

Calibration of FEC Equipment

This document serves as a guide to FEC's policy concerning calibration of our equipment. The information contained within by no means sets a standard or specification, but instead provides information for each end user to set their own policies.

Factory Calibration

Each torque transducer manufactured by FEC (Daichi-Dentsu LTD.) is calibrated traceable to NIST standards. They are calibrated once upon manufacturing using a dead weight tester (using these values to program the zero level & full scale level voltages in the preamplifier) and once again using a master transducer once the tool is assembled. The calibration is verified once again on FEC's floor using master transducers (Before the equipment is shipped to the end user). Since the FEC Controller only uses the Calibration data programmed into the torque transducer, the controller requires no calibration; only the torque transducer requires calibration. FEC provides the final calibration documentation for each unit calibrated.

End User Calibration

FEC recommends the system (torque output) is verified upon initial installation, changing a component of the control of the motor (Tool Assembly, Cable or Controller), or in the event of an abnormally high number of rejects. A number of methods are used to do this and each end user may use their own preferred method. Some users prefer master transducers (dynamic) and others use static torque checks (Torque wrench). FEC does not promote one method over another, but *prefers* dynamic methods over static methods due to the variability of static methods.

Calibration during Operation

All newer model FEC tools (1993 & later), contain an EEPROM in the torque transducer pre-amplifier which stores the transducer Zero & Calibration voltage levels from the dead weight testing during manufacture. These levels are representative of the actual Zero Level & Full Scale Calibration level of the transducer. The controller uses these levels to check the zero level and full scale calibration levels every cycle during operation of the system. Upon receiving a "Start" signal, the transducer zero level and then the full scale calibration level is checked BEFORE the motor starts to turn*. Both levels must be within +/- 4% of the value programmed at manufacture. If the values read are outside of this value, an ABNORMAL will result and the spindle will shutdown until it is replaced or the problem resolved.

***NOTE:** The "self-check" of the transducer can be disabled by the end user using the "disable self-check" input on each controller (this is very uncommon, and FEC should be consulted upon its use)

Manual Calibration

FEC provides a manual means to check the torque transducer zero level as well as the full scale calibration. BY depressing the RESET button on either the Multi Unit or SAN unit Keypad, the system will perform a ZERO LEVEL check. By depressing the CAL button, the system will perform a Full Scale Calibration check. Either check will produce an ABNORMAL output if the reading(s) were out of specification and the affected spindle disabled until the problem is resolved. The spindle (controller) green Accept LED's will light if the readings are acceptable.

Calibration Schedule

FEC makes no set schedule for requiring calibration and leaves this decision to the end user as required by their quality system, since the system automatically checks the calibration & zero level each cycle. As long as proper parameter set-up limits (High/low Torque, Angles, Rates & times) have been set, the system will identify calibration problems as part of its ongoing cycle in the form of an abnormal or rejects from the system. FEC recommends following the procedure listed under "End User Calibration" as part of ongoing calibration follow-up.