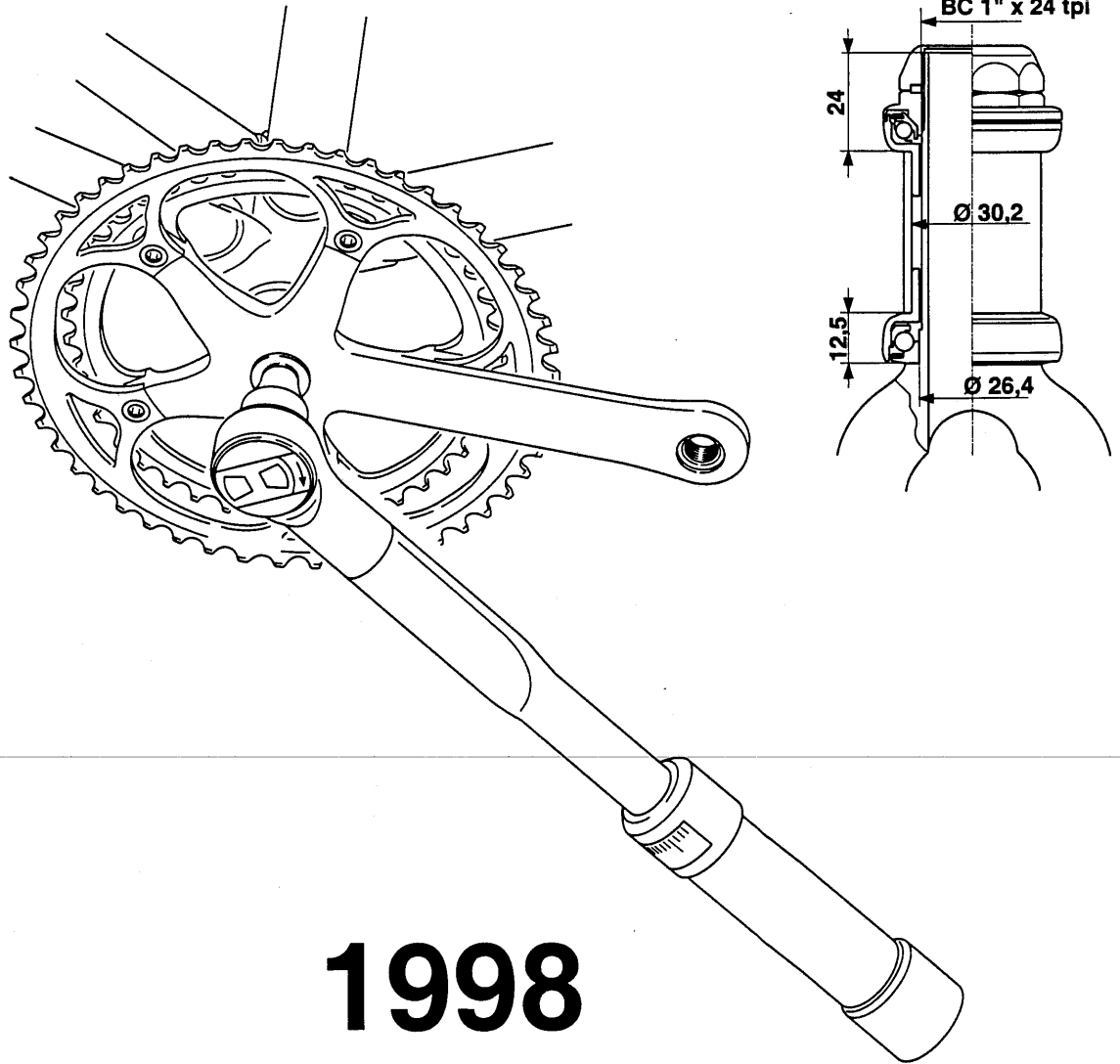


Campagnolo[®]



1998
TECHNICAL
SPECIFICATIONS

INTRODUCTION

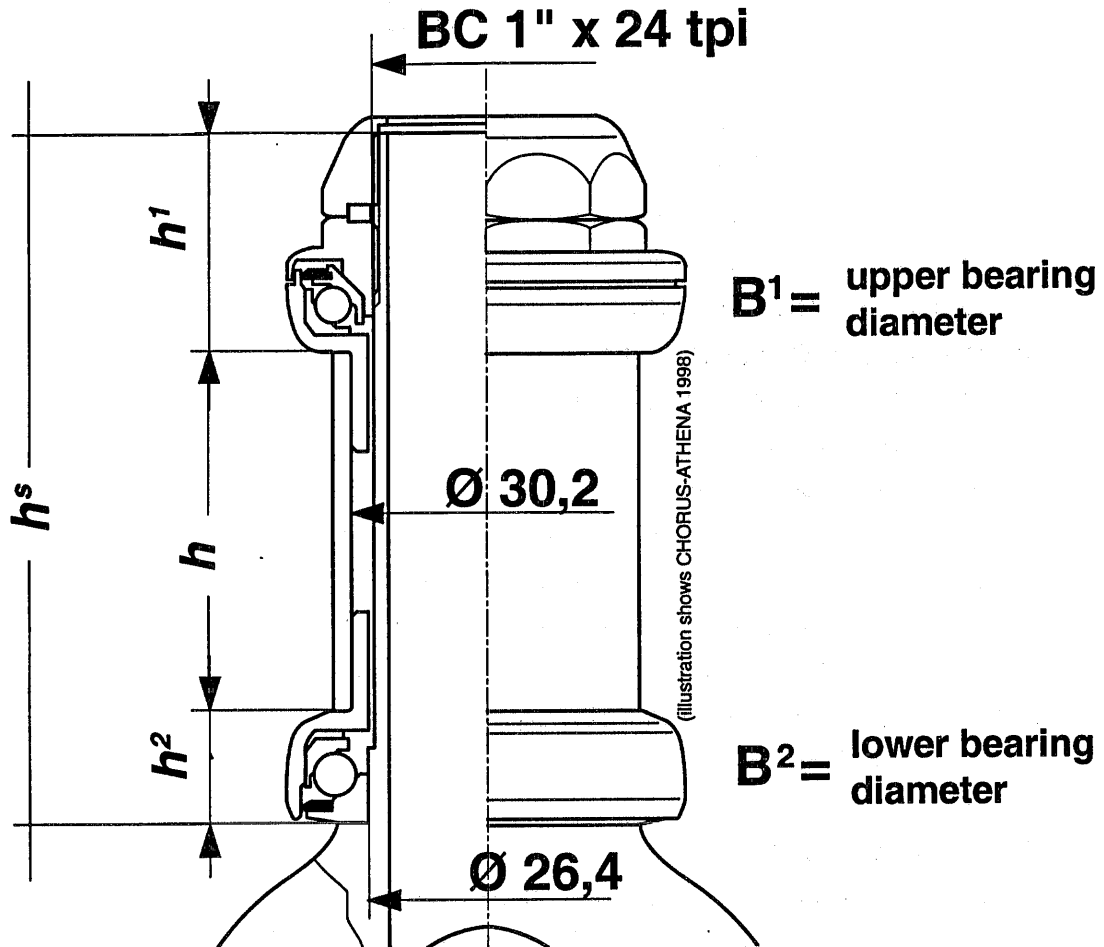
The following pages are intended as a brief summary of specifications and various technical data relevant to the assembly of Campagnolo components from the 1998 product line. They are to be considered a supplement to the information provided in the instruction sheets added to the original packaging of Campagnolo products, without the pretension of constituting a complete guide to bicycle assembly.

For any questions and suggestions regarding the contents of this brochure, contact Campagnolo USA Inc., 5451-H Avenida Encinas, Carlsbad, CA 92008.

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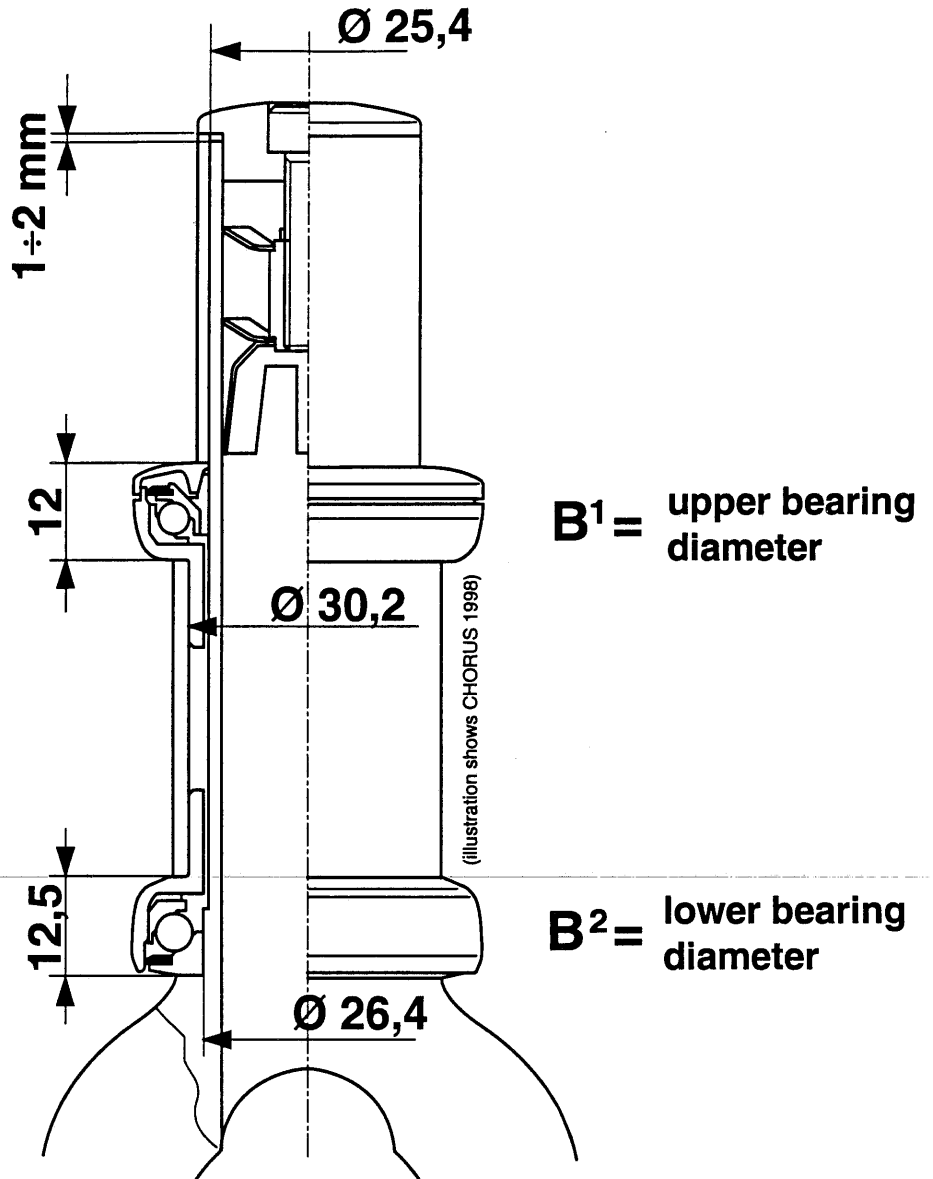
RECORD-CHORUS-ATHENA-VELOCE-MIRAGE
HEADSETS (threaded)



STACKING HEIGHTS for 1998 HEADSETS						
model	item code	B ¹ Ø	B ² Ø	h^1	h^2	$h^1 + h^2$
RECORD	HS-21RE	5/32"!	3/16"!	24mm	12.5 mm	36.5 mm
CHORUS	HS-21CH	5/32"!	3/16"!	24mm	12.5 mm	36.5 mm
ATHENA	HS-21AT	5/32"!	3/16"!	24mm	12.5 mm	36.5 mm
VELOCE	HS-21VL	3/16"	3/16"	26mm	15.5 mm	41.5 mm
MIRAGE	HS-21MI	3/16"	3/16"	26mm	15.5 mm	41.5 mm

! = make sure to install smaller Ø bearings (5/32") on top and larger Ø bearings at bottom of HS

RECORD-CHORUS
Threadless HEADSETS



1998 THREADLESS HEADSETS

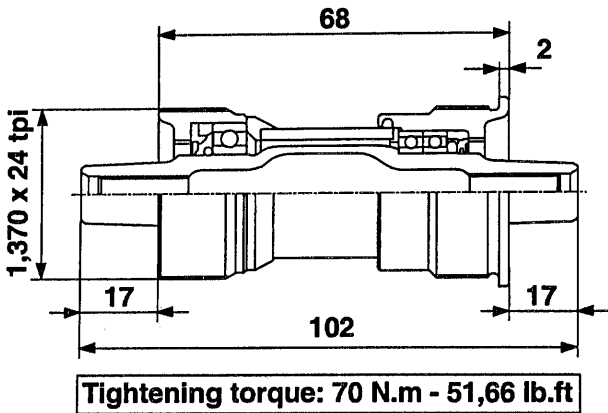
model	item code	$B^1 \text{ Ø}$	$B^2 \text{ Ø}$	h^1	h^2	$h^1 + h^2$
RECORD	HS-01REHD	5/32"!	3/16"!	12mm	12.5 mm	24.5 mm
CHORUS	HS-01CHHD	5/32"!	3/16"!	12mm	12.5 mm	24.5 mm

! = make sure to install smaller Ø bearings (5/32") on top and larger Ø bearings at bottom of HS

RECORD - CHORUS BOTTOM BRACKETS

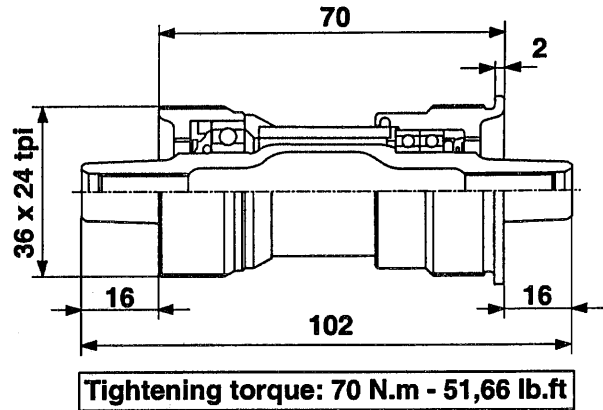
RECORD BSC. threading

item code	weight	spindle length
BB-33RECART	190g	102mm



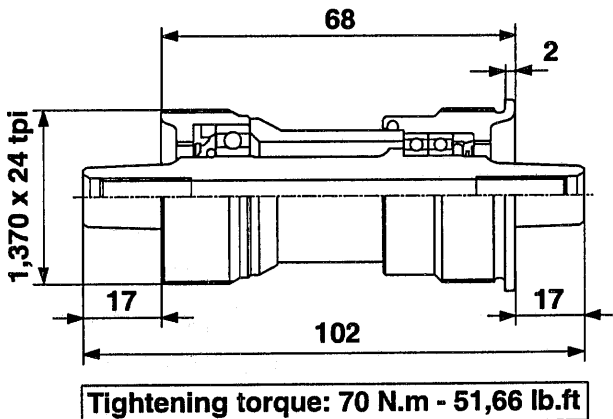
RECORD ITA. threading

item code	weight	spindle length
BB-31RECART	193g	102mm



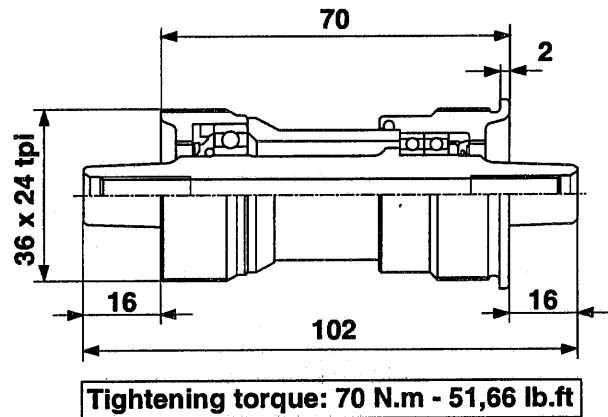
CHORUS BSC. threading

item code	weight	spindle length
BB-03CHCART	223g	102mm



CHORUS ITA. threading

item code	weight	spindle length
BB-01CHCART	226g	102mm

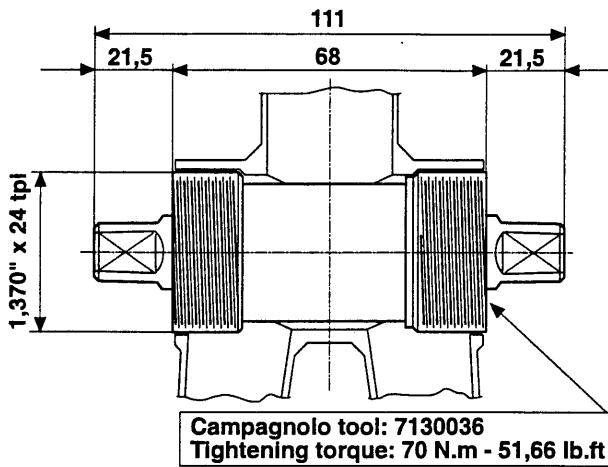


ATHENA BOTTOM BRACKETS

Standard for *ATHENA* & *RACING T*:

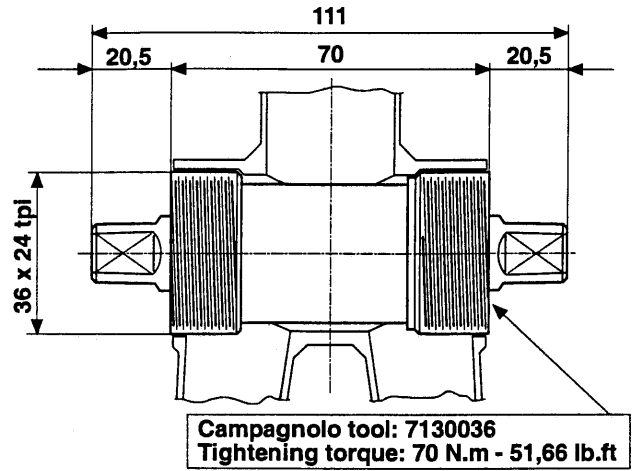
ATHENA BSC. threading

item code	weight	spindle length
BB-13ATCART	276g	111mm



ATHENA ITA. threading

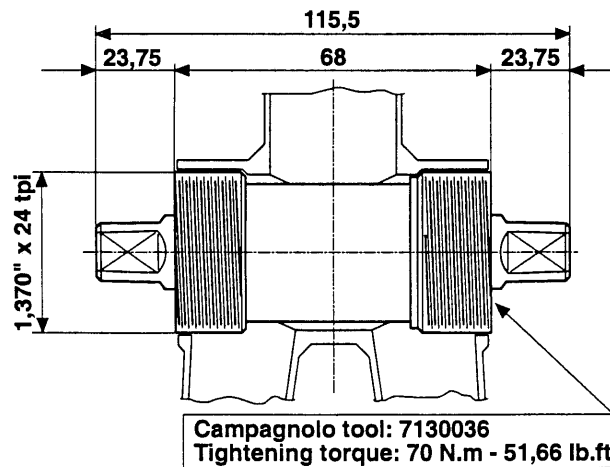
item code	weight	spindle length
BB-11ATCART	278g	111mm



For *RACING T* with seat-tube $\varnothing \geq 32\text{mm}$:

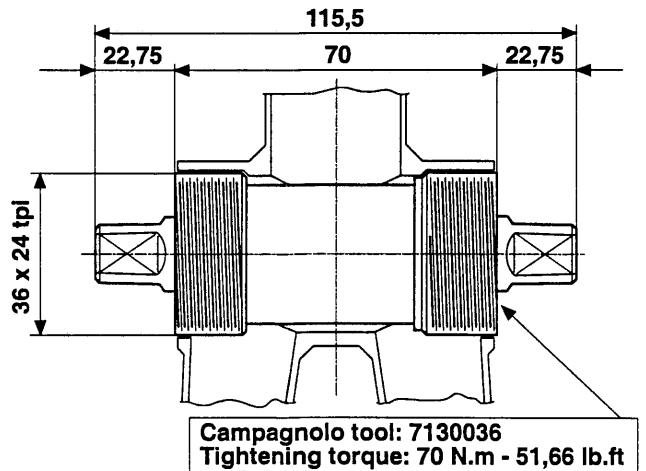
ATHENA BSC. threading

item code	weight	spindle length
BB-13RA3	294g	115,5mm



ATHENA ITA. threading

item code	weight	spindle length
BB-11RA3	296g	115,5mm



VELOCE BOTTOM BRACKETS

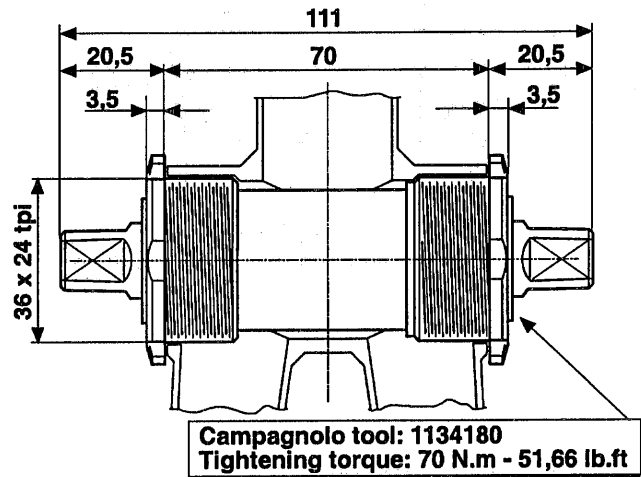
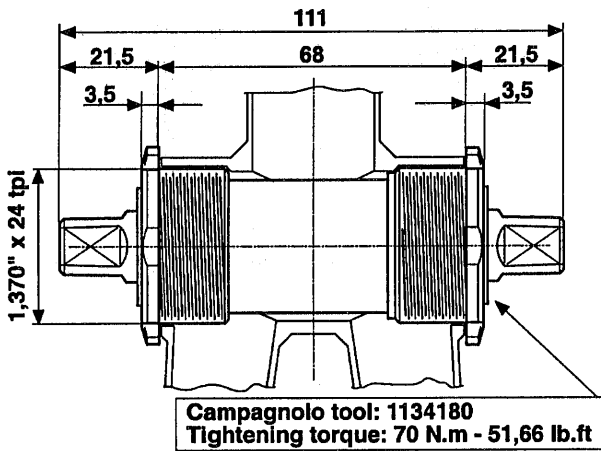
For **VELOCE** & **VELOCE Triple Standard**:

VELOCE BSC. threading

item code	weight	spindle length
BB-13VLCART	297g	111mm

VELOCEITA. threading

item code	weight	spindle length
BB-11VLCART	303g	111mm

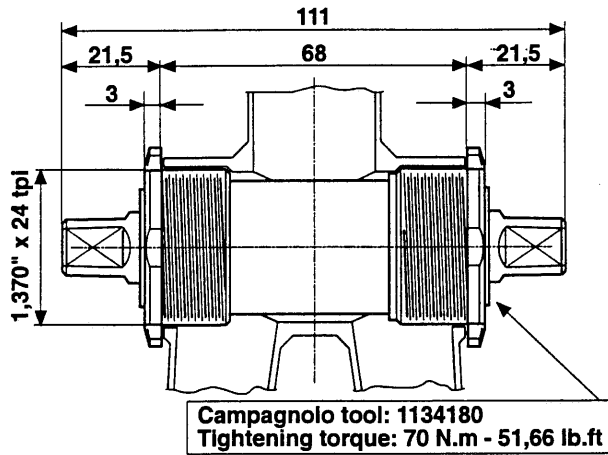


MIRAGE BOTTOM BRACKETS

Standard for *MIRAGE-AVANTI* & *MIRAGE Triple*:

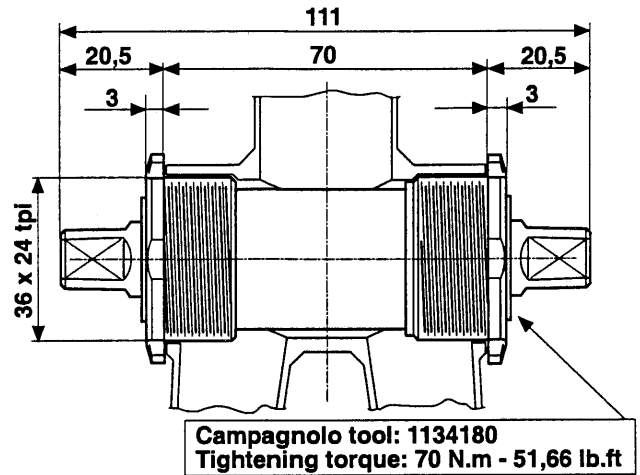
***MIRAGE* BSC. threading**

item code	weight	spindle length
BB-13MICART	297g	111mm



***MIRAGE* ITA. threading**

item code	weight	spindle length
BB-11MICART	303g	111mm

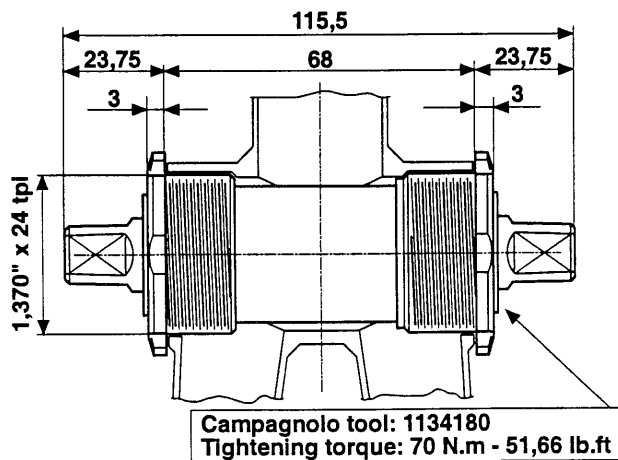


***VELOCE Triple*,**

***MIRAGE Triple*, with seat-tube $\varnothing \geq 32\text{mm}$:**

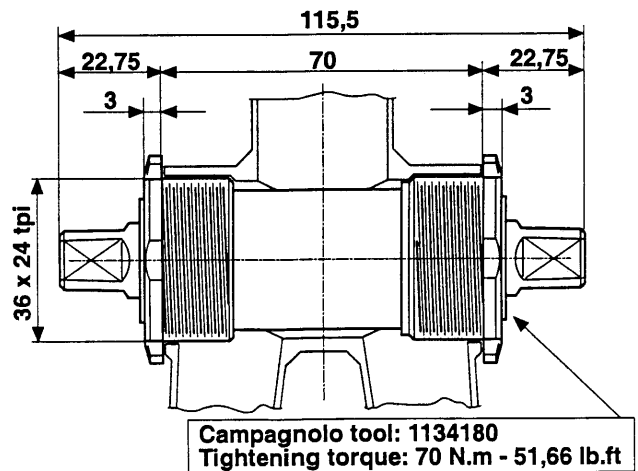
***MIRAGE* BSC. threading**

item code	weight	spindle length
BB-03MI3	364g	115,5mm

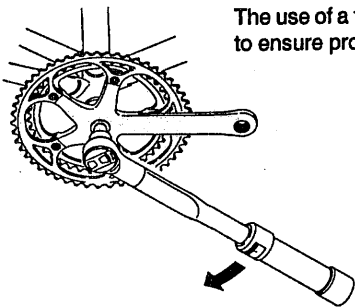


***MIRAGE* ITA. threading**

item code	weight	spindle length
BB-01MI3	364g	115,5mm

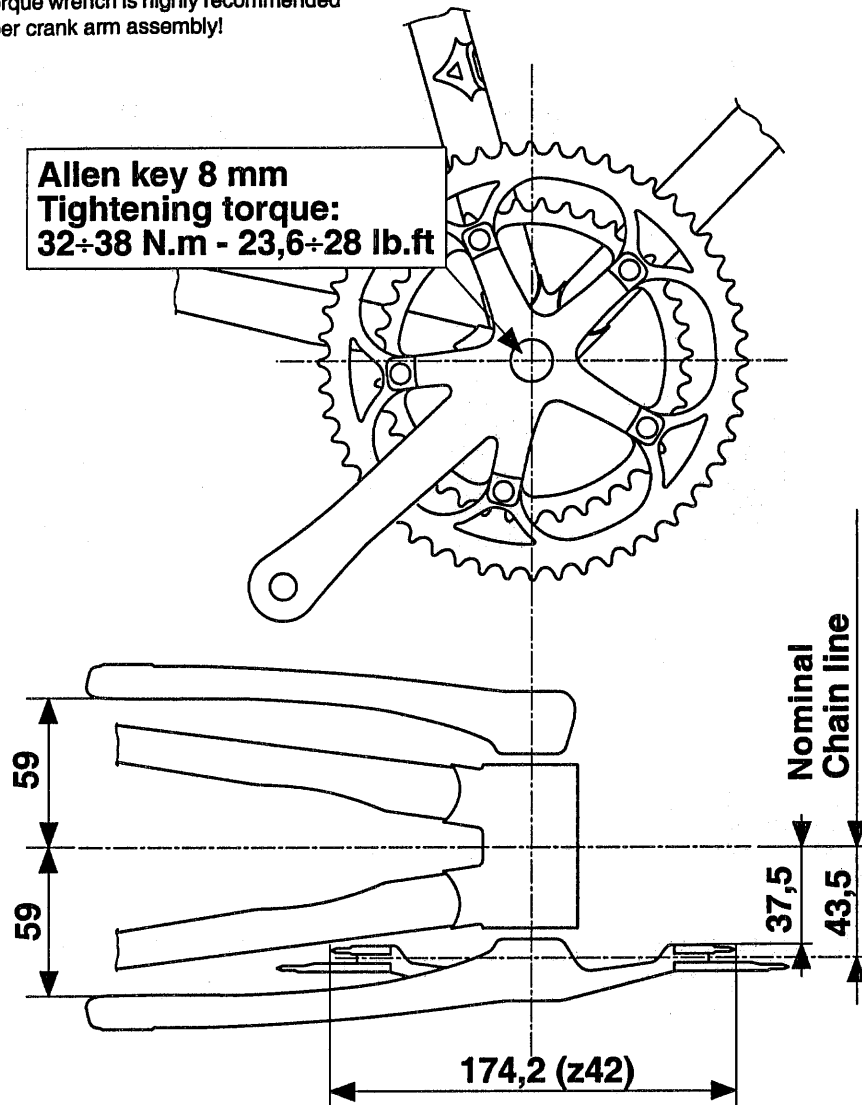


CRANKSETS (with double chainrings)



The use of a torque wrench is highly recommended to ensure proper crank arm assembly!

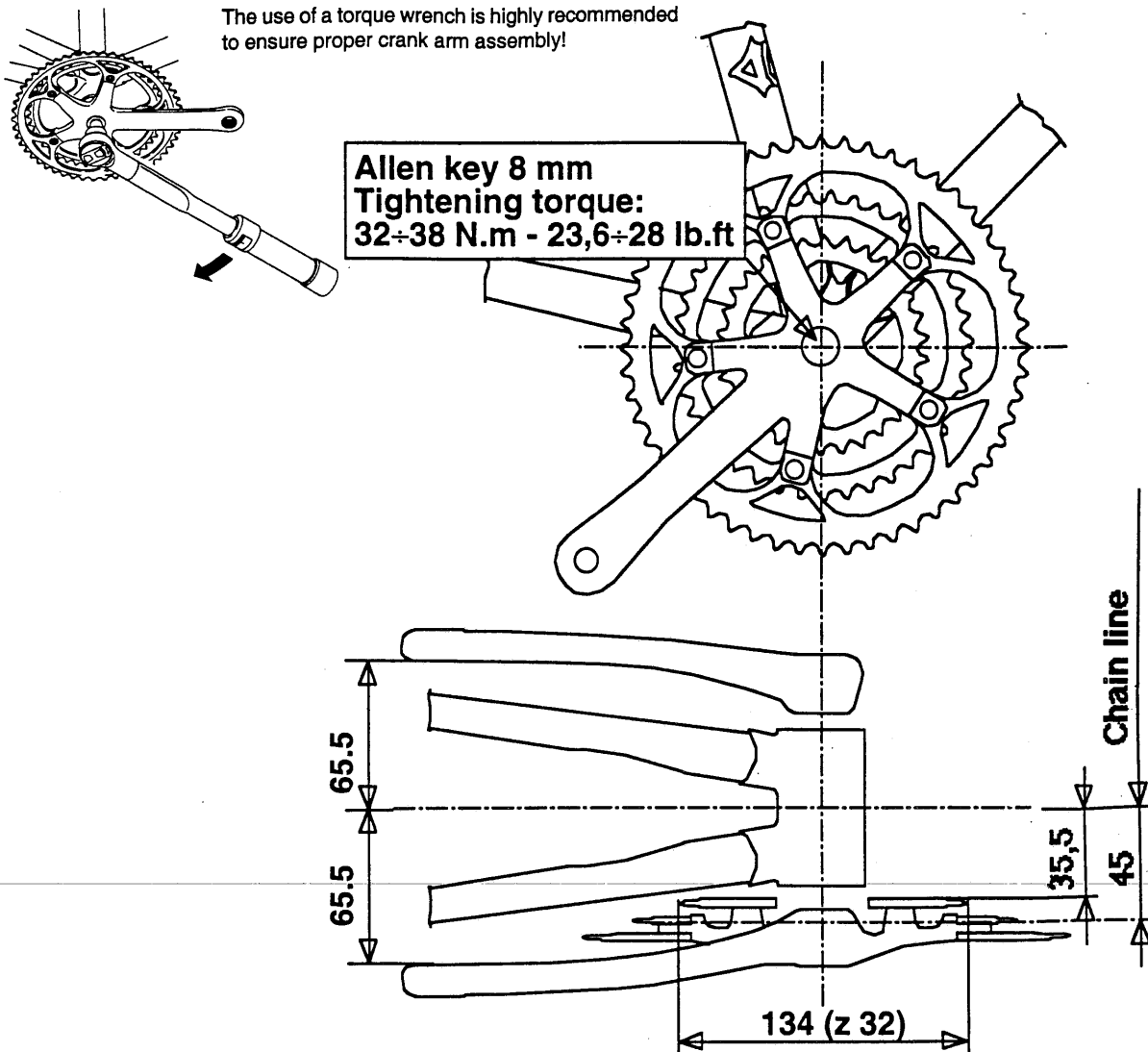
Allen key 8 mm
Tightening torque:
32÷38 N.m - 23,6÷28 lb.ft



1998 CRANKSETS			
model	item code	weight	bb-spindle
RECORD	FC-21RE	632 g	102 mm
CHORUS	FC-21CH	667 g	102 mm
ATHENA	FC-21AT	650 g	111 mm
VELOCE	FC-31VL	650 g	111 mm
MIRAGE	FC-21MI	691 g	111 mm
AVANTI	FC-21AV	730 g	111 mm

To determine chainline: use a pair of precise callipers measuring from the left hand side of seat tube to the outer (right hand) side of the big chainring (setting tip of callipers at the basis of chainring-teeth). Memorize this measurement; then deduct half of the seat-tube diameter (e.g.: 16mm on a frame set with a 32mm seat tube) minus 4.8mm (given number based on Campagnolo chainring & spacer thickness) to obtain nominal chainline as indicated in illustration. The tolerance on this measurement is 43.5mm +/- 1.5mm.

TRIPLE CRANKSETS



The use of a torque wrench is highly recommended to ensure proper crank arm assembly!

Allen key 8 mm
Tightening torque:
32÷38 N.m - 23,6÷28 lb.ft

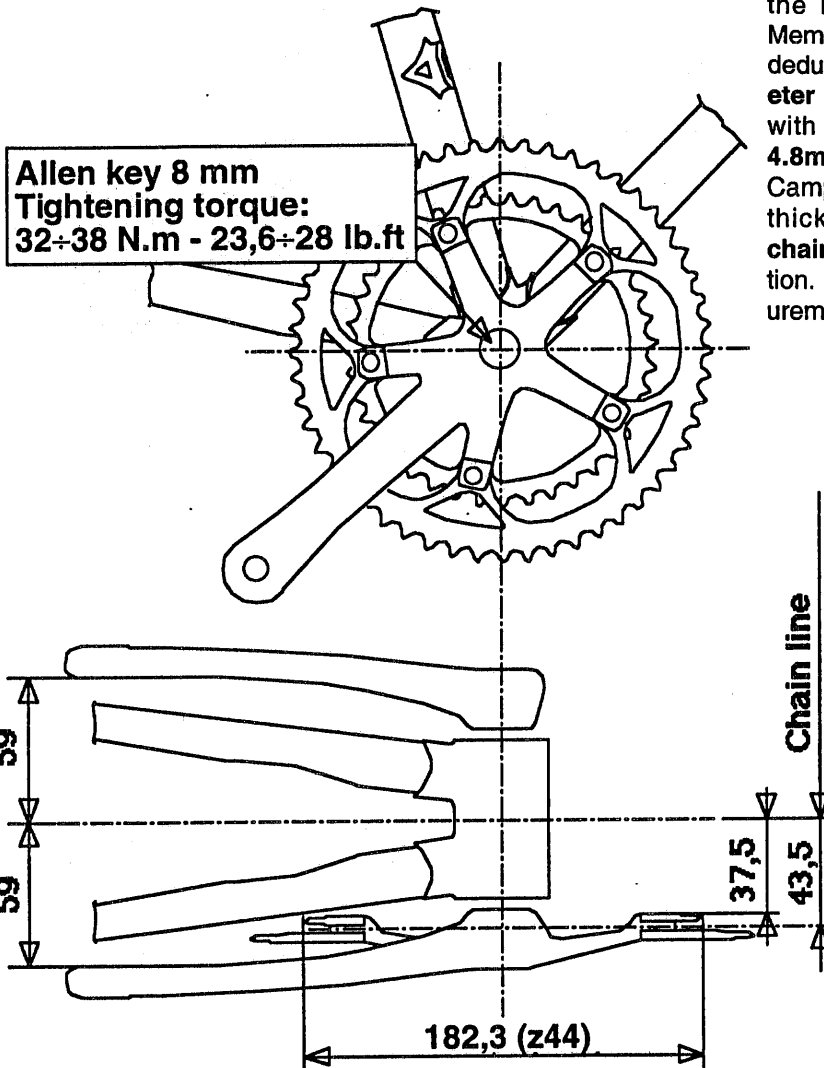
All 1998 cranksets will perform in conjunction with Campagnolo's 9-Speed system

1998 TRIPLE CRANKSETS

model	item code	weight	bb-spindle
RACING T	FC-11RA3	735 g	111 mm
VELOCE Triple	FC-21VL3	740 g	111 mm
MIRAGE Triple	FC-21MI3	728 g	111 mm

To determine chainline: use a pair of precise callipers measuring from the left hand side of seat tube to the outer (right hand) side of the big chainring (setting tip of callipers at the basis of chainring-teeth). Memorize this measurement; then deduct **half** of the **seat-tube diameter** (e.g.: 16mm on a frame set with a 32mm seat tube) minus **4.8mm** (given number based on Campagnolo chainring & spacer thickness) to obtain **nominal chainline** as indicated in illustration. The tolerance on this measurement is $\pm 1.5\text{mm}$.

SPEED TH - CRANKSET

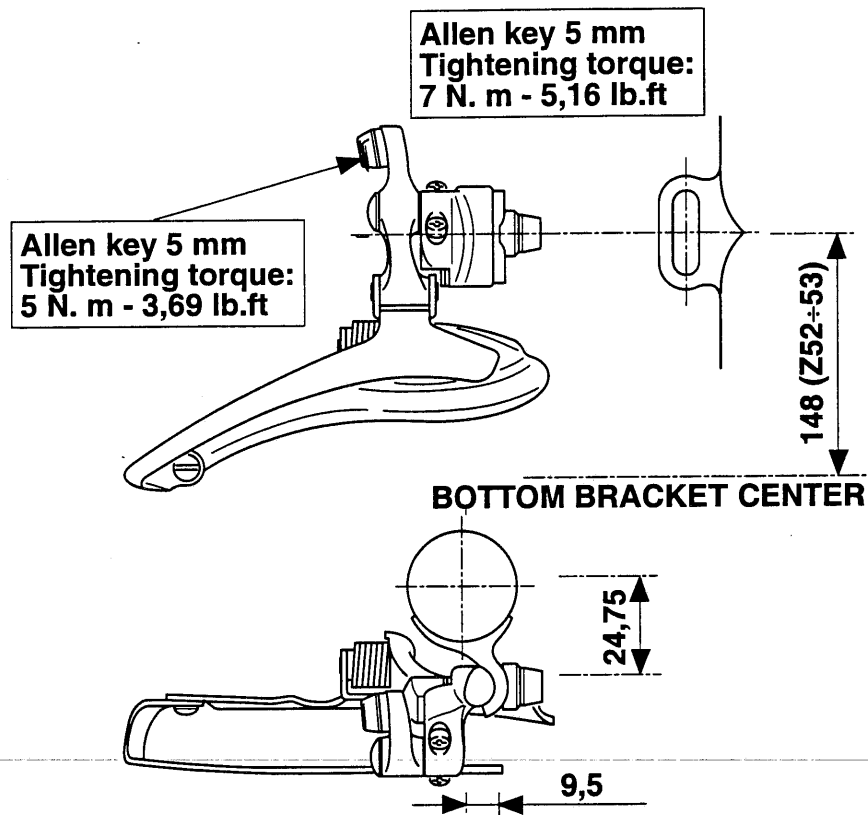


To determine chainline: use a pair of precise callipers measuring from the left hand side of seat tube to the outer (right hand) side of the big chainring (setting tip of callipers at the basis of chainring-teeth). Memorize this measurement; then deduct half of the seat-tube diameter (e.g.: 16mm on a frame set with a 32mm seat tube) minus 4.8mm (given number based on Campagnolo chainring & spacer thickness) to obtain nominal chainline as indicated in illustration. The tolerance on this measurement is 43.5mm +/- 1.5mm.

SPEED TH - CRANKSET

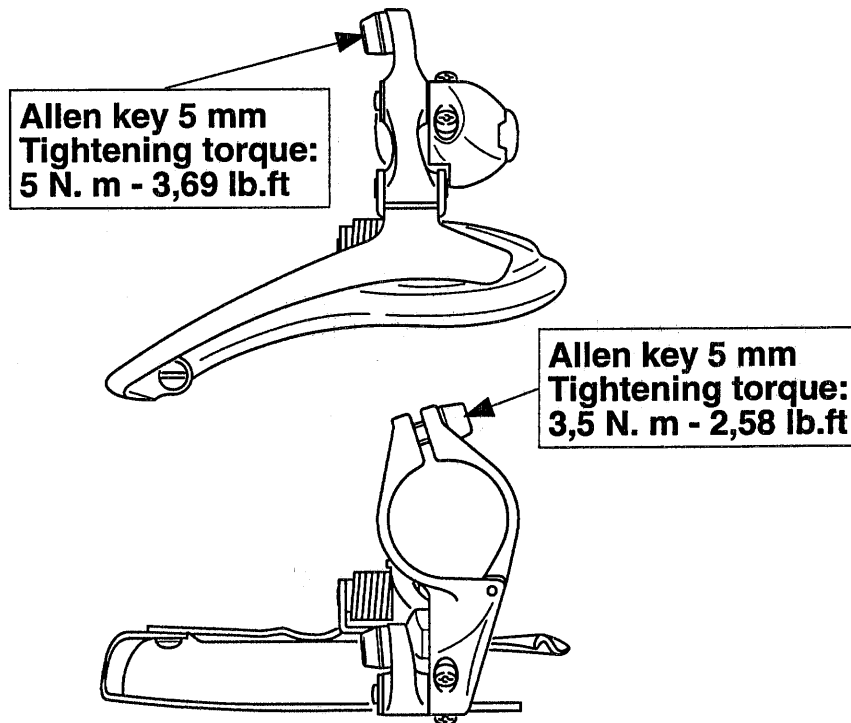
model	item code	weight	bb-spindle	big chainring	small chainr.
SPEED TH	FC-01TH	670 g	111 mm	4 mm	3,5 mm

BRAZE-ON FRONT DERAILLEURS (for double chainrings)



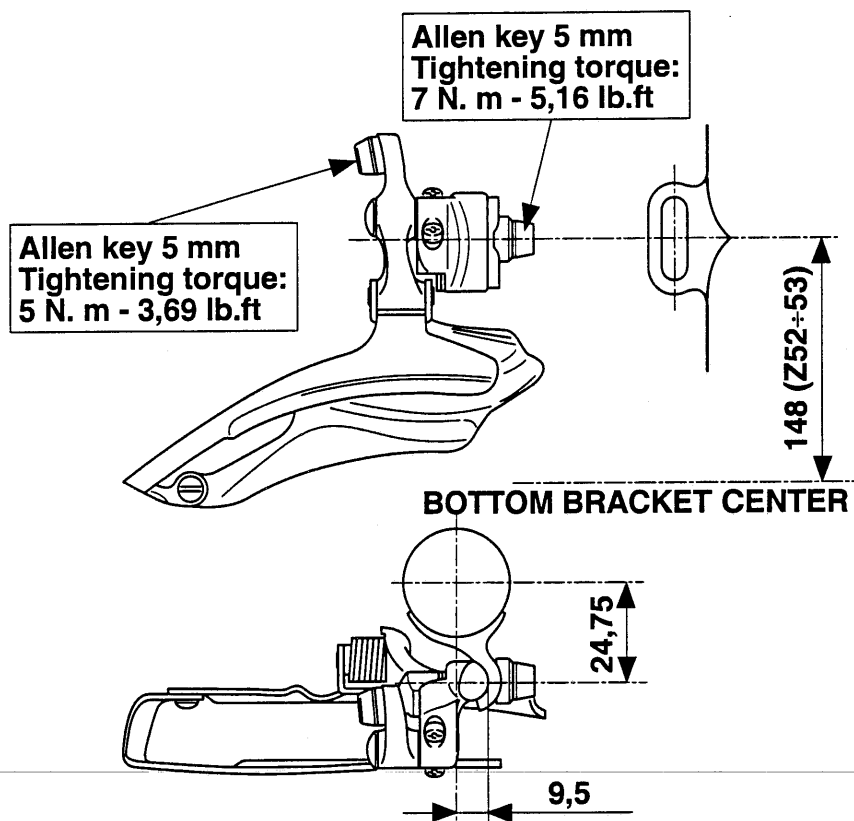
1998 braze-on FRONT DERAILLEURS				
model	item code	weight	capacity	max. chainr.
<i>RECORD</i>	FD-31SRE	89 g	15 teeth	54
<i>CHORUS</i>	FD-21SCH	87 g	15 teeth	54
<i>VELOCE</i>	FD-41SVL	93 g	15 teeth	54
<i>AVANTI</i>	FD-21SAV	100 g	15 teeth	54

CLAMP-ON FRONT DERAILLEURS (for double chainrings)



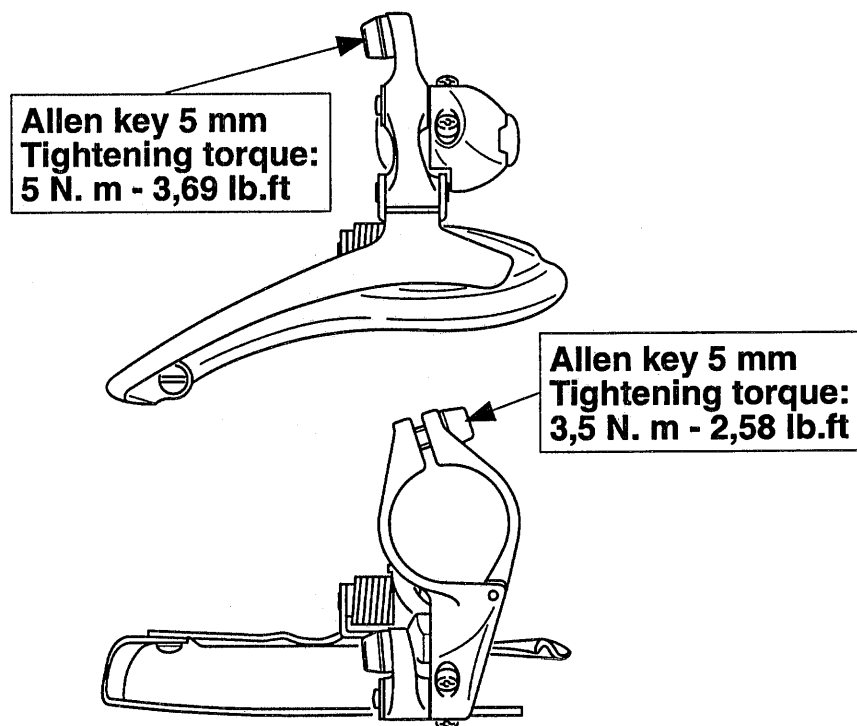
1998 clamp-on FRONT DERAILLEURS				
model	item code	weight	capacity	max. chainr.
RECORD (Ø 28.6)	FD-31FRE	98 g	15 teeth	54
RECORD (Ø 32)	FD-12FRE	103 g	15 teeth	54
RECORD (Ø 35)	FD-13FRE	104 g	15 teeth	54
CHORUS (Ø 28.6)	FD-11FCH	98 g	15 teeth	54
CHORUS (Ø 32)	FD-12FCH	101 g	15 teeth	54
CHORUS (Ø 35)	FD-03FCH	102 g	15 teeth	54
VELOCE (Ø 28.6)	FD-41FVL	99 g	15 teeth	54
VELOCE (Ø 32)	FD-22FVL	101 g	15 teeth	54
VELOCE (Ø 35)	FD-23FVL	102 g	15 teeth	54
AVANTI (Ø 28.6)	FD-11FAV	116 g	15 teeth	54

BRAZE-ON FRONT DERAILLEURS (for triple chainrings)



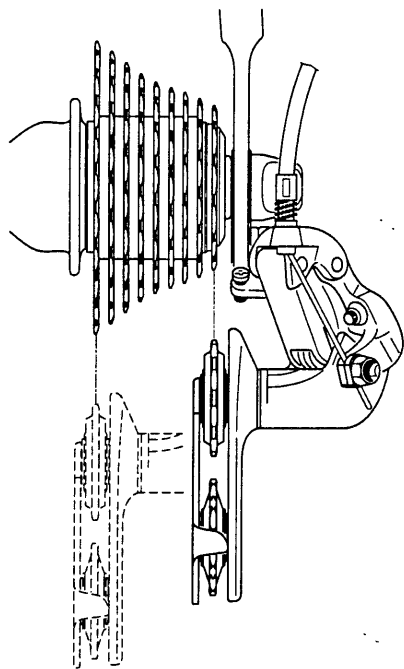
1998 braze-on FRONT DERAILLEURS				
model	item code	weight	capacity	max. chainr.
<i>RACING T</i>	FD-11SRA3	100 g	22 teeth	52
<i>VELOCE Triple</i>	FD-21SVL3	101 g	22 teeth	52
<i>AVANTI Triple</i>	FD-11SAV3	115 g	22 teeth	52

CLAMP-ON FRONT DERAILLEURS (for triple chainrings)



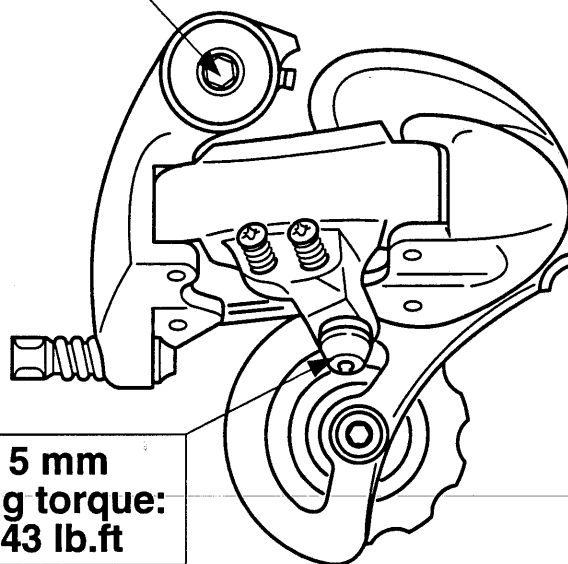
1998 clamp-on FRONT DERAILLEURS				
model	item code	weight	capacity	max. chainr.
<i>RACING T</i> (Ø 28.6)	FD-11FRA3	114 g	22 teeth	5 2
<i>RACING T</i> (Ø 32)	FD-12FRA3	115 g	22 teeth	5 2
<i>RACING T</i> (Ø 35)	FD-13FRA3	115 g	22 teeth	5 2
<i>VELOCE T</i> (Ø 28.6)	FD-21FVL3	114 g	22 teeth	5 2
<i>VELOCE T</i> (Ø 32)	FD-22FVL3	115 g	22 teeth	5 2
<i>AVANTI T</i> (Ø 28.6)	FD-11FAV3	131 g	22 teeth	5 2

REAR DERAILLEURS (with short cage)



9-SPEED

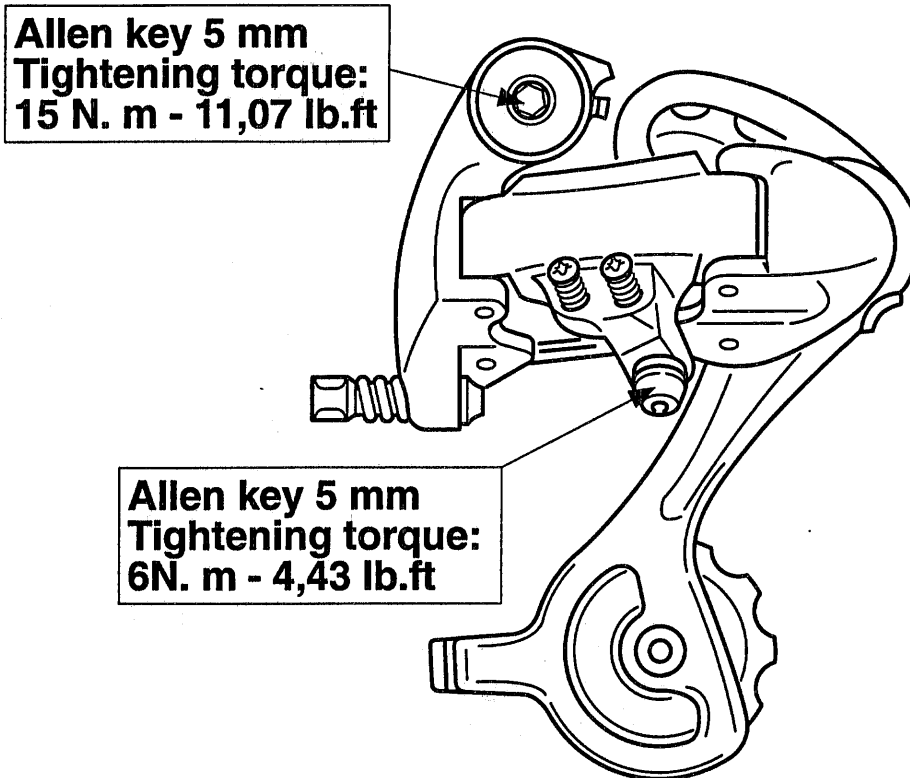
Allen key 5 mm
Tightening torque:
15 N. m - 11,07 lb.ft



Allen key 5 mm
Tightening torque:
6N. m - 4,43 lb.ft

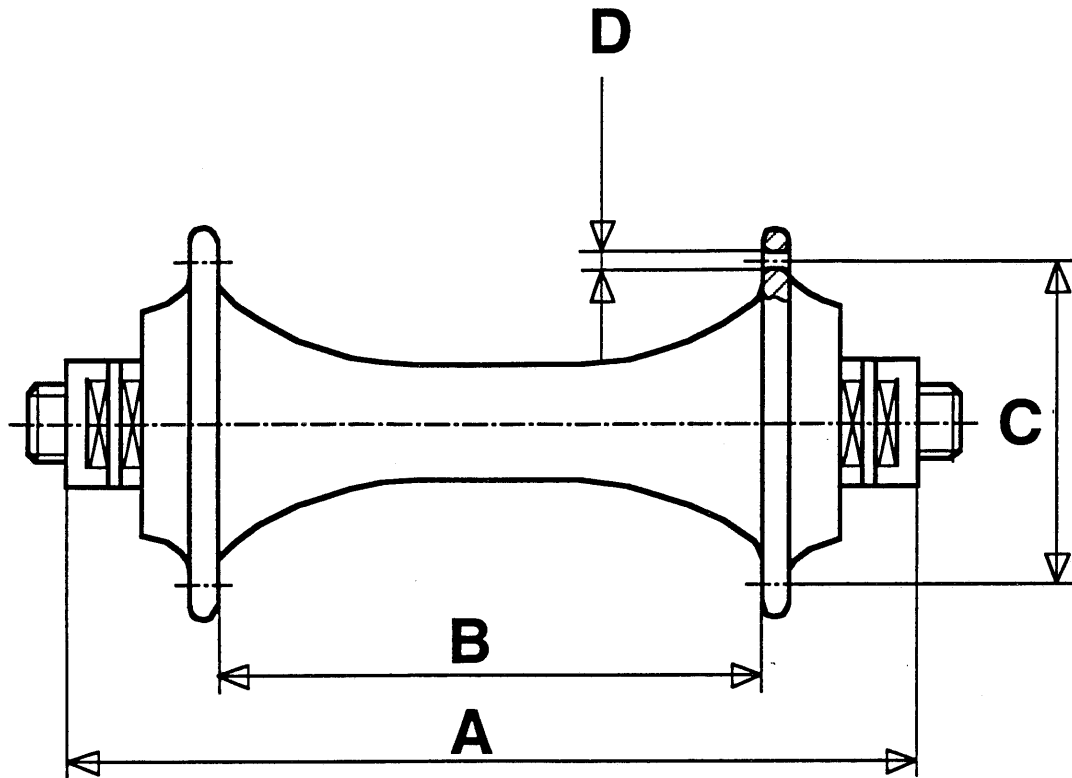
1998 REAR DERAILLEURS				
model	item code	weight	capacity	max. cog
<i>RECORD 9 Speed</i>	RD-19RE	226 g	27 teeth	26
<i>CHORUS 9 Speed</i>	RD-19CH	243 g	27 teeth	26
<i>ATHENA 9 Speed</i>	RD-09AT	237 g	27 teeth	26
<i>VELOCE 9 Speed</i>	RD-09VL	251 g	27 teeth	26
<i>MIRAGE</i>	RD-21MI	251 g	28 teeth	28
<i>AVANTI</i>	RD-21AV	251 g	28 teeth	28

TRIPLE REAR DERAILLEURS (with long cage)



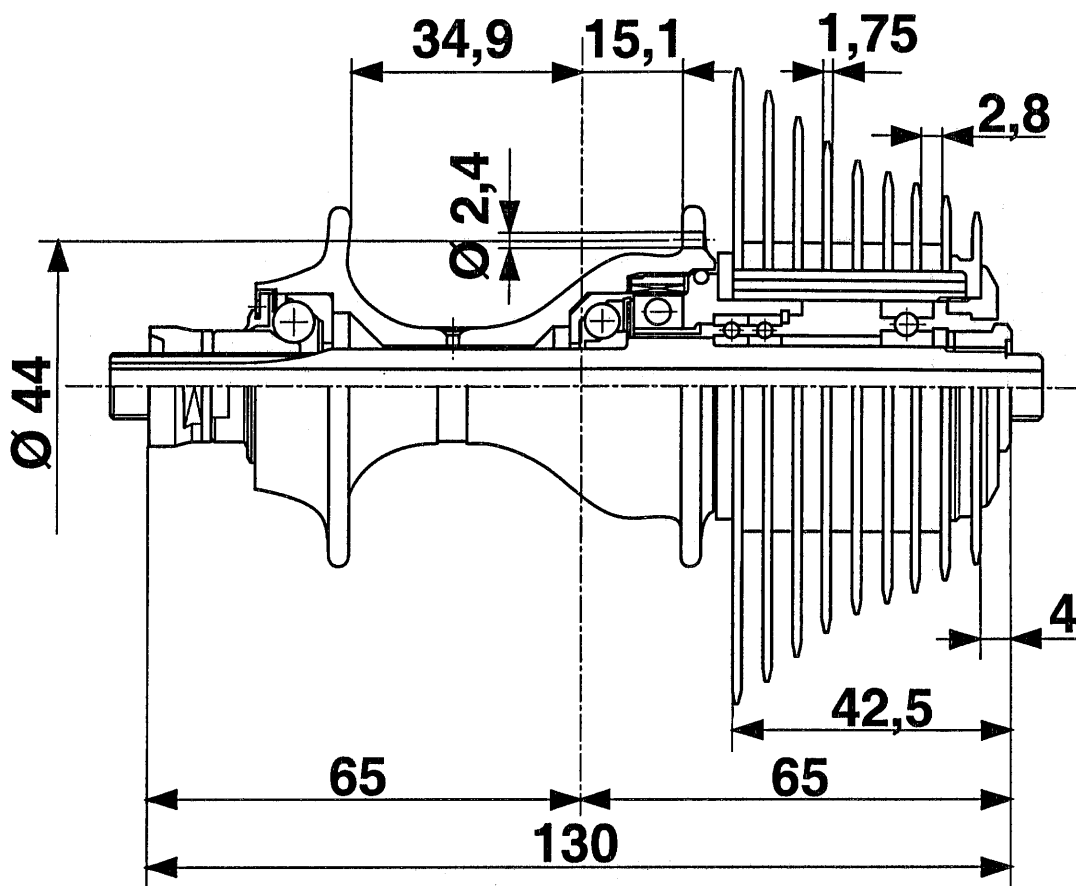
1998 TRIPLE REAR DERAILLEURS				
model	item code	weight	capacity	max. cog
<i>RACING T 9 Speed</i>	RD-09RA3	261 g	37 teeth	28
<i>VELOCE T 9 Speed</i>	RD-09VL3	268 g	37 teeth	28
<i>MIRAGE Triple</i>	RD-13MI	276 g	37 teeth	28
<i>AVANTI Triple</i>	RD-13AV	298 g	37 teeth	28

FRONT HUBS



1998 FRONT HUBS						
model	item code	weight	A	B	C	D
<i>RECORD</i>	HB-30RE	128 g	100 mm	65 mm	38.5 mm	2.4 mm
<i>CHORUS</i>	HB-20CH	146 g	100 mm	65 mm	38.5 mm	2.6 mm
<i>ATHENA</i>	HB-50AT	144 g	100 mm	65 mm	38.5 mm	2.6 mm
<i>VELOCE</i>	HB-40VL	144 g	100 mm	65 mm	38.5 mm	2.6 mm
<i>MIRAGE</i>	HB-30MI	154 g	100 mm	65 mm	38.5 mm	2.6 mm
<i>AVANTI</i>	HB-00AV	154 g	100 mm	64 mm	40 mm	2.7 mm

**9-Speed CASSETTE HUBS
RECORD, CHORUS, ATHENA, VELOCE**

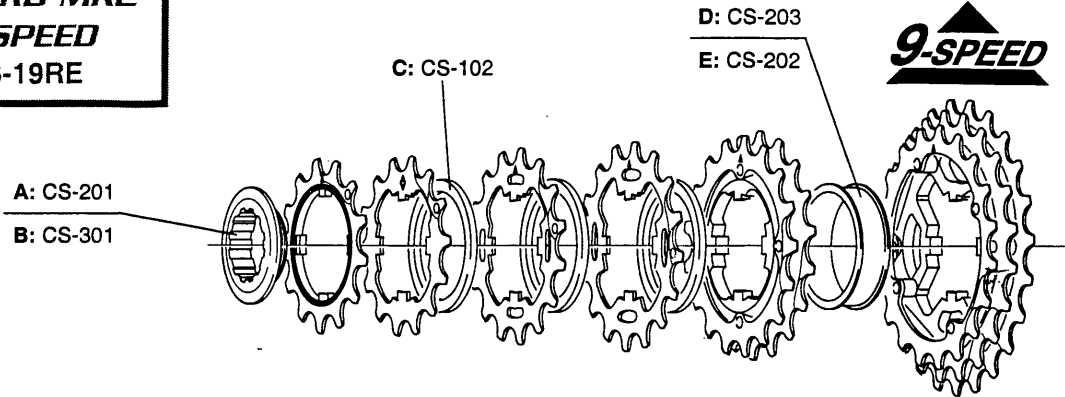


1998 9-Speed REAR HUBS		
model	item code	weight *
RECORD 9 Speed	FH-19RE	388 g *
CHORUS 9 Speed	FH-19CH	438 g *
ATHENA 9 Speed	FH-09AT	457 g *
VELOCE 9 Speed	FH-09VL	457 g *

* = weight including quick release skewer

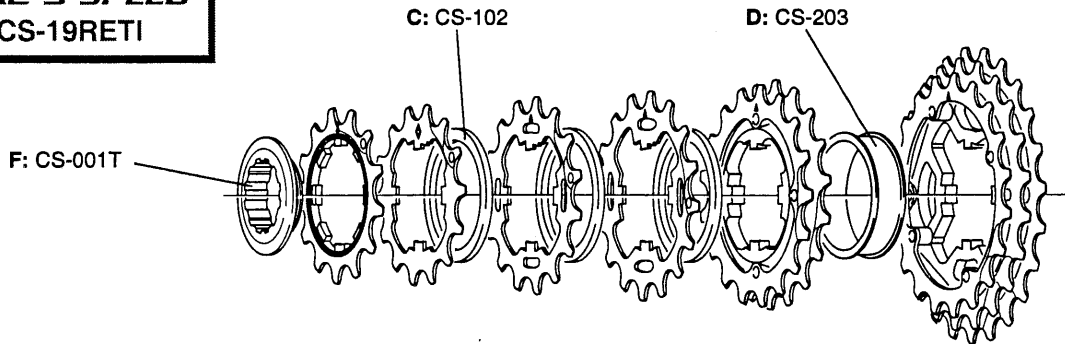
1998 *9-Speed* EXA-DRIVE CASSETTES RECORD MK2, RECORD TITANIUM MK2

RECORD MK2
9 SPEED
CS-19RE



11 - 21	B	11A-1° 9S-011	12A 9S-113	C	13A 9S-131	C	14A 9S-141	C	15A 9S-151	C	16A-17A* 9S-670	E	19A-21A* 9S-91AT
11 - 23	B	11B-1° 9S-012	12B 9S-122	C	13B 9S-132	C	14B 9S-142	C	15B 9S-152	C	17B-19A* 9S-79B	E	21A-23A* 9S-130T
12 - 21	A	12A-1° 9S-113	13A 9S-131	C	14A 9S-141	C	15A 9S-151	C	16A-17A-18C* 9S-678	D	19C-21C* 9S-91CT		
12 - 23	A	12A-1° 9S-113	13A 9S-131	C	14A 9S-141	C	15A 9S-151	C	16A-17A* 9S-670	D	19A-21A-23A* 9S-913AT		
13 - 23	A	13A-1° 9S-114	14A 9S-141	C	15A 9S-151	C	16A 9S-161	C	17A-18C* 9S-780	D	19C-21C-23C* 9S-913CT		
13 - 26	A	13A-1° 9S-114	14A 9S-141	C	15A 9S-151	C	16A 9S-161	C	17A-19A* 9S-79A	D	21A-23A-26A* 9S-136T		

RECORD TITANIUM
MK2 9 SPEED
CS-19RETI



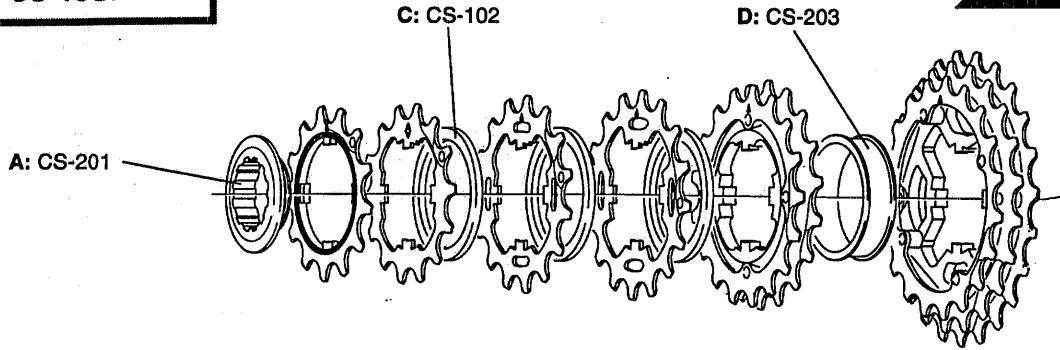
12 - 21	F	12A-1° 9S-012T	13A 9S-131T	C	14A 9S-141T	C	15A 9S-151T	C	16A-17A-18C* 9S-678T	D	19C-21C* 9S-91CT		
12 - 23	F	12A-1° 9S-012T	13A 9S-131T	C	14A 9S-141T	C	15A 9S-151T	C	16A-17A* 9S-670T	D	19A-21A-23A* 9S-913AT		
13 - 23	F	13A-1° 9S-013T	14A 9S-141T	C	15A 9S-151T	C	16A 9S-161T	C	17A-18C* 9S-780T	D	19C-21C-23C* 9S-913CT		
13 - 26	F	13A-1° 9S-013T	14A 9S-141T	C	15A 9S-151T	C	16A 9S-161T	C	17A-19A* 9S-79AT	D	21A-23A-26A* 9S-136T		

* pre-assembled

1998 9-Speed EXA-DRIVE CASSETTES

CHORUS MK2
9 SPEED
CS-19SP

CHORUS MK2, 9 SPEED



12 - 21	A	12A-1° 9S-113	13A 9S-131	C	14A 9S-141	C	15A 9S-151	C	16A-17A-18C* 9S-678	D	19C-21C* 9S-91C
12 - 23	A	12A-1° 9S-113	13A 9S-131	C	14A 9S-141	C	15A 9S-151	C	16A-17A* 9S-670	D	19A-21A-23A* 9S-933A
13 - 23	A	13A-1° 9S-114	14A 9S-141	C	15A 9S-151	C	16A 9S-161	C	17A-18C* 9S-780	D	19C-21C-23C* 9S-913C
13 - 26	A	13A-1° 9S-114	14A 9S-141	C	15A 9S-151	C	16A 9S-161	C	17A-19A* 9S-79A	D	21A-23A-26A* 9S-136

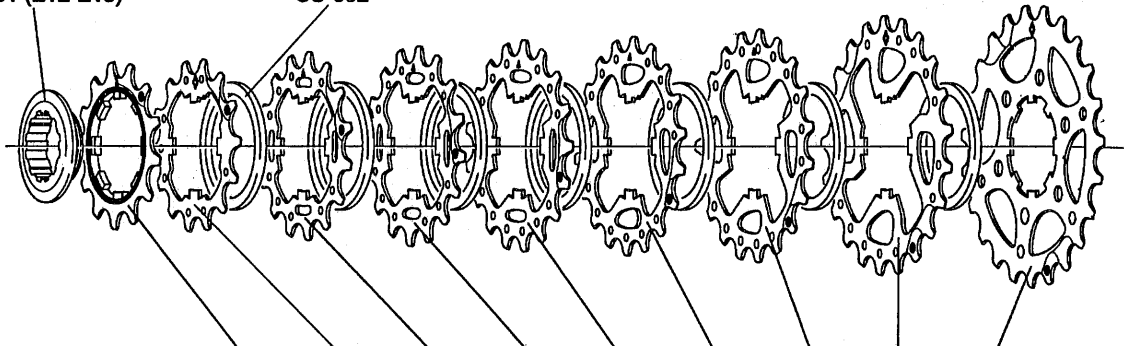
* pre-assembled

9 SPEED
CS-09SP

CS-301 (Z11)

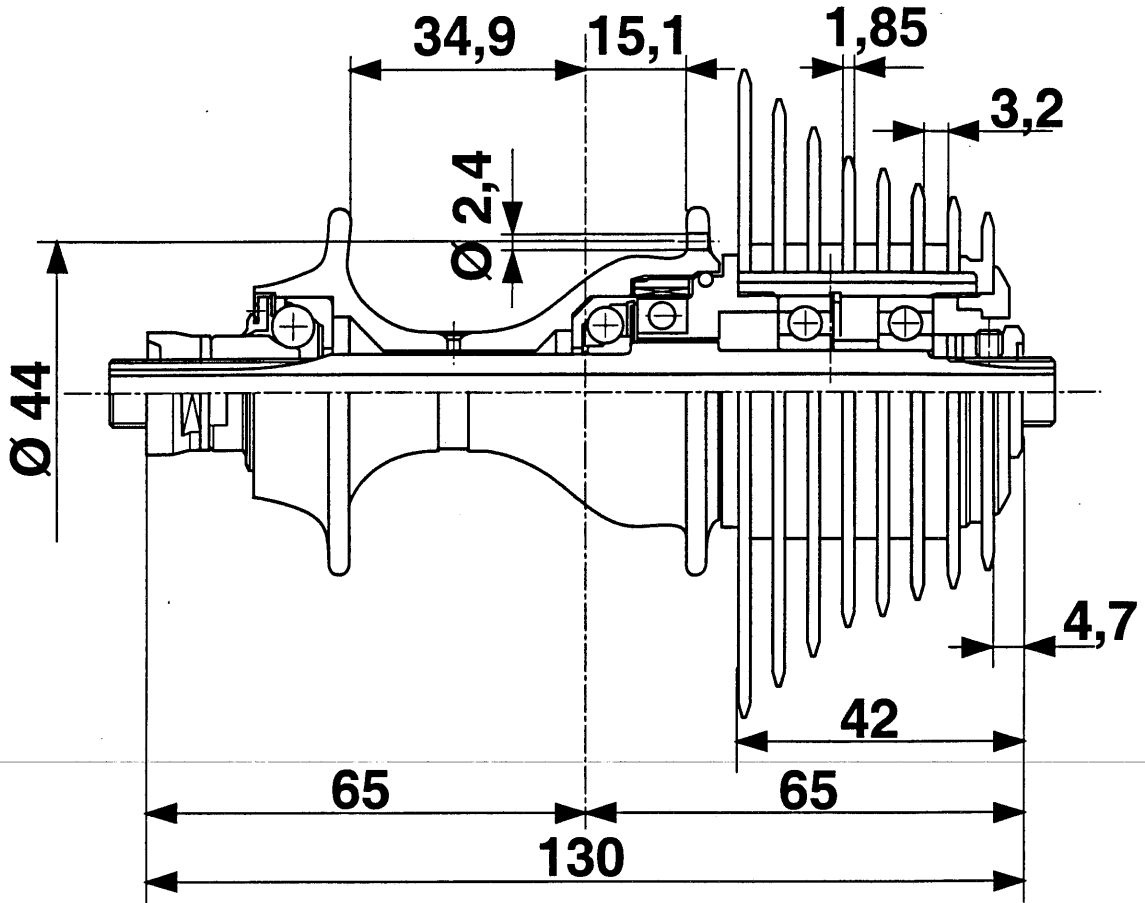
CS-201 (Z12-Z13)

CS-002



11 - 23	11B-1P 9S-012	12B 9S-022	13B 9S-132	14B 9S-142	15B 9S-152	17B 9S-172	19A 9S-191	21A 9S-211	23A CS-231
12 - 23	12A-1P 9S-013	13A 9S-131	14A 9S-141	15A 9S-151	16A 9S-161	17A 9S-171	19A 9S-191	21A 9S-211	23A CS-231
13 - 23	13A-1P 9S-014	14A 9S-141	15A 9S-151	16A 9S-161	17A 9S-171	18C 9S-183	19C 9S-193	21C 9S-213	23C CS-233
13 - 26	13A-1P 9S-014	14A 9S-141	15A 9S-151	16A 9S-161	17A 9S-171	19A 9S-191	21A 9S-211	23A 9S-231	26A CS-261

8-Speed CASSETTE HUBS
MIRAGE, AVANTI

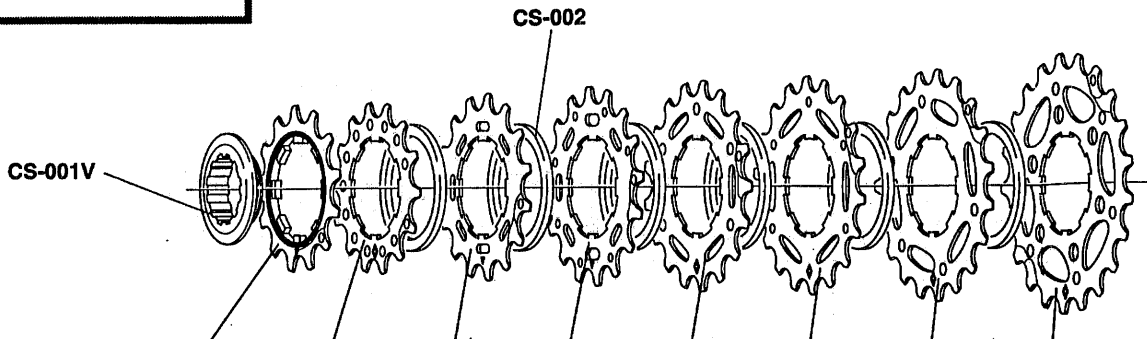


1998 8-Speed REAR HUBS		
model	item code	weight *
MIRAGE	FH-20MI	261 g *
AVANTI	FH-20AV	268 g *

* = weight including quick release skewer

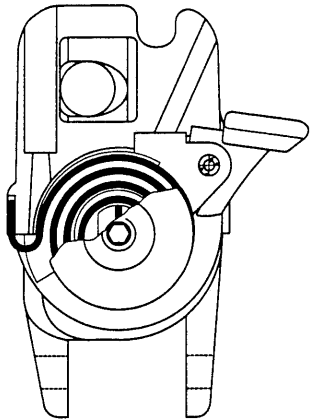
1998 *8-Speed* EXA-DRIVE CASSETTES *MIRAGE, AVANTI*

8 SPEED
CS-08SP

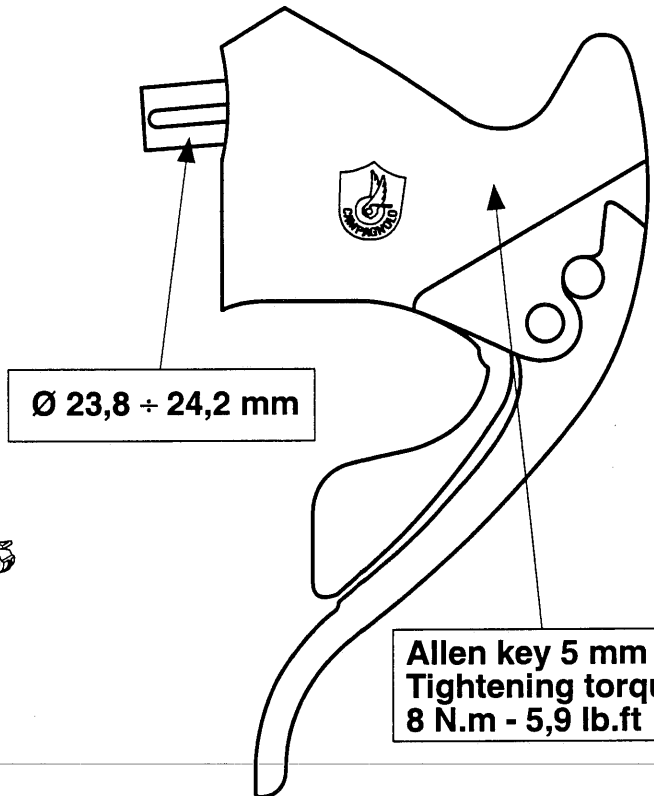


12 - 23	12B-1P CS-004V	13B CS-132V	14B CS-142V	15B CS-152V	17B CS-172V	19A CS-191V	21A CS-211V	23A CS-231V
12 - 25	12C-1P CS-010V	13C CS-133V	15C CS-153V	17B CS-172V	19A CS-191V	21A CS-211V	23A CS-231V	25A CS-251V
13 - 23	13A-1P CS-005V	14A CS-141V	15A CS-151V	16A CS-161V	17A CS-171V	19A CS-191V	21A CS-211V	23A CS-231V
13 - 26	13B-1P CS-006V	14B CS-142V	15B CS-152V	17B CS-172V	19A CS-191V	21A CS-211V	23A CS-231V	26A CS-261V
14 - 26	14A-1P CS-007V	15A CS-151V	16A CS-161V	17A CS-171V	19A CS-191V	21A CS-211V	23A CS-231V	26A CS-261V
16 - 23	16A-1P CS-012V	17A CS-171V	18C CS-183V	19C CS-193V	20D CS-204V	21D CS-214V	22D CS-224V	23D CS-234V

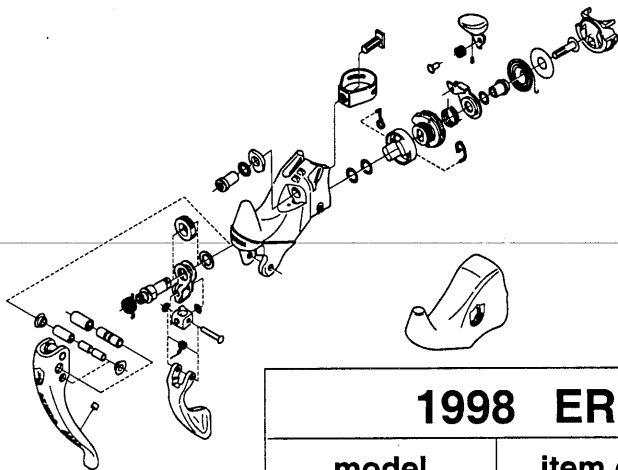
1998 ERGOPOWER CONTROLS
9-Speed: RECORD, CHORUS, ATHENA, VELOCE
8-Speed: MIRAGE, AVANTI



All 1998 left hand and right hand Ergopower controls contain a compensation spring for effortless shifts.



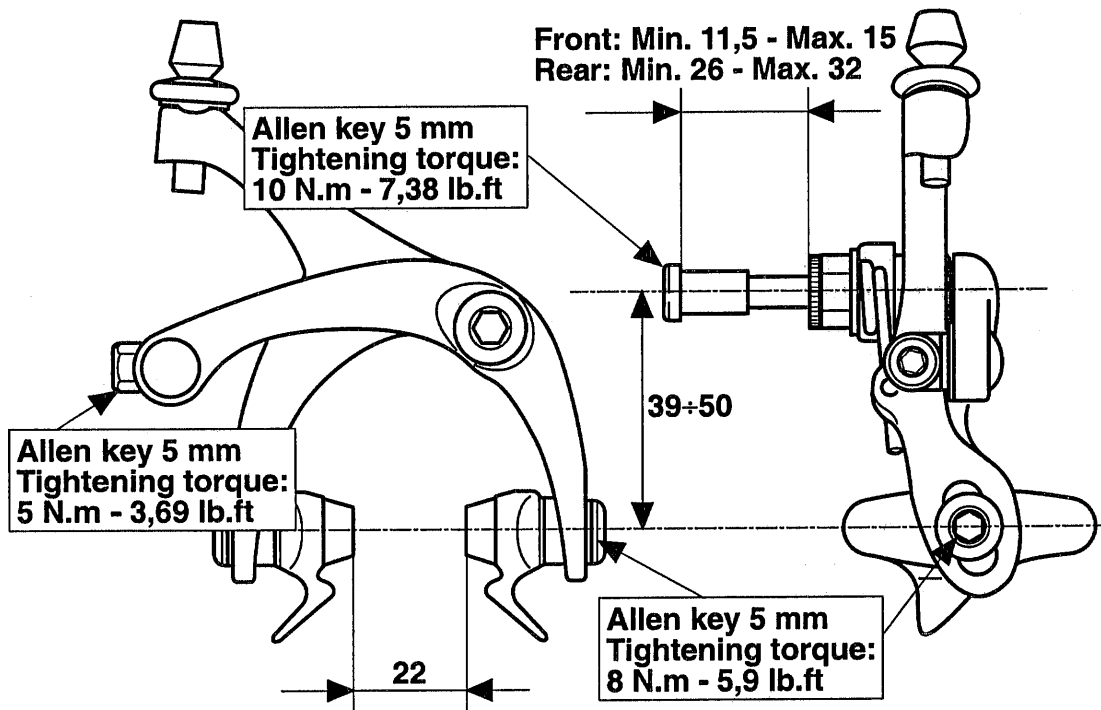
(illustration shows 1998 ATHENA, VELOCE type lever)



1998 ERGOPOWER CONTROLS				
model	item code	9-Speed	8-Speed	weight *
RECORD	EC-19RECG	9-Speed	-	365 g *
CHORUS	EC-19CHCG	9-Speed	-	380 g *
ATHENA	EC-09ATCG	9-Speed	-	435 g *
VELOCE	EC-09VLCG	9-Speed	-	453 g *
MIRAGE	EC-08MICG	-	8-Speed	464 g *
AVANTI	EC-08AVCG	-	8-Speed	466 g *

* = weight per pair

1998 DUAL-PIVOT BRAKES
RECORD, CHORUS, ATHENA,
VELOCE, MIRAGE, AVANTI



1998 DUAL-PIVOT REAR HUBS		
model	item code	weight
RECORD	BR-44RE	388 g *
CHORUS	BR-52CH	380 g *
ATHENA	BR-42AT	380 g *
VELOCE	BR-32VL	390 g *
MIRAGE	BR-22MI	390 g *
AVANTI	BR-22AV	375 g *

* = weight for front + rear caliper

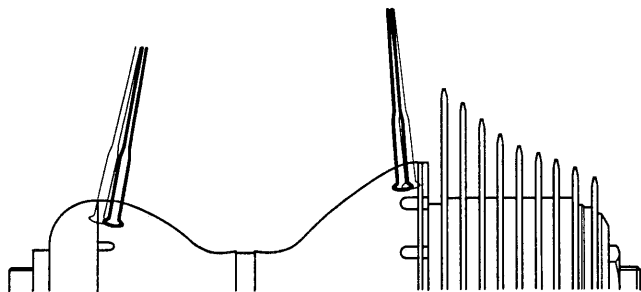
9-Speed SYSTEM

RECORD, VELOCE 9-Speed CHAIN

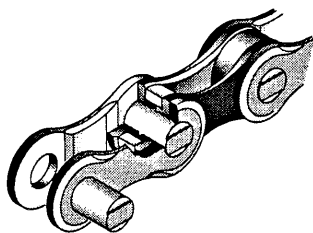
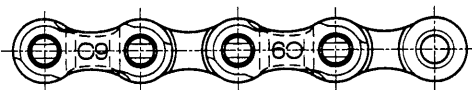
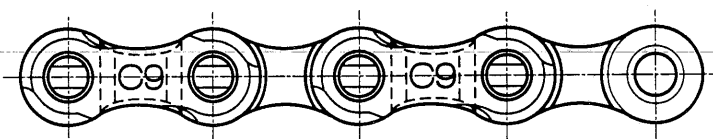
The five specific **9-Speed** components, essential for adequate performance of the system are:

- a.) cassette hub with a **9-Speed** free-hub body *
- b.) any Campagnolo **9-Speed** cassette
- c.) **9-Speed** chain
- d.) **9-Speed** rear derailleur
- e.) **9-Speed** indexed rear-derailleur shifter

* (note that a standard 8-Speed hub can be up-graded to a 9-Speed hub, by replacing the original 8-Speed freehub-body with a 9-Speed body; refer to rear hub overhaul procedure p. 26)



WARNING: the up-grade procedure described above, does not apply for preassembled 8-Speed aero wheels (Shamal, Vento, etc.). Preassembled Campagnolo 9-Speed wheels have customized hubshells providing narrower wheel-dish (refer to illustration).



1998 9-Speed CHAINS		
model	item code	weight *
RECORD	CN-19RE	300 g *
VELOCE	CN-09VL	300 g *

* = 114 links

REAR CASSETTE HUB OVERHAUL

Tools Required: 2 - 14mm Cone Wrenches
1 - 17mm Cone Wrench - Adjustable Wrench will work
1 - 2mm Allen Key
1 - Axle Vice
1 - Pawl Retainer Clip

- 1) Remove the Quick Release Skewer.
- 2) Remove the Cogs using a chain whip and Campagnolo splined tool #7130036.
- 3) Remove the freehub body from the hub.
 - a) Use the 2mm Allen Key to loosen the small set screw on the right axle locknut, back out about 2-3 turns.
 - b) Hold the cone on the left side using a 14mm cone wrench, loosen and remove the right locknut with the 17mm wrench.
 - c) Hold the wheel or hub so the Freehub (right) side is down and close to the workbench. Slide the Freehub body off the axle, the pawls and springs will release but with residual lubrication and if all is close to the bench they will just drop onto the bench.

Now you have what is basically a traditional hub for all practical purposes. The differences are that all adjustments must be made from one side and there are two different size balls used here. There are 9 pieces of 1/4" ball on the left and 10 pieces of 7/32" ball on the right.

- 4) Axle and Shell Disassembly and Inspection
 - a) Use the 14mm cone wrenches to free the left side locknut and cone.
 - b) Remove the locknut, washer and cone.
 - c) Remove the axle and bearings.
 - d) Clean and inspect all bearing surfaces, pawls, springs, pawl ratchet step and the hub shell and freebody in general.
- 5) Cassette Hub Reassemble
 - a) Apply a liberal coat of grease to the cups in the hub shell. Place all of the bearings in the hub. Check that all are there and that the right sizes are on the correct sides. Swab grease over all the bearings so that they are immersed in grease.
 - b) Install the axle from the freehub side and screw the cone down to the bearings. Put the washer on and then the locknut.
 - c) The adjustment is made most easily using an axle vise to anchor the axle for minute adjustments. Look for perfect setting here, this cassette axle will not compress appreciably under clamp load as traditional freewheel hub axles would.
 - d) Lightly grease the pawl ratchet steps and then insert pawls and springs into their respective sockets. It is recommended that the o-ring seal be greased as well for the best sealing effect.
 - e) There is a wire clip supplied with all of the cassette hubs. This clip will compress the pawls so that they will allow insertion of the freehub body into hub shell. Set the freehub body on the workbench with the pawl end up and just clip it on. Slide the body onto the axle and into the shell part way. Hold everything steady and remove the wire clip. Move the body into the shell all the way. Sometimes turning it a bit while moving the last few millimeters will assist in sliding the o-ring seal into its proper position.
 - f) Put the washers back onto the axle and then the locknut. Note that there is a split washer along with the flat washers. The locknut should be tightened only until the split washer is compressed. Just snug it up after feeling the resistance increase, indicating complete compression of said washer.
 - g) Last thing, tighten up the 2mm hex screw in the right locknut and you are ready for cogs and QR and then it's to ride on down the road!

NOTES:
