

Replacement Instructions

Meade® LX200 Service Kit

For all Meade Model LX200 Telescopes

Following are instructions for the removal and replacement of the PCB and the R.A. and Dec. motors for the LX200 telescope.

R.A. MOTOR AND PCB REPLACEMENT

Static Electricity

The LX200 main circuit board is sensitive to static electricity and should be handled with care to avoid damage. Whenever you handle the PCB, make sure to observe the following precautions:

- Work on a formica or wood surface.
- Limit your movements while working, as unnecessary movement can increase the chance of static build-up and discharge.
- Discharge yourself by touching the metal of the telescope before you touch the PCB.

Removing the PCB and CNGC Library Chips

1. Turn off the power switch and remove any power cords from the power panel.
2. Unlock the R.A. and Dec. lock knobs and remove the LX200 from its tripod and/or wedge. Lay the telescope on its side on a table. Orient the drive base as shown in Figure 1.
3. Use the static electricity precautions described above.
4. Remove the Phillips-head screws holding the drive base cover in place. Also, most telescopes have four buttonhead hex screws in the middle of the cover. The two smaller 1/16" hex screws hold the cover in place and need to be removed. The two larger screws do not (the holes in the cover are larger than the screw heads).
5. Disconnect the ribbon cable (7, Fig. 1) from the PCB.
6. Remove the motor cable (5, Fig. 1) from the PCB.
7. Some LX200 models have two resistors mounted to the drive-base wall. If this is the case with your LX200, remove the resistor mount clip from the drive base wall. Using a putty knife, carefully wedge the knife between the mount clip and the drive base and pry the mount clip loose. Return the PCB to Meade with the resistors attached.
8. On the PCB, locate the two large CNGC Library chips ("E" and "O" chips; 2 and 3, Fig. 1). Carefully remove these two chips by placing a screwdriver under each chip and gently prying the chip from the socket. Move the screwdriver back and forth between the ends of the chip, gradually working the chip free. These chips need to be added to the new PCB board. Set them aside for now.
9. The PCB is held in place at 6 possible locations

(1 and 8, Fig. 1). Most telescopes use only four of these locations, but some use all 6. On Fig. 1, use a pencil to mark the mounting holes used on your telescope. These marks will serve as a guide when installing the new PCB. Remove the screws holding the PCB in place and carefully remove the board from the telescope.

10. Set the PCB to one side.

Replacing the R.A. Motor

1. Unplug the R.A. motor cable (5, Fig. 1), then remove the two hex screws (6, Fig. 1) holding the old R.A. motor in place.
2. Remove the R.A. motor from the drive base and set

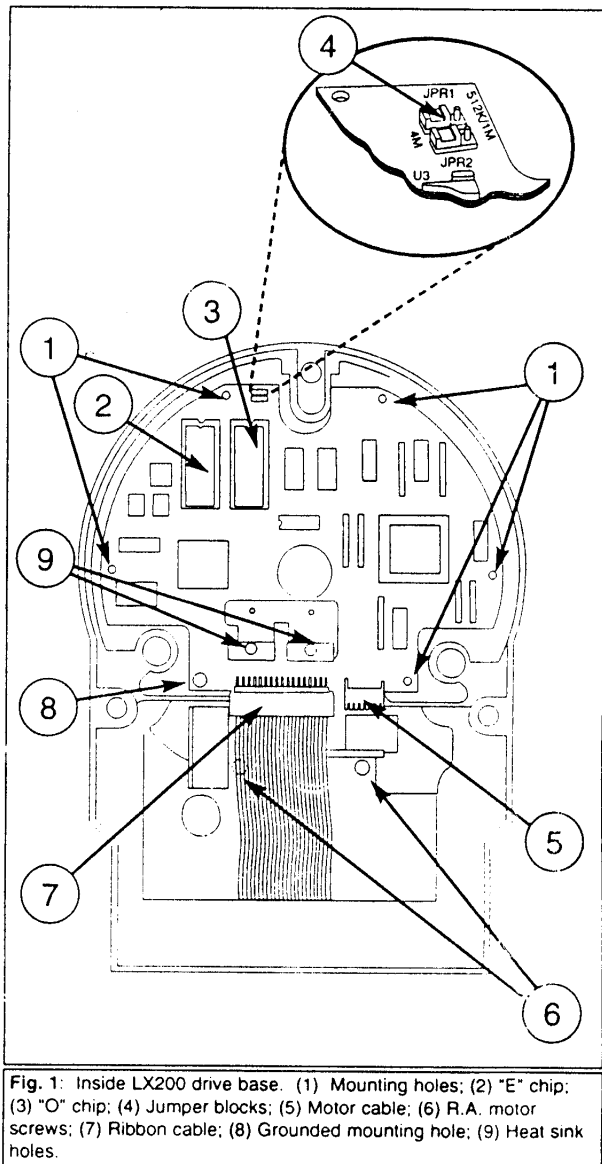


Fig. 1: Inside LX200 drive base. (1) Mounting holes; (2) "E" chip; (3) "O" chip; (4) Jumper blocks; (5) Motor cable; (6) R.A. motor screws; (7) Ribbon cable; (8) Grounded mounting hole; (9) Heat sink holes.

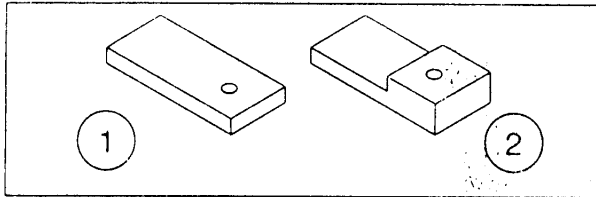


Fig. 2: Mounting Pads. (1) Without Step; (2) With Step...

the motor to one side.

- Over the years, there have been minor changes in the way the R.A. and Dec. motors are mounted. There are two basic types: the first has a "step" on the mount pads (2, Fig. 2) that matches a "recess" on the motor hinge. The other style is without such a "step" (1, Fig. 2); it mounts flush.

The motors included with this repair kit are of the first

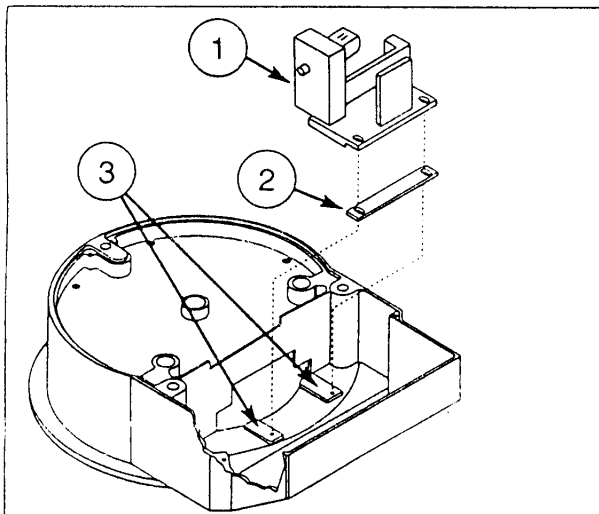


Fig. 3: Mounting the R.A. motor. (1) R.A. motor; (2) Mounting plate; (3) Motor mounting pads.

type (i.e., the motor hinge has a recess). Check the mounting pads (3, Fig. 3) in the drive base. If the pads do not have "steps" cut into them, the motor mounting plate (2, Fig. 3) needs to be installed.

- If needed, position the motor mounting plate such that it fits onto the "step" on the motor hinge. Then center the motor assembly over the two mounting holes. If the motor mounting plate is not needed, align the R.A. motor assembly with the two threaded mounting holes.
- While inserting the R.A. motor, gently squeeze the spring-loaded hinge and carefully match the teeth of the worm wheel to the worm gear. Thread in the left mounting screw loosely, then line up the right mounting hole and loosely thread in the right mounting screw. Turn the left mounting screw for a semi-tight feel (do not overtighten). As the right screw is tightened, gently push up on the bottom of the motor block to level the assembly. Firmly tighten the right, then left mounting screw.
- Confirm that the tension spring is in place within the motor. The tension set screw should be adjusted to allow for 1/16" to 1/8" of flex when you manually tilt the drive motor. This amount of flex allows the motor

to compensate for high and low spots in the drive gear. The worm gear should not be so tight as to bind or so loose as to disengage or cause lash in the system.

- Plug in the R.A. motor cable connector (5, Fig. 1).

Installing the Printed Circuit Board

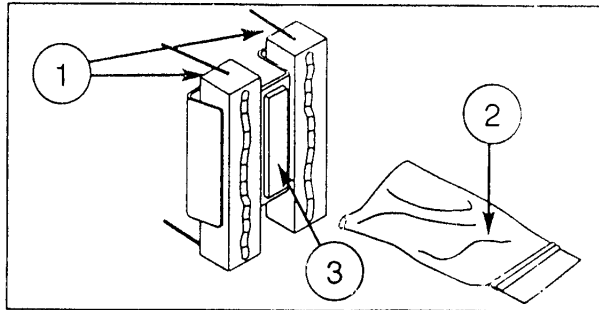


Fig. 4: (1) Resistor mount clip; (2) Thermal conductive compound; (3) Double-sided tape.

- After installing the R.A. motor, position the new PCB within the drive base, as shown in Fig. 1, aligning the holes in the PCB with the mounting holes in the drive base. Begin by replacing the grounded mounting screw in the grounded mounting hole (8, Fig. 1). Then replace the rest of the screws.
- The PCB included with this kit has two ceramic resistors attached by 7" wires. Place each resistor (1, Fig. 4) into a channel in the resistor clip mount. Adjust the position of the resistors such that only a 1/4" or so extends beyond one end of the clip.
- Carefully bend the wires coming off the resistors away from the side of the mount clip that has the black double-sided tape (3, Fig. 4).
- Clip off a small corner of the ziplock pouch and squeeze out a long bead of thermal conductive compound (2, Fig. 4) onto the face of each resistor. Be careful not to contaminate the double-sided tape (3, Fig. 4) on the resistor mount clip.

WARNING: Do not ingest the thermal conductive compound. Nausea and diarrhea are possible. Keep away from children.

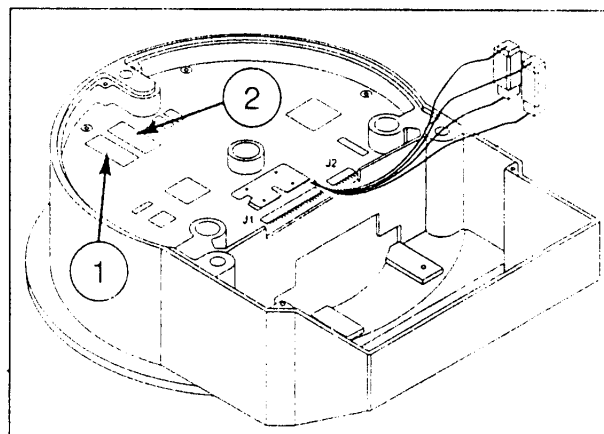


Fig. 5: Mounting the Resistor Mount Clip and CNGC Library Chips. (1) "U2" socket; (2) "U3" socket.

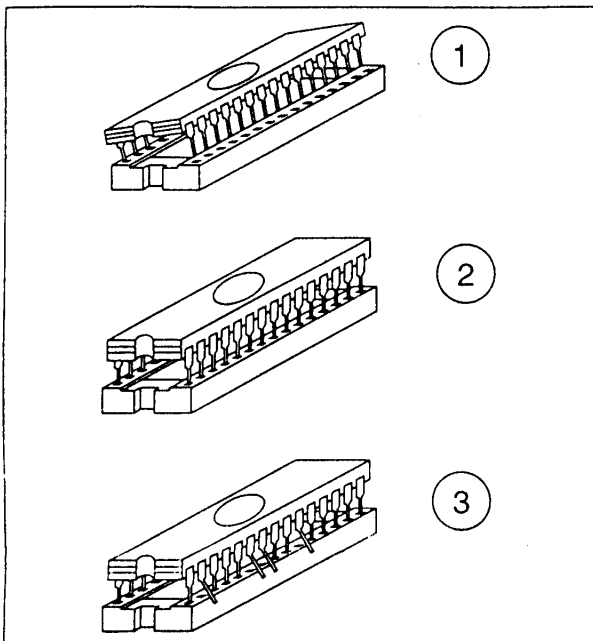


Fig. 6: Inserting Computer Chips.

5. Peel off the tape backing on the resistor clip and press the assembly onto the side wall on the inside of the drive base (Fig. 5). Make certain that the resistor assembly is down deep enough such that the wires of the resistors will not extend above the electronics cover plate.
6. Group the wires of the resistor assembly together and slide them under the aluminum heat sink and through the gap between the cable connectors J1 and J2 (4, Fig. 1) on the main board.
7. On the new PCB, locate the two empty sockets, labeled "U2" (1, Fig. 5) and "U3" (2, Fig. 5).
8. The chips from the old PCB, are marked with either an "O" (for odd) or "E" (for even). Using the static electricity precautions described on page 1, locate the "O" chip. Insert the "O" chip into the "U3" socket (2, Fig 5) using the following procedures:

Orient the chip so that the notch on the end of the chip faces the same direction as the notch in the socket (toward the curved end of the drive base). Other chips on the PCB will all have the notch going in the same direction.

Before you install the chip, verify that its pins match up with the holes in the socket. If they do not, align the pins by laying the chip on its side on the table and gently pressing its top edge (**not the pins**). Light, even pressure will bend all the pins slightly inward. Repeat for the other side. When you do this properly, both rows of pins will exactly line up with the holes in the socket.

Carefully insert the pins on one side of the chip halfway into the holes on the same side of the socket (2, Fig. 6).

Insert the pins on the other side of the chip halfway into the holes on that side of the socket. If the pins do not line up with the holes (1 or 3, Fig. 6), remove the chip and go back to step 3.

Carefully examine the chip's pins. Look for any pins that are bent under or out (Fig. 6). If you find any bent pins, remove the chip, gently straighten them, and go back to step 3.

When all the pins are in the socket holes, apply gentle, even pressure with two fingers until the chip is completely inserted into the socket.

9. Install the "E" chip into the "U2" socket (1, Fig. 5) using the procedures listed above in step 8.
10. Verify that the two jumper blocks JPR1 and JPR2 (4, Fig. 1) are set for "4M". Each black square jumper connects two of three pins on the PCB. If the jumpers are set correctly, there should be a free pin on the "512K/1M" side. If the free pin is on the "4M" side, gently pry the jumper off the first two pins and move it over one pin.
11. Re-connect the motor cord connector (5, Fig. 1) to the new PCB.
12. Re-connect the new ribbon cord connector (7, Fig. 1) to the new PCB.
13. Replace the drive base cover.

CAUTION: Be sure to replace the two screws in the middle of the cover. These secure the cover to the heat sinks on the PCB. Damage will result if these screws are not replaced tightly.

14. Return the telescope to its upright position.

REPLACING THE DEC. MOTOR

1. Completely unthread and remove the Dec. lock knob (4, Fig. 7).
2. Remove the three mounting screws (1, Fig. 7) that hold the plastic cosmetic cover. The Dec. motor assembly is now visible.
3. In order to see how the entire motor assembly properly lines up with the fork arm mounting holes, loosen (but do not remove) the two worm block

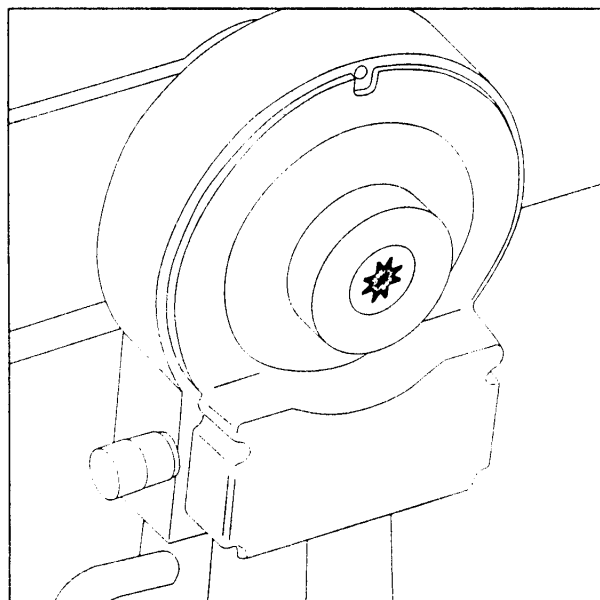


Fig. 7: LX200 Dec. assembly. (1) Mounting screws; (2) Worm gear cover; (3) Dec. slow-motion control; (4) Dec. lock knob.

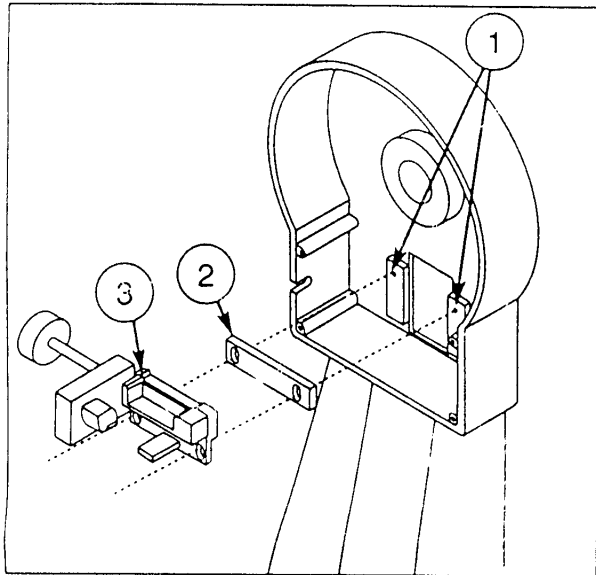


Fig. 8: Mounting the Dec. Motor.
 (1) Mounting Holes; (2) Mounting plate; (3) Dec. motor.

screws. Replace the Dec. lock knob and slightly rock the entire optical tube assembly (OTA) back and forth. Notice how the motor assembly flexes at this point. This same exercise is performed when the new motor is being replaced to seat the worm wheel properly and to find the holes for the worm block mounting screws.

4. Now completely remove the Dec. lock knob (4, Fig. 7) and the worm block mounting screws.
5. Unplug the Dec. motor power cord from inside the fork arm. Before pulling the entire assembly straight out, note that the motor assembly contains a spring, which is used to ensure proper meshing of the worm wheel with the worm gear and is located between two sides of a hinge. This spring can easily fall out when pressure is released during removal.
6. Slowly pull the entire Dec. motor assembly out of the fork arm and set the motor aside.
7. Run the power cord of the new Dec. motor through the opening in the fork arm Dec. motor housing, and plug it into the telephone jack connector inside the fork arm.
8. Check the mounting pad inside the fork arms, as described on page 2. If necessary, position the motor mounting plate (2, Fig. 8) such that it fits onto the "step" on the motor hinge; center this assembly over

the two mounting holes. If the mounting plate is not needed, position the Dec. motor assembly (3, Fig. 8) such that its two mounting holes match the threaded holes in the fork arm Dec. housing.

9. While inserting the Dec. motor assembly, squeeze the spring-loaded hinge and carefully match the teeth of the worm wheel to the worm gear.
10. Make any minor adjustments necessary to sight the left mounting hole of the motor assembly with the left threaded hole in the fork arm Dec. housing. Thread in the left mounting bolt loosely, then line up the right mounting hole and loosely thread in the right mounting bolt.

It may be necessary to adjust the tube assembly so that the entire Dec. motor assembly moves more to the left. This is done so that the large worm wheel will clear the reduction gear box, and for proper gear meshing between the worm gear and worm wheel.

Tighten the left mounting screw for a semi-tight feel, then align the right. As the right screw is tightened, gently push up on the bottom of the motor block to level the assembly. As the final adjustment, firmly tighten the left mounting screw. In this technique, gently meshing the worm wheel and the worm gear avoids any tendency to jam the gears together.

11. Confirm that the tension spring is in place within the motor. The tension set screw should be adjusted to allow for 1/16" to 1/8" of flex when you manually tilt the drive motor. This setting allows the motor to compensate for high and low spots in the drive gear. The worm gear should not be so tight as to bind or so loose as to disengage or cause lash in the system.
12. Thread the Dec. lock knob (4, Fig. 7) into place and check the gear action by turning the Dec. slow motion control knob (3, Fig. 7). If necessary, use some lithium grease or standard automotive grease on the worm gear to improve the smoothness. Once satisfied, remove the Dec. lock knob, replace the cosmetic cover with its three screws, and re-attach the Dec. lock.

If you have any questions regarding these instructions, call Meade Instruments Customer Service Department, at (949) 451-1450, or fax at (949) 451-1460. Customer Service hours are from 8:30 AM to 4:30 PM Pacific Time, Monday through Friday.