Crankshaft Position Sensor: Description and Operation

OPERATION

The two crankshaft sensors are located on the front bank of the engine block between cylinders 4 and 6. Crankshaft position 'A sensor is located in the upper crankcase and crankshaft position 'B' sensor is located in the lower crankcase. Both sensors extend into the crankcase and are sealed to the engine block with 0-rings. The crankshaft position sensors are not adjustable.

The magnetic crankshaft position sensors operate similar to the pick-up coil in a distributor. When a piece of steel (called a reluctor) is repeatedly moved over the sensor, a voltage will be created by the sensor that appears to go 'ON-OFF-ON-OFF-ON-OFF'. This ON-OFF signal is also similar to the signal that a set of breaker points in a distributor would generate as the distributor shaft turned and the points opened and closed.

The reluctor ring is cast onto the crankshaft between the #3 and #4 main bearing journals. The reluctor ring has 24 evenly spaced notches or air gaps and an additional 8 unevenly spaced notches for a total of 32.

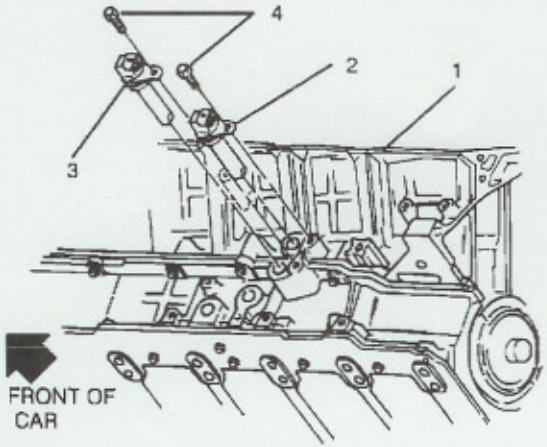
As the crankshaft makes one complete revolution, both the A and 'B' sensors will produce 32° 'ON-OFF' pulses per revolution. In addition, the 'm sensor is positioned 27° of crankshaft revolution before the 'B' sensor. This creates a unique pattern of 'ON-OFF' pulses sent to the ignition control module so that it can recognize crankshaft position.

LOCATION

The two crankshaft sensors are located on the front bank of the engine block between cylinders 4 and 6.

DIAGNOSTIC NOTE

The crankshaft sensors are not adjustable.



1	ENGINE
2	CRANKSHAFT POSITION "A" SENSOR
3	CRANKSHAFT POSITION "B" SENSOR
4	BOLT (10 N•m/89 LB.IN.)

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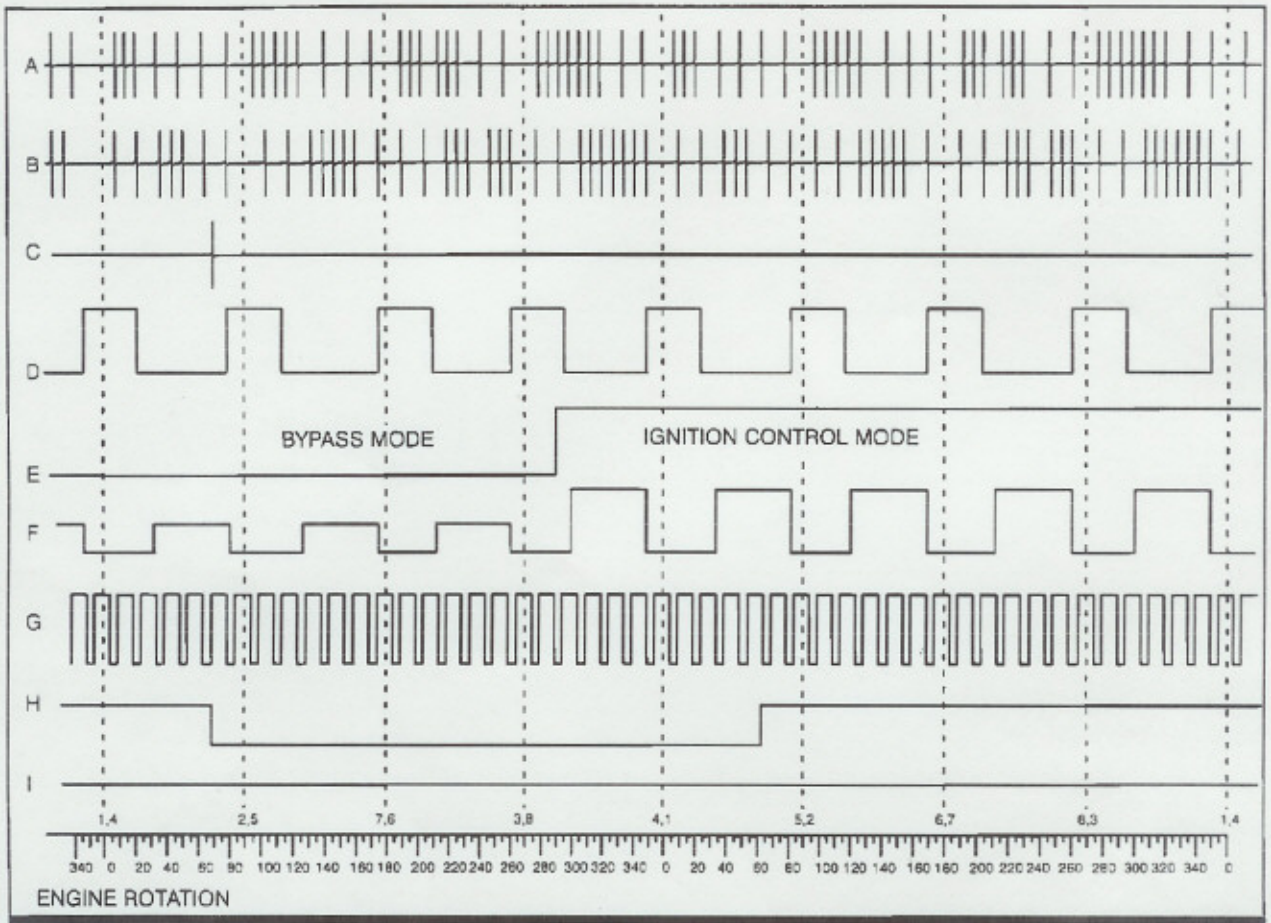
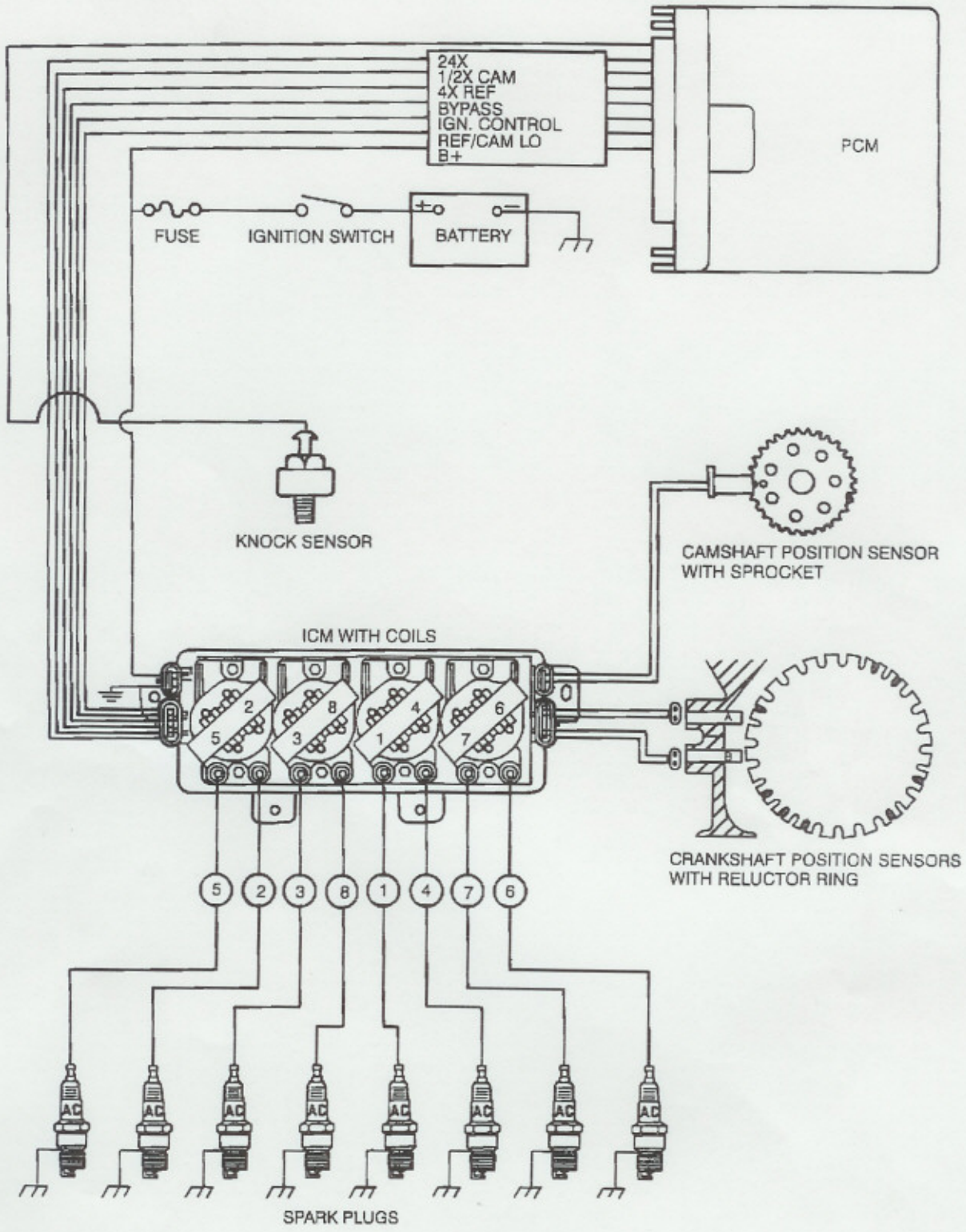
Crankshaft Position Sensor Replacement

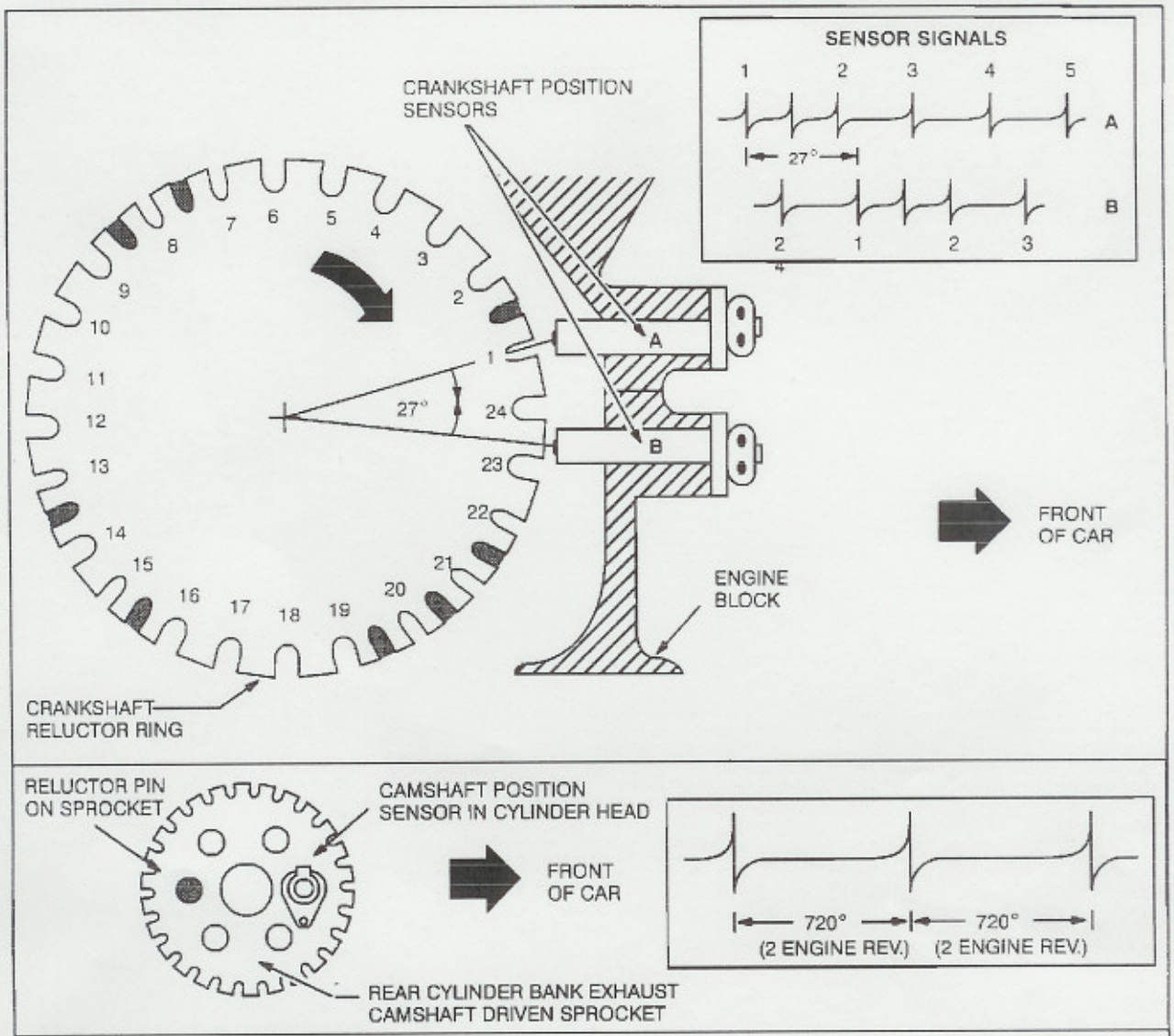


SIGNAL	SIGNAL NAME	CKT	VOLTAGE RANGE	DESCRIPTION
A	CRANKSHAFT POSITION 'A' SENSOR	1727 1728	+/- 100V AC	THE VOLTAGE AND FREQUENCY OF THIS SIGNAL WILL VARY WITH ENGINE SPEED.
B	CRANKSHAFT POSITION 'B' SENSOR	1729 1730	+/- 100V AC	THE VOLTAGE AND FREQUENCY OF THIS SIGNAL WILL VARY WITH ENGINE SPEED.
C	CAMSHAFT POSITION SENSOR	631 632	+/- 100V AC	THE VOLTAGE AND FREQUENCY OF THIS SIGNAL WILL VARY WITH ENGINE SPEED. THIS SIGNAL OCCURS ONCE EVERY 720° (2 CRANKSHAFT REVOLUTIONS).
D	4X REF HI	430	0 – 5V DC	KEY ON, ENGINE OFF, SIGNAL IS HIGH. HIGH TO LOW OCCURS AT FIRST SYNC, THEN FOLLOWS FIRING ORDER.
E	BYPASS	424	0 – 5V DC	KEY ON, ENGINE OFF, SIGNAL IS LOW. LOW TO HIGH OCCURS WITH PCM IGNITION CONTROL.
F	IGNITION CONTROL	423	0 – 5V DC	PCM SENDS IGNITION CONTROL SIGNAL TO ICM. THE FALLING EDGE SIGNALS ICM TO TURN OFF COIL PRIMARY CURRENT.
G	24X CRANK	647	0 – 5V DC	THIS SIGNAL WILL REMAIN HIGH IF THE ICM IDENTIFIES A FAULT WITH ONE OF ITS THREE POSITION SENSORS.
H	$^1/_2$X CAM HI	633	0 – 5V DC	THE PCM USES THIS SIGNAL FOR FUEL CONTROL.
I	REF LO/CAM LO	453	0V DC	THIS IS GROUND REFERENCE BETWEEN PCM AND ICM.
FIRING ORDER: 1 – 2 – 7 – 3 – 4 – 5 – 6 – 8				P66030-6D4-EK-I

Ignition Control



Ignition Schematic



4.6L Northstar V-8 IGNITION SYNCHRONIZATION

1. THE CRANKSHAFT RELUCTOR RING HAS 24 EVENLY SPACED NOTCHES PLUS EIGHT ADDITIONAL NOTCHES (SHADED) USED FOR SYNCHRONIZATION.
2. AS THE CRANKSHAFT ROTATES, THE NOTCHES PASS THE POSITION SENSORS, AND CREATE A VOLTAGE PULSE SIGNAL IN THE SENSOR THAT IS AN INPUT TO THE IGNITION CONTROL MODULE (ICM).
3. BECAUSE OF THE PHYSICAL LOCATION OF THE TWO CRANKSHAFT SENSORS, THE SIGNAL OF 'B' LAGS THE SIGNAL OF 'A' BY 27° OF CRANKSHAFT REVOLUTION.
4. TO SYNCHRONIZE THE IGNITION, THE ICM FIRST COUNTS THE NUMBER OF 'B' PULSES BETWEEN EVERY TWO 'A' PULSES. THERE CAN BE 0, 1 OR 2 'B' PULSES BETWEEN 'A' PULSES.
5. WHEN THE ICM SEES 0 'B' PULSES BETWEEN 'A' PULSES, IT STARTS COUNTING 'B' PULSES BETWEEN 'A' PULSES. WHEN THE ICM COUNTS EXACTLY 4, IT SYNCHRONIZES THE IGNITION ON THE VERY NEXT 'A' PULSE. IF THE ICM COUNTS OVER 4 (JUMPS FROM 3 TO 5), IT WAITS FOR ANOTHER 0 'B' PULSES BETWEEN 'A' PULSES TO START COUNTING AGAIN.
6. THIS PROCESS ALLOWS THE IGNITION TO SYNCHRONIZE AND FIRE THE 1ST SPARK PLUG WITHIN 180° ($^1/_2$ ENGINE REVOLUTION).
7. THE CAMSHAFT POSITION SENSOR PROVIDES THE ICM WITH CYLINDER #1 FIRING ORDER INFORMATION, WHICH THE PCM USES FOR SEQUENTIAL FUEL INJECTION.
8. USING THREE SENSORS ALLOWS THE ICM TO MAINTAIN IGNITION SYNCHRONIZATION EVEN IF ONE OF THE THREE SENSORS BECOMES FAULTY.

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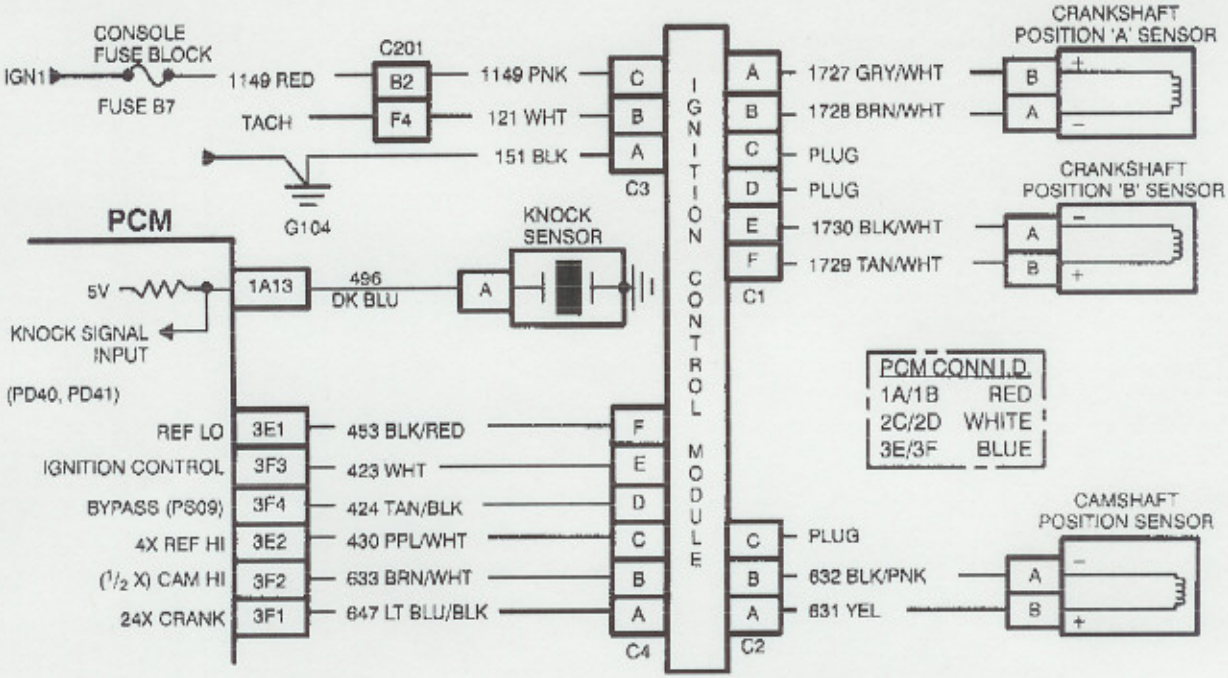
Ignition Synchronization



Ignition Module Circuit