



Installation Instructions

TSM-21 Bosch Motor Carriage

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1 Introduction

Thank you for purchasing a TSM-21 Bosch Motor Carriage upgrade. Since 1985 our goal is to manufacture and develop machines that make cabinetmaking and casework easier, faster, and more profitable for woodworking professionals. This upgrade represents our patented screw pocket cutting technology. Castle machines are made in Petaluma, California and are manufactured to the highest standards using local vendors wherever possible.

The Castle model TSM-21 is designed for use on a wide variety of materials. The machine performs well in hardwoods, softwoods, melamine, particleboard and MDF. The machine will work on materials varying in thickness from $\frac{1}{2}$ " to 1 $\frac{3}{4}$ ".

Warning: Do not attempt to perform maintenance or operate this machine until you have read and understand the information contained in this manual.

TERM	DEFINITION
Pocket	The depression cuts into material to allow for toe-screw mortise joinery.
Pocket Cycle	The procedure by which the machine clamps the work piece, cuts the mortising pocket, drills the pilot hole, then releases the work piece.
Web	The offset distance from the end of the pocket to the edge of the work piece.

1.1 Definition of Terms

1.2 Identification of Operating Features and Controls

Router Travel Adjustment	Router Stop Plate: Located just inside the rear door, this black metal plate extends through the top of the case and along the right side of the Clamp Guard. The position of this plate determines the size of the "Web."
	Safety Buttons: Two small, silver button-head screws under the Clamp Guard detect if a work piece is in place for pocketing. The machine will not cycle unless these buttons are depressed simultaneously with the Foot Pedal.
Pilot Hole Alignment Nut U-Bajit Top Nut Drill Motor T-Handle	Motor Carriage: The Motor Carriage is the yellow, pivoting A-frame structure inside the machine. Both the Router Motor and the Drill Motor are mounted to this carriage. The forward and back carriage motion during the machine cycle is provided by the Drive Cylinder.
Routter SQE VALVE VALVE VALVE VALVE VALVE VALVE CTUB/DER	Drive Cylinder: This double-acting pneumatic cylinder connected to the Motor Carriage and the machine case, moves the carriage through the routing and drilling phases of the cycle. When the cylinder rod extends (moving the carriage toward the rear) the router cuts the pocket. When the cylinder rod retracts (moving the carriage forward) the pilot drill bores the pilot hole into the pocket. NOTE: SQE valves are replaced by elbow fittings in models with Serial Number 62481 and higher.
Router Adjustment Serews	Router Stop Switch: This magnetic proximity switch is mounted on the Router Stop Plate inside of the machine. At the full extension of the routing stroke, the carriage interrupts this switch to signal the start of the drilling stroke.

2 Installation Instructions

These instructions are intended to illustrate how to remove the motor carriage designed for Porter Cable motors and replace it with a carriage designed for Bosch motors. At the same time the Router Stop Plate must be changed as the old style will interfere with the Bosch carriage movement.

2.1 Safety Rules

The Castle Model TSM-21 Pocket Machine was designed with operator safety as a priority, which is why Castle highly recommends the following:

- 1. Read this Instruction Manual carefully before beginning the carriage exchange.
- Before attempting adjustments, maintenance, or repair, TURN OFF this machine, disconnect it from its power source and air supply. Wait for all motion to stop.
 Failure to disconnect this machine from its power source and air supply or wait for all motion to stop could result in electrocution or injury.

2.2 Inventory

With your Castle TSM-21 Bosch Motor Carriage upgrade pack you should have received the following:

CASTLE TSM-21 Bosch Carriage Upgrade Parts					
Part #	Part Description	Qty			
G21123	TSM-21 Router Carriage – Bosch	1			
N21142	TSM-21 U-Bolt (Router) Installed	1			
N21143	TSM-21 U-Bolt (Trimmer) Installed	1			
H00141	1/4-20 Bar Knob Installed	2			
G21007	TSM-21 Rear Stop	1			
N00538	1/2" to 3/8" Collet Reducer	1			
F01420	1/4-20 Nylon Insert Locknut	3			
	Lithium Grease	1			
	With purchase of Upgrade Kit with motors:				
E21610	Bosch PR20EVS 1.0 HP Motor	1			
E21617	Bosch 1617EVS 2.25 HP Motor	1			
B00338	Solid Carbide, 3/8" Rough Mill Three Flute Router Bit	1			
B02964	9/64" Brad and Spur Premium Drill Bit with ¼" Shank	1			

3 Replacing the Router Carriage

Caution: Make sure your machine is unplugged from its electrical outlet and the air supply has been detached.

These instructions will detail the steps required to upgrade your TSM-21 to use Bosch Motors. Videos of these processes are available on line.

Here are the steps detailed in this instruction guide:

- Remove the Router Stop Plate (3.1)
- Remove the Porter Cable Router Carriage (3.2)
- Install the Bosch Router Carriage (3.3)
- Replace the Router Stop Plate (3.4)
- Adjust the carriage and center the pocket and pilot hole (4.1)
 - You must adjust carriage to center after installation to reset drill and router alignment. Please see section 4.2 once you have installed both motors in the new carriage.

3.1 Removing the Router Stop Plate

Note: Marking the location of the Router Stop Plate on the yellow Clamp guard will save time and keep the same web depth when installing the new Router Stop Plate.

- From the back door use a Phillips Screw Driver remove the screws holding the switch portion (wires attached) of the two piece Router Stop Switch. (Save for installation of new stop plate.)
 - The switches are held in place with square nuts (save for installation of new stop plate).
- From the top of the machine use a 7/16 wrench to remove the ¼-20 Nylock Nut
 - Remove the washer (save for installation of new stop plate)
- Push the bolt through into the clamp guard and remove by reaching through the back door and up into the clamp guard. (Save for installation of new stop plate.)
- Remove the old plate by angling the top of the Router Stop Plate through the slot next to the clamp guard and removing through the back door.
- Remove the magnet portion of the Router Stop Switch
 - Save magnet, screws, and square nuts for installation of new stop plate.

3.2 Removing the Porter Cable Motor Carriage

- Remove the Porter Cable motors from the Carriage.
- Disconnect the Spring from the Carriage with a pair of pliers but leave attached to the case.
- Disconnect the Drive Cylinder from the Carriage but leave attached to the case.
 - Remove the cotter pin from the clevis pin (save for installation of new carriage)
 - Remove the clevis pin from the rod clevis (save for installation of new carriage)

Note: Removing the Work Top will allow easier access to the router motor, spring, and drive cylinder.

- Remove the Set Screws on the sides of the machine
 - Loosen the ¼-20 Nylock nuts with a 7/16 Wrench

- Use a 1/8" Allen Wrench to loosen and completely remove the Set Screws (save for installation of new carriage)
- Through the back door twist the Motor Carriage to remove from the Bearing Jacks.
 - The carriage will release with the Brass Hex Pivot Bushings in place
 - Remove the old Motor Carriage through the back door
- Remove the Brass Hex Pivot Bushings from the carriage
 - Wipe out to remove old grease and any sawdust or debris buildup

3.3 Install the new Bosch Motor Carriage

Note: We suggest that you test install the drill motor in the new carriage before it is in the case. The drill motor is held in place by two braces on either side of the ubolt, and rests against a stop at the front. You will need to remove it before installing the carriage.



- Re-grease the Brass Hex Pivot Bushings with lithium grease (provided)
- Place Brass Hex Pivot Bushings on new Motor Carriage
- Move the new carriage into the machine through the back door.

Note: The U-Bolt to hold the router in place should face to the front of the machine, and the bar knob used to tighten the pilot hole motor should face to the left as viewed from the back of the machine.

- Hold the carriage at an angle and align the Hex Brass Pivot Bushings within the slots of the bearing jacks
- Twist / push carriage until the Brass Hex Pivot Bushings are fully seated at the front of the bearing jacks

Note: There will be a slight bulge on each side of the machine at the pivot point. This is normal and necessary for the correct operation of the machine.

- Replace the reserved Set Screws with 1/8" Allen Wrench
- Reattach Spring to Carriage
- Reattach Drive Cylinder to Carriage using reserved Clevis Pin and Cotter Pin

3.4 Install the new Router Stop Plate

- Using the retained screws and square nuts, attach the magnet to the new Router Stop Plate in the same position it was before.
- From the back door slip the top of the Router Stop Plate through the slot in the top of the machine next to the clamp guard.

Note: When installing the Router Stop Plate make sure the plate that holds the Router Stop Switch is to the left of the trimmer motor and the switch and magnet are mounted facing the front of the machine.

- Replace the reserved carriage bolt through the clamp guard to hold the Router Stop Plate in place. Use the mark made on the clamp guard to position the Router Stop Plate.
- Replace reserved washer and tighten with new ¼-20 Nylock nut and 7/16 wrench.
- From the back door replace the switch portion of the Router Stop Switch with the reserved screws and square nuts.

Note: The Router Stop Switch magnet and switch should be as close together as the spacing on the plate will allow without interfering with the travel of the carriage. Leave the screws slightly loose to help with positioning later.

4 Final Installation and Adjustments

4.1 Motor Replacement

- Install the Bosch Model 1617EVS Router Motor in the carriage by slipping it through the carriage and up into the U-bolt. Make sure it is seated at the top.
 - Tighten with the bar knob.
 - Plug in motor.

Note: Removing the Work Top will allow easier access to the router motor for correct placement.

- Install the Bosch PR20EVS Trimmer Motor in the carriage. Make sure it is seated correctly.
 - Tighten with bar knob.
 - Plug in motor.

4.2 Carriage Adjustments

- Adjust the carriage right or left with the set screws to position the carriage so that the router bit is centered in the machine, using the hole for the drill as a reference point. The pilot hole will be adjusted separately.
- Once the carriage is centered based on the location of the router bit, tighten the lock nuts on the sets screws while holding the set screws in position with an Allen wrench.
- The drill is centered by adjusting the nut located below and to the front of the Drill Motor T-Handle.
 - Adjust the nut as needed to position the pilot hole bit in the center of the hole in the case, and to the center of the pocket.

Note: Only tighten the nut as needed. Overtightening can reduce the ability to move the bit in the opposite direction.

4.3 Pocket Web Adjustment

The offset distance from the end of the pocket to the edge of the work piece is called the "Web." (Fig 9) It has been factory set at approximately 7/8" to accommodate 1 $\frac{1}{2}$ " screws.



Fig 9

If you are using $1\frac{1}{4}$ " screws you may choose to shorten the Web to $\frac{5}{8}$ ".

Note: The minimum recommended Web under any circumstance is $\frac{5}{8}$ ".

The Web is adjusted by shortening or lengthening the travel of the router's cutting stroke.

• Locate the Router Stop Plate nut on the right side of the yellow Clamp Guard on top of the machine. (Fig 10)



Fig 10

- Loosen the nylon locking nut.
- To shorten the Web, slide the black Stop Plate toward the rear of the machine slightly.
- To lengthen the Web, slide the plate toward the front of the machine slightly.

Note: When the desired position has achieved, tighten the nylon locking nut securely to prevent shifting during operation. Subsequent adjustment of the Router Stop Switch may also be necessary (Page 31).

4.4 Pocket Depth Adjustment

The router bit for cutting the pocket should be installed at a distance of approximately 1 1/8" from the tip of the bit to the collet. This setting cuts at an optimal depth of approximately 3/8" for material between 5/8" and 7/8" thickness.

To cut a shallower pocket (in 1/2" material for example):

• Place a shim (like 1/8" hardboard) with a known thickness on the work top and place your work piece over it.

To cut a shallower pocket:

- Remove the router motor as described in the section for "Tool Changes".
- Loosen the motor collet and slide the bit to the desired exposure. (If the bit does not move easily, try gently tapping on the bit near the collet with a wrench.)
- Secure the collet and reinstall the router motor.

For your convenience, a blank Bit Gauge (Fig 11) is included with your machine so that you may scribe a mark to record the depth that is most suitable for your purposes. Refer to the "Pilot Drill Depth Adjustment" for this procedure.



Fig 11

4.5 Drill Feed Rate Adjustment

The stroke speed with which the machine drills the pilot hole (and clamps the work piece) is solely a function of the air pressure set at the internal Pressure Regulator. There is no separate adjustment knob.

Note: If the Drill Feed Rate is so fast that the machine shakes violently during the Pocket Cycle or if the Drill Feed Rate is so slow that the Pocket Cycle is significantly longer than two seconds, then it may be necessary to adjust the Pressure Regulator. Do not adjust the internal Pressure Regulator unless absolutely necessary.

The internal Pressure Regulator knob is located on the Control Box (Fig 12), just below the duplex power outlet for the Router and Drill motors. If in doubt whether the internal Pressure Regulator is set correctly, follow the steps described below:



Fig 12

- Unlock the knob by pulling it slightly away from the Control Box.
- Turn the knob counter-clockwise until it reaches a mechanical stop.
- Turn the knob clockwise five full revolutions (it's helpful to make an index mark on the knob.)
- Lock the knob by pushing it slightly toward the Control Box.

4.6 Pilot Drill Depth Adjustment

The Pilot Drill operation works best when the drill depth is adjusted so that the drill bit just barely breaks into the pocket. If the drill bit extends farther than necessary, it can cause shorter bit life and over-size holes. The drill bit should be installed approximately 1 $^{13}/_{16}$ " from drill bit tip to drill motor collet (this is a suitable distance for a $^{7}/_{8}$ " Web). *As a general rule, if the Web is decreased, then the Pilot Drill depth should also be decreased.*

To adjust the Pilot Bit Depth:

• For your convenience, a blank Bit Gauge (Fig 13) is included with your machine so that you may scribe a mark to record the depth that is most suitable for your purposes.



Fig 13



Fig 14

- Simply set the Bit Gauge on top of the collet and use any sharp object to scratch a reference line in the soft aluminum where each bit should be. (Fig 14)
- The plate has two sides that can be used as settings for different processes in the shop.
- Remove the Pilot Drill Motor as described in the section for "Tool Changes".
- Loosen the motor collet and slide the bit to the desired height. (If the bit does not move easily, try gently tapping on the shank of the bit near the collet with a wrench.)
- Secure the collet and reinstall the router motor.

4.7 Pilot Drill Height Adjustment

The position of the Pilot Hole can be raised or lowered slightly to accommodate various thickness in work pieces or various pocket depths.

On the sides of the machine case, secure the Carriage Centering Screw with a ¹/₈" allen wrench. Loosen - but do not remove - the nylon lock nuts securing the set screw of the Motor Carriage to the machine case. (Fig 15)



Fig 15



Fig 16

Note: The left-to-right alignment of the Motor Carriage may shift if care is not taken during the loosening of the nylon lock nuts. Make sure that each preload set screw is secured with an allen wrench before loosening each lock nut.

- From the Rear Door of the machine locate the Bearing Jack plate on the inner wall of the cabinet. (Fig 16)
- Loosen, but do not remove, the nut on the plate that is nearest to the carriage axle.
- Remove the nut and bolt on the plate that is farthest from the carriage axle. Typically this nut and bolt are factory set to the center hole of the five holes on this end of the plate.
- To raise the pilot hole, slide the plate upward one or two hole positions (each hole position equals ¹/₁₆" of drill position). To lower the pilot hole, slide the plate downward.

- Reattach the nut and bolt in the new hole position, and secure in place.
- Tighten the nut on the plate that is nearest to the carriage axle.
- Repeat for the other side.
- On the outside of the machine, secure the Carriage Centering Screw with a ¹/₈" allen wrench and tighten the nuts securing the pivot point of the Motor Carriage to the machine case.

5 Service and Maintenance

5.1 Tool Changes

Caution: Do not attempt to change tooling with compressed air power supplied to the machine!

You do not need to remove the Work Top to change the bits, but removal of the Work Top will give access to the Router Motor. To change the Pocket Router Bit or the Pilot Drill Bit without removal of the Work Top, you will need to remove the respective motors from the carriage.

5.2 Pocket Router Bit

- Open the rear door and unplug the router motor.
- Locate the black T-Knob to the **right** of the drill motor at the top of the carriage. The black T-Knob is threaded onto a large U-bolt that secures the Router Motor.
- Support the bottom of the Router Motor with your left hand (Fig 21). Use your right hand to loosen the T-Knob a few turns to provide slack on the U-bolt. (Push slightly forward on the T-knob if necessary.)



Fig 21

- Allow the motor to drop into your left hand, then lift it out the rear door and change the tooling.
- When re-installing, slide the motor through the curve of the U-bolt. Make sure that the motor's power cable is pointing toward the rear of the machine.
- Push the Router Motor fully toward the top of the Motor Carriage. Make sure that the motor contacts the angled tabs on the yellow carriage (Fig 22). If unsure remove Work Top to confirm location.



Fig 22

• Use your right hand to tighten the T-Knob until the U-bolt is hugging the Router Motor tightly to the Motor Carriage. When fully secured the motor should be in contact or very close to contacting the angled tabs on the yellow carriage.

OR

 Remove the ¼-20 Nylock Nuts from the (4) bolts holding the Work Top with a 7/16" wrench. Access the Router Motor collet for tolling changes. (Fig 22)

5.3 Pilot Drill Bit

- Open the rear door and unplug the drill motor.
- Locate the black T-Knob to the left of the drill motor at the top of the carriage (Fig23).
 Loosen the T-Knob, but **do not remove.**



Fig 23

- Pull the motor toward the rear of the machine to remove. If there is resistance, push on the black T-knob to loosen the U-bolt.
- When re-installing insert the motor through the loosed U-bolt until it stops. Make sure the motor cord is pointing to the floor of the machine. Tighten the black T-Knob to secure motor.

5.4 General Machine Maintenance

The model TSM-21 requires some maintenance. To ensure the productivity and longevity of your Castle Pocket Cutter, it is essential to follow a few simple steps. How often these steps are performed depends upon the number of hours the machine is operated each day. As a general rule, operators should visually inspect the machine at the start of each work shift in the following manner:

- Check the Power Cord and the Foot Switch cord for wear or damage.
- Ensure that the Router Bit and the Drill Bit are clean, sharp, and undamaged.
- Keep the Router and Drill Motors free from dust build up.

Check for proper Safety Switch function. Turn the machine on and press the Foot Pedal **without** a work piece against the Safety Buttons. The machine should not cycle if the Safety Buttons are not pressed. If you suspect a Safety Switch malfunction, contact a Castle, Inc. Support Technician at 1-800-282-8338 as soon as possible for corrective action.

Warning: Do not introduce lubricants, oils, or solvents into the pneumatic system. Irreparable damage to pneumatic seals and components may occur. Using lubricants in the pneumatics of your TSM-21 may <u>void your Warranty!</u>

5.5 Motors and Bits

The life of the machine is directly related to the care of the motors that cut the pocket and drill the pilot hole. Because the motors are enclosed in the machine care must be taken to ensure that they do not overheat. Use the motors as you would use typical router motors in your shop. It is important that the maintenance guidelines provided in the Bosch instruction manual be strictly followed.

• Regularly blow out the air passages on both motors with compressed air.

Caution: Always wear safety goggles when using compressed air.

- Do not run the motors for more than **one hour** at a time.
- To prolong motor life, and avoid costly downtime, it is strongly recommended that a dust collection system be connected to the machine. A port has been provided on the left side of the machine for this purpose. An air inlet vent on the rear door works with the dust collector to help keep the motors cool.
- To ensure safe and effective operation, make certain that there is at least 80psi air pressure to the machine. Pay attention to the cycle time of machine. A typical cycle will last from 1¹/₂ to 2 seconds. A cycle significantly longer than this may indicate low Router Feed rate, or low internal air pressure. This will lead to excessive bit wear and shortened motor life.

Note: Failure to clean sawdust from your machine may void your Warranty!

Castle provides premium versions of the Router Bit and Drill Bit in the TSM-21 as standard equipment from the factory. Castle recommends these bits for all applications:

Part No	Part Description	Function
B00338	Solid Carbide, ³ / ₈ " Rough Mill, Three Flute Bit	Routs pocket – Works in all materials, especially particle board, plywood, MDF, Melamine, etc.
B02964	TiN Coated, ⁹ / ₆₄ " Brad and Spur Bit	Drills pilot hole – Works well in all materials. TiN coating provides longer life than standard bits.
B00438	Cobalt Steel, ³ / ₈ " Rough Mill, Four Flute (RM-38)	An alternative when cutting pockets exclusively in solid woods such as maple, oak, ash or alder. The B00038 will cut in any material, however exposure to glue and resin found in particle board, plywood, MDF, Melamine, etc. will lead to premature wear on the bit.
B00964	⁹ / ₆₄ " Brad and Spur Bit w/ ¹ / ₄ " Shank (CDB-964)	An economic alternative based on the geometry of our premium TiN coated pilot bit.
B01964	⁹ / ₆₄ " Split Point Bit w/ ¹ / ₄ " Shank	An alternative to the B00964. The split point construction is stiffer and is preferred in plywood and tightly grained hard woods.
B00764	⁷ / ₆₄ " Split Point Bit w/ ¹ / ₄ " Shank	An alternative for smaller diameter pilot hole
B00316	^{3/} 16" Split Point Bit w/ ¹ /4" Shank	An alternative for larger diameter pilot hole

To purchase bits feel free to contact your local Castle dealer or contact our Parts Department TOLL FREE at 800-282-8338 or visit our website at www.castleusa.com for information and pricing on tooling and accessory products for your TSM-21.

Scan with QR code reader for our Web Store:



5.6 Serial Number Log

SERIAL NUMBER LOG						
MANUFACTURER	PART NUMBER	SERIAL NO.				
Castle, Inc	A00022 – TSM-21 Pocket Hole Machine					
Robert Bosch Co.	E21610 – Bosch PR20EVS 1.0 HP Motor					
Robert Bosch Co.	E21617 – Bosch 1617EVS 2.25 HP Motor					
PURCHASE DATE:						