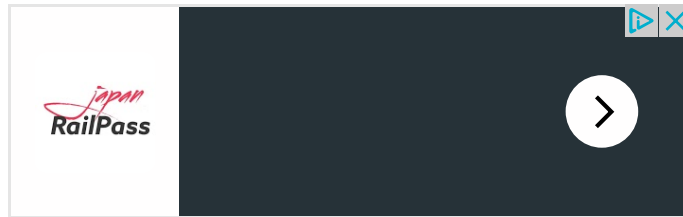


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LIFE

3 Secrets Behind the Wonders of the Shinkansen (Japanese Bullet Train)

Japan's shinkansen has been praised overseas for its punctuality, comfort, and safety. Here are the secrets behind its success.

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TSUNAGU — SEPTEMBER 18, 2014

This post is also available in: Chinese (Traditional)



The Japanese shinkansen, or bullet train, is one of Japan's most prominent technological advancement and it receives a lot of attention from overseas. The Tokaido shinkansen takes 2 hours and 25 minutes between Tokyo and Shin-Osaka, and has a top speed of 270km/hour. This year is its 50th anniversary and since 1964 it has transported more than 5 billion people.



PIXTA

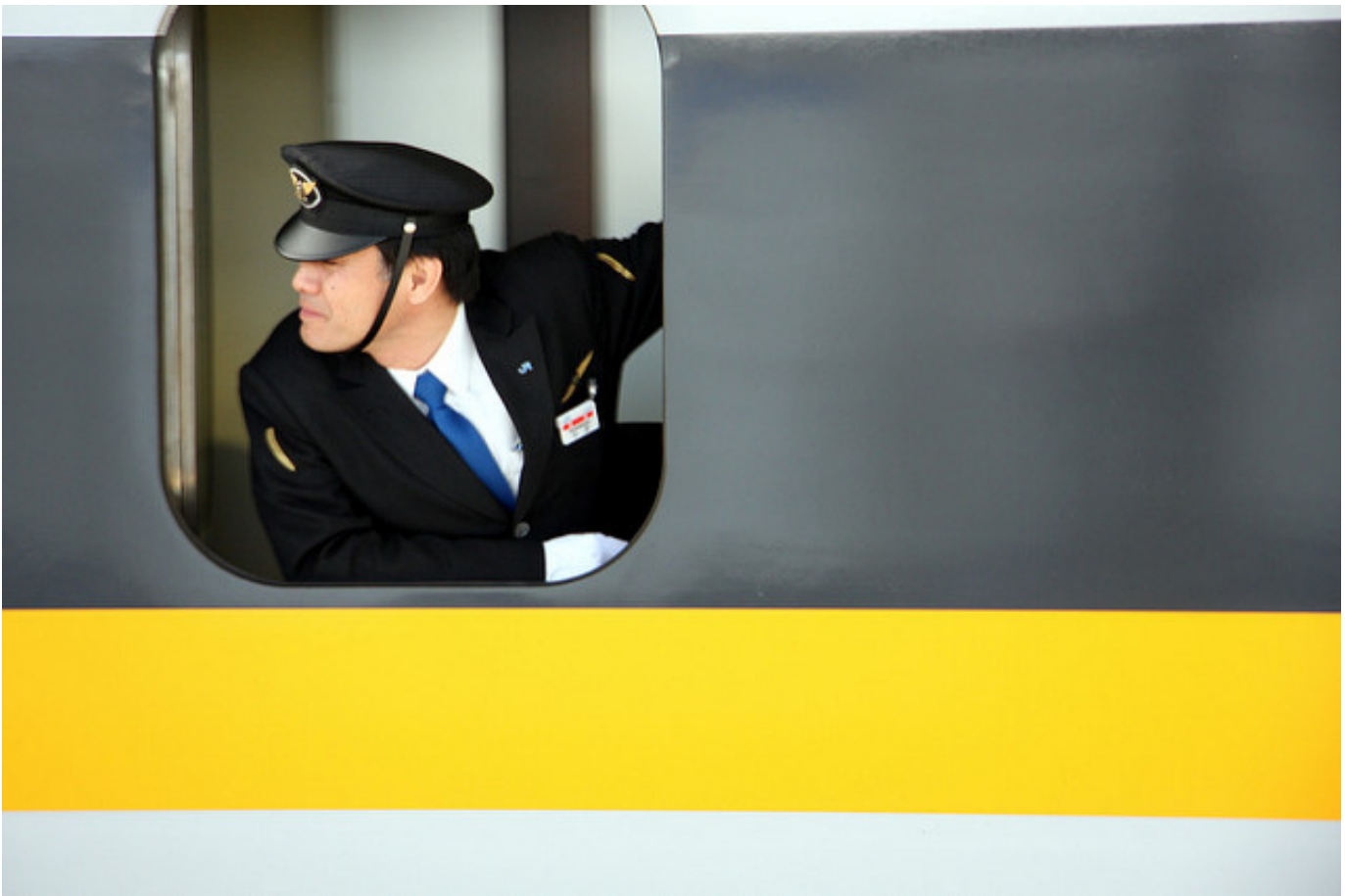
Of course, the speed is one of the reasons tourists are so shocked by the shinkansen, but there are other reasons like the punctuality, the comfort, and the safety.

1. **Punctuality:** the trains are almost never late. The yearly average delay time per train is 30 seconds.
2. **Comfort:** the trains run smoothly and are kept very clean.
3. **Safety:** in its 50 years of operation, there has never been a accident-related death.

Of course all this is attributed to the technology, but actually the drivers and other staff that support the way the train runs contribute hugely to the shinkansen's quality.

(Part of this article comes from TV Asahi's "Korezo Nippon Ryu" and has had original content added.)

Secret #1: The conductor has a high skill level



Lee LeFever/Flickr

In a year, 120,000 trains run on the the Tokaido shinkansen tracks. On a heavy day, more than 400 trains run, so in terms of time that's 1 train every 3 minutes.

Because the interval between trains is so short, if one train is late even a little it will affect all the trains coming behind it, but the yearly average delay is only 30 seconds. This takes huge delays caused by events like typhoons into consideration, so it means that trains on a regular basis are not late.

Because there are not many platforms, it is important that the shinkansen is always on time so that they can serve as many customers as possible. However, what is the real reason the trains are so punctual?

The real reason behind the train's punctuality is the conductor. Since the shinkansen is such a high tech vehicle, you may think that the conductor has an easy job, but that's not the case. Here are some of the secrets behind shinkansen conducting.

a. The speed calculations are always extra-accurate

The shinkansen conductor is constantly mentally calculating the speed the train needs to run at in order to get to the next station precisely as planned.

By the way, when the train pulls in and out of station, the conductor announces how late or fast the train was in seconds, and confirms the time using a pocket watch assigned by the company.

 mark.kawata



Embedded from Instagram

All the meters run digitally, but that watch remains analog. With a digital watch, you have to calculate if it's running fast or slow, but you can tell with an analog watch how long it is until the next station with a glance. For that, the watch remains analog.

With a pocket watch, it is easier to make split-second calculations. For example, if you have an hour left to get to the next station 100km away, then you would drive at 100km/hour. If it was 30 minutes away, then 200km/hour. Using a pocket watch makes this mental arithmetic more visual and easier to do.

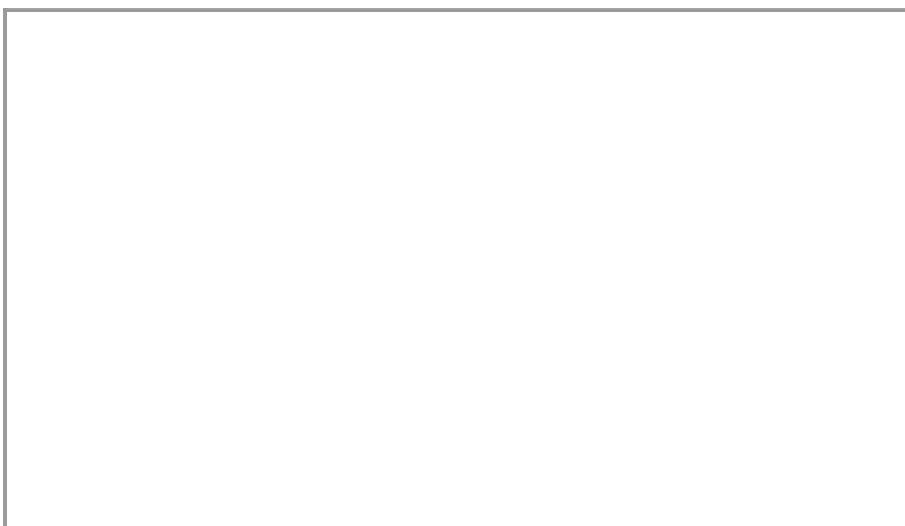


PIXTA

Furthermore, in order for the conductor to be able to protect the train's punctuality, they also establish how long it is to the next station that they pass through even if it isn't a stop on their route.

Every time a train passes through a station it isn't stopping at, the conductor will say it out loud and check the time. If the train is going faster or slower than scheduled, they finetune the speed to match. Using their proficient techniques, they correct the gap in time at every station they pass through.

Female conductor



For example, from Shin-Yokohama Station to Nagoya Station is 300km, so if the train runs at 270km it will take a little over an hour. However, in reality it takes an hour and twenty minutes. Because there are curves and slopes in the rail, the speed changes in consideration for safety and the passengers' comfort.

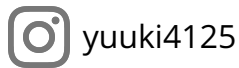
This way, when they calculate the speed in order to accelerate within the limited time, they don't have to go at an impossible speed nor do they have to decelerate, so passengers can spend their time on the train in comfort.

For the conductor, accurately calculating the speed ties into the train's punctuality and the pleasant ride.

b. Strategic power against unexpected occurrences

Actually, as the shinkansen runs, it may break a little bit, but not enough to stop the train. When that happens, the conductor can't change the train schedule, so they deal with the breakdown as they drive.

In order to stay calm whenever something happens, conductors regularly practice driving on simulators.



yuuki4125



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The simulator creates scenarios where various breakdowns occur. As the conductor drives, he consults a manual and says his approach to the problem out loud. Of course, as he does all this, he is calculating the speed and adjusting the accelerator.

With this sort of regular practice, the driver can reach even the lowest level of skill necessary to stay calm no matter what happens.

Secret #2: The wonders of the cleaning staff

It's not just the conductor's skills that supports the punctuality and the comfort.

When the train reaches its last stop, before it turns around and departs for its next destination, there is a little less than ten minutes excluding the passengers getting off and on. In that short time span, the cleaning staff quickly makes the inside of the cars spotless.



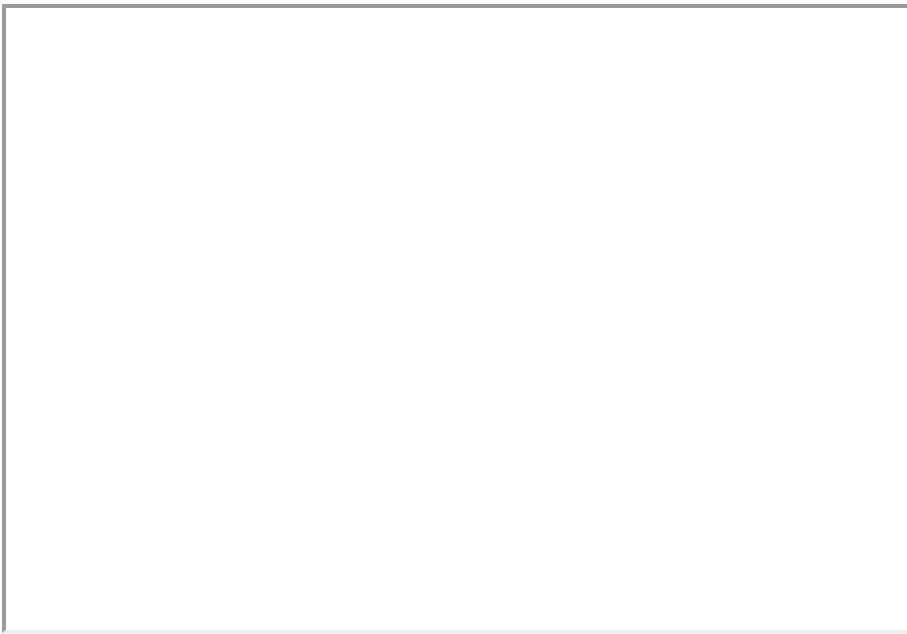
insho impression/Flickr

As the door opens, they rush in, and with incredible energy they dust the seats, wipe the windows and tables, and change the seat covers. In their hands are an electric cleaner and a garbage bag. They make the inside of the carriages sparkle in less than ten minutes, and then bow to the passengers waiting on the platform. They disappear like the wind.

www.yomiuri.co.jp

It might be easier to understand if you watch the video. You can see how quickly they clean the inside of the car in less than ten minutes.

A video of the cleaning staff of the Tokaido shinkansen.



A video of the cleaning staff on the Tohoku/Jouetsu shinkansen. Since they have less than 7 minutes, their way of working became a huge topic.



After the staff is finished cleaning, they line up and bow towards the waiting passengers.

 maimu_yamaguchi



Embedded from Instagram

When the president of TGV, the French rail line that is said to be the fastest in the world, visited Japan, he said:

“There is no match for the shinkansen. I want to take the cleaning staff home with me.”

www.yomiuri.co.jp

In this way, the staff works quickly and politely to keep the shinkansen's schedule as well as the making the passenger's experience more comfortable.

If you get a chance to ride the shinkansen, if you get a chance to watch the way the cleaning staff work, it might be interesting.

3. The detailed safety check system

For example, on the 50 year old Tokaido shinkansen, there have never been any deaths related to a train accident.

This safety is propped up by a series of detailed checks that is in place.

a. 4-tier frame inspection

The shinkansen's inspection is established as a 4-tier system by a ministerial ordinance.

Once every two days, an inspector looks over the train for defects both by sight and by touch. They also check the aerial wiring that takes in the energy through a pantograph and the degradation of the brakes.

Once a month, the shinkansen undergoes a complete examination. They turn on the power and double-check that it is running as it should be.



You can see the attention to detail especially in the monthly check. There are 4 people who each check the condition of the bolts so in case any of them have defects they can be thoroughly changed. Among that, the doors are considerably checked. The doors alone have more than 27 spots to check. If any of the doors fail, it would be a hindrance to the passengers getting on and off, and it could lead to a delay in the schedule.

Every six months, the motor and the flatcar attached to the wheels are disassembled. The motor rotation is checked to see if any of the axles are weakened and for other problems.

Once every three years, there is a huge overall inspection. Almost the whole train is dismantled and is thoroughly checked over half a month. Afterwards, it's repainted with a fresh coat.



Francisco Antunes/Flickr

One train (16 cars) is inspected more than 500 times in 3 years. The huge number of inspections they do is a secret to secure the passengers' safety.

Of course, after the inspection, the train is thoroughly cleaned.

b. Railroad inspection at the proper speeds

Concerning the railroad, there is a special train called Dr. Yellow that runs on the track at 270km/hr that inspects the rail condition, the aerial wiring, and the signals.



Fumiaki Yoshimatsu/Flickr

Dr. Yellow isn't often seen so if you catch it while you're in Japan, you can consider yourself lucky.

By the way, Dr. Yellow inspects the following two points:

1. Railroad check: it inspects the rails with a laser and measures gaps of 1 millimeter.
2. Aerial wiring check: checks the wear and tear on the wires (because it's rubbed everyday by pantographs)

These inspections are carried out late at night every day, and the staff that carry out the repairs number about 3000 people every night. That large number of people carry out steady work every day.



Yuya Tamai/Flickr

c. The world's first ballast replacement machine

The rocks that are laid 1 meter under the tracks are called ballasts, and are sucked up by the vibration of the moving train. They stop gaps in the rails and help block the noise.



Sherwin Huang/Flickr

Because the shinkansen runs at a high speed every day, it erodes the top layer of the rocks. Because of tht, they change the ballasts every day.

Actually, this machine was created in Japan and was the first of its kind in the world.

The ballast replacement machine changes the ballasts every night to keep the quality constant.

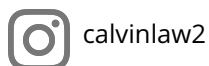
[A video of the ballast replacement machine at work](#)

Afterwards, people clean it by hand. In one night they cover 50m each.

Because of these detailed checks in place, the shinkansen's safety is protected.

What do you think about the shinkansen now? The shinkansen's wonders isn't just the technology but also the people and the structures in place.

As mentioned earlier, the Tokaido shinkansen turns 50 this year. To go along with the 50th anniversary, they have 50 kinds of anniversary cards and the bento boxes. If you come to Japan, please try one of the bento and get one of the cards!



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[PS]

Japanese newspaper Asahi just reported on 18th September, that Tokaido Shinkansen will upgrade its top speed into 285km/h in the coming spring:

In the coming Spring, Tokaido Shinkansen (between Tokyo Station and Shin-Osaka Station) will upgrade its top speed, for the first time in the last 23 years, into 285 km/h. Since there are many curves on this railway, it has been impossible to excel the 270km/h which Shinkansen “Nozomi” achieved in 1992. The first day of the next month is their 50th anniversary. Their record-breaking is the result of their continuous pursuit of “the technique to curve well and stop quickly”.

digital.asahi.com



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20 COMMENTS

JAMES

September 20, 2014 at 12:53 am — Reply

Top speed of the shinkansen is 330km/h, not 270km/h.

TSUNAGU JAPAN

September 20, 2014 at 1:01 am — Reply

Thanks for the comment James!
330km/h is the max speed of "Sanyou Shinkansen" which runs between Shin-Osaka and Hakata, but max speed of "Tokaido Shinkansen" which runs between Tokyo and Shin-Osaka is 270km/h.

CHARLES

September 21, 2014 at 12:32 am — Reply

French TGV broke a new record in 2007, reaching a top speed of 574.8 km/h. It regularly transport people between Paris and southern cities of France at an average speed of around 300km/h (top speed: 320 km/h). However, the comfort of the Shinkansen is probably better. The root cause in my opinion is that some French people do not respect public goods. Also, the efforts deployed to clean TGVs are not as good as the ones deployed to clean the Shinkansen !

HG

September 23, 2014 at 8:16 pm — Reply

I have been in TGV many times in 1985-86, and Shinkansen in 1999.
Shinkansen is much better in terms of comfort, cleanliness and service.

GARTH AQUINO

September 24, 2014 at 12:56 pm — Reply

Japan is so great there System in train station is admirable and they are always accurate in many ways

CHS

October 2, 2014 at 12:56 pm — Reply

No doubt that the Shinkansen is one of the fastest and most probably the most precise train. However, except the punctuality there is not much service offered. No luggage space for suit cases, no dining car, no in seat audio or video system, only one operating company offers a wireless

connection and the access code must be bought before the train ride and can not be bought in the train, almost no variation of discount tickets, ...

Discussions regarding the speed must be separated depending on the operating company. Each one is using different top speed and a resulting frequency of trains. In Japan the top speed of 320km/h operated in the regular train service is used by JR-East.

However most of this report "3 Secrets Behind the Wonders of the Shinkansen" is complete bullshit. Most probably another reporter who had to write an article about a subject he/she has no clue!

And the maintenance machine shown on the picture at the bottom of this report is not a ballast cleaning machine, it is a ballast distribution machine and by far not the first of its kind. This machine has been delivered between 2010 and 2012 built from an Austrian company!

TSUNAGU JAPAN

October 3, 2014 at 5:20 pm — Reply

Thank you for your comment. We will look into the details of the article.

RICO MARTINEZ

October 9, 2014 at 6:01 pm — Reply

High five...imagine for five decades 0 accident and an average of 30 sec delay.

DAILY INSIGHTS: ARE YOU SHINKANSEN ENOUGH AS A PROFESSIONAL? « CLOVERS

October 28, 2014 at 10:24 am — Reply

[...] comfort, dan safety yang secara konsisten diberikan dalam level tertinggi bagi para customernya. <http://www.tsunagujapan.com/3-secrets-behind-the-wonders-of-the-shinkansen-japanese-bullet-train/> Bagaimana dengan kita sebagai seorang professional, are we “shinkansen” [...]

MICHAEL RICHARD MURPHY

January 15, 2015 at 5:52 am — Reply

No surprise here. I have and use cameras and lenses made in Japan...
Some of them more than FORTY years ago! Build a classic, it can last forever!
Do the Shinkansen trains slow down going through tunnels? The Seikan Tunnel, for example?

FUN LINK FRIDAY: THE SECRET OF THE SHINKANSEN | WHAT CAN I DO WITH A B.A. IN JAPANESE STUDIES?

January 24, 2015 at 9:54 am — Reply

[...] like the bullet train (shinkansen) are always so efficient and on time? tsunagu Japan recently posted an article explaining just how those super-fast trains always manage to get people where they're going [...]

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November 21, 2015 at 3:49 pm — Reply

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November 21, 2015 at 3:50 pm — Reply

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May 10, 2016 at 3:33 pm — Reply

[...] Source : tsunagujapan.com [...]

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June 9, 2016 at 5:26 pm — Reply

[...] 3 Secrets Behind the Wonders of the Shinkansen (Japanese Bullet Train) [...]

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September 22, 2016 at 5:45 pm — Reply

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January 8, 2017 at 8:46 pm — Reply

[...] 3 Secrets Behind the Wonders of the Shinkansen (Japanese Bullet Train) [...]

JAMES STOKES

March 1, 2017 at 10:10 am — Reply

Hello, my name is James Stokes Australia magtrain@hotmail.com
my invention of a fast light weight train is 200 klms faster than the latest model
from Japan. please view
maglevtrain.com.au
I have been trying to make contact with CENTRAL JAPAN RAIL, I would like to sell them
my patent rights

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April 20, 2017 at 4:46 pm — Reply

[...] Also check: 3 Secrets Behind the Wonders of the Shinkansen (Japanese Bullet Train)
[...]

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June 1, 2017 at 3:19 pm — Reply

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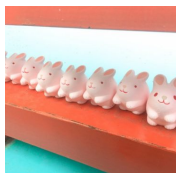
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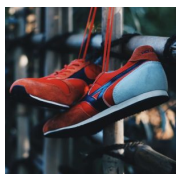
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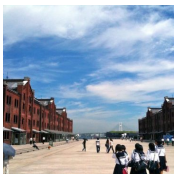
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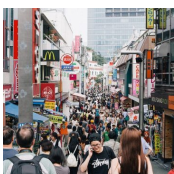
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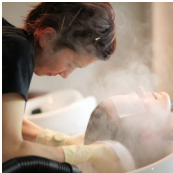
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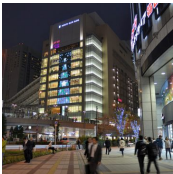


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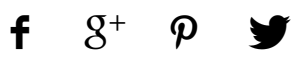


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