Holley Carburetor O.E. Specifications and Applications for 1967-'69 Z28 302 Engines

There were three unique Holley 780 CFM, vacuum secondary, Model 4150 carburetors used on the 1967 thru 1969 Z28 302 Engines, as follows:

1967 w/o K19 A.I.R. Emission Control System: Holley List **3910**, Chevy P/N & Code: 3916143-CT. Used on 1967 Z28's delivered in all states except California
1967 w/K19 A.I.R. Emission Control System: Holley List **3911**, Chevy P/N & Code: 3916145-CU. Used on 1967 Z28's delivered in California
1968-'69 (A.I.R. System std on all 1968-'69 Z28's): Holley List **4053**, Chevy P/N & Code: 3923289-DZ. Used on 1968-'69 Z28's delivered in all 50 states
The Holley List No., Chevrolet P/N and Date Code for each of these carbs is stamped on the choke tower's forward face.

In addition to the Z28 302 engine, Holley Model 4150 4-bbl carburetors were used as original equipment on other 1st Gen Camaro engines, namely the L78 & L89 396/375HP, the COPO L72 427/425HP and the COPO ZL1 427/430HP, but these carburetors are not included in this discussion.

The following data have been compiled from several sources: 1973 Holley Carburetion Illustrated Parts & Spec's Manual No. 36-51 (Rev 1), 1968 & '69 Chevrolet Service Manuals, as well as from measuring and inspecting known original, unmodified carbs (J. MacNeish - owner of Camaro Hi-Performance, B. Wenzel - owner of 1967 Z28 C-Stock National Record Holder, C. Brick - owner of unrestored '69 Z28 and article's author). Included are various specifications that affect air/fuel calibration obtained from published Holley Numerical Listing Charts, as well as additional information and key specifications affecting calibration never published by Holley, such as: metering block identification numbers, power valve channel restriction (PVCR) dia.'s, air bleed dia.'s, idle feed restriction (IFR) dia.'s, etc.

List 3910 - 1967 Z28 w/o K19 A.I.R. (Jerry MacNeish, two carbs)

P/N 3916143-CT, Date Codes: 751, 753 (1967, May, 1st & 3rd week)

	Primary:	Area (in.²):	Secondary:	Area (in.²):
Venturi Dia.	1 3/8	1.4849	1 7/16	1.6230
Throttle Bore	1 11/16	2.2365	1 11/16	2.2365
Booster Style	Drop Leg		Drop Leg	
Meter. Block Ident. No.	5417		4519	
	No. Dia.:	Area (in.²):	No. Dia.:	Area (in.²):
Main Jet	71 0.076	0.00454	76 0.084	0.00554
PVCR	0.063	0.00312	0.070	0.00385
	Total:	0.00765	Total:	0.00939
Power Valve, (in. Hg.)	6.5		8.5	
Idle Feed Restr.	0.031		---	
Low Speed Air Bleeds	(See footnote 1)		0.028	
Hi Speed Air Bleeds	0.028		0.025	
Main Well Siphon Break	0.026		---	
Emulsion Bleeds Dia.:				
Upper	0.026		0.026	
Lower	0.026		0.026	
Inlet Needle & Seat P/N	6-504		6-504	
Pump Nozzle	0.025		---	
Pump Cam	#218	White	---	
Pump Cam Hole #	#1		---	
Init. Idle Mix. Screw Adj.	1-1.25 turns out from seated		---	
Initial Dry Float Setting	0.35		0.50	
Init. Sec'y Idle Stop Adj.	---		1/4 - 1/2 turn open	
Vac. Sec'y Spring Color	---		Yellow	
Vac. Sec'y Check Ball?	---		Not Used[2]	
Choke Vac. Break Dim[3]	0.340 - 0.360		---	
Choke Unloader Dim[4]	0.320 - 0.380		---	

Primary vs. Sec'y ***Fuel*** Flow Area Comparison (using specified jets/PVCR's):

	Dia.	Area		Dia.	Area
Pri #71 jet =	0.076	0.00454	Sec #76 jet =	0.084	0.00554
Pri PVCR =	0.063	0.00312	Sec PVCR =	0.070	0.00385
Total fuel flow area =		0.00765	Total fuel flow area =		0.00939
			% Pri **Fuel** Flow < Sec'y **Fuel** Flow:		**23%**

Primary vs. Sec'y Venturi ***Air*** Flow Area Comparison[5]: **A**

	Dia.	Area		Dia.	Area
Pri Venturi =	1 3/8	1.4849	Sec'y Venturi =	1 7/16	1.6230
Less calc. booster X-area:		0.3510	Less calc. booster X-area:		0.3510
Resultant air flow area:		1.1339	Resultant air flow area:		1.2720
			% Pri **Air** Flow < Sec'y **Air** Flow:		**12%**

Note: Fuel flow vs. air flow in primary is somewhat leaner than secondary.

List 3911 - 1967 Z28 with K19 A.I.R. (Ben Wenzel)

P/N 3916145-CU, Date Code: 864 (1968, June, 4th week)

	Primary:	Area (in.²):	Secondary:	Area (in.²):
Venturi Dia.	1 3/8	1.4849	1 7/16	1.6230
Throttle Bore	1 11/16	2.2365	1 11/16	2.2365
Booster Style	Drop Leg		Drop Leg	
Meter. Block Ident. No.	5462		4519	
	No. Dia.:	Area (in.²):	No. Dia.:	Area (in.²):
Main Jet	68 0.069	0.00374	76 0.084	0.00554
PVCR	0.063	0.00312	0.070	0.00385
	Total:	0.00686	Total:	0.00939
Power Valve, (in. Hg.)	6.5		8.5	
Idle Feed Restr.	0.039		---	
Low Speed Air Bleeds	(See footnote 1)		0.028	
Hi Speed Air Bleeds	0.028		0.025	
Main Well Siphon Break	0.026		---	
Emulsion Bleeds Dia.:				
Upper	0.028		0.026	
Lower	0.028		0.026	
Inlet Needle & Seat P/N	6-504		6-504	
Pump Nozzle	0.025		---	
Pump Cam	#218	White	---	
Pump Cam Hole #	#1		---	
Init. Idle Mix. Screw Adj.	1-1.25 turns out from seated		---	
Initial Dry Float Setting	0.35		0.50	
Init. Sec'y Idle Stop Adj.	---		1/4 - 1/2 turn open	
Vac. Sec'y Spring Color	---		Yellow	
Vac. Sec'y Check Ball?	---		Not Used[2]	
Choke Vac. Break Dim[3]	0.340 - 0.360		---	
Choke Unloader Dim[4]	0.320 - 0.380		---	

Primary vs. Sec'y ***Fuel*** Flow Area Comparison (using specified jets/PVCR's):

	Dia.	Area		Dia.	Area
Pri #68 jet =	0.069	0.00374	Sec #76 jet =	0.084	0.00554
Pri PVCR =	0.063	0.00312	Sec PVCR =	0.070	0.00385
Total fuel flow area =		0.00686	Total fuel flow area =		0.00939
			% Pri **Fuel** Flow < Sec'y **Fuel** Flow:		**37%**

Primary vs. Sec'y Venturi ***Air*** Flow Area Comparison[5]: **B**

	Dia.	Area		Dia.	Area
Pri Venturi =	1 3/8	1.4849	Sec'y Venturi =	1 7/16	1.6230
Less calc. booster X-area:		0.3510	Less calc. booster X-area:		0.3510
Resultant air flow area:		1.1339	Resultant air flow area:		1.2720
			% Pri **Air** Flow < Sec'y **Air** Flow:		**12%**

Note: Fuel flow vs. air flow in primary is much leaner than secondary.

List 4053 - 1968 and '69 Z28 - All (Chuck Brick, CRG: COPOZ/28)

P/N 3923289-DZ, Date Code: 944 (1969, April, 4th Week)

	Primary:	Area (in.²):	Secondary:	Area (in.²):
Venturi Dia.	1 3/8	1.4849	1 7/16	1.6230
Throttle Bore	1 11/16	2.2365	1 11/16	2.2365
Booster Style	Drop Leg		Drop Leg	
Meter. Block Ident. No.	5583		4519	
	No. Dia.:	Area (in.²):	No. Dia.:	Area (in.²):
Main Jet	68 0.069	0.00374	76 0.084	0.00554
PVCR	0.063	0.00312	0.070	0.00385
	Total:	0.00686	Total:	0.00939
Power Valve, (in. Hg.)	6.5		8.5	
Idle Feed Restr.	0.035		---	
Low Speed Air Bleeds	(See footnote 1)		0.028	
Hi Speed Air Bleeds	0.0292		0.025	
Main Well Siphon Break	0.028		---	
Emulsion Bleeds Dia.:				
Upper	0.026		0.026	
Lower	0.026		0.026	
Inlet Needle & Seat P/N	6-504		6-504	
Pump Nozzle	0.025		---	
Pump Cam	#218	White	---	
Pump Cam Hole #	#1		---	
Init. Idle Mix. Screw Adj.	1-1.25 turns out from seated		---	
Initial Dry Float Setting	0.35	(per Chevy Serv. Man.)	0.50	(per Chevy Serv. Man.)
Init. Sec'y Idle Stop Adj.	---		1/4 - 1/2 turn open	
Vac. Sec'y Spring Color	---		Yellow	
Vac. Sec'y Check Ball?	---		Not Used[2]	
Choke Vac. Break Dim[3]	0.285 - 0.315		---	
Choke Unloader Dim[4]	0.320 - 0.380		---	

Primary vs. Sec'y ***Fuel*** Flow Area Comparison (using specified jets/PVCR's):

	Dia.	Area		Dia.	Area
Pri #68 jet =	0.069	0.00374	Sec #76 jet =	0.084	0.00554
Pri PVCR =	0.063	0.00312	Sec PVCR =	0.070	0.00385
Total fuel flow area =		0.00686	Total fuel flow area =		0.00939
			% Pri **Fuel** Flow < Sec'y **Fuel** Flow:		**37%**

Primary vs. Sec'y Venturi ***Air*** Flow Area Comparison[5]: **C**

	Dia.	Area		Dia.	Area
Pri Venturi =	1 3/8	1.4849	Sec'y Venturi=	1 7/16	1.6230
Less booster/leg x-area:		0.3510	Less calc. booster X-area:		0.3510
Resultant air flow area:		1.1339	Resultant air flow area:		1.2720
			% Pri **Air** Flow < Sec'y **Air** Flow:		**12%**

Note: Fuel flow vs. air flow in primary is much leaner than secondary.

Included for Reference Only:

List 3310 (1st version) Aftermarket Carb, Manual Choke Version

P/N 3878261-EH, Date Code: 072 = 1970, July, 2nd Week

	Primary:	Area (in.²):	Secondary:	Area (in.²):
Venturi Dia.	1 3/8	1.4849	1 7/16	1.6230
Throttle Bore	1 11/16	2.2365	1 11/16	
Booster Style	Drop Leg		Drop Leg	
Meter. Block Ident. No.	5271		4519	
	No. Dia.:	Area (in.²):	No. Dia.:	Area (in.²):
Main Jet	72 0.079	0.00490	76 0.084	0.00554
PVCR	0.063	0.00312	0.070	0.00385
	Total:	0.00802	Total:	0.00939
Power Valve, (in. Hg.)	10.5		8.5	
Idle Feed Restr.	0.035		---	
Low Speed Air Bleeds	0.076		0.028	
Hi Speed Air Bleeds	0.025		0.025	
Main Well Siphon Break	0.031		---	
Emulsion Bleeds Dia.:				
Upper	0.026		0.026	
Lower	0.026		0.026	
Inlet Needle & Seat P/N	6-504		6-504	
Pump Nozzle	0.025		---	
Pump Cam	#218	White	---	
Pump Cam Hole #	#1		---	
Init. Idle Mix. Screw Adj.	1-1.5 turns out from seated		---	
Initial Dry Float Setting	0.375	(per Holley)	0.50	(per Holley)
Init. Sec'y Idle Stop Adj.	---		1/4 - 1/2 turn open	
Vac. Sec'y Spring Color	---		Plain	
Vac. Sec'y Check Ball?	---		TBD	
Choke Vac. Break Dim	N/A - has manual choke		---	
Choke Unloader Dim	N/A - has manual choke		---	

Primary vs. Sec'y ***Fuel*** Flow Area Comparison (using specified jets/PVCR's):

	Dia.	Area		Dia.	Area
Pri #72 jet =	0.079	0.00490	Sec #76 jet =	0.084	0.00554
Pri PVCR =	0.063	0.00312	Sec PVCR =	0.070	0.00385
Total fuel flow area =		0.00802	Total fuel flow area =		0.00939
			% Pri **Fuel** Flow < Sec'y **Fuel** Flow:		**17%**

Primary vs. Sec'y Venturi ***Air*** Flow Area Comparison[5]: **D**

	Dia.	Area		Dia.	Area
Pri Venturi =	1 3/8	1.4849	Sec'y Venturi =	1 7/16	1.6230
Less calc. booster X-area:		0.3510	Less calc. booster X-area:		0.3510
Resultant air flow area:		1.1339	Resultant air flow area:		1.2720
			% Pri **Air** Flow < Sec'y **Air** Flow:		**12%**

Note: Fuel flow vs. air flow in primary more closely matches sec'y in 3310 carb.

Primary to Secondary Fuel Flow Area vs. Air Flow Area Relationship: This is depicted by "A" in the 3910 carb, "B" in the 3911 carb and "C" in the 4053 carb, compared to that of the aftermarket 3310 carb depicted by "D". All three of these Z28 carbs are early emissions era calibrated carbs with leaned out primaries, whereas the 3310 carb is tuned by Holley for off-road max output. This implies the 3911 and 4053 carbs (and the 3910 carb to a lesser extent) would benefit from larger #72 primary jets (or larger primary PVCR's) to better match the more balanced primary to secondary fuel flow vs. air flow relationship that exists in the performanced tuned 3310 carb when at wide open throttle -- a jetting change that is recommended by Jerry MacNeish of Camaro Hi-Performance for 302/Z28 engines in their original build condition.

Comments:

A. Green shaded items show differences in '67 3911 carb vs. 3910. Yellow shaded items show differences in '68-'69 4053 carb vs. 3910.
B. All drilled air/fuel calibration hole diameters shown are +/- 0.001"

Footnotes:

1. Primary low speed air bleed holes appear oversize. To compensate, a drilled and threaded hole, starting outside the choke tower, intersects the air bleed passage at an angle deeper inside the main body. A setscrew is inserted in this hole and adjusted so that it partially restricts airflow thru the vertical oversize low speed air bleed channel. The setscrew is adjusted by Holley on their flow bench prior to shipment to achieve a Chevrolet specified air/fuel ratio at a specified vacuum level and percent throttle opening. Once set, the setscrew access hole is plugged over to prevent tampering.
2. Per Jerry MacNeish of Camaro Hi-Performance, and per 1969 Chevrolet Service Manual.
3. Per specific year Chevrolet Service manual: measured gap between lower edge of choke blade and inside wall of choke tower, using appropriate dia. drill rod, with vacuum applied to pull-off diaphragm.
4. Per Chevrolet Service Manual: measured gap between lower edge of choke blade and inside wall of choke tower, using appropriate dia. drill rod, with throttle held fully open.
5. Adjusted for booster cross-sectional area acting as a restriction to air flow through venturi. Its effect on air flow reduction is greater on the smaller primary venturi than on the larger sec'y venturi.