

DIAGNOSE TIMING CHAIN FAULT

How to diagnose a timing chain fault in the YD25 D40, D22 Navara & R51 Pathfinder engine.

This page explains the methods used to diagnose a timing chain fault in the Nissan Navara D40, D22 & Pathfinder R51 YD25 engine.

All common rail YD25 engines from 2005 have duplex (double row) camshaft timing chains. The duplex camshaft timing chain is built for a 300,000 km service life. **The fuel pump drive timing chain is simplex (single row) and is failing well before the camshaft timing chain.**

Nissan Navara YD25 engines have been fitted with timing chains from two manufacturers, a French chain (white-yellow) timing marks and a Japanese Tsubaki chain (blue-yellow) timing marks. The French chain is fitted in all VINs prefix VSK up to 2010. The Japanese chain is fitted to VINs prefix VSK 2010 and on all VINs JN1 and MNT. Chain service life varies enormously. We have heard of failures as low as 70,000 km while others are still serviceable after several hundred thousand km. We have found no regular pattern of wear in chains from either manufacturer. We have seen some chains showing consistent wear throughout the entire length and others showing little wear in some links while other links are badly worn.

We have undertaken many chain inspections for owners who have purchased used YD25 powered vehicles with over 100,000 km. We have found that some vehicles have been fitted with an inferior quality **aftermarket simplex or duplex fuel pump drive timing chain**. These chains are easily identified by the coloured link combination. We know of the following colour combinations, yellow-yellow, yellow-orange, yellow-silver, silver-silver, blue-blue, blue-tan, blue-white, and blue-bronze. These chains are not identifiable by the manufacturer's stamps. Examples of these chains can be found here [1](#) [2](#). The chains have a limited life ranging from 10,000 km to 40,000 km. If one of these chains is installed then there is a high risk of tensioner, balance shaft, woodruff key failure and chain misalignment.

We have also seen inferior quality **aftermarket tensioners**. These have higher failure rates compared to the genuine Nissan product. Nissan tensioners have a 7 to 10 digit number stamped on the machined casting face. Aftermarket tensioners have no such numbers. Our timing chain kits include genuine Nissan tensioners.

We advise owners to have the chains and tensioners checked at 80,000 km and then every 20,000 to 40,000 km thereafter if the original simplex fuel pump drive timing chain is installed. Checks should be more frequent if aftermarket parts are installed. These regular checks are the only way to assess the condition of the timing chain parts and to determine when they need replacing.

How to diagnose a timing chain fault

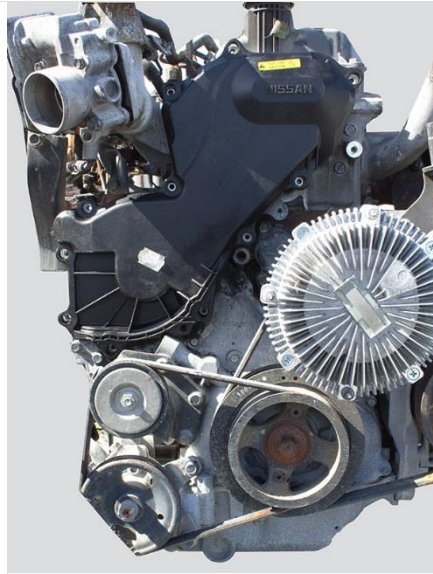
The computer in D40 vehicles with VIN MNT is programmed to check the correlation between the camshaft and the crankshaft and shuts the engine down within 5 seconds of cold start up when the fuel pump drive timing chain is worn however if the engine is hot (over 65 degrees C) then it will idle and not shut down. To confirm that fuel pump timing chain wear is the problem, ensure the engine temp is below 65 deg, disconnect the camshaft sensor plug located on the cylinder head, left hand side rear, and restart the engine. If the engine does not shut down after 5 seconds then the fuel pump drive timing chain needs replacing.

In all other models VINs VSK MNT JN1, if the engine only runs for a short time at idle or if it only runs when the revs are kept over 1500 rpm then this is an indicator of serious wear to fuel pump drive timing chain, camshaft timing chain and guides. As there is no computer shut down in these models, the engine will run until the fuel pump drive timing chain breaks.

In any model, if the engine has a timing chain rattle on start-up and the noise goes away just after the oil light goes out or if there is no noise when cold but the chain rattles when hot then this is an indicator of failure of the top tensioner. These symptoms can occur at relatively low km. A failing top tensioner is a serious fault and needs immediate attention. Our timing chain replacement kit includes genuine tensioners with a special part that improves their reliability.

The signal pattern of the crank and cam angle pick-ups can be checked with scoping equipment. New chains will show overlapping cam and crank signals. Worn chains will show time delay on the cam signal. The MN D40 shuts down when a delay of 18 degrees is detected. **Use this method with caution as it will not identify if there is just one worn link.**

Procedure for checking tensioners and timing chains

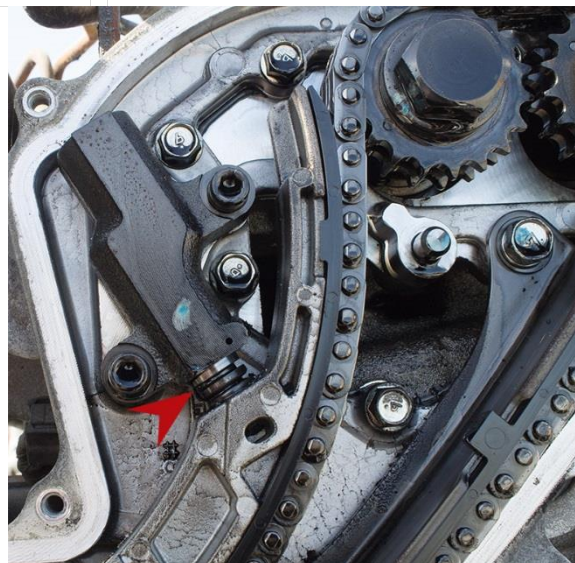


YD25 engine front view

Step 1: Remove the EGR pipe in front of the black cam chain cover.

YD25 engine with EGR pipe removed

Step 2: Remove the 10mm bolts securing the black cam chain cover. Remove the cam chain cover taking special care that the alignment dowel does not fall into the sump.



YD25 engine & exposed cam chain

Step 3: Inspect the cam chain tensioner piston protrusion

YD25 engine cam chain tensioner

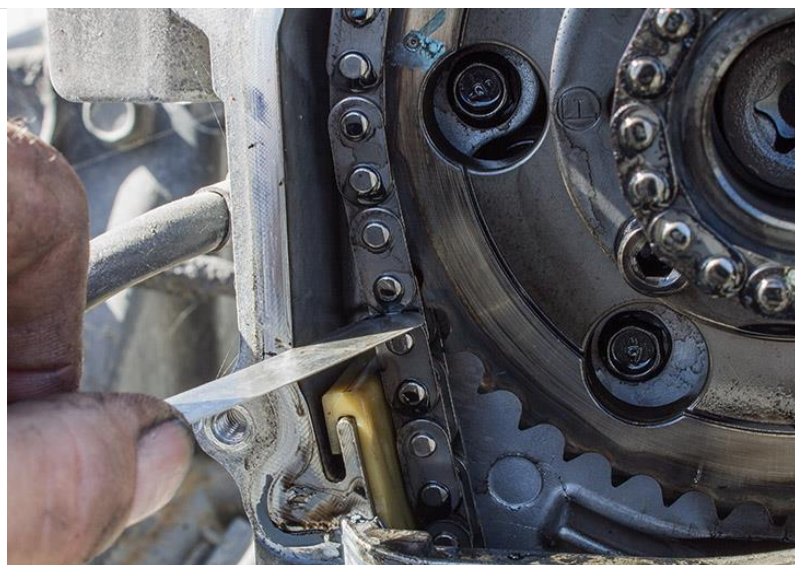
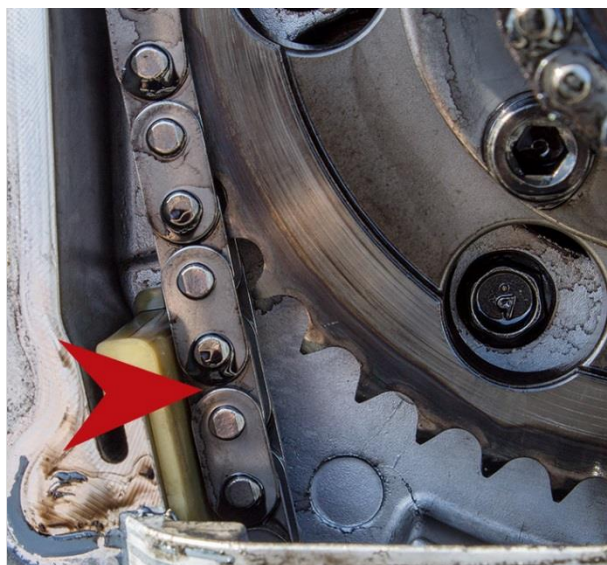
Step 4: Use a vernier or ruler to measure the piston protrusion from the housing.

piston protrusion	chain life
6mm	100%
9mm	75%
12mm	50%
15mm	25%
18mm	worn out

Step 5: To check the condition of the camshaft chain tensioner, pull the slack guide back to the tensioner and if it bleeds back quickly then the tensioner has a valve failure and needs replacing. A secondary test can be performed as follows:

1. with the ignition off, remove the injector plug leads
2. while cranking the engine inspect the tensioner piston

The piston must maintain tension on the chain at cranking speed; if the piston moves in and out then the tensioner should be replaced.



YD25 engine fuel pump drive chain

Step 6: Mark the first link to ensure that every link plate clearance is measured.

YD25 engine fuel pump drive chain measure

Step 7: Use a feeler gauge to measure the clearance between each chain link plate.

Fuel pump drive timing chain breakage is the major cause of timing chain failures in YD25s. It is essential that you measure every fuel pump drive chain link gap. Do not take short cuts by measuring some links, a badly worn link may be missed and later fails with catastrophic results.

Calculation of chain wear

New French and Japanese fuel pump drive chains have the same measurement between the link plates of 0.38mm (0.015in)

When a measurement of 0.50mm (0.020in) is taken there is 0.12mm (0.005in) wear in that link.

The next 0.12mm (0.005in) wear to 0.63mm (0.025in) happens at a much faster rate than the first 0.12mm (0.005in). At this level of wear we have found links binding which causes extremely rapid wear to the chain.

When a chain measures consistently 0.50mm (0.020in) there will be overall wear to the chain.

To calculate chain wear when 0.50mm (0.020in) measurements are regular the wear will be 0.12mm or (0.005in) x 46 chain link plates = 5.842mm (0.230in). Total chain wear of 10mm (0.400in) indicates that guide damage is occurring and that the chain and guide should be replaced.

Problems arising from poor installation of timing chains

Vibrations in the engine rpm range = balance shaft miss timed

If the engine shakes noticeably at some rpm ranges this is an indicator of a miss-timed balance shaft. A miss-timed balance shaft puts unnecessary stress on the engine. Without rectification the vibrations will cause premature engine component failure. With a correctly timed balance shaft the engine runs without vibrations.

Incorrectly torqued crankshaft bolt = sheared woodruff key

It is common to find an **incorrectly torqued crankshaft bolt** when the fuel pump timing chain has been replaced. Failure to torque the crankshaft bolt to the manufacturer's specification results in the woodruff key flogging in the crankshaft and crankshaft drive sprocket. Over time the crankshaft woodruff **keyway** is damaged. The woodruff key can also shear, causing catastrophic valve, piston and cylinder head damage.

Scissor gear pretension released = increased wear in balance shaft drive gears

The scissor gear is spring loaded. When pretension of the scissor gear is released this increases engine noise and results in faster wear to the balance shaft drive gears. A new balance shaft from Nissan is about \$2,500 AUD.

Missing fuel pump sprocket alignment shim = excessive wear in chain and sprockets

The fuel pump alignment shim is quite often left out because it can stick to the fuel pump sprocket when removed. The resulting misalignment of the chain and sprockets causes excessive wear and rapid chain failure resulting in catastrophic valve, piston and cylinder head damage. If a shim is not fitted, the front of the fuel pump sprocket will show no chain engagement marks while the back of the fuel pump sprocket and the front of the vacuum pump sprocket will show excessive wear.

We at YD25.com.au hope you have found this information useful.

For more information please submit your query using our [online form](#) or contact Paul directly on (+61) (0) 424 034 935.

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