

Addendum to ERS Technical Manual Notes Regarding the Extended Length ERS

This set of notes is intended to serve as an addendum to the existing ERS Technical Manual, Version 2.0, previously submitted. The new longer length ERS has similar but different components providing more length as required by some operations. This addendum supplies information relevant to the new configuration and re-emphasizes key points of general ERS operation.

Preparation

Order of Assembly – First, fill the Motor Cans with oil and bleed air out appropriately. Because the Motor Can seals seep, it is recommended that they not be filled with oil until they are ready to be installed and run.

The Motor Can is mounted in the Motor Housing via six screws. The motor output shaft must be keyed to the ERS Drive Shaft (which rotates and drives the latch mechanism) in the Motor Housing via the D-shaped hole. If the Motor Can has been removed and the motor rotated for any reason, the alignment is probably not correct. In this case, either the ERS Drive Shaft, or the motor output shaft must be rotated to achieve proper mating alignment so the Motor Can may be properly installed.

Rotating the ERS Drive Shaft - There is a gear component tool in the ERS tool box that has an integral spur gear. This part can be inserted into the drive shaft and the gear rotated using a slim pair of channel locks or slip-joint pliers. The rotation should be easy to accomplish by hand. That is, it will not take significant torque to rotate the drive shaft. (NOTE: The only exception to this is if the ERS has been driven to the full RELEASE end of travel where a stall condition exists, i.e. the one end-of-travel case that causes the current draw “spike” on the MFTM power meter. This is why it is essential that the ERS be driven to a “LATCH” position before being disassembled.) Note that the Drive Shaft and ERS latch mechanism is a right hand thread. Turning the Drive Shaft to the right looking downhole will run to the “RELEASE” position. Conversely, if the Drive Shaft is turned counter-clockwise, the ERS will move towards the “LATCH” position.

Rotating the ERS Motor Output Shaft – The motor’s output shaft can be rotated by applying 24 VDC to the electrical connector. The entire MFTM/ERS system does not have to be hooked up in order to accomplish this. However, care should be taken to not forcefully insert any object into the connector. Irreparable damage to the connector may result. Sufficient connectivity may be achieved by inserting a stripped 22 or 24 AWG wire into each pin socket. NOTE: Under NO circumstances should a wrench be put on the motor output shaft. The gear ratio of the ERS motor prevents any backdriving. Attempts to turn the motor output shaft directly will lead to mechanical damage.

Assembly

The order of components of the longer length ERS looking downhole is as follows:

MFTM→ERS P-Case→Modified Sinker Bar→Extender Tube→Extender Tube→Motor Housing Crossover→ERS Motor Housing

NOTE: The Extender Tubes are identical and two are required for each ERS assembly.

As in the earlier version of the ERS, a pair of extension cables run from the P-Case down through the Sinker Bar/Extender Tube assembly. New longer cables are included with the ERS package. A Y-adapter mates to the P-Case electrical connector and then splits into a two conductor cable for the motor and a four conductor cable which passes all the way to the IE4 connector in the ERS Core.

To assemble the longer length ERS, first makeup the Modified Sinker Bar, both of the Extender Tubes, and the Motor Housing Crossover. This is easier if pipe stands are available. These connections are all stub acme threads and can be initially shouldered up by hand. Apply a light amount of grease or thread lubricant to the threads before making them up. Tightening using pipe wrenches will be done last.

Once the above sub-assembly is made up, gather the cable set (two extension cables and Y-adapter made up together) and begin to feed them into the upper end of the assembly. Push the two separate ends in together as the Y-adapter will end up on the uphole end. By attempting to push the cables into the Modified Sinker Bar in a continuous fashion, it will generally be possible to feed them all the way until the Y-adapter is close to flush with the upper end of the Modified Sinker Bar. Before final makeup, the Y-adapter end of the cable will be temporarily pulled into the upper end of the Modified Sinker Bar. To retrieve it, put a string around the connector on the Y-Adapter at this point.

Based on the lengths of the components, the connections in the two and four pin cables will end up being inside of the Motor Housing Crossover. With assistance, temporarily remove the Motor Housing Crossover and pull the lower end of the extension cables out far enough to extend past the bottom of the Motor Housing Crossover. Then, feed the cable ends through the Motor Housing Crossover and re-shoulder up the Crossover.

Next, align the Motor Housing (with the Motor Can properly installed) with the end of the Motor Housing Crossover. Make up the two cable connections: the two pin and the four pin. These connections do not employ separate seals and no wrenches are to be used. Just make them up “finger tight”. Next, with the aid of an assistant to pull the string to extract the Y-adapter on the upper end of the assembly, slowly bring the Motor Housing closer to the Crossover, while the cable slack is gently removed. Make up the connection by rotating the Motor Housing, using care to make sure the cable are sufficiently clear of the threaded connection to avoid pinching.

The final connection to be made is between the ERS P-case and the Modified Sinker Bar. The Y-Adapter is made up at this time. This last step will complete the mechanical and electrical assembly of the ERS. The user must remove the 1/4" set screw in the shoulder of the split ring connection on the upper end of the Modified Sinker Bar in order to install the locking nut. The set screw MUST be reinstalled after sliding the Locking Nut onto the Modified Sinker Bar prior to completing the assembly. This set screw keys into a notch on the P-Case and serves to prevent rotation between the P-Case and the Modified Sinker Bar. After reinstalling the set screw, place the split rings in the groove in the Modified Sinker Bar and pull the Locking Nut forward. This will capture the split rings and keep them from falling out.

Position the ERS P-Case in close proximity to the Modified Sinker Bar. Gently feed the Y-adapter and cable up into the Modified Sinker Bar leaving only enough slack outside to make up the connection. There is a little excess length in the cables that must be pushed up into the Modified Sinker Bar. This is easily done particularly with some rotation, but care should always be exercised when handling the cables to avoid damage to them. Next, remove the protective cap on the ERS P-Case electrical connector and store it in a safe place. This cap should be placed back on the connector upon disassembly after a run for protection during storage and transport.

NOTE: There is an o-ring that sits in a dovetail groove in the bottom of the Y-adapter connector. Make sure this o-ring is properly seated in the groove before making up the connection.

This electrical connector is keyed, so visually check to make sure that it is aligned and insert the plug on the Y-Adapter into the mating receptacle on the ERS P-Case. Then thread the connector ring on the ERS P-Case connector and run it up until it is tight. The gold colored shell will not shoulder up to the stainless steel connector body, but when tightening the connection by hand, you will feel a hard stop as the seals are engaged and the thread tightens up. There is no torque spec. Do not use any wrenches. Proper makeup is achieved only by hand tightening.

When this connection is made up, note the relative positions of the set screw in the shoulder of the Modified Sinker Bar and the notch in the end of the ERS P-Case. You can gently rotate the P-Case and feed in the cable excess, taking care to not pinch the cables or exert any significant bending on the Y-Adapter connection. Bring the P-Case closer to the Modified Sinker Bar, align the notch and set screw, and then spin up the Locking Nut. The assembly is now complete.

At this point, all of the connections should already be shouldered up. Using pipe wrenches, snug the connections up (there is no torque spec) and install the 1/4" set screws. There are two, 90 ° apart, at each connection. When these are installed the ERS is ready to mate to the MFTM.

Disassembly After A Run

For disassembly after a run, follow the above sequence in reverse order. It is highly recommended, however, that the tool be rinsed off with clean water, especially the lower ERS latching mechanism and the IE4 connector up inside of the ERS Core. Use care when disassembling the ERS to make sure that the cables do not get pinched or sheared when breaking the mechanical connections.

The Motor Can should be removed at the earliest convenience and the oil drained from it. This is most easily achieved by removing one end of the tubing loop and letting the oil drain out into a container. The fill plug can also be removed. All of the oil will not come out obviously, but the majority of it will and it will bring any debris or sediment out with it. Fresh oil should be put in before every run.

Summary of Important Notes

Do not run motor in-hole without being filled with oil! The motor may be run for short durations without being filled with oil, such as to pre-align the motor shaft with the D-shaped hole in the ERS Drive Shaft.

Verify the presence of properly seated o-rings in the Y-adaptor connection that makes up to the pressure case.

Drain oil out of motor cans by removing one end of tubing loop and hex pipe plug

Always run motor to LATCH position after removing ERS from hole. This makes subsequent removal of the motor can from the motor housing much easier

Rinse out lower end of ERS with clean water as soon as is practical after running tool in hole. This will reduce possibility of debris causing interference in later runs

There is an Orientation Pin that can be installed in the skirt of ERS. This is a modified hex screw. Its purpose is to provide rotational alignment between ERS and a fishing neck with a fixed mating IE4 connector. This may not be necessary for T2P and MDHDS but it is for SCIMPI so care should be exercised to verify whether it is necessary or not for a given mission.