



Cam Sync Systems for Small and Big Block Chevys Holley PN 556-114, 556-119, 556-120, & 556-121

1.0 INTRODUCTION:

A cam sync signal is required to run sequential fuel injection. This tells the ECU which cylinder is cylinder #1 (or the first cylinder in the firing order as entered in the software).

Note: Installation of this kit should not be attempted until these instructions have been completely read and understood.

2.0 APPLICATIONS:

P/N	APPLICATION
556-114	Standard Cam Height Big Block Chevy Cam Sync Kit
556-119	Standard Cam Height Small Block Chevy Cam Sync Kit
556-120	+.400" Raised Cam Big Block Chevy Cam Sync Kit
556-121	+.600/+1.000" Raised Cam Big Block Chevy Cam Sync Kit

These kits were specifically designed to provide a "plug-&-play" cam position signal to Holley EFI systems, although they may be used with any EFI system which can read a digital, square-wave input cam signal. They are intended for use with Small and Big Block Chevy engines equipped with external, dry timing-belt, cam drive systems. It is required that the upper cam drive pulley permit the installation of a 1/4"-20 "Flying Magnet" screw in the proper radial and angular locations. Proper mounting location for the flying magnet target in each application is outlined in detail in section 5, below.

3.0 COMPONENT IDENTIFICATION:



Item	Qty.	Components
1	1	Aluminum Sensor Bracket
2	2	Aluminum Spacer
3	1	Sensor Bracket T-Nut (SS)
4	1	1/4"-20 Flying Magnet Target
5	1	1/4" Split-Lock Washer (SS)
6	1	M12x1mm Sensor w/Jam Nut
7	1	M12 Washer (SS)
8	1	M12 Internal-Tooth Washer
9	2	1/4"-20 x 2.5" Screw
10	2	1/4" Washer
11	2	1/4" Split-lock Washer
12	1	Connector
13	1	TPA Lock
14	3	Seals
15	3	Pins

4.0 MATERIALS REQUIRED FOR INSTALLATION:

Vertical Mill, Drill Press, or Hand Operated Drill (minimum)	Small Crescent Wrench
No. 7 or 13/64" Drill Bit	7-16" Wrench or Socket w/ Ratchet
Center Punch	17mm Wrench
1/4"-20 Starting Tap	3/16" Allen Wrench
Calipers	Permanent Strength Thread Adhesive
Fine Tip Permanent Marker	

5.0 SENSOR BRACKET ASSEMBLY & INSTALLATION

NOTE: The sensor and sensor bracket assembly will protrude a maximum distance of about 2-3/4" off of the front of the cam cover (**Figure 2**). It is recommended to trial-fit the complete sensor bracket assembly in the desired mounting location on the engine prior to drilling and tapping the cam drive pulley. This will ensure that the bracket and sensor will clear all accessory drives (i.e.: water pump, fuel pump, cam-driven distributor, etc.), prior to modifying the upper cam pulley. Water pump spacers and/or shortening of the supplied motor bracket spacers may be required to accommodate installation in some applications.

The included sensor bracket was designed to be installed in 1 of 5 positions along the perimeter of the cam drive cover using 2 of the cam cover's 1/4" bolt-holes. To accommodate this feature, the sensor bracket's slot and T-nut offers an additional 60° of angular adjustment about the upper cam pulley hub so that proper sensor-to-flying magnet target alignment may be achieved in all locations. The sensor bracket assembly goes together as shown in **Figure 3**.

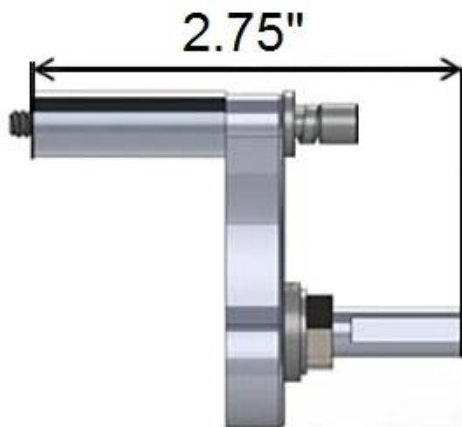


Figure 2: Bracket Assembly Standoff

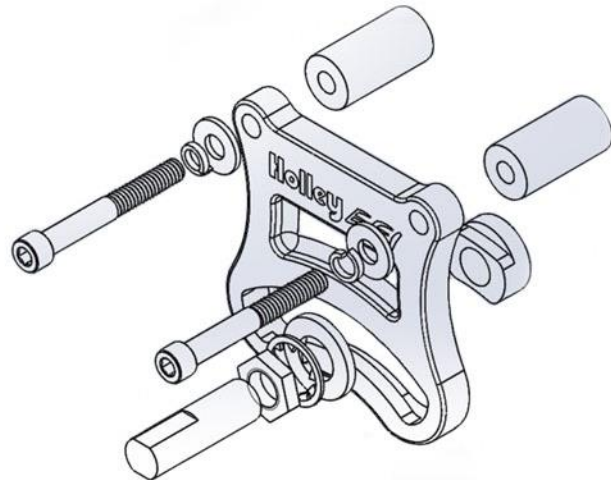


Figure 3: Sensor Bracket Assembly

Figure 4 shows the five possible mounting locations for the sensor bracket assembly. It should be noted that although five positions are technically possible, cam pulley lightening hole-pattern geometry, along with accessory-drive clearance will dictate if a given position is permitted. If proper sensor-to-target alignment cannot be achieved in one location it may be necessary to relocate the bracket to another mounting location.



Position 1

Position 2

Position 3

Position 4

Position 5

Figure 4: Mounting Locations

1. Using a 3/16" Allen wrench, remove two adjacent cam cover 1/4" bolts corresponding to the desired sensor bracket, mounting position.
2. Install the sensor into the sensor bracket using the sensor jam nut, M12 washers, & T-nut as seen in **Figure 3** above. Do not tighten the sensor jam nut at this time. The sensor and T-nut should be left free to slide within the bracket slot.
3. Using the spacers, 1/4" washers (flat & split-lock), and the supplied 1/4"x 2.5" screws, mount the bracket and sensor assembly to the timing belt cover in the location where the cam cover bolts were just removed.
4. Run the 1/4" screws down until the bracket is just snug. Do not compress the split-lock washers at this time.

6.0 FLYING MAGNET TARGET POSITIONING & INSTALLATION

Flying magnet target location is determined by the desired sensor bracket mounting location, calculated cam sync position, and application-specific, radial distance (R) from cam hub centerline (as seen in **Tables 1 & 2** of **Section 6.2** below) . These specifications vary with crank trigger type and cam pulley hole-pattern geometry as well. The following set-up applies to “one pulse per fire (i.e.: MSD),” “60-2,” & “36-1” crank inputs.

6.1 Determining proper angular position of the Flying Magnet Target screw

The cam sync signal must occur in a specific range to properly identify which cylinder is cylinder #1. If this is not done properly, individual cylinder trims will not be performed on the correct cylinder or worse yet, the wrong cylinder may be fired if using individual coils-resulting in possible engine damage.

1. Ensure that desired mechanical cam timing has been set and all upper cam drive pulley nuts have been tightened to manufacturer’s specifications.
2. Determine correct cam sync phasing for the specific application. If using Holley EFI, correct cam sync phasing and therefore, flying magnet target cam trigger angle can be calculated using the following formula:

$$\text{Cam Sync Position} = \text{Crank Reference Angle} + (1080^\circ/\text{Number of Cylinders}) \pm 30^\circ$$

Example: 8 cylinder engine with an Ignition Reference Angle of 60°

Cam Sync Position = 60° + (1080°/8) = 195° degrees BTDC #1 (**B**efore **T**op **D**ead **C**enter of #1 Cylinder’s Compression Stroke)

195° would be the centrally "perfect" location in this specific example. However, this location can vary by +/- 30° degrees from this nominal target value with no issues. In other words, if the flying magnet target is located at the center of the sensor bracket’s 60° slot when installed, the sensor can be moved to each extreme end of the sensor bracket’s slot with no adverse effects to system performance. Conversely, if the flying magnet target is located at an extreme end of the sensor bracket’s slot when installed, the sensor can only be moved to the center of the slot without complications.

Number of Cylinders	Ignition Reference Angle	Cam Trigger Location Range (BTDC #1)
4	60°	330° +/- 30°
6	60°	240° +/- 30°
8	60°	195° +/- 30°

NOTE: It is important to make certain that the cam trigger event does not coincide with the crank pulse in 1-pulse per fire applications (i.e.: MSD). If using 36-1 or 60-2 crank trigger wheels, the cam trigger event should not coincide with the tooth directly before the gap.

3. Once correct cam sync position has been calculated, manually rotate the engine until the balancer’s timing pointer lines up with the calculated value (195° in this example).
4. Slide the sensor to the side and mark the cam pulley hub (with a vertical line, as shown in **Figure 5**) through the slot of the sensor bracket with a fine-tip marker. The surface marked should be within the range of sensor travel. Ideally, the diameter of the sensor tip can be equally split about the vertical reference-mark.

NOTE: If the cam pulley must be drilled on a web face between lightening-holes, it is recommended that the angular reference mark is located as closely to the center of the web-face as possible. This will ensure there is adequate material on both sides of the finished tapped hole.

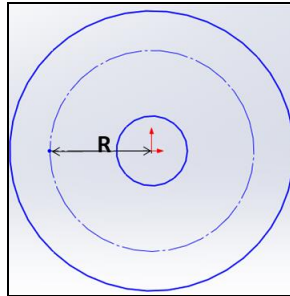


Figure 5: Angular reference

6.2 Determining Proper Radial Location for the Flying Magnet Target Screw

Table 1: Cam hub flying magnet target mounting radii by application.		
Part Number	Application	Radial distance from hub center (R)
556-114	Standard Cam Height BBC	1.850" +/- .025"
556-119	Standard Cam Height SBC	1.625" +/- .025"
*556-120	+.400" Raised Cam BBC	Varies w/ location (see Table 2)
556-121	+.600"/+1.0" Raised Cam BBC	1.855" +/- .015"

Table 2: Radial distance from hub center (R) by sensor bracket mounting location (556-120 only)		
Positions 1 & 5	Positions 2 & 4	Position 3
1.965" +/- .010"	1.925" +/- .010"	1.850" +/- .025"



* When using 556-120 in positions 1 and 5, it is recommended to try and mount the sensor bracket as high as possible: with the mounting bolt-holes located low in the sensor bracket's mounting slots. This will greatly minimize possible sensor to flying magnet target offset in these locations.

1. After marking the cam hub for proper angular position, remove the sensor bracket so that the hub may now be marked for radial positioning of the flying magnet target screw.
2. Based on the specific application, measure (the proper distance R) from the cam hub/camshaft centerline with a pair of calipers.
3. Place a second reference mark perpendicular to the existing mark at the correct measured distance from the cam hub's centerline. This should create an intersection at which the hub can be drilled and tapped for flying magnet target installation as seen in **Figure 6** below.



Figure 6: Indexing the Cam Hub for Drilling & Drilling the Cam Hub

6.3 Mounting the Flying Magnet Target

1. Using a No. 7 or 13/64" drill bit, drill a through hole at the intersection of the angular and radial reference marks (**Figure 7**). This may be done with a hand drill on engine or a drill press or mill off engine (recommended). It is advised to use a center-punch to help locate the drill bit prior to drilling the cam pulley.



Figure 7: Drilling the Cam Hub



Figure 8: Tapping the Cam Hub



Figure 9: Finished Cam Hub

NOTE: If drilling on engine, care must be taken to keep from drilling into the underlying belt drive cover and block once the drill bit passes through the cam hub. A split-lock washer has been included for added flying target retention and optional off engine drilling when using a vertical mill. If it is desired to use the supplied washer, spot-face a flat onto the surface of the cam gear, concentric to the 13/64" hole using a 1/2" end mill. This will provide a flat surface on which the split-lock may fully seat.

2. Using a 1/4"-20 tap, fully thread the previously drilled hole (**Figure 8**). The threads may be slightly angled in relation to the axis of the sensor without causing any issues. However, it is recommended that the threads are cut parallel to the sensor axis.

NOTE: If the flying magnet screw happens to protrude beyond the rear surface of the cam pulley hub, ensure that it cannot make contact with the underlying cam cover studs. This can be done by making sure that the engine can be rotated a full revolution without interference. Camshaft end-play should be considered as well.

3. Apply a liberal amount of permanent strength thread adhesive to the threads of the flying magnet target and thread it into the cam hub until it stops.

NOTE: Do not torque the flying magnet target beyond 70 in-lbs. as doing so may result in stripped threads. It is recommended to allow the thread adhesive at least 24 hours to cure before operating the engine.

7.0 FINAL INSTALLATION & SENSOR GAP

1. Re-install the upper cam pulley (if necessary) and re-attach the sensor bracket assembly to the cam cover using the supplied 1/4"x 2.5" screws. Tighten the screws using a 3/16" Allen wrench. Do not tighten these beyond 85 in-lbs as doing so may result in damage to the engine block.
2. Slide the sensor in the sensor bracket's slot until it is located directly over the head of the flying magnet target. By hand, lock the sensor in place using the sensor's jam-nut.
3. With a feeler gauge, set the gap between the sensor and flying magnet target to .040"-.080" by backing the jam nut off and screwing the sensor in or out of the T-nut as seen in **Figure 10**. The smaller the gap, the better.
4. Lock the sensor's position by holding the sensor in place with a crescent wrench and tightening the jam nut with a 17mm wrench (**Figure 11**). Do not tighten the jam nut beyond 23 ft.-lbs or damage to the sensor's threads may result.



Figure 10: Adjusting Sensor Gap

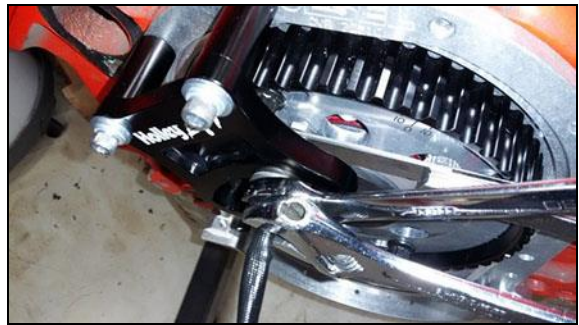


Figure 11: Locking Sensor Gap & Position

8.0 SENSOR SETUP

Loose pins and seals are included and must be crimped onto an existing harness (Holley P/N: 558-306 or 558-431). Use the proper tools to crimp metripak 150 style pins (Delphi P/N: 12155975 - Available through Waytek, Inc. Item No.: 509). It is advised to use shielded wiring (with drain wire grounded at the ECU end) to connect to the sensor. The pins are inserted into the back of the connector. Install the TPA lock after the wires are inserted.

The following is the proper wiring for the included sensor:

- A – Red – 5V to 20V “clean” switched power. Pin B20 (“EST 12V Output”) on Holley EFI systems would be good choices.
- B – White – Sensor Output to ECU cam input signal (Pin A22 on Holley EFI).
- C – Black – Sensor ground. Connect to a “clean” ECU ground, such pin A14 (“IPU Ground”) on Holley EFI systems.

NOTE: If using Holley EFI, set the cam sensor “Type” to “Digital Rising” or “Digital Falling” in *Ignition Type* under Ignition Parameters. “Digital Falling” is recommended.

HOLLEY TECHNICAL SUPPORT
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