

ACTIONABLE INTELLIGENCE SPECIAL REPORT:

Second Lab Finds Ninestar and Subsidiaries Are Source for Chips Used on Counterfeit Toner Cartridges



EXECUTIVE SUMMARY

With one of the world's largest installed bases of digital printing devices, HP Inc.'s printers are popular targets for toner cartridge counterfeiters around the world. **Since the pandemic, HP has reported that counterfeiting has been on the rise and its Anti-Counterfeit and Fraud (ACF) unit has seized millions of fake ink and toner cartridges in Africa, the Americas, Asia, and Europe.**

As part of an ongoing effort to protect markets from counterfeit HP supplies, the firm's ACF unit retained Texplained, a Valbonne, France-based testing laboratory, to determine the source of a key component in counterfeit cartridges: integrated circuits or "chips." Essential in the production of functional cartridges, chips are used to establish a communication link with the printer. HP has been monitoring markets worldwide for third-party chips that may violate its intellectual property (IP) and deceive consumers into thinking that they are using HP supplies when they are not. Earlier this year, Actionable Intelligence released a report based on the results of chip testing done by a United States-based lab, MicroNet Solutions, Inc., a recognized expert in reverse-engineering integrated circuits. (Click [here](#) to download the report.)

Working independently, both labs tested chips harvested from toner cartridges used in some of HP's most popular machines, and, in many ways, Texplained's test results practically mirror those published by MicroNet Solutions. The French lab's testing found that:

- » Chips found on counterfeit toner cartridges employ code that mimics the behavior of genuine HP cartridges so that they are not detected as counterfeit cartridges by HP machines;
- » Chips taken from third-party and counterfeit toner cartridges are either pre-programmed or re-programmed to behave like original HP chips;
- » Non-HP chips programmed to behave as if they were manufactured by HP may mislead customers into believing they purchased an original cartridge; and
- » Re-programming third-party chips to simulate HP chip behavior is "easily done with a chip resetting tool and this facilitates counterfeiting."

After testing the cartridges, Texplained removed the protective covering from the infringing chips—a process known as "decapsulating" or "de-capping"—to examine the silicon etched into the microcontrollers. Like the U.S. lab, the French lab found markings on decapsulated chips taken from the counterfeit and third-party toner cartridges that "confirm" the samples had "all been produced by the same manufacturer owned by Ninestar Corporation."

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HP has begun to actively scour markets for third-party chips used on counterfeit cartridges and other chips that infringe its intellectual property (IP). Chips are essential to the proper operation of many HP cartridges and the company is now following these cartridge components closely to ensure they do not violate its IP protections. In the second half of 2022, HP commissioned Texplained, a testing facility based in Valbonne, France, to examine chips taken from third-party and counterfeit toner cartridges marketed for use in HP machines and compare them with the behavior of chips taken from genuine HP supplies. News of the French study follows a recently-released report from Actionable Intelligence featuring similar test results published last year by the U.S.-based testing lab MicroNet Solutions, which was also hired by HP. The results of Texplained's chip testing in many ways mirrored the conclusions that MicroNet Solutions published in the United States.

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In November 2022, Texplained released a slide deck detailing the testing it did on chip samples taken from select HP, third-party, and counterfeit cartridges. The samples came from counterfeits identified by HP channel partners or seized in China and in Egypt. Texplained also tested chips taken from cartridges manufactured and marketed by Ninestar Corporation and individual pre-programmed and programmable chips sold by Ninestar's chip subsidiary, Apex Microelectronics and its distributor Apus Soluções..

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Comparing the overall experience of printing, Texplained found that most of the chips identified the cartridges as genuine HP products in those machines featuring a front-panel display or supported with HP's Embedded Web Server (EWS). For these devices, the chip samples taken from the counterfeit cartridges and from most of the cartridges from Ninestar generated deceptive messages indicating falsely that the machines had genuine HP cartridges installed. According to Texplained, the chips with the deceptive messages featured code written to falsely identify the manufacturer as HP. The lab also analyzed certain physical characteristics and markings on the silicon that contained the integrated circuits. After removing the chip coverings, Texplained concluded that all the violating chips had been developed and manufactured by the same company—Ninestar Corporation.

SECTION 1 INTRODUCTION

Actionable Intelligence, Inc., the world's leading market research firm covering consumables used in home and office digital imaging devices, has learned that a French laboratory recently released the results of chip testing that was commissioned by HP Inc. News of the testing, which was conducted by the Valbonne, France-based firm Texplained, follows word of similar testing commissioned by HP in the United States by the Albuquerque, NM-based testing facility MicroNet Solutions, Inc. **Both laboratories are experts at reverse-engineering and evaluating the performance of integrated circuits and were hired by the printer maker to analyze and compare an assortment of cartridge chips for certain LaserJet machines. While each lab's testing was performed independent of the other's, the results were similar.**

(Note: See the appendix for a comparison of the test results from the two labs.)

Like the MicroNet Solutions testing, the French lab tested chips on toner cartridges from HP, the original equipment manufacturer (OEM), and compared their behavior to chips taken from non-HP cartridges marketed by the Ninestar Corporation, the world's largest producer of third-party supplies. Texplained also examined the behavior of chips harvested from counterfeit HP toner cartridges seized in various countries, including China, Egypt, and Germany. In addition to samples removed from cartridges, various chips were tested from the firm formerly known as Apex Microelectronics. Now doing business as Geehy Microelectronics, this Ninestar subsidiary is the world's largest producer of chips for third-party ink and toner cartridges.

The chip testing in France and the United States was done in conjunction with HP's Anti-Counterfeit and Fraud (ACF) unit. With hundreds of millions of LaserJet machines operating in the field, HP has one of the world's largest installed bases of digital printing devices and it is a favorite target for counterfeiters. According to HP, the availability of counterfeit HP supplies grew during the COVID pandemic and continues to rise. With its porous Eastern border, markets in Europe have been hit hard by counterfeiters, which makes the results from Texplained especially relevant to HP and its European channel partners.

Why Test Chips?

Small integrated circuits—or chips—can be found on most cartridges used in today's digital printers and copiers and they are essential for the full functionality of the machine. The chip establishes a two-way communication path with the firmware inside the printer or copier and transmits valuable information about the cartridge and its condition, which is displayed to the end user either through the front panel on the machine or in reports viewed on a computer. In some cases, the messages are available through both.

All toner cartridges used in LaserJet machines released since 2014 must have a chip or the machines will not operate properly. This is true regardless of whether the cartridge is from HP, a third-party, or even a counterfeiter. In some cases, if a chip doesn't work properly, the device will not print.

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According to HP, the availability of counterfeit HP supplies grew during the COVID pandemic and continues to rise.

As part of HP's ACF effort, it appears the company is seeking to identify the source of chips that counterfeiters use on the fake HP cartridges they are peddling. As noted, prior to retaining Texplained, HP hired MicroNet Solutions in the United States to analyze and compare an assortment of chips obtained from a variety of sources. That lab's test results were released late last year in a 22-page publication entitled *Third Party Aftermarket and Counterfeit Product Analysis HP Printers / Aftermarket Chips*, which is available for a free download at this link: http://micronetsol.net/wp-content/uploads/2022/10/22R0041_MSI_HP_Third_Party_Analysis.pdf.

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Actionable Intelligence examines those findings in its report, *Testing Performed for HP Finds Ninestar and Subsidiaries Are Source for Chips on Counterfeit Supplies*, which is available at this link: <https://www.action-intell.com/2023/02/21/micronet-solutions-inds-ninestar-and-subsidiaries-are-source-for-chips-on-counterfeit-hp-supplies/>.

Eye-Opening Results

The MicroNet Solutions report was quite revealing. Not surprisingly, the lab found that chips from counterfeit cartridges falsely identify the fakes as genuine HP supplies. Likewise, as anticipated, the chips on certain finished cartridges from Ninestar correctly identified them as non-HP. What was surprising, however, was that individual chips marketed by Apex/Geehy generated messages that falsely identified third-party supplies as HP products. Moreover, users of the Unismart chip resetter, an Apex/Geehy device, are given the option of producing chips that can correctly identify a third-party cartridge as non-HP or deceptively message the cartridge as genuine HP.

The reason for our surprise is that we thought issues related to chips misidentifying cartridges had been resolved years ago. The misidentification comes when third-party chips violate HP's IP protections. In 2013, HP put the third-party supplies industry on notice as to the problems of infringing chips. At the time, HP had a limited number of cartridges and LaserJet machines capable of prompting the printer's firmware as to the cartridge's origin, but the installed base of devices with that functionality was growing. All LaserJets released since 2014 have had the ability to provide messages to end users about the origin of cartridges installed in the device.

This messaging functionality is enabled in part by copyrighted code running HP's chips, which uses the firm's trademark to identify its origin. To ensure third-party chip makers stayed on the right side of its related IP protections, HP published a four-page technical paper, which is still available (click to access [**Aftermarket Chips for HP LaserJet Printers: Recommended Changes to Avoid Brand Misidentification**](#)). It explains that the chip's code generates a message about the cartridge's manufacturer, which is read by the printer's firmware. There are only a few ASCII characters in a couple of lines of code in the data structure of third-party chips that are used to identify the cartridge manufacturer and that code cannot use the term "HP" in the trademark field or a false message will be generated. HP's technical paper explains, by using the proper trademark code, companies marketing third-party cartridges can "validate that their products are not used to pass off counterfeit product."

According to a report in 2013 from the Recycling Times Media Corp., which caters to China's third-party supplies industry, HP representatives warned some 200 remanufacturers from more than 40 countries at an event in Zhuhai, China, that by misusing its trademark, third-

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In a video, an RT Media spokesperson said that HP representatives made clear that **“Consumers are being misled when the message on the printer screen says ‘genuine HP installed’ when an aftermarket cartridge is being used.”**

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PRESENTATION**



party chips could send “messages to the printer that infringe HP’s intellectual property.” In a video, an RT Media spokesperson said that HP representatives made clear that “Consumers are being misled when the message on the printer screen says ‘genuine HP installed’ when an aftermarket cartridge is being used. It also infringes HP’s brand.”

Given that Zhuhai is its home city, we believed that Ninestar and its subsidiaries were well aware of HP’s IP protection on its chip code. Listed on the Shenzhen Stock Exchange (002180.SZ), Ninestar is a large, multi-national enterprise with a market cap of over \$11 billion as of this writing. The firm promotes itself as being respectful of all IP and has initiated lawsuits against those that have encroached on its own patented technologies. It employs hundreds of engineers and technicians along with a sophisticated team of legal experts. Thanks to its chip subsidiaries, Ninestar is the world’s largest third-party cartridge chip producer and markets a range of chips for LaserJet compatible supplies. In fiscal 2021, the last full fiscal year we have data for, the firm reported it had sold 444.5 million chips and its general consumables sales, which were made up primarily of third-party ink, toner, and ribbon cartridges, totaled nearly \$865 million.

Texplained’s evaluation and analysis of cartridge chips in many ways mirrored the testing done by MicroNet Solutions in the United States. As detailed below, the French lab documented the end user experience when using sets of toner cartridges from various sources in HP laser devices. Texplained also did an extensive examination of the sample chips that included analyzing the Simple Network Management Protocol (SNMP) object identifier (OID) data and decapsulating each chip so it could inspect and record the die markings for each sample. Texplained’s findings, which are strikingly similar to those released by MicroNet Solutions, were made public in the 61-slide presentation, *Report: Counterfeits, Clones & Genuine Printer Cartridges*. Click here for a free **download**.

(Note: See the appendix for a side-by-side comparison of the results from the MicroNet Solutions and Texplained testing.)

SECTION 2 SAMPLES

In November 2022, Texplained released the results of the testing it performed for HP during the second half of last year. Like the MicroNet Solutions testing, the French lab analyzed chip samples taken from HP, third-party, and counterfeit cartridges employed by two LaserJet devices introduced in 2015: The HP LaserJet Pro M402dn and the LaserJet Enterprise M553dn. In addition, Texplained examined chips from toner cartridges used in the HP Laser107w, which were not tested by the U.S. lab. This entry-level machine is sold mainly in emerging markets and Europe.

The samples evaluated by Texplained included chips taken from:

1. HP CF226X and W1106A OEM toner cartridges
2. Counterfeit HP CF226X, CF361A, and W1106A cartridges
3. CF363A and W1106A compatible cartridges marketed by Ninestar Corporation

Texplained also evaluated pre-programmed Apex/Geehy chips sourced from Apus Soluções, one of the Chinese chipmaker's distributors based in Brazil. And the lab tested programmable chips from Apex/Geehy designed for use with its Unismart chip resetter. (Note: See below for an overview of Texplained's testing.)

Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP LaserJet Pro M402dn	CF226X	HP	HP
		Apus Soluções pre-programmed chip	
		Counterfeit seized in Germany	
		Counterfeit seized in Germany	
	CF226A	Apex Microelectronics B73 chip programmed using a Unismart device	Non-HP
		HP	
HP LaserJet Enterprise M553dn	CF361A	Apus Soluções pre-programmed chip	HP
		Counterfeit seized in China	
	CF363A	Ninestar cartridge	Non-HP
	CF360A	Apex Microelectronics B73 chip programmed using a Unismart device	Non-HP
			HP
HP Laser 107w	W1106A	HP cartridge	N/A
		Ninestar cartridge	
		Counterfeit seized in Egypt	
Source: Actionable Intelligence, based on information from Texplained			

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Actionable Intelligence estimates that China's domestic third-party supplies industry sells close to \$2 billion worth of cartridges annually and employs tens of thousands of workers.

Texplained's samples included chips taken from two counterfeit CF226X cartridges that came from an HP channel partner in Germany. The channel partner had sourced its cartridges from a wholesaler in The Netherlands. After receiving the order, the German company notified HP's ACF team that certain products were suspect, and it was determined that some of the CF226X cartridges were fakes. HP confirmed with the Dutch company that it had supplied its German channel partner with the products. It is believed that the counterfeits were sourced from one of the Dutch wholesaler's Eastern European suppliers. For years, counterfeiters have brought fake cartridges originating in Asia and the Middle East into Western Europe through distributors in Eastern Europe and Russia.

A sample chip taken from a counterfeit CF361A cartridge seized in China was also examined by the testing facility in France. The Chinese authorities nabbed the fake cartridge in 2021 as part of an ongoing crackdown on counterfeiters in China. According to the World Trademark Review (WTR), each year thousands of individuals are prosecuted by the Chinese government for intellectual property crimes, and prosecutions have seen double-digit growth in recent years. The Chinese government is dedicated to reducing the production of goods that violate IP, says WTR. Actionable Intelligence estimates that China's domestic third-party supplies industry sells close to \$2 billion worth of cartridges annually and employs tens of thousands of workers. Counterfeit cartridges represent a huge threat to this important industry. They not only siphon off sales from China's legitimate third-party supplies vendors, but counterfeiters also sully the reputation of all Chinese cartridge makers in foreign markets. Since the pandemic, the Chinese government has increased its scrutiny of the industry, and the sample provided to HP for testing came from a recent seizure.

A chip removed from a counterfeit W1106A cartridge seized in Egypt was also evaluated as part of Texplained's testing. HP has grown increasingly active over the past couple of years in rooting out fakes and removing them from African and Middle Eastern markets. According to an announcement last fall from the Imaging Consumables Coalition of Europe, Middle East, and Africa (ICCE), in 2021 and 2022 HP launched a dedicated anti-counterfeit initiative in Egypt along with several other Middle Eastern countries such as Saudi Arabia and the United Arab Emirates (UAE). Targeting local retailers selling counterfeits, ICCE indicated that the program successfully reduced the availability of fakes sold at brick-and-mortar stores in the region.

In addition to the counterfeits, Texplained compared the behavior of chips taken from OEM and from Ninestar toner cartridges. As noted in the following Analysis section, in one instance, the lab found that a chip on one of the Ninestar sample cartridges correctly identified it as non-HP. However, all the individual pre-programmed third-party chips from Apex/Geely that Texplained tested misidentified themselves as being OEM toner cartridges. In fact, the French lab determined that the chips from the counterfeits and the pre-programmed and programmable chips all came from the same source: Apex/Geely. The French lab further determined that Unismart users had the option of programming chips to properly identify cartridges as non-HP, or of programming them so they falsely indicated that they were genuine HP cartridges.

SECTION 3 ANALYSIS

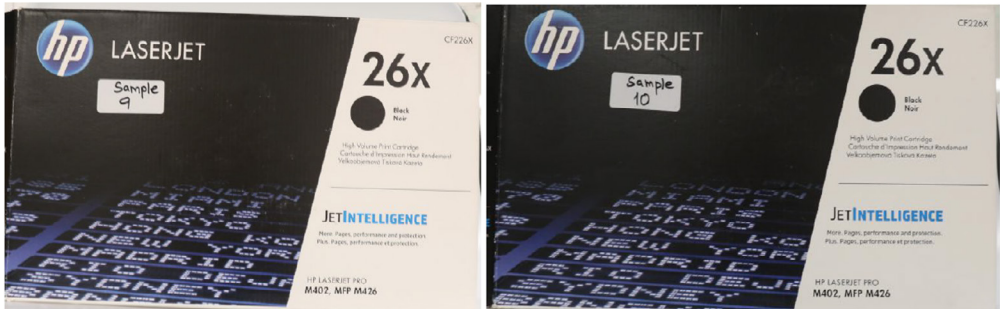
We begin our review of Texplained’s research with a detailed look at its testing of the CF226X cartridges used in the HP LaserJet Pro M402dn (see below). The lab compared the behavior of chips taken from an OEM cartridge with chips from the two counterfeits submitted by HP’s channel partner in Germany and with chips sourced from the Brazilian distributor, Apus Soluções. Texplained found that all the third-party chips mimicked the behavior of the chip on the HP cartridge.



HP LaserJet Pro M402dn

Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP LaserJet Pro M402dn	CF226X	HP cartridge	HP
		Counterfeits seized in Germany*	
		Apus Soluções chip	
*Two chip samples		Source: Actionable Intelligence, based on information from Texplained	



In the appendix of its presentation, Texplained provided images of the packaging the two counterfeit cartridges came in (see below) and it was virtually identical to HP’s boxes.





In addition to the deceptive packaging, the French lab found that the chips on the counterfeits contained code that generated messages in the machine falsely indicating that genuine HP cartridges were installed. On the front panel, for example, the chips on the counterfeits falsely triggered the same message as an original HP cartridge, saying: “Genuine HP installed.” These results were consistent with MicroNet Solutions’s findings.

Texplained also gathered information presented to end users via their computers that identifies the cartridges being used. LaserJet machines are supported by what is known as an Embedded Web Server (EWS). This web-based technology monitors the machine's operational status and provides other functions such as firmware updates. The EWS tracks the machine's consumables and reports the type of cartridge installed to the end user along with information such as the cartridge's manufacturer and when it was installed.

The four images below compare the Supplies Status section of EWS reports for the sample CF226X cartridges that Texplained tested in the HP LaserJet Pro M402dn. The genuine HP CF226X cartridge sample is identified as a "Black Cartridge" in the EWS as shown in the red box in the image on the top left. In the EWS report, "Black Cartridge" signifies an OEM consumable is being used. The third-party cartridge using an Apex/Geehy chip sourced from Apus Soluções misidentified its cartridge as an OEM product (top right) as did the chips on the counterfeit cartridges (bottom left and right). As we shall see in the set of sample cartridges used in the LaserJet Enterprise M553dn, the EWS should instead identify these three cartridges as "Non-HP."

 Black Cartridge Order 26X (CF226X)	80% *	 Black Cartridge Order 26X (CF226X)	100% *
Status: Normal Approximate Pages Remaining *: 5950 Pages Printed With This Supply *: 2208 Serial Number: 0016912433-7A24 First Install Date: 20180725 Last Used Date: Not Available		Status: Normal Approximate Pages Remaining *: > 7200 † Pages Printed With This Supply *: 1 Serial Number: 0016922170-6B1C First Install Date: Not Available Last Used Date: Not Available	

 Black Cartridge Order 26X (CF226X)	100% *	 Black Cartridge Order 26X (CF226X)	100% *
Status: Normal Approximate Pages Remaining *: > 7200 † Pages Printed With This Supply *: 2 Serial Number: 0016844396-5J25 First Install Date: Not Available Last Used Date: Not Available		Status: Normal Approximate Pages Remaining *: > 7200 † Pages Printed With This Supply *: 2 Serial Number: 0016844396-5J25 First Install Date: Not Available Last Used Date: Not Available	

In addition to examining black toner cartridges in a monochrome HP LaserJet Pro M402dn desktop printer, Texplained tested several third-party color toner cartridges in an HP LaserJet Enterprise M553dn (see the next page). The French lab tested the machine with a third-party CF361A cyan cartridge using an Apex/Geehy chip sourced from Apus Soluções and a counterfeit CF361A cyan cartridge seized in China. The lab also tested a Ninestar compatible CF363A magenta toner cartridge.

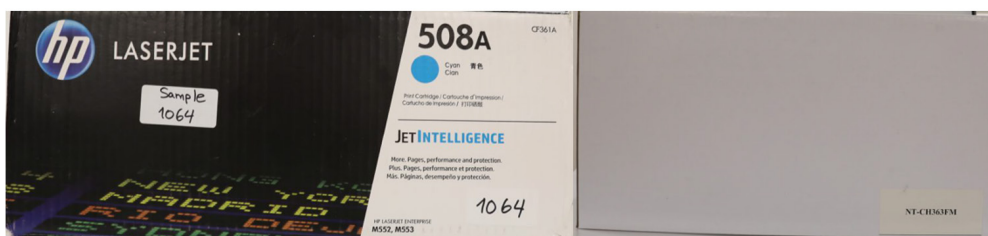


**HP LaserJet
Enterprise M553dn**

Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP LaserJet Enterprise M553dn	CF363A	Ninestar compatible	Non-HP
	CF361A	Counterfeit seized in China	HP
		Apus Soluções chip	

Source: Actionable Intelligence, based on information from Texplained

The slide deck that Texplained released features images of the packaging for the counterfeit cartridge (below left) obtained from the Chinese authorities and the white box that the Ninestar compatible sample (below right) shipped in.



The lab also provided images of the Supplies Status Page from the EWS for each sample cartridge (see the next page). In this set, the EWS status report for the counterfeit cyan cartridge (top) and the third-party cyan cartridge (middle) with the Apex/Geehy chip sourced from Apus Soluções both identify the cartridges as a “Cyan Cartridge,” indicating falsely that these are genuine HP products. The magenta cartridge sourced from Ninestar, however, correctly identifies itself as a “Non-HP Magenta Cartridge” (bottom).

Cyan Cartridge	
Order 508A (CF361A)	100%*
Status:	OK
Approximate Pages Remaining:†	>4100
Serial Number:	100795560
Pages printed with this supply:*	1
First Install Date:	20210820
Last Use Date:	20220922

Cyan Cartridge	
Order 508A (CF361A)	100%*
Status:	OK
Approximate Pages Remaining:†	>4100
Serial Number:	100730034
Pages printed with this supply:*	1
First Install Date:	20221102
Last Use Date:	20221102

Non-HP Magenta Cartridge††	
Order 508A (CF363A)	100%*
Status:	OK
Approximate Pages Remaining:†	>4100
Serial Number:	100729767
Pages printed with this supply:*	1
First Install Date:	20220921
Last Use Date:	20220921

▼
 in the code extracted from the third-party cyan cartridge with the Apex/Geehy chip and from the chip on the counterfeit cyan cartridge, the French lab **recognized values that misidentified them as HP cartridges in the EWS.**

Like MicroNet Solutions, Texplained extracted and analyzed the SNMP OID data used by the HP LaserJet Enterprise M553dn to identify consumables. In the code extracted from the third-party cyan cartridge with the Apex/Geehy chip and from the chip on the counterfeit cyan cartridge, the French lab recognized values that misidentified them as HP cartridges in the EWS. Likewise, the lab reported that code extracted from the Ninestar compatible was written such that it would properly identify the cartridge as “Non-HP.”

As noted, the Texplained report includes test results from the entry-level HP Laser 107w (see the next page), which was not examined by MicroNet Solutions. The single-function monochrome unit, which was introduced in the spring of 2019, features technology based on Samsung architecture. HP acquired the technology as part of its acquisition of Samsung’s printer business in 2017.



HP Laser 107w

Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP Laser 107w	W1106A	HP cartridge	N/A
		Ninestar compatible	
		Counterfeit seized in Egypt	
Source: Actionable Intelligence, based on information from Texplained			

The French lab tested a chip taken from a genuine HP W1106A cartridge, a counterfeit W1106A cartridge (below left) that was seized in Egypt, and a G&G compatible (below right) that is marketed by Ninestar. As we will see below, Texplained's examination of the non-HP chips indicated that they originated at the same source.



Chips Programmed Using Unismart

In addition to examining chips found on various sample cartridges and pre-programmed chips sourced from the Apex/Geehy Brazilian chip distributor, Apus Soluções, Texplained analyzed chips that were programmed using the Unismart chip resetter. Now in its third generation, this device, which is manufactured by Apex/Geehy, was introduced in 2007 and is popular with third-party supplies manufacturers. The Unismart 3 unit (see <https://www.apexmic.com/unismart/about>) premiered in 2017 and *Recycling Times Magazine*, a trade publication that caters to China's third-party supplies industry, claims the device can reset over 4,000 chipsets used on ink or toner cartridges (see <https://www.rtmworld.com/unboxing-the-latest-chip-resetter-unismart-3/>).



Like MicroNet Solutions, the French lab tested samples programmed using the Unismart device for toner cartridges employed by the HP LaserJet M402dn and samples for the HP LaserJet M553dn. Both labs independently determined that the Apex/Geehy device can be configured to program chips so they correctly identify third-party cartridges as “non-HP” or misinform end users that an HP cartridge is installed in the machine when that is not true. (Note: See the table on the following page.)

Both labs independently determined that the Apex/Geehy device can be configured to program chips so they correctly identify third-party cartridges as “non-HP” or misinform end users that an HP cartridge is installed in the machine when that is not true.



Device type	Cartridge type	Unismart configuration	Cartridge identified as
HP LaserJet Pro M402dn	CF226A	CF226A-V2	HP
		CF226A-N-V2	Non-HP
HP LaserJet Enterprise M553dn	CF360A	CF360A-V2	HP
		CF360A-N-V2	Non-HP

Source: Actionable Intelligence, based on information from Texplained

Texplained provided images of the EWS Supplies Status reports from the HP LaserJet M402dn for two Unismart configurations. When a third-party cartridge is used with a chip programmed using the Unismart configured to the CF226A-V2 setting, the EWS reports it as being an OEM consumable as shown in the image below on the left. Conversely, when configured to CF226A-N-V2, the EWS reports the consumable correctly as shown in the image below on the right.

 Black Cartridge Order 26A (CF226A)		100% *
Status: Approximate Pages Remaining *: Pages Printed With This Supply *: Serial Number: First Install Date: Last Used Date:	Normal > 2450 † 2 0016842833-5F17 Not Available Not Available	
 Non-HP Black Cartridge * Order 26A (CF226A)		100% †
Status: Approximate Pages Remaining †: Pages Printed With This Supply †: Serial Number: First Install Date: Last Used Date:	Normal > 2450 ‡ 2 0016842825-6F21 Not Available Not Available	

When it examined chips programmed using the Unismart unit for third-party black cartridges in the HP LaserJet M553dn, the lab detailed similar results. A chip programmed using the device configured to its CF360A-V2 setting indicates falsely in the EWS report that an HP cartridge is installed, as the lab's image below on the left shows. However, when configured to CF360A-N-V2, the EWS report identifies the cartridge correctly as shown on the right. According to Texplained, it extracted SNMP OID data from chips programmed using the Unismart device and found values in the code for the CF360A-V2 setting that refer to HP. Although it did not say it in the lab's slide deck, we believe that the HP reference in the data is a violation of the OEM's IP.

Supplies Status Page		Supplies Status Page	
 Black Cartridge Order 500A (CF360A)		 Non-HP Black Cartridge † Order 500A (CF360A)	
100% *		100% †	
Status: Approximate Pages Remaining †: Serial Number: Pages printed with this supply: First Install Date: Last Use Date:	OK ~4800 10072852 5 20220922 20220922	Status: Approximate Pages Remaining †: Serial Number: Pages printed with this supply: First Install Date: Last Use Date:	OK ~4800 10072850 5 20220922 20220922

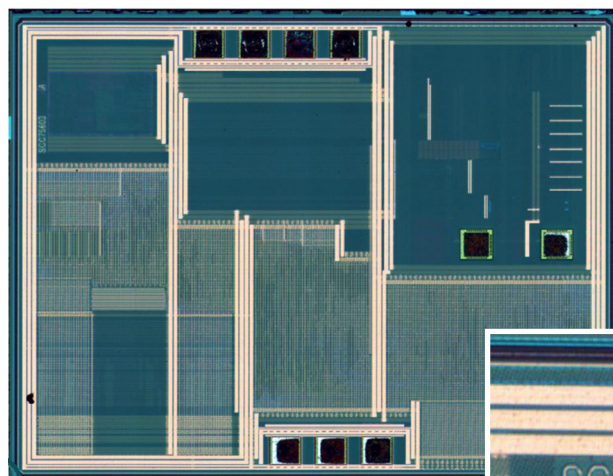
Die Marks

Texplained analyzed the physical structure of the various chips it tested. Like the analysis performed by MicroNet Solutions in the U.S., the French lab “decapsulated” the chip samples. Also known as “decapping,” the decapsulation process involves removing the chip’s protective coating to expose the silicon substrate where the integrated circuits are etched.

The French lab decapped 11 chip samples and optically scanned each chip's top layer, finding at least one die mark on each chip. Although several samples contained a second integrated circuit of unknown purpose and origin, all the samples decapped by Texplained housed an integrated circuit for use on a third-party toner cartridge. A list of the chips identifying each sample's source and its corresponding die mark is presented in the table below.

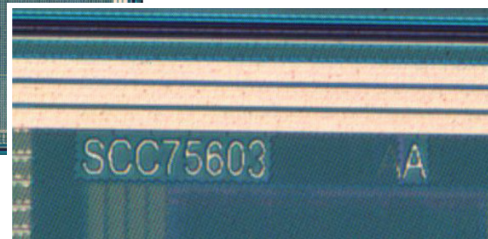
Chip source	Die mark 1	Die mark 2
Ninestar CF363A compatible	SCC75603	—
Unismart programmable B73		
Counterfeit CF226X		
Counterfeit CF361A		
Apus Soluções CF361A	SEC-CHIP UM5012V20160715	SCC2016 HII790FS
Apus Soluções CF226X		
Counterfeit CF226X		
Apex W1106A (2 samples)	SCC75605	SEC-CHIP SCC232V20190529
Ninestar W1106A compatible		
Counterfeit W1106A		
Source: Actionable Intelligence, based on information from Texplained		

In addition to presenting what Texplained referred to as “Top Optical Imagery” for each chip sample, the lab also provided close-up images of the die marks (see images below). All the chips housing integrated circuits identified for cartridge use shared similar “SCC” die markings, as shown in the close-up images. In addition, seven of the samples were inscribed with “SEC-CHIP” chip marks.

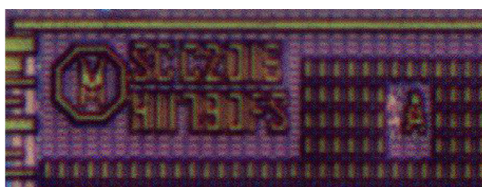
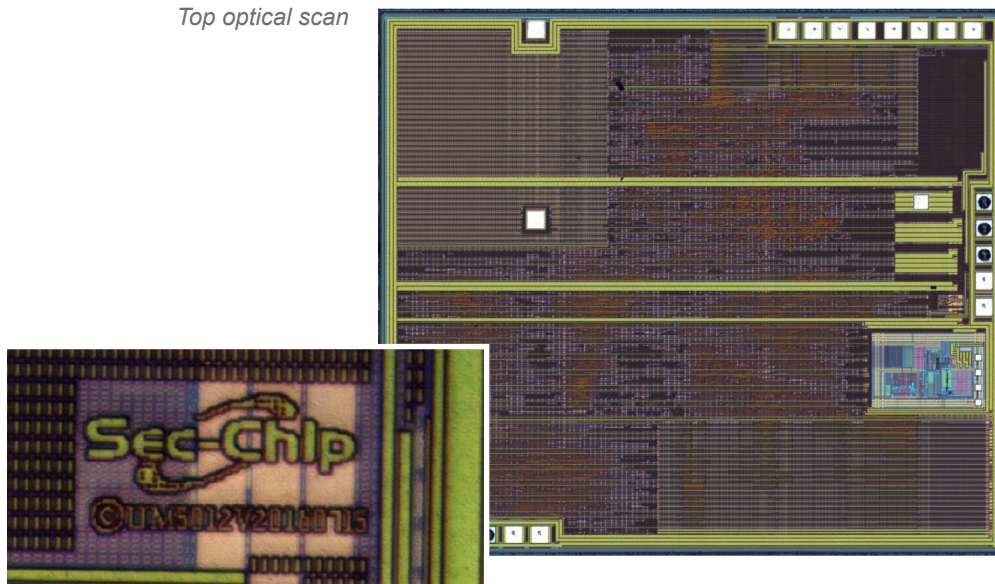


Top optical scan

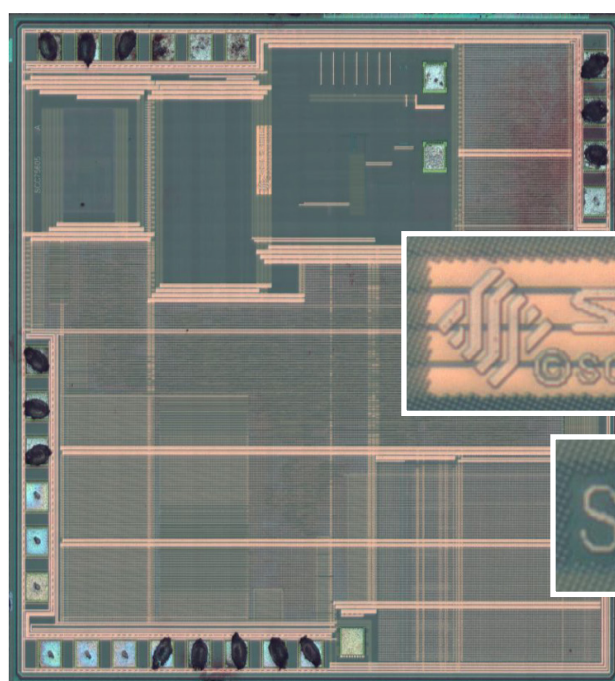
Die mark close-up



Top optical scan



Die mark close-ups



Top optical scan

Die mark close-ups

Although we cannot say that the die marks on the chip samples presented by Texplaind are absolutely identical to the corresponding images presented by MicroNet Solutions in its report, the images are strikingly similar. As noted, the French testing facility shared the U.S.-based lab's conclusion: All of the third-party chip samples were manufactured by a Ninestar company. (Note: See the appendix for tables comparing the die marks noted by MicroNet Solutions and Texplaind.)

Key Findings

In the 61-slide presentation, *Report: Counterfeits, Clones & Genuine Printer Cartridges*, released by Texplaind in November 2022, the French lab offered a summary of its results from the testing commissioned by HP. While not identical to those released by the U.S.-based lab MicroNet Solutions last year, Texplaind's results are remarkably similar. Like the report released by MicroNet Solutions, the French lab determined that chips from Ninestar Corporation are used by counterfeiters to produce counterfeit HP-branded toner cartridges, although it did not indicate that the Chinese firm itself actually manufactured the fake products. Other results included the discovery that third-party chip samples mimic the behavior of HP's chips, which can deceive end users into believing they are using genuine HP products when they are not.

Texplaind summarized its test findings as follows:

1. The chips found on counterfeit cartridges have been programmed so that they behave exactly like original HP chips and are not detected as counterfeit cartridges by HP printers
2. The clone chips found on aftermarket cartridges have either been pre-programmed (as had happened in the counterfeit cartridges) or can be easily re-programmed to be identified and behave like original HP chips
3. When clone chips are re-programmed with "HP" as the manufacturer, customers may be misled into believing they purchased an original cartridge
4. Re-programming clone chips to simulate original chip behavior is easily done with a chip resetting tool and this facilitates counterfeiting
5. Decapsulating the chips found on counterfeit cartridges and other tested clone chips revealed markings that confirmed that they had all been produced by the same manufacturer owned by Ninestar Corporation

APPENDIX

Comparing the Studies

As noted earlier in this report, both MicroNet Solutions and Texplained examined chip samples taken from replacement toner cartridges employed by one of two machines: The HP LaserJet Pro M402dn and the LaserJet Enterprise M553dn. The cartridges the two labs sampled included counterfeit and third-party products along with cartridges sourced from HP. Texplained also examined chips from replacement cartridges used in the entry-level HP Laser 107w, which were not tested by the U.S. lab. In addition to chips taken from various finished cartridges, the France- and U.S.-based testing labs evaluated pre-programmed individual chips marketed by Ninestar Corporation's chip subsidiary Apex Microelectronics, which now does business as Geehy Microelectronics. Some of these chips were pre-programmed and sourced from Apus Soluções, one of the Chinese chipmaker's distributors based in Brazil, while the others were programmable chips from Apex/Geehy designed for use with its Unismart chip resetter. The test results from the two laboratories are summarized below.

Testing Lab			
MicroNet Solutions			
(USA)			
Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP LaserJet Pro M402dn	CF226X	Two counterfeits seized in Germany	HP
		Apus Soluções (Pre-programmed chip)	
	CF226A	HP	HP and Non-HP*
		Apex Microelectronics (B73 chip programmed using a Unismart device)	
HP LaserJet Enterprise M553dn	CF361A	Counterfeit seized in China	HP
		HP	
		Ninestar cartridge	Non-HP
	CF361X	Apus Soluções (Pre-programmed chip)	HP
		Apex Microelectronics (B73 chip programmed using a Unismart device)	HP and Non-HP*
*Unismart device allows end user to program chips to identify cartridge as either "HP" or "Non-HP"			
Source: Actionable Intelligence, based on information from MicroNet Solutions			

Testing Lab Texplained (France)			
Device type	HP cartridge number	Chip sample origin	Cartridge identified as
HP LaserJet Pro M402dn	CF226X	Two counterfeits seized in Germany	HP
		Apus Soluções (Pre-programmed chip)	
		HP	HP
	CF226A	Apex Microelectronics (B73 chip programmed using a Unismart device)	HP and Non-HP*
HP LaserJet Enterprise M553dn	CF361A	Counterfeit seized in China	HP
		Apus Soluções (Pre-programmed chip)	
	CF363A	Ninestar cartridge	Non-HP
	CF360A	Apex Microelectronics (B73 chip programmed using a Unismart device)	HP and Non-HP*
HP Laser 107w	W1106A	Counterfeit seized in Egypt	N/A
		Ninestar cartridge	
		HP cartridge	
*Unismart device allows end user to program chips to identify cartridge as either "HP" or "Non-HP"			
Source: Actionable Intelligence, based on information from Texplained			

Each lab decapsulated the third-party chip samples as part of the testing commissioned by HP. The process involves removing the protective covering from each chip to reveal the die marking on the individual chip's silicon substrate. Die marks are unique to a chip's manufacturer. It was determined that each third-party chip examined by MicroNet Solutions and Texplained was sourced from the same manufacturer: Ninestar Corporation. The tables below offer a comparison of the die marks on the decapsulated chips discovered by each lab.

Testing Lab		
MicroNet Solutions (USA)		
Chip source	Die mark 1	Die mark 2
Apus Soluções CF226	SCC75603	—
Counterfeit CF226A		
Apus Soluções CF361X		
Counterfeit CF226X	SEC-CHIP UM5012V20160715	SCC2016 HII790FS
Counterfeit CF361A		
Ninestar CF361A		
Unismart programmable B73		
Source: Actionable Intelligence, based on information from MicroNet Solutions		

Testing Lab		
Texplained		
(France)		
Chip source	Die mark 1	Die mark 2
Ninestar CF363A	SCC75603	—
Unismart programmable B73		
Counterfeit CF226X		
Counterfeit CF361A		
Apus Soluções CF361A	SEC-CHIP UM5012V20160715	SCC2016 HII790FS
Apus Soluções CF226X		
Counterfeit CF226X		
Apex W1106A (2 samples)	SCC75605	SEC-CHIP SCC232V20190529
Ninestar W1106A		
Counterfeit W1106A		
Source: Actionable Intelligence, based on information from Texplained		



About Actionable Intelligence

Actionable Intelligence is the leading source for news, analysis, and research on the digital printer and MFP industry and the original and third-party consumables business. Actionable Intelligence provides clients with customized research and consulting, as well as up-to-date news and strategic analysis on Action-Intell.com, the industry's leading destination site visited by tens of thousands of printer and supplies executives worldwide. Global printer OEMs, third-party supplies vendors, distributors, resellers, and a diverse mix of other companies rely on Actionable Intelligence to deliver timely and accurate information about the trends shaping the printer hardware and supplies markets. To learn more about Actionable Intelligence, visit www.action-intell.com.