camera	1	3 - on	0	0	1
Interpretation			All deactivated	All deactivated	Activated
A- Electricutor	2	1 - off	2	2	2
B - GPS	2	2 - off	2	2	2
C- Camera	2	3 - off	2	2	2
Interpretation			All deactivated	All deactivated	All deactivated

Legend:

Status

2 – pressed twice

1 – pressed once

0 - unpressed

Actuation

Deactivated

Activated

Deactivated

Acceptability of the Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle Terms of the Electrocuter

The statement “The electrocution (Fig. 2) system only activates when the remote control is turned on by the user” received the highest mean rating of 4.94, indicating that the device is considered “highly acceptable.” Respondents believe that the technology does not interfere with the regular ignition and operation of the motorcycle, and as it defines, electrical add-on systems must be electrically separated so that they do not impact the fundamental functions of the vehicle.

However, “Electrocution currents are available in the metal parts of the motorcycle” got a low mean of 1.48 with the verbal description of “Not Highly Acceptable.” It indicates that respondents strongly observed that electricity does not pass through the metal parts of the motorcycle. The design argued with Cervantes's (2026) concept that faulty grounding and electrical design in automobiles can lead to risks and interference with sensitive electronic systems, thus requiring proper isolation of electrical systems for safety and performance. The overall mean of 3.85 with a verbal description of “acceptable” depicts the respondents' acceptability of the remote facial monitoring and GPS-triggered electrocutor system as adequate in terms of safety, functionality, and protective capacity.

Table 2. Acceptability of the device in terms of Electrocuter

Statement	Mean	Verbal Description
Electrocution current is present at the time if it is enabled by the user.	4.90	Highly Acceptable
The presence of electrocution does not affect the electronic ignition system of a motorcycle	4.26	Acceptable
Electrocution is not too hazardous enough to kill	4.22	Acceptable
Electrocution currents are available in metal parts of motorcycle.	1.48	Not Highly Acceptable
Electrocution currents are still present even when two people are riding the motorcycles.	1.98	Not Highly Acceptable
The electrocution system only activates when the remote control is turned on by the user.	4.94	Highly Acceptable
The electrocution system does not cause damage to other electrical and electronics components of the motorcycle.	4.44	Acceptable
The device prevents motorcycles from starting when an attempted is made to steal them.	4.44	Acceptable
The device is suitable for improving motorcycle safety at home.	4.44	Acceptable
The device is suitable for personal motorcycle protection.	4.38	Acceptable
OVERALL MEAN	3.85	Acceptable

Acceptability of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle Terms of the GPS Monitoring

Table 3 presents the respondents' ratings on the acceptability of the device in terms of GPS monitoring (Fig. 4). The statement "The GPS becomes active if the remote control is activated" received the highest mean rating of 4.90 and was verbally interpreted as "Highly Acceptable." It suggests that respondents strongly agreed that the GPS system operates only through user activation, showing confidence in its controlled functionality. The acceptability is supported by the study of Moussa and Abderrahmane (2019), which stated that GPS tracking systems in security applications are commonly designed with remote or user-controlled activation for better operational security and power efficiency. Also Baran et al. (2016) explained that embedded tracking systems use electromagnetic isolation principles, allowing different electronic modules to operate independently without affecting each other.

Furthermore, the placement of GPS and the independent power supply also underscores the acceptance of the respondents of the device, which is high. As Kumar et al. (2019) explained, modern GPS tracking systems are often equipped with backup power supplies to ensure uninterrupted tracking capability. The overall mean of 4.81 yielded the respondents' acceptability, indicating that the GPS monitoring feature of the system for motorcycle tracking and theft recovery is highly acceptable.

Table 3. Acceptability of the device in term of GPS monitoring

Statement	Mean	Verbal Description
The GPS becomes active if the remote control is activated.	4.9	Highly Acceptable
The GPS can send location.	4.78	Highly Acceptable
GPS performance is not affected when the electrocution system is activated.	4.90	Highly Acceptable
GPS placement is hidden from potential thieves.	4.94	Highly Acceptable
The GPS had an independent power supply.	4.9	Highly Acceptable
The GPS keeps working as long as there is a mobile network.	4.82	Highly Acceptable
The GPS can be tracked via mobile phone.	4.82	Highly Acceptable
The GPS installed on the motorcycle can provide the location to the owner of the motorcycle.	4.8	Highly Acceptable
The GPS can accurately track its location even with or without a motorcycle.	4.68	Highly Acceptable
The system is useful for tracking a stolen motorcycle.	4.56	Highly Acceptable

Overall Mean	4.81	Highly Acceptable
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Acceptability of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle in Terms of Facial Monitoring

Table 4 divulges the respondent's acceptability of the device in terms of facial monitoring. It has an overall mean of 4.27, verbally described as "acceptable." There is a highest mean rating of 4.96, indicating that respondents highly accepted the features of the camera placement, which is safe and not easily noticed by thieves. This demonstrates that respondents strongly agreed that concealed camera placement enhances security and reduces the likelihood of detection by thieves. Hidden placement of surveillance devices improves protection against tampering and theft (Meek et al., 2016). Providing facial monitoring to the device increases protection from theft. More considering the placement of cameras permits effective capturing of clear facial images (Zhang et al. (2017).

In contrast, when the storage battery had a voltage lower than 1 volt, it observed that capturing images was not possible. A mean rating of 1.60 verbally describes that the device is not acceptable to respondents. Although respondents perceived that the performance of the camera differed from the battery performance. As Chandra et al. (2000) stress, adaptive energy management in digital cameras may still perceive low battery conditions as a limitation to camera performance. However, respondents generally considered the camera monitoring feature acceptable in terms of functionality, reliability, security, and usability for motorcycle monitoring and protection.

Table 4. Acceptability of the device in terms of facial monitoring

Statement	Mean	Verbal Description
The camera works well in the day or nighttime.	4.36	Acceptable
The camera maintains image clarity even when it exposed to heat.	4.46	Acceptable
The camera can capture faces or images and sent them to a phone.	4.66	Highly Acceptable
The camera installed on the side mirror captures clear facial images.	4.58	Highly Acceptable
The camera can still detect faces even when partly angled.	3.76	Acceptable
The camera captured and sent pictures when the motorcycle was stolen.	4.82	Highly Acceptable
The camera pictures or video are saved directly onto the memory card.	4.82	Highly Acceptable
The camera can still capture even if the battery is one (1) volt lower.	1.6	Highly Not Acceptable
The camera placement is safe and not easily noticed by thieves.	4.96	Highly Acceptable

The camera does not affect the normal use of the side mirror.	4.7	Highly Acceptable
Overall Mean	4.27	Acceptable

Acceptability of Remote Facial Monitoring and GPS Triggered Electrocuter for Motorcycle in Terms of Safety

Table 5 shows the evaluation done by the respondents on the safety aspect of the acceptability of the device. The device scored an overall average of 4.46, which translates into “Acceptable.” This means that the device used in the motorcycle is deemed to be safe to use and can further serve to provide some precautions against theft of the motorcycle. The presence of facial recognition, electric shocks, and GPS in the device makes the motorcycle owner feel safer because the device can prevent the theft of the motorcycle.

“The remote allows the device to be turned off safely” had the highest mean score of 4.58, which can be defined as “Highly Acceptable.” This indicates that the installation and activation of the device are done appropriately and the remote control sends signals to turn the device ON/OFF safely. Utilization of remote-control technology increases the level of safety because users will have access to the device in a controlled way (Rashid et al., 2016).

Moreover, the remote-controlled switching process works as a security measure and can prevent any damage that could occur to the electrical circuitry of the motorcycle. Also, it helps to prevent any unauthorized attempt of running the motorcycle and stealing it and makes people stay away from sitting on the motorcycle or gaining access to it in any way.

Table 5. Acceptability of the device in terms of Safety

Statement	Mean	Verbal Description
The device has a safety feature to prevent harm to the user.	4.28	Acceptable
The device does not turn on by accident.	4.24	Acceptable
The device has a safety feature that prevents damage to the motorcycle’s electrical circuitry.	4.56	Highly Acceptable
The device does not affect the normal operation of the motorcycle.	4.48	Acceptable
The device increases prevention of attempted motorcycle theft.	4.52	Highly Acceptable
The device is safe during normal use.	4.46	Acceptable
The remote permits the device to be turned off safely.	4.58	Highly Acceptable
The device is placed in a secured area.	4.54	Highly Acceptable
The devices attached to the motorcycle serve to protect it.	4.48	Acceptable

The device prevents bystanders from sitting on the motorcycle. 4.48 Acceptable

Overall Mean 4.46 Acceptable

4. Conclusions

The device named "Remote Facial Monitoring and GPS-Triggered Electrocuter for Motorcycles" has been developed and constructed to increase the safety of motorcycles from being stolen and to ensure the safety of both pedestrians and operators. The incorporation of an electrocutor, facial monitoring system, GPS monitoring and other safety mechanisms increases precautionary measures against theft. The facial monitoring turned out to be an efficient mechanism for recognizing people, and the GPS monitoring system appeared to be adequate enough for ensuring motorcycle tracking and recovering.

Nevertheless, some aspects, like distance, lighting conditions, and speed of the motorcycle or of the person being monitored, can influence the functioning of the device. The electrocutor mechanism has received a positive response as well, especially due to the fact that electrical discharge is limited by two handlebar grips. Despite the overall good assessment of the device, it requires further improvements concerning safety mechanisms, its efficiency and reliability.

For this reason, it can be recommended to make further improvements to the device and to integrate all its features into one compact system that can be easily attached to a motorcycle.

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