



INSTRUCTIONS

AUTOMATIC PILOT

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PLEASE READ INSTRUCTIONS BEFORE INSTALLATION

LIMITED WARRANTY

We provide with your Tiller Master a one-year warranty from date of sale of the unit and its components. This Warranty is limited to the replacement and/or repair of the unit or the replacement and/or repair of defective and damaged parts and components. For repair, ship to factory address. Be sure to package properly to avoid damage in transit. We are not responsible for damage to the unit or components due to misuse, neglect, or improper installation.

IMPORTANT WARNINGS

TILLER MASTER runs on 12V DC only. Do not run TILLER MASTER unfused. If run unfused, circuit board could be damaged and warranty invalidated. Extra fuses included with shipment are 1-1/2 amp slo-blo fuses. Do not use anything larger. Larger pin on plug is negative. Fuse will blow if polarity is reversed.

Do not run TILLER MASTER in free-wheeling positions under load. The system of free wheeling at the ends of the stroke is used instead of limit switches to keep TILLER MASTER as simple and free from corrodible moving parts as possible, but it is not designed to work at the end of the stroke continuously under heavy loads. Normally, the pressure of the water on the rudder will start the screw back on the thread. A slight push (or pull) may be needed in static conditions.

INSTALLATION OF TILLER MODEL

1. The standard TILLER MASTER is installed on starboard side of cockpit. Portside model is available by special order. For interior arrangement of starboard side TILLER MASTER see Fig. B. You can identify portside model by the position of feedback wheel on the same side of case as compass bracket. (Parts are available for changing starboard to portside model and vice versa). If TILLER MASTER is not installed on the proper side, your course will be a circle.
2. TILLER MASTER should be installed as near level as possible in order to operate at the same angle of heel on both tacks. TILLER MASTER operates up to about 30° angle of heel.

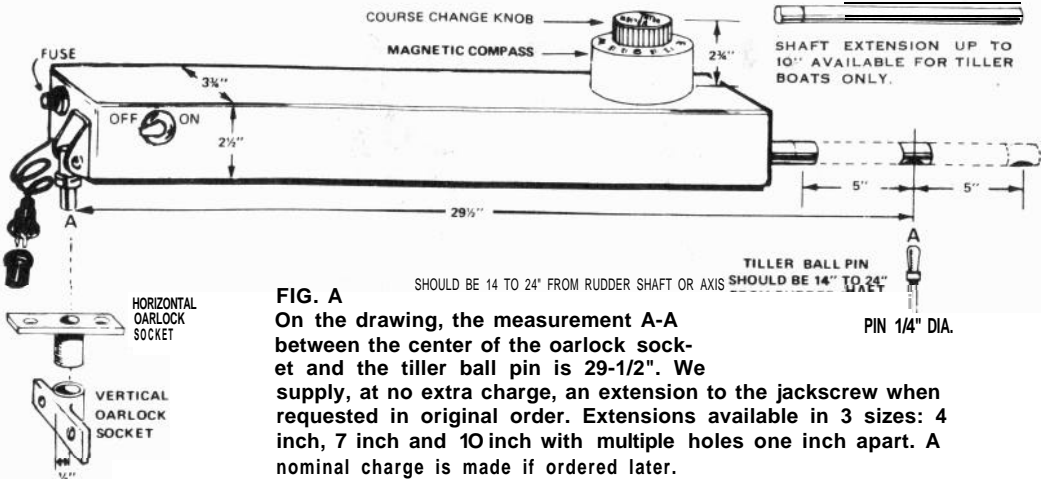


FIG. A
 SHOULD BE 14 TO 24" FROM RUDDER SHAFT OR AXIS
 SHOULD BE 14" TO 24" FROM TILLER BALL PIN
 PIN 1/4" DIA.
 On the drawing, the measurement A-A between the center of the oarlock socket and the tiller ball pin is 29-1/2". We supply, at no extra charge, an extension to the jackscrew when requested in original order. Extensions available in 3 sizes: 4 inch, 7 inch and 10 inch with multiple holes one inch apart. A nominal charge is made if ordered later.

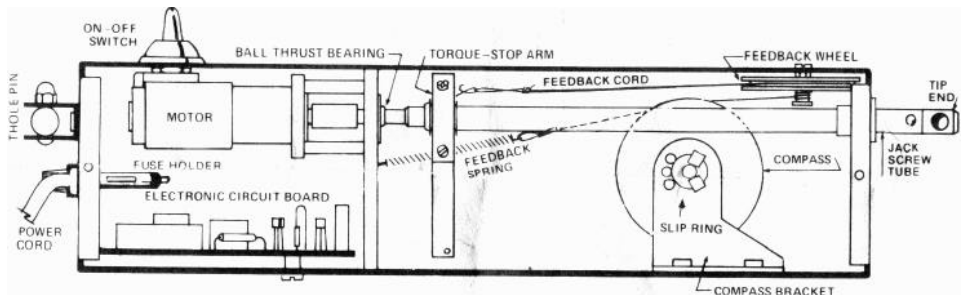


FIG. B
 Schematic view of interior of starboard side model (not to scale)

3. OARLOCK SOCKET INSTALLATION:

The standard TILLER MASTER should be installed so that the distance from the tiller ballpin to the center of the oarlock socket is 29-1/2". This dimension insures that TILLER MASTER has equal travel either side of center. See dimension A-A, Fig. A. Multi-position jackscrew extensions are available in several sizes, as shown on drawing. To find mid-position, extend the jackscrew until the junction of the aluminum tip end and the stainless tube is 6-1/2" from the case. The tube can be moved either way by rotating by hand, or by attaching TILLER MASTER to power supply.

A Horizontal oarlock socket: (Usually for TILLER MASTER without extension). When tiller is on centerline of boat, the measurement from center of tiller to centerline of oarlock socket is 29-1/2". TILLER MASTER does not have to be exactly perpendicular to the tiller, but you should note the position of the tiller ballpin (see section 4) before drilling the hole, and bed-lasting and screwing oarlock socket in place. To prevent leakage, epoxy a cork or plug in bottom of oarlock socket.

B Vertical oarlock socket: The vertical oarlock socket may be screwed directly to the coaming, or if coaming has extreme slope, a tapered shim may be used. On light fiber glass, a back-up block may be needed to provide

support. If you have an extension, extend the jackscrew tube of TILLER MASTER to midpoint, and when thole pin is in oarlock socket and tiller amidships, choose nearest hole in extension to drop onto tiller ballpin. For a boat with a cockpit wider than 39-1/2", mount the oarlock socket on a block inside the coaming, or mount the tiller ballpin on a block or a bracket on the near side of the tiller. For a narrow cockpit or a double-ender, the oarlock socket may be mounted outside the coaming, or the tiller ballpin may be mounted on the far side of the tiller, using a block or bracket to get the extra width.

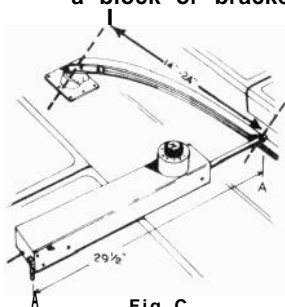


Fig C

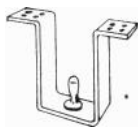


Fig C-1

4. TILLER BALL PIN INSTALLATION:

Since TILLER MASTER has 10" of total travel at a constant speed, the tiller ball pin should be installed 14" to 24" from rudder axis, at the point where 5" either side of center gives sufficient course change. If you are undecided exactly where to put it, it is suggested you make temporary installation by putting the tiller ball pin in a block and attaching it to the tiller with clamps. (Wrap your tiller well so as not to mar it.) Drill 1/4" hole 1" deep on top of tiller. Secure in place with epoxy or varnish. If the tiller is high above the oarlock socket, it may be necessary to make a special U-shaped bracket for the underside of the tiller for the tiller ball pin. (See Fig. C-1). The tiller ball pin cannot be installed upside down.

The connection depends on the weight bearing on the tiller ball pin. This free-floating method permits a quick disconnection in any emergency. **SECURITY:** if your TILLER MASTER is so high that it could be easily knocked overboard by someone tripping or by a flying sheet, it is recommended that you secure TILLER MASTER to the boat by a lanyard.

5. POWER INSTALLATION:

The power socket should be placed out of the weather. It is suggested that #18 weather-proof wire be used. Use a good solid connection to your 12V battery. Solder all connections and tin ends of wire before inserting into female plug. Do not use alligator clips. The larger pin on socket is negative. TILLER MASTER is protected from damage by accidental reversal of polarity by the 1-1/2 amp fuse.

OPERATING INSTRUCTIONS

WARNING - KEEP A LOOK OUT! TILLER MASTER can steer a course, but cannot see. Even if you are sailing in mid-ocean, and no one is in sight, use a minute-timer that rings to remind you to keep a good lookout. In clear weather it takes a fast steamer ten minutes to come over the horizon and be near you. Even with radar you cannot be sure that a steamer will see you.

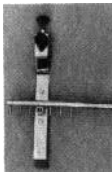
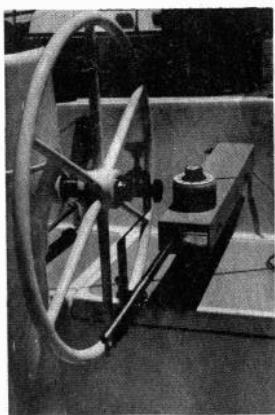
1. Hold the boat steady on course.
2. Put TILLER MASTER thole pin into oarlock socket. Turn course change knob to align compass approximately with boat's compass.
3. Turn on power switch and wait for TILLER MASTER motor to stop. Compass knob will turn as jack screw extends or retracts.
4. Adjust TILLER MASTER course change knob a little, if necessary, to bring jack shaft socket over tiller ball pin; drop into position.

5. Watch your course for a few minutes. TILLER MASTER has a magnetic compass, and because it is not compensated for your boat (it does not have to be) it may not agree perfectly with your own ship's compass. There are no lubber lines on TILLER MASTER, as there are many variations in the way TILLER MASTER is installed. Your own ship's compass shows your course direction and you can check that day and night. If you are not going in exactly the direction you want, make small course adjustments with the course change knob. It does not matter where TILLER MASTER'S compass points — it's where you are going that counts,
6. You can steer your boat by turning the course change knob. Initially move the knob only 5-10 degrees until you are familiar with the reaction of your boat. It is better to make large course changes in several small increments. However, if you want to make a large course change, or even tack with one twist of the dial, expect TILLER MASTER to take a longer time to settle down on the new course.
7. For dodging unexpected obstacles, it is easy to lift TILLER MASTER off the tiller and steer by hand. If the course change knob has not been turned, TILLER MASTER will resume original course when reconnected. A dodger is available. See page 6.
- a. No compass-sensing autopilot can anticipate waves or following seas the way a person can. Under conditions where there is a heavy load on the tiller (as on some boats when reaching in strong wind), load can be eased by rigging shock cord from end of tiller to windward side of boat. Some rigs handle much more easily with the mainsail down. Speed is reduced usually less than a knot by taking the mainsail down in these extreme conditions. Try it — it will surprise you!

INSTALLATION OF WHEEL MODEL

(See figures D, E, F)

TILLER MASTER, developed originally for sailboats with tillers, now offers a system for wheel steering. The TILLER MASTER wheel adapter was inspired by the experiences of TILLER MASTER customers, who modified their TILLER MASTERS for use on a wheel. This adapter, (which can be used on old or new TILLER MASTERS) is available for most Edson and Yacht Specialties wheels with destroyer-type rims. The adapter is built on a 3/4" x 10 nut, and each adapter is made to fit a wheel of a specific type and diameter. If your wheel has a shaft with a different thread, it is possible to drill and tap your own wheel nut to attach the adapter. It is also necessary to know the dimension (F) and the wheel diameter to build the adapter to fit your wheel. It hooks around the rim and is clamped firmly after the boat is on course. Thus you



have already corrected for windward helm before turning on the TILLER MASTER autopilot, which is attached to the swivel fitting on the adapter. A travel of 102 deg. of arc provides rudder angles sufficient to control most boats in average sea conditions. It is particularly suited for sailboats with responsive helms, and is especially helpful on sailboats under power.

TILLER MASTER FOR WHEEL STEERING
TILLER MASTER'S wheel steering adapter has 2 parts:

1. Wheel adapter bracket (installed on wheel)
2. Multi-pin shaft extension (installed on shaft of TILLER MASTER). Use the pin that suits your cockpit width.

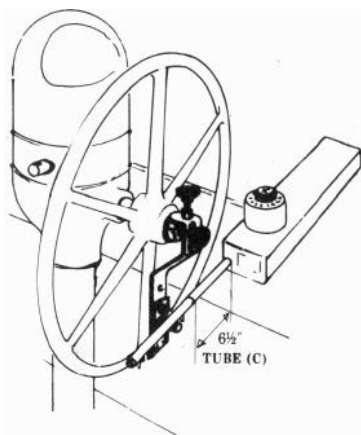


FIG. D

INSTALLATION OF MULTI-PIN EXTENSION ON TILLER MODEL TILLER MASTER

1. Older TILLER MASTERS have the shaft extension attached by drive screws. Remove drive screws with diagonal cutters and install multipin shaft extension by pounding in new drive screws. As the holes will not be the correct size, rotate extension and redrill a .120" hole (#31 drill). Use a drill press for precision.
2. Newer models use a slotted screw to attach shaft extension, and the same fasteners can be used to interchange shaft extensions.

NOTE: The mechanical feedback system built into TILLER MASTER is calibrated for the steering characteristics of the individual boat. The same boat changing from tiller to wheel may need a feedback system with a different ratio. (See instructions for replacing feedback wheel and cord.)

INSTALLATION OF WHEEL ADAPTER BRACKET

To install wheel adapter bracket, remove nut in center of your wheel and replace it with stud nut (N) of TILLER MASTER wheel adapter, first removing knob (A). Hook adapter over bottom rim of wheel. With the adapter hanging vertically, tighten the knob (B) at top of adapter. Lock the adapter in place with knob (A).

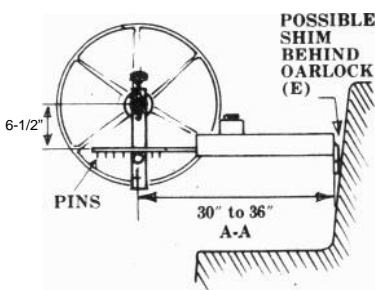


FIG. E

INSTALLATION OF OARLOCK SOCKET

If pedestal is forward of the wheel, it must be a starboard installation. If pedestal is aft of the wheel, it must be a portside installation. The A-A dimension (Fig. E) for the wheel adapter has to be a maximum 36" and a minimum of 30" in 1" increments. It may be necessary to shim the oarlock socket so that it is on the even inch as 4-1/2" travel is lost in 1/2". Extend jackscrew (either by rotating by hand or by power) on TILLER MASTER until the tube (not counting the extension) measures 6-1/2" (C). Hold TILLER MASTER level in position, with thole pin in oarlock socket pressed against the coaming at the level of the swivel socket (D). Drop the appropriate pin of shaft extension into the swivel socket. Screw oarlock socket into place.

POWER INSTALLATION

See page 3, section 5.

OPERATION

1. With both knobs loose, bracket in vertical position, and TILLER MASTER at mid stroke (tube extended 6-1/2"), put boat on course and turn compass knob to correspond with heading of boat's compass. Tighten knobs and turn on TILLER MASTER.
2. Using your own compass for navigation, make course adjustments in very small increments, letting it settle on a course before -adjusting further. To override TILLER MASTER, simply disconnect by lifting pin out of swivel socket, or loosen knobs (A) and (B) sufficiently to allow wheel to rotate freely and TILLER MASTER can remain attached,

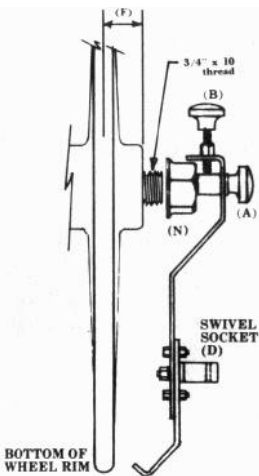
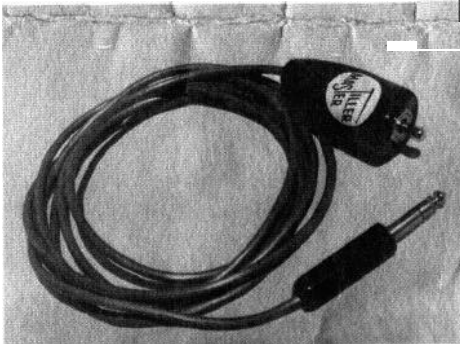


FIG. F

COURSE DODGER (Optional accessory)



Tiller Master's Course Dodger comes with 25 feet of cable (or more if specified) to allow you to pilot around obstacles from almost any location on your boat.

You can change course simply by moving the toggle to port or starboard on the hand-held remote control. When the toggle is released, your boat will return to its original course. Be sure plug is inserted all the way into the jack.

MAINTENANCE

1. To look inside TILLER MASTER, remove 2 screws in bottom cover and pry off cover. When replacing cover, be sure to put semi-circular cut-out over feedback wheel.
2. Keep jackscrew lightly lubricated. With jackscrew fully extended, apply only a little grease to the threads of the jackscrew if it is dry. Do not lube exterior of tube. Keep all lubricants away from feedback system. Shell Darina EP is provided. It is orange grease that turns dark with use.
3. Always watch plugs and contacts for corrosion, especially power plug (both parts) and compass jack slip rings. Check power plug screws for tightness. A little Vaseline is a good protection.

4. Although the circuit board plug-in and contacts are gold plated, it is sometimes advisable to clean with soft cloth. You may use WD-40 or Tri-flon or similar product sparingly.
5. The compass card should rotate when the jackscrew moves. If it is not turning, remove cover and check the feedback cord and spring. There should be no grease on the cord, and the spring should have a good tension. See instructions (page 7) for replacing wheel and cord.
6. Because of TILLER MASTER'S built-in compass, TILLER MASTER should be handled as carefully as a ship's compass.
7. TILLER MASTER is weather-proof when right side up, but must not be submerged. If dunked, remove bottom cover, rinse with fresh water and when dry give a light application of WD-40 or Tri-flon or similar product on electrical contacts. Avoid spraying feedback cord and wheel.

TROUBLE SHOOTING

MOST PROBLEMS ARISE FROM POOR CONNECTIONS IN THE BOAT'S ELECTRICAL SYSTEM. ALL SPLICING SHOULD BE SOLDERED. BULKHEAD MOUNTED PLUGS (EVEN THOSE LABELED WATERPROOF) FREQUENTLY CORRODE. KEEP ALL CONTACTS CLEAN AND PLUG SCREWS TIGHT

1. If TILLER MASTER acts lazy or erratic, your voltage may be too low or too high. Check your charging regulator to be sure it is not charging too high. Be sure your voltage at the plug is 10-1/2 volts to 14 volts
2. Corrosion can make your voltage unstable and cause TILLER MASTER to be erratic. Check both ends of plug.
3. If TILLER MASTER does not go at all:
 - a. Check fuse and replace. A defect in a fuse is not always visible.
 - b. Check power at plug.
 - c. Check for loose wire in plug.
 - d. Check prongs in plug— make sure there is tight contact.
4. If TILLER MASTER does not steer a good course, check feedback cord and spring. If slipping, spring may have lost its elasticity, and it may be reinforced temporarily with a rubber band. If the course has extreme S curves, the tiller ball pin may be too far aft, or the feedback ratio may be calibrated for the steering characteristics of a larger boat. If TILLER MASTER does not return to course, the tiller ball pin may be too far forward, or the feedback ratio may be calibrated for the steering characteristics of a smaller boat. TILLER MASTER should have a course with a slight S curve in calm seas to operate effectively in a breeze. TILLER MASTER is calibrated at the factory to your boat's handling characteristics. We can change the ratio for you, or send you the parts to do it yourself.
5. If TILLER MASTER operates in one direction only, check: compass slip ring contacts and circuit board contacts. Make sure the compass is rotating. If it is not, the feedback cord is probably not rotating the compass due to grease or oil on the cord, feedback wheel or cord groove in the base of the compass. Degrease these carefully with alcohol and be sure the feedback cord is installed according to instructions. If all of these things are OK, it is possibly failure of an electrical component. Do not attempt repair, as irreparable damage may result. Return circuit board to factory for repair. To remove circuit board, unscrew the screw holding it and unplug.

INSTRUCTIONS FOR REPLACING FEEDBACK WHEEL AND CORD

STARBOARD SIDE MODEL — See Fig. G (also see note 1, page 1)

1. Remove bottom cover of TILLER MASTER (one screw at each end of cover).
2. Unhook spring from hook on thrust bridge.
3. Unhook loop of feedback cord from hook on torque-stop arm.
4. Back out screw holding feedback wheel with thin 3/8" wrench. Remove feedback wheel.
5. Wrap new cord once around feedback wheel and pull thru hole.
- 6a. Wrap cord four times around hub groove in a clockwise direction. This cord length should be 12" from center of hub to end of wire loop.
7. Tape or hold cord in this position, and slide feedback wheel into position over axle screw and tighten screw and nut.
8. Be sure to keep the cord on small hub as you hook loop from big hub to hook on torque-stop arm.
- 9a. Wrap cord once around groove on base of compass, counter clockwise looking at bottom.
10. Stretch spring and hook it on thrust bridge. Remove tape, if used, from feedback wheel.

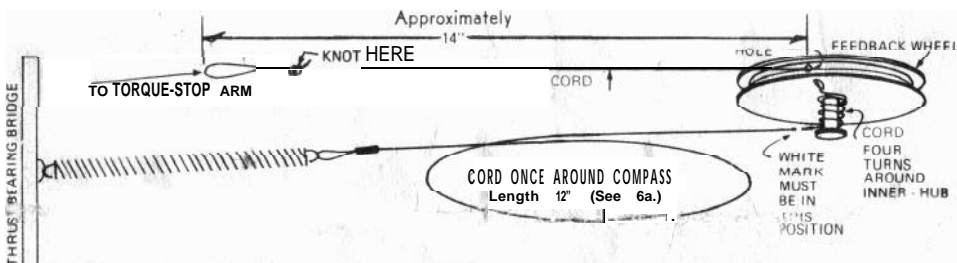


FIG. G

FEEDBACK CORD WITH JACKSHAFT FULLY RETRACTED — STARBOARD SIDE MODEL

PORTSIDE MODEL — See Fig. H

Follow instructions above, except substitute 6b for 6a and 9b for 9a.

- 6b. Wrap cord four turns around hub groove in a counter clockwise direction. This cord length should be 12" from center of hub to end of wire loop.
- 9b. Wrap cord once around groove on base of compass, clockwise looking at bottom.

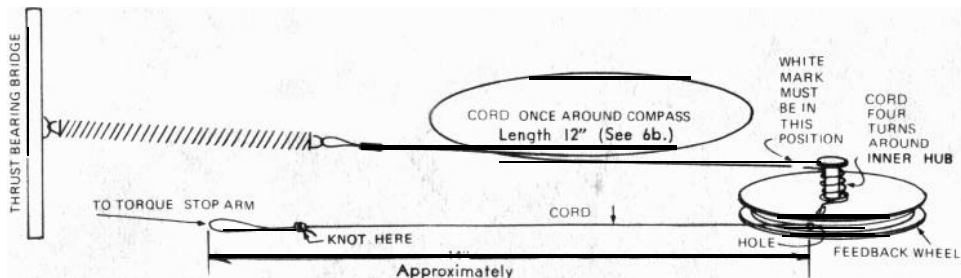


FIG. H

FEEDBACK CORD WITH JACKSHAFT FULLY RETRACTED — MODEL