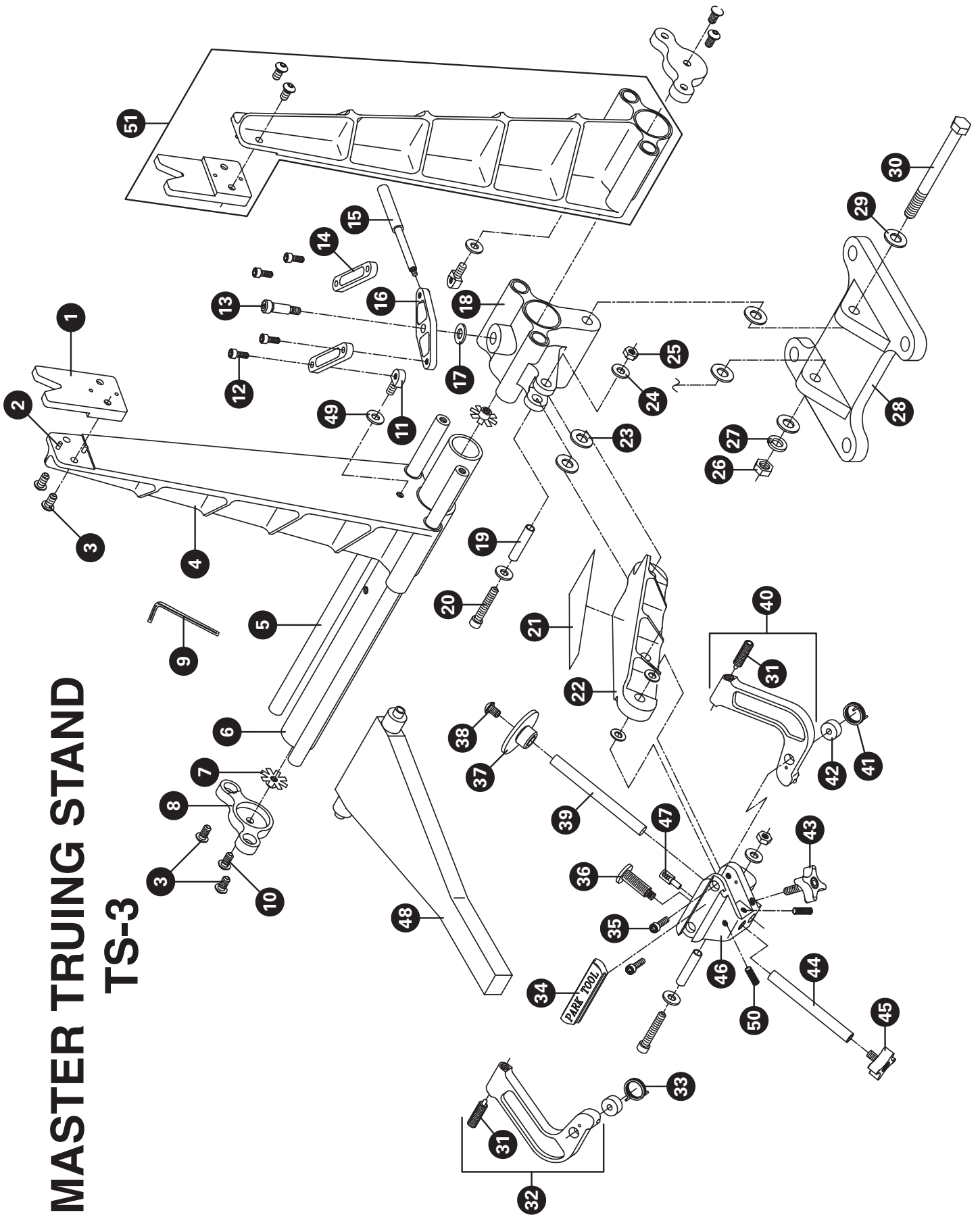


MASTER TRUING STAND

TS-3



PARTS LIST FOR PARK TOOL MASTER TRUING STAND TS-3

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	1523-2	V-plate	2	28	1512-1	Base plate	1
2	1536-4	V-plate pin 1/8" DIA x 5/8"	4	29	231-2	Washer 3/8"	2
3	1539-8	V-plate screw 1/4" - 20 x 1/2" BHSCS	8	30	1543-1	Main body pivot bolt 3/8" - 16 x 4-1/2"	1
4	1510-2	Upright	2	31	1532-2	Indicator screw	2
5	1525-2	Minor shaft 1/2"	2	32	1515-1LA	Left caliper assembly	1
6	1524-1	Main shaft 1-1/4"	1	33	1561-1L	Left caliper spring	1
7	1550-2	Star fangled nut	2	34	1514-1N	Park Tool name plate	1
8	1516-2	End cap	2	35	1540-2	Caliper pivot shoulder screw 1/4"x1/2"	2
9	1563-1	3/16" Hex wrench	1	36	1533-1	Caliper actuator stud	1
10	1549-2	Main shaft screw 6mm x 20 BHSCS	2	37	1530-1	Disk	1
11	1526-2	Knee	2	38	1541-1	Disk screw 1/4" - 28 x 1" BHSCS	1
12	1537-4	Link shoulder screw 1/4" x 1/4"	4	39	1529-1	Disk shaft	1
13	1538-1	Center link shoulder screw 5/16" x 3/4"	1	40	1515-1RA	Right caliper assembly	1
14	1520-2	Upright link	2	41	1561-1R	Right caliper spring	1
15	1527-1	Center link handle	1	42	1567-2	Caliper spacer	2
16	1521-1	Center link	1	43	1534-2A	Dial knob with 1/4" - 20 x 1" SHCS	2
17	107-3	Center link thrust washer 5/16"	2	44	1528-1	Caliper shaft	1
18	1511-1	Main body	1	45	1534-1B	Dial knob with 1/4" - 20 x 5/8" SHCS	1
19	1522-2	Bushing	2	46	1514-1	Caliper bracket	1
20	1542-2	Socket cap screw 1/4" - 20 x 1-3/8"	2	47	1560-1	Dial knurl knob	1
21	1553-1	Caliper arm decal	1	48	1554-1	Centering gauge assembly	1
22	1513-1	Caliper arm	1	49	1565-2	Belleville washer 1/4"	2
23	1542-6	Thrust washer	6	50	1569-2	Socket Set Screw 5/16" - 18-1/4"	2
24	1556-4	Hardened washer 1/4" ID x .062 thick	4	51	1510-2A	Upright Assembly	—
25	226-2	Nylok nut 1/4" - 20	3		1564-1	Serial number plate	1
26	1566-1	Hex nut 3/8" - 16	1		1555-1	Dial indicator set with brackets (Optional)	
27	1544-1	Lock washer 3/8"	1		1556-1	Dial indicator bracket set only (Optional)	



PARK TOOL CO.

6 Long Lake Road
St. Paul, MN 55115
(651) 777-6868
Fax (651) 777-5559
www.parktool.com

MASTER TRUING STAND TS-3

Congratulations, and welcome to a select group of professional bicycle mechanics! You've chosen the TS-3 Master Wheel Truing Stand - the next level in wheel truing accuracy. Your new TS-3 was designed and built with special care and attention to every important detail. Each component, material, and process was thoroughly researched and tested to produce a new standard in high accuracy wheel truing. Combined with the optional Dial Indicator Set, your new TS-3 can be used to set standards for your shop and to train employees. Your customers will appreciate your ability to measure and document each wheel you true, and you will appreciate the speed and repeatability of your new stand. Again, congratulations. **The TS-3 is a precision instrument worthy of special care so please follow the use directions and maintenance information closely.**

ASSEMBLY

The TS-3 is shipped with the uprights and main body assembled. Caliper arm assembly and center link handle must be attached before stand is used. A 3/16" hex key wrench is enclosed. Use parts schematic to reference part numbers used below.

1. Using 3/16" hex key wrench and 11mm (7/16") wrench, remove socket cap screw #1542-2, washers #1556-4, thrust washers #1542-6, nylok nut #226-2, and bushing #1522-2 from main body #1511-1. The above parts are found in main body fitting for caliper arm. See Fig. 1.
2. Grease thrust washers #1542-6 and place one on each side of hole on lower end of caliper arm.
3. With white decal side upward, insert caliper arm #1513-1 into main body and align washers #1542-6 between caliper arm and main body. Align washers with hole and install bushing #1522-2.
4. Install washer #1556-4 on socket cap screw #1542-2 and insert through bushing. Install a second washer #1556-4 on thread and install nylok nut #226-2.
5. Tighten socket cap screw while holding nylok nut until caliper arm has adequate friction when moved. Test by moving caliper arm up and down. Arm should move without excessive force, but should not move after being released.
6. Apply Loctite #222 or #242 on threads of center link handle #1527-1. Thread and tighten handle into center link #1521-1.
7. Grab caliper bracket #1514-1 and pivot toward user until calipers become approximately perpendicular to caliper arm. Caliper bracket pivots to maximize position of calipers.
8. TS-3 is ready for mounting. The TS-3 is designed to be used when secured to bench top or other large base. Base plate accepts lag or machine bolts up to 12mm (1/2") in diameter.
9. Main body and uprights pivot on base plate in order to achieve perfect working angle. Pivoting tension is adjustable by tightening or loosening main body pivot bolt #1543-1.

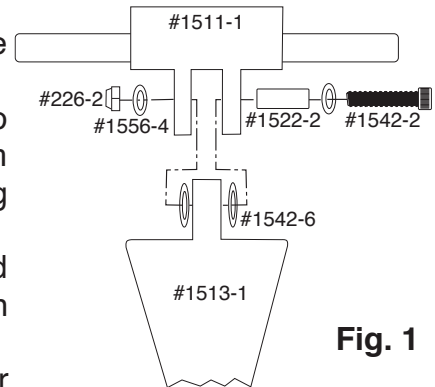


Fig. 1

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USE OF TS-3

The TS-3 is designed to remove as many variables as possible from the process of truing the wheel. The parts of the TS-3 have been machined, fitted and assembled with care. Although the TS-3 is reliable and repeatable, bicycle wheels themselves have many features that detract from accuracy in truing. Inconsistencies in axle threads, burrs on locknut faces, eccentric axles, bearing play, and unusually worn cones add to small variations that multiply into tolerance variations seen at the rim.

Uprights #1510-2 open when handle is moved to the right. Uprights close when handle is moved to the left. Each upright moves symmetrically to center link screw. Uprights and V-plates move parallel to one another and to face of locknut. Movement of the uprights does not rely upon thread and is therefore not effected by thread backlash.

To install wheel, begin by pushing caliper arm and calipers down to clear rim or tire. Hold hub axle ends over V-plates #1523-2, and adjust center link handle until V-plates are slightly wider than locknut face width. Place hub axle down into V-plates. Use center link handle to adjust V-plates against locknut faces. **DO NOT USE EXCESSIVE FORCE ON CENTER LINK HANDLE.** V-plates should lightly contact locknuts. Use care that V-plates do not rest on axle thread or other burr. Press down lightly on axle ends to ensure full engagement in V-plates.

Secure axle quick release to preload axle and to secure wheel into stand. Do not use center link handle in an attempt to pre-load uprights against locknuts. Use of quick release pre-loads hub bearings and simulates "on bike" conditions. Close quick release with the same load as on the bike. Play in the hub bearings will reduce the accuracy of the true. For solid axles, snug axle nuts against V-plates.

For oversize "through axle" wheels, use the axle from the fork/frame as a support for the wheel in the V-plates. Another option is to use the 20mm wheel truing plugs available through some bicycle distributors.

USE OF CALIPER FOR SIGHTING LATERAL RUN-OUT

Open calipers wide enough to clear tire/rim by turning dial knob #1534-1B. Move caliper arm up to align indicator screw #1532-2 to rim braking surface. Begin with calipers away from rim, then slowly move indicator screws closer to allow sighting for lateral truing. Calipers move simultaneously when knob is turned.

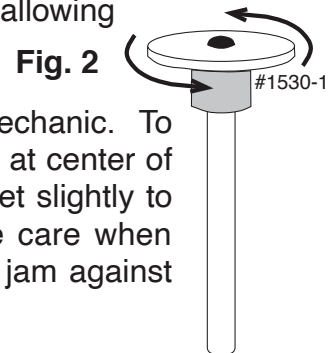
In some cases, the knobs of very large tires may rub slightly on the disk screw #1541-1. If this occurs, lower the caliper arm, loosen dial knob #1534-2A, and remove disk and shaft from caliper bracket.

USE OF RADIAL INDICATOR FOR SIGHTING RADIAL RUN-OUT

When truing wheels for radial run-out, it is necessary to remove the tire before mounting in the TS-3. True wheel to lateral tolerance before beginning radial truing.

To use both lateral and radial indicators simultaneously, position indicator screws close to middle of braking surface. Next, loosen dial knob #1534-2A and raise disk #1530-1 to within a few millimeters of rim edge. Secure shaft by tightening dial knob. Turning knurled portion

beneath disk allows fine control in bringing disk surface close to rim, allowing visual sighting of radial problems. See Fig. 2.



Disk surface may be pivoted depending upon the preference of the mechanic. To use flat center portion of disk, pivot caliper bracket so disk shaft points at center of hub. This aligns disk face parallel with edge of rim. Tilt caliper bracket slightly to use front or back edge of disk. If using edge of disk for truing, use care when turning wheel. Avoid spinning wheel in a direction that causes rim to jam against disk edge.

CORRECTING RIM CENTERING

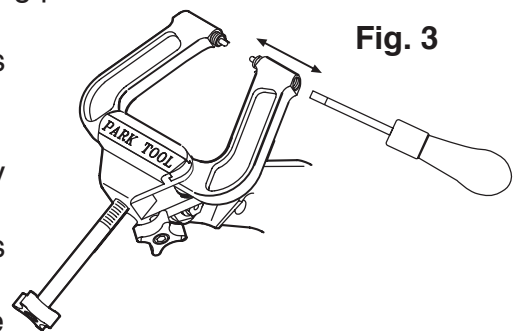
The TS-3 upright and V-plates are designed to center to the caliper indicator screws. It is necessary that the rim have acceptable lateral true before adjusting centering (dish). Slowly close caliper to rim. If both indicator screws contact the rim at the same time, the rim will have very close centering. If one indicator screw contacts first, stop and note gap on opposite indicator screw. The rim is out of center only one-half the amount of gap. For example, a 1mm gap (1/16") would mean the rim is off center 0.5mm (1/32").

To correct centering, note the gap at the indicator screw. Adjust spoke tension to pull the rim toward the indicator screw with the gap. For example, a rim is laterally trued, but when the left indicator is just touching the rim, a gap is apparent between the rim and the right indicator screw. It is necessary to move the rim to the right by either tightening the right side spokes, loosening the left side spokes, or a combination of both. A gap at the left indicator screw indicates the rim needs to move to the left.

CALIBRATION OF CENTERING FEATURE

The TS-3 uprights are centered to the center link screw. The caliper arm and caliper bracket are also centered to center link screw. The TS-3 centering gauge #1554-1 can be used to fine tune centering feature. To check centering use the following procedures:

1. Install rear quick release in gauge.
2. Place centering gauge into V-plates and adjust V-plates against gauge.
3. Pull gauge toward calipers and secure quick release.
4. Do not rotate gauge back and forth in stand as this may change engagement of gauge ends in V-plates.
5. Align calipers to gauge. Slowly close indicator screws to gauge. Note centering to gauge.
6. Indicator screws can be turned in or out from the outboard side of either caliper to fine tune centering alignment of TS-3. See Fig. 3.



The TS-3 is designed to stay in center. If the TS-3 is out of calibration more than 5-10mm there are other possible problems other than those solved by the fine tune adjustment. Check security of end cap screws and linkage screws. Major alignment problems are caused by abuse, dropping, or improper handling. If problems continue, return to Park Tool for service.

MAINTENANCE OF TS-3

The TS-3 is a precision measuring instrument. It should be kept clean and away from damaging and corrosive environments. Avoid truing wheels that leave a trail of grime and

abrasive dirt. Occasionally wipe shafts of TS-3 with oiled cloth. Aluminum surfaces should be kept clean and free of dirt and oils. Using the TS-3 as a holder for applying tubular glue, wiping wheels clean of grit, or manual rim bending is not recommended.

Bearings of uprights are pressed in. Return TS-3 to Park Tool for service of bearings if necessary.

SPOKE WRENCH SELECTION AND USE

Park Tool spoke wrenches are available in several sizes. Always select the smallest wrench that will fit the nipple flats.

SW-0 (black handle) sized 3.23mm (0.127") SW-3 (blue handle) sized 3.96mm (0.156")
SW-1 (green handle) sized 3.30mm (0.130") SW-4 (yellow handle) sized 4.9mm (0.193")
SW-2 (red handle) sized 3.45mm (0.136")

When using a spoke wrench, double check that the wrench is fully engaged on the nipple flats before turning. It is recommended to use a light lubricant at the nipple threads and where the nipple exits the rim. For nipples that have rounded wrench flats, use the Park Tool SW-10 adjustable spoke wrench. Remove rounded nipples and replace.

OPTIONAL DIAL INDICATOR SET #1555-1 (not included with TS-3)

Use of the optional Dial Indicator Set #1555-1 can make wheel truing with the TS-3 Master Wheel Truing Stand quicker, more accurate, and more repeatable for a large staff of mechanics. One metric dial indicator mounts to the caliper arm to read lateral rim run-out, and another dial indicator mounts to the caliper bracket to read radial rim run-out.

The Dial Indicators magnify the lateral (side to side) and radial (up and down) motion of the rim. This allows the mechanic to easily notice even subtle problems.

By setting standards for wheel true (run-out), a service department can save time by having mechanics true to the same standard. Wheels should be trued to measurable and repeatable standards. In some cases the standard will be tight, but for other cases, the standard may safely be set wider. By using the dial indicator set, a service dept. is able to have different tolerances for different models of bikes or different price points if desired.

For example, the run-out standard used by wheel building programs ranges from 0.008 inch to 0.040 inch (0.2mm to 1mm) lateral run-out. When a mechanic sees on the dial indicator set that the wheel has achieved a specified tolerance, the wheel is adequately trued. This adds to productivity by eliminating mechanics truing to personal standards or "best guesses" or subjective standards such as "really true", or "good enough".

The Park Tool Dial Indicators allow a service department to inform the customer of the lateral and radial run-out on his/her wheel. Customers will appreciate this attention to detail, especially on high end wheels.

The Dial Indicators also are useful for training new mechanics. When a trainee makes a correction, and has chosen the wrong side spoke or turns the nipple the wrong direction, the dial will move away from zero.