

XM-2000 Motor Disassembly & Inspection

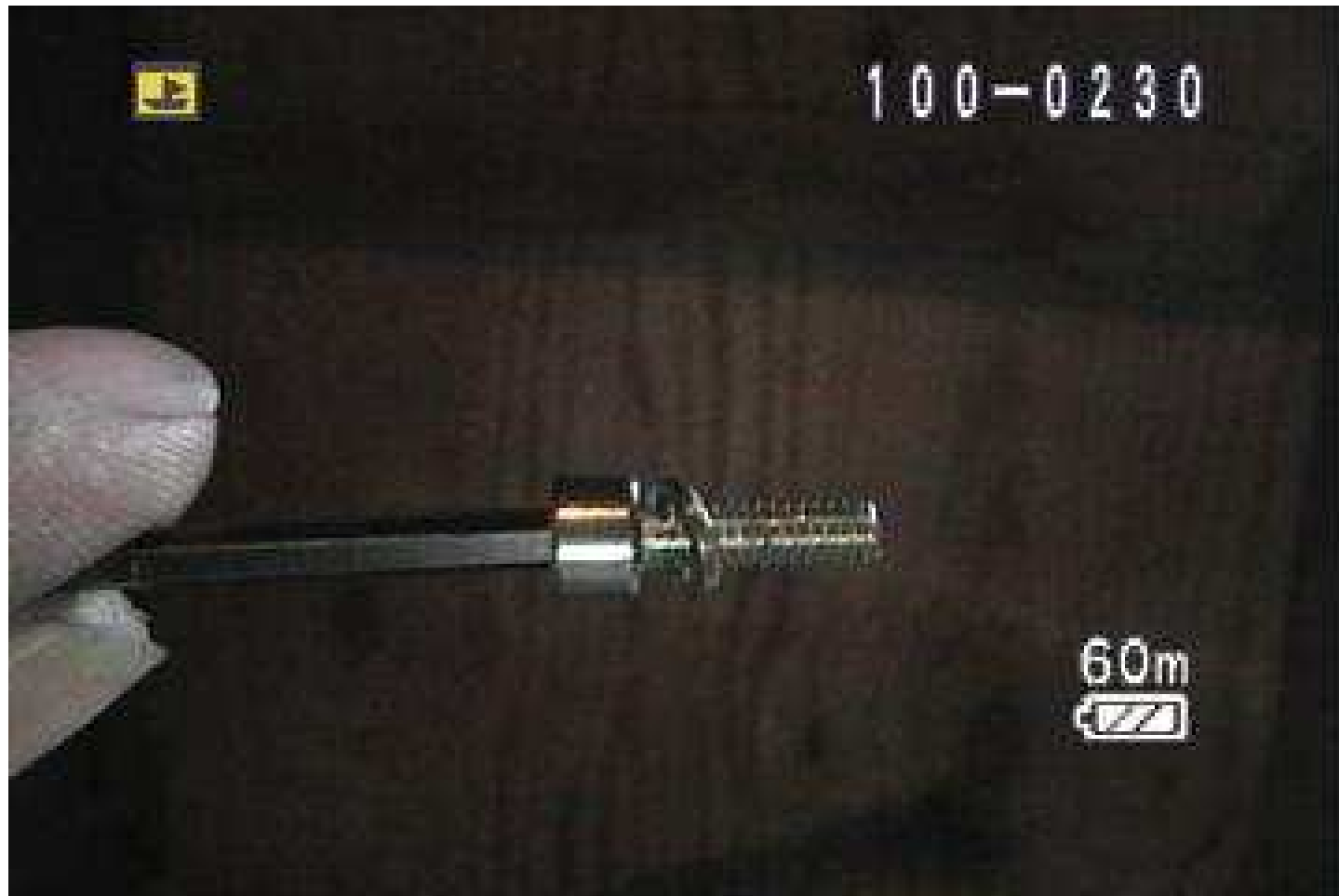
by USATracy



1 – Place motor on bench with shift shaft down and wires up
Note (to get to this point in the tear down, refer to the XM-2000
Rear Wheel & Motor Removal pdf document)



2 – Using a 3 mm hex wrench, remove the 8 screws from the motor cover plate.



3 – When removing the screws do not lose the tiny washers.



4 – Using a screwdriver with a thin sharp edge and a hammer, lightly break the cover plate seal just a little. DO NOT PRY. The cover plate is glued on, you are just trying to break the initial seal.



5 – Remove the axle nut that was put in place to protect the shift shaft during motor removal from wheel.



6 – Place a 5/8 deepwell socket over the axle threads, ensure that the socket fully covers the threads and seats to the axle. Make sure the socket is not too big or it may get stuck to the axle beyond the threads or burr the round part of the axle during the next steps.



7 – The socket covers the threads and seats nicely. Place a small piece of duct tape or electrical tape on the socket at the round part of axle, make sure it is just holding the socket on when the motor is flipped over and will also be easy to remove with one hand in the next steps.



8 – Using a firm surface like a sidewalk, place a board on the cement and place the motor, socket side down, on the board. Holding the motor by the flanges where the 4 motor to wheel bolts go, lift and drop the motor lightly tapping the socket to the board and see if the cover plate separates more from the housing.



9 – Here you can see the housing is beginning to separate.



10 – WARNING – Do NOT get any body part, fingers, inner thighs anywhere near the opening between the cover plate and the housing. EXTREME DANGER of losing a finger or worse. EXTREME MAGNETISM – When attempting to separate these parts that can fly back together without warning.



11 – You may have to try a couple of times, magnetism will pull the parts back together, but a combination of slamming the socket into the wood and PUSHING on the flanges at the same time should yield the above result.

DANGER DANGER DANGER – KEEP BODY PARTS CLEAR



12 – DANGER –KEEP BODY PARTS CLEAR

You are working with a loaded gun here, VERY GENTLY and while holding onto the WIRE END AXLE SHAFT ONLY lay the motor on it's side and remove the socket, see why only a LITTLE tape ? Reverse the socket around the other way.



13 – DANGER KEEP BODY PARTS CLEAR

The socket is reversed now so that it is just covering the shift shaft, we need to repeat the board tapping one more time to complete the separation. CAREFULLY place a little tape on the socket to hold it to the axle.



14 – Lift motor back onto board by holding onto the WIRE END OF AXLE ONLY, once motor is centered on board, grasp by flanges, DO NOT LIFT UP ON FLANGES, and PUSH DOWN HARD and the housing should drop.



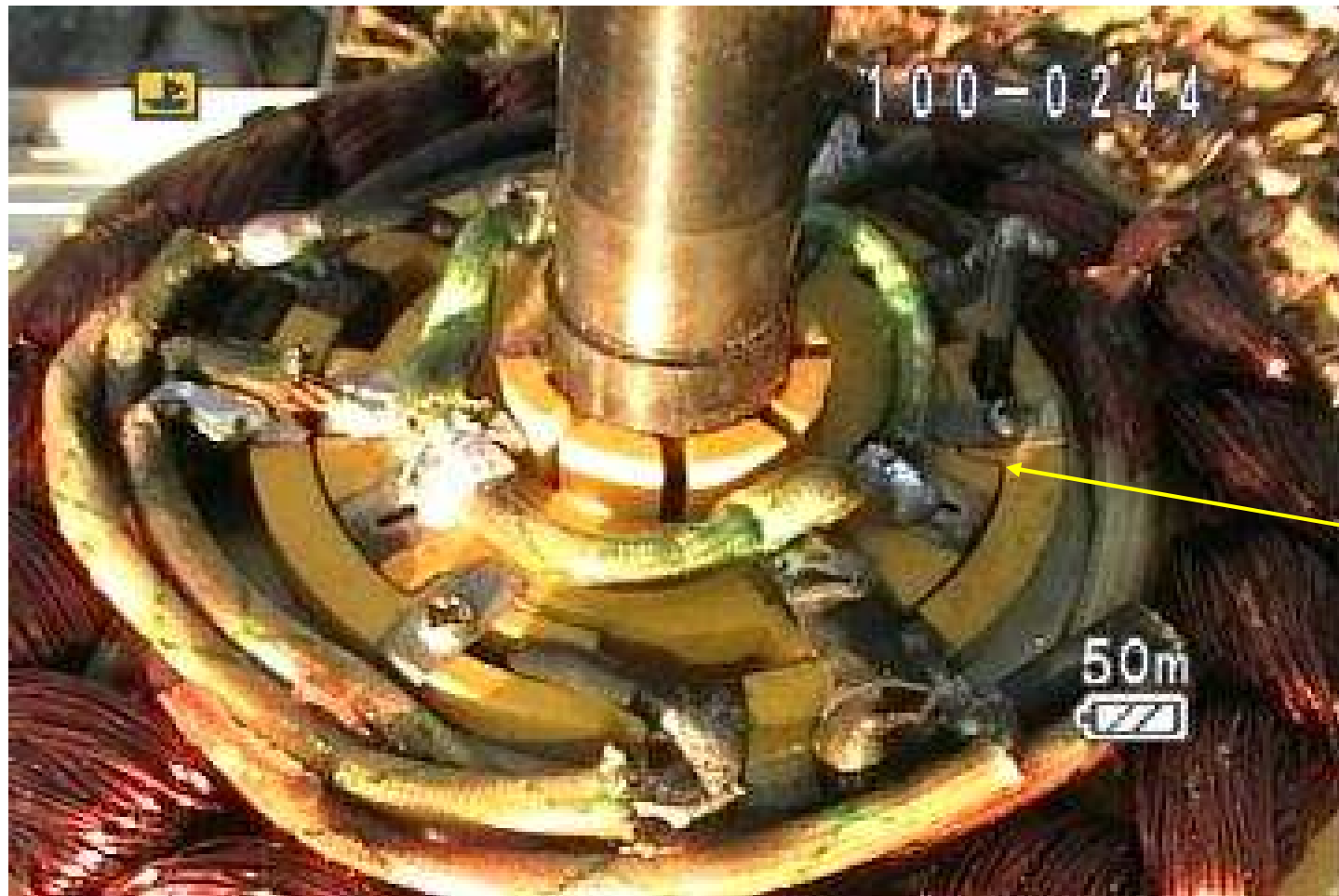
15 – The permanent magnet housing separated from the armature and cover plate.



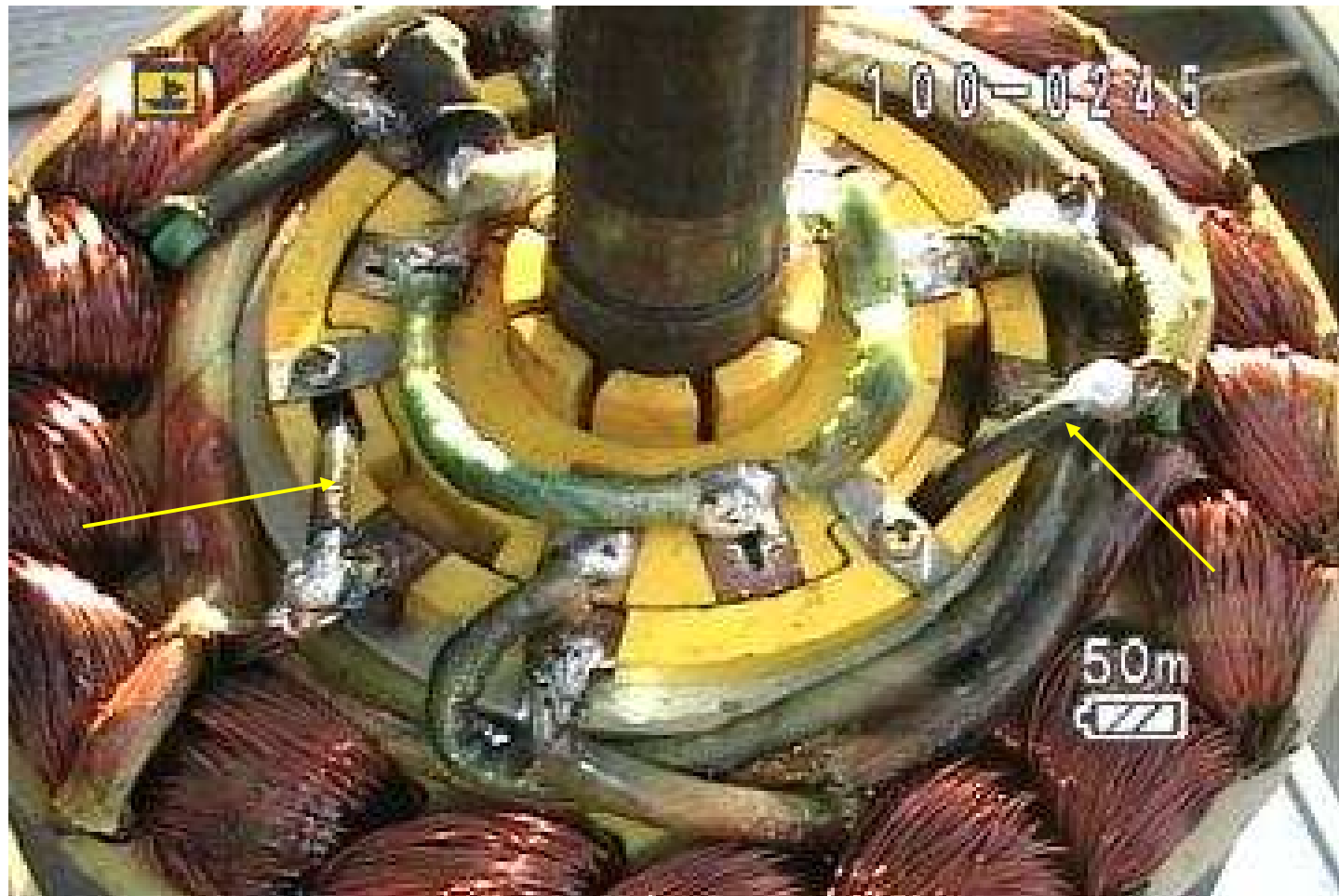
16 – Permanent magnet housing. Keep debris, especially metal shavings, clear. Wipe housing out and make sure there is no debris on magnets.



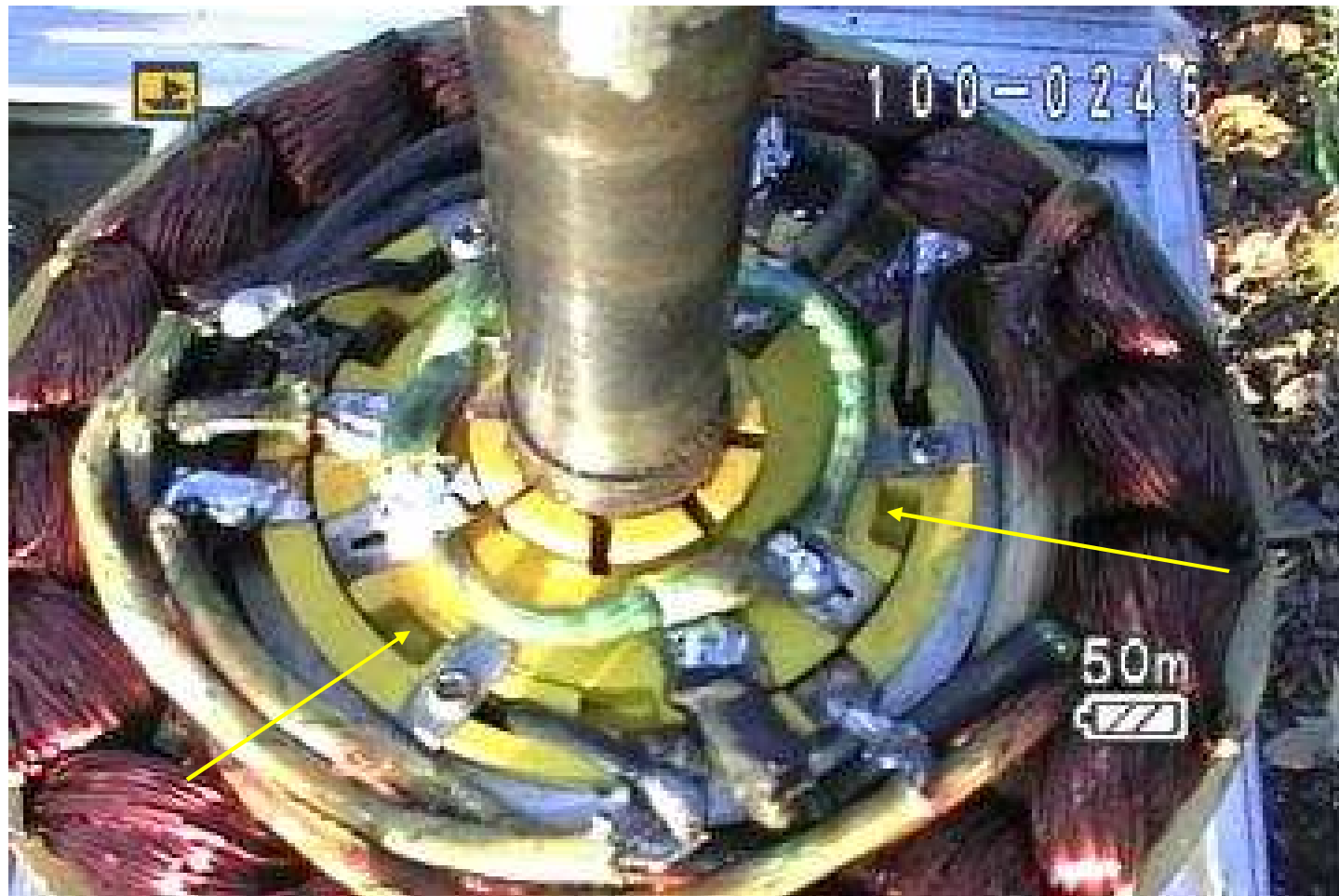
17 – Armature winding and shift plate.



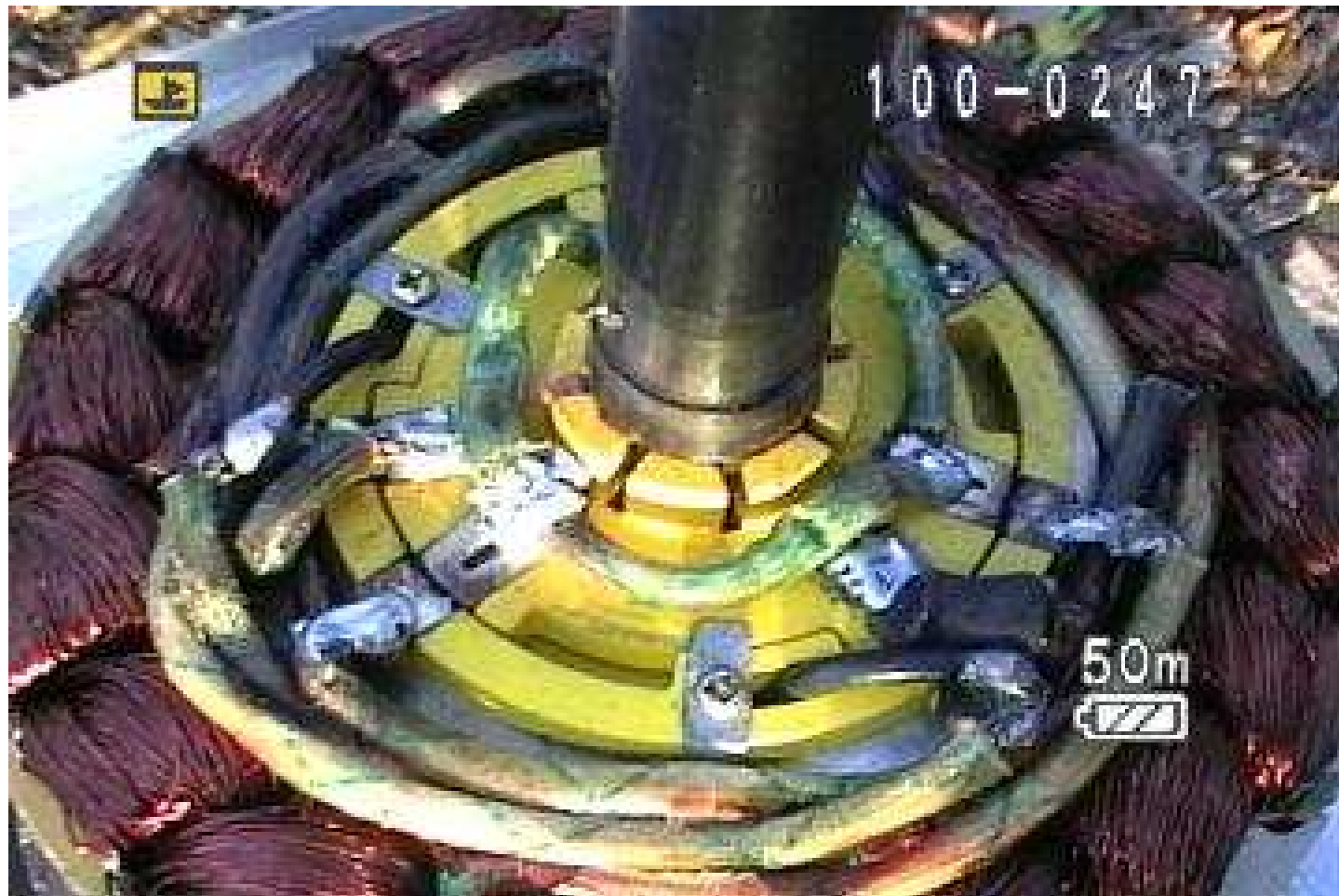
18 – The yellow plastic is the shifter. The inner ring rotates back and forth within the outer yellow ring. There are 6 contacts on the inner ring connecting to 6 contacts on the outer ring. The ring is resting against the counter clockwise stop. It is in low gear. In high gear the inner ring's green loop of wire makes all connections/contacts common.



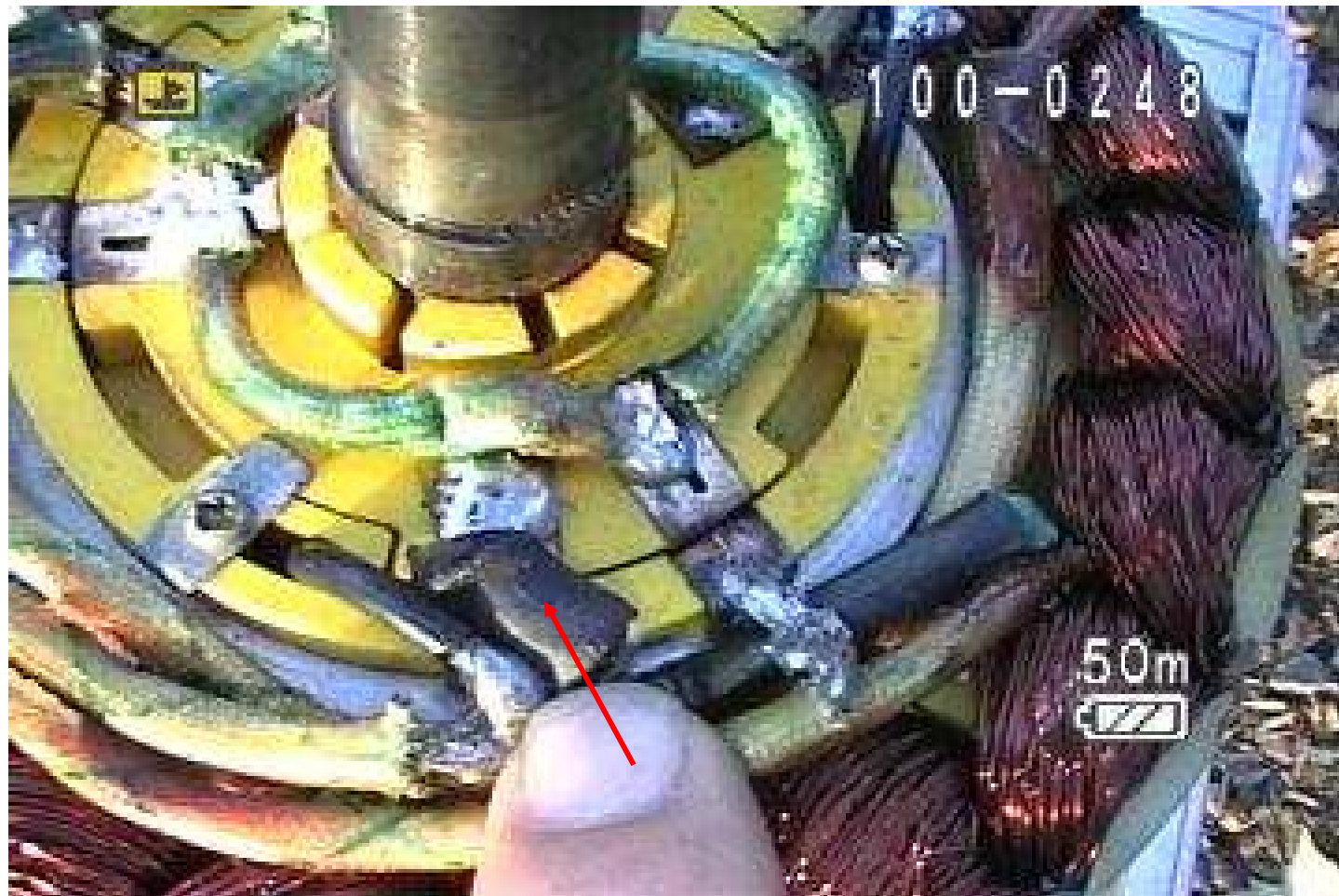
19 – Still in low, opposite side of ring. The three black wires come from the controller (2 shown)



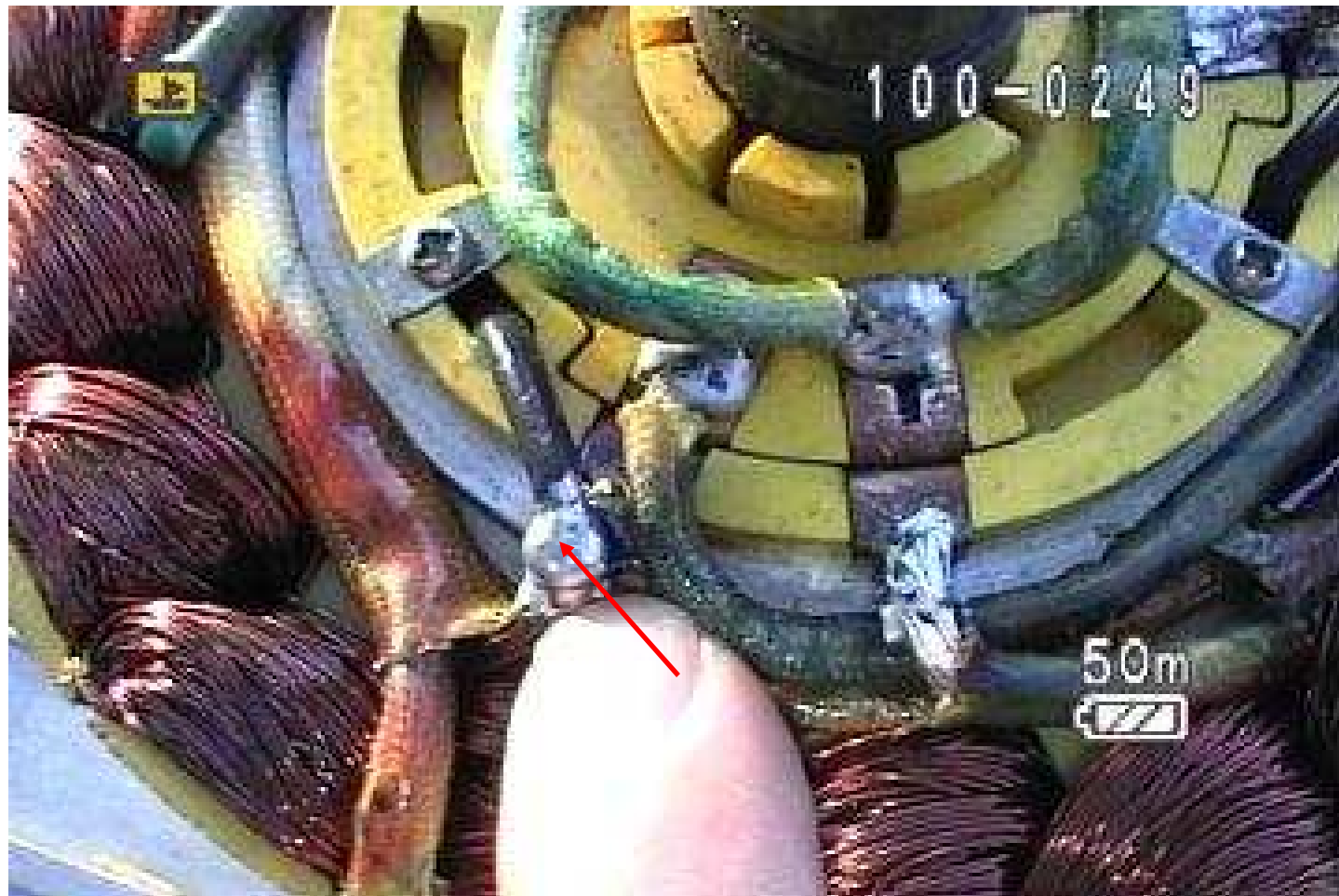
20 – Rotating shifter clockwise for high speed, but the shifter is between contacts so no power. This is one reason why it is important to get the shift mechanism adjusted correctly. Notice that the inner and outer contacts are not contacting anything. It is also possible, due to tolerances, for some low and high windings to activate at the same time causing a growling sound.



21 – Motor is now in high speed, notice the inner green loop of wire has made all 3 of its contact connections common with each other.



22 – Repaired, when the shift ring moves back and forth, wires move with it, this can cause wires to break lose and In this case this one wire was 1/8” too long and rubbed the magneto housing when in low speed. Shortened the wire and resoldered and covered with shrink tube to protect where missing insulation was rubbed off.



23 – Repaired, this motor has been operated with a non-functioning shifter and was operated in high speed mode causing motor to run hot. Some solder joints separated. Here one of the three controller power wires had detached.



24 – Repaired, once the power wire was attached, motor growled In high speed, the culprit was excess solder that had melted and joined with a neighboring low speed contact, heated and wicked excess solder off the joint.



25 – Pictures of the windings...



26 – Pictures of the windings...



27 – Pictures of the windings...got a little hot



28 – Pictures of the windings...



29 – Pictures of the windings...



30 – Pictures of the windings...



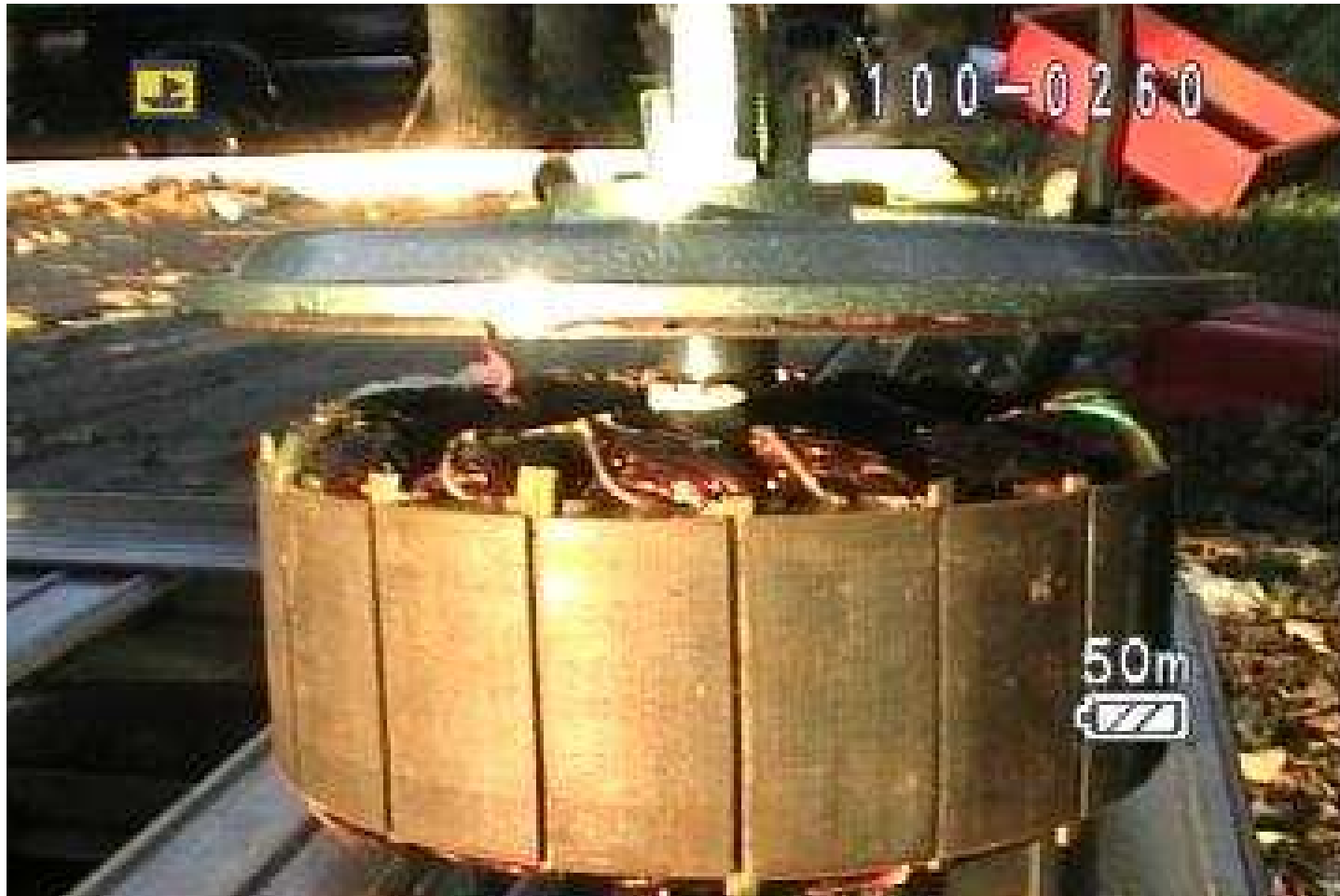
31 – Pictures of the windings...



32 – Pictures of the windings...



33 – Pictures of the windings...There is a low speed and high speed winding.



34 – Windings flipped over to cover side, not a lot there, remember that tiny 5 wire connector we pulled from the controller?
That was for the HALL sensors. They are in there but they are not really serviceable unless the motor is being professionally rewound.



35 – Getting ready to reassemble, make sure no wires are sticking up, move the shifter and watch the wires.



36 – Ready to put the housing on.



37 – The housing may drop right in place, if not use a socket and a mallet and give it a tap.

DANGER - KEEP ALL EXTREMITIES CLEAR, ONCE MAGNETS GRAB IT IS GOING TO JUMP ONTO THE WINDINGS.



38 – And with a bang, it is on, good thing your fingers were clear !!!
The small gap will close up when the eight screws are installed.



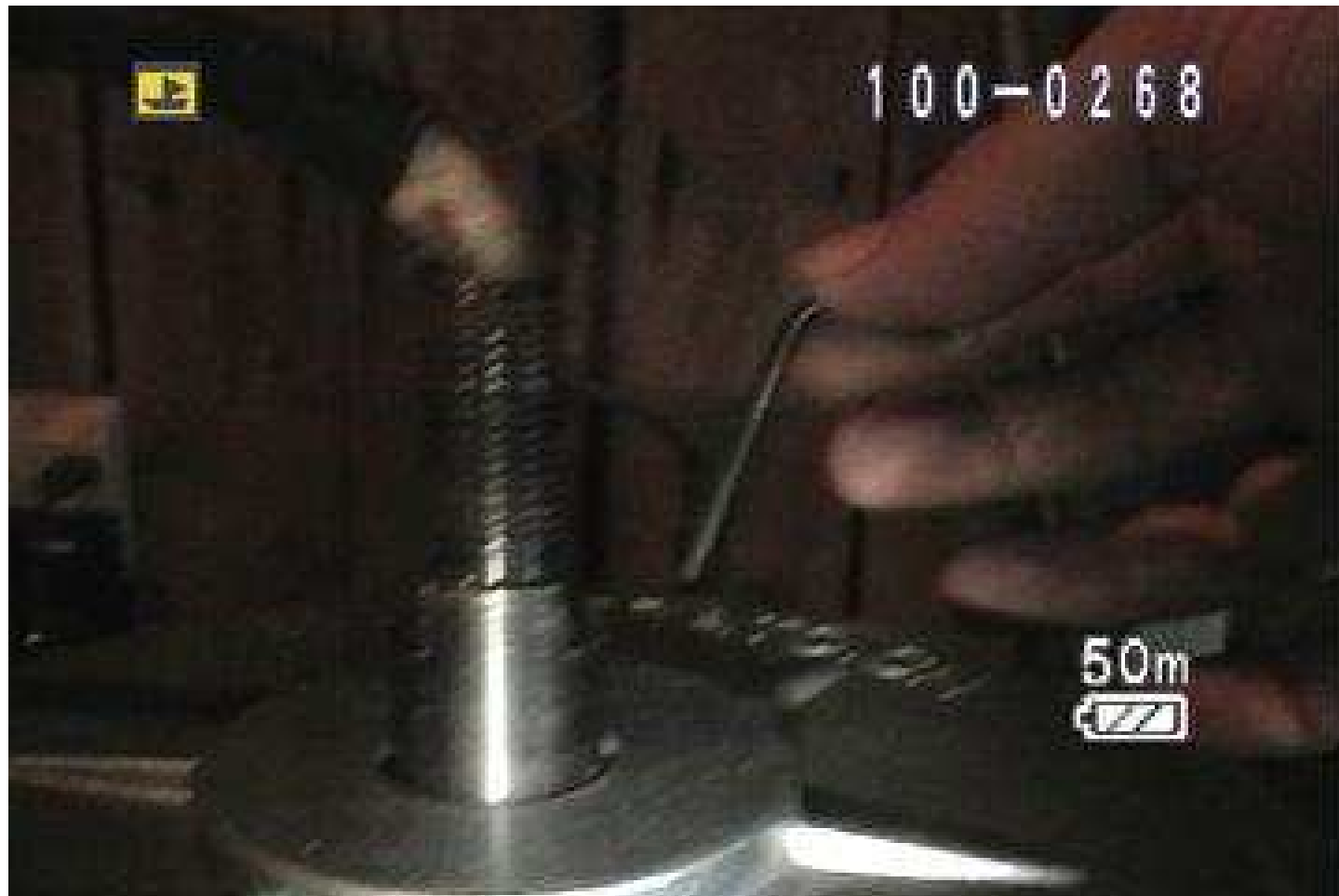
39 – Flip it over, remember to put your axle nut on to protect your shift shaft.



40 – Rotate the cover if you need to in order for the holes to line up, due to the magnets pulling on things you will not get all eight to line up.



41 – So insert and thread the ones that you can. Don't force and don't cross thread. Look how far off that one in the back is....



42 – Use your allen wrench without a screw and insert it into the threaded hole and GENTLY pry the cover into alignment.



43 – You may have to go a little past straight as the magnets will try to pull it back, so you may have to hold the cover in place and thread the bolt.

KEEP CLEAR OF THE SEAM BETWEEN THE COVER AND THE HOUSING.



44 – Once all of the screws are in place, run them up until they just touch, DO NOT TIGHTEN OR SNUG YET.



45 – Visually inspect that the cover is level and the screws are just touching.



46 – This screw is in the thread, but the cover still isn't perfectly aligned, the screw heads will recess into the cover, but this one is not going to.

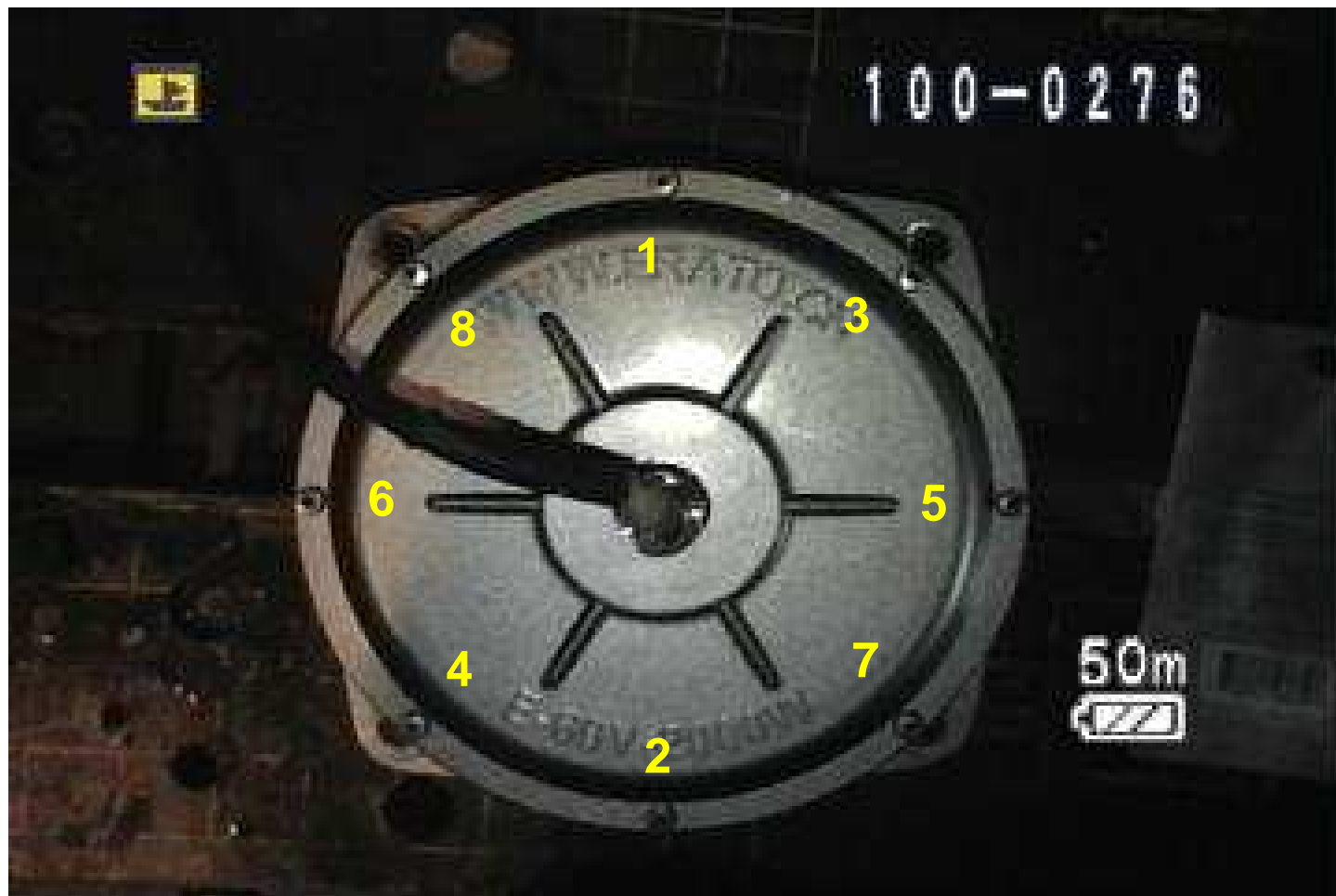


47 – The screw right next to it is ok and centered.



48 – Slowly go around turning each screw $\frac{1}{2}$ turn. This usually will self align the out of line screws and holes. If not, loosen the screws and work the cover in place better.

Notice the allen wrench, use the short end to hold onto and not the long end. Keep going round the cover $\frac{1}{2}$ turn at a time until all are tight.



49 – Use the following sequence when tightening.



50 - Torque the screws tight, do not overtighten, they will strip or break easily