

AUTOMATED ROD MOVEMENT TIMING & SEQUENCING TESTING

For Control Rod Drive Mechanism (CRDM) Systems

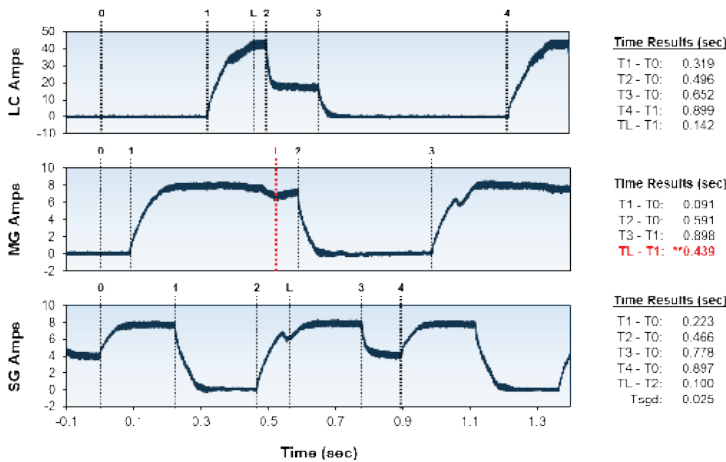


Timing and sequencing testing of Control Rod Drive Mechanisms (CRDMs) in Pressurized Water Reactors (PWRs) is performed by monitoring the stationary gripper, moveable gripper, and lift coil currents of a group of control or shutdown rods as they are moved in or out of the reactor. This test is normally performed in Westinghouse PWRs near the end of a refueling outage. The outputs of these coils are sampled for each rod and analyzed to ensure proper communication, regulation, and timing of the CRDMs. The CRDM test is often performed in conjunction with rod drop time measurements and slave cyclers timing tests.

Automated Report of Results with Outlier Flagging

Stationary Coils							
Item	Rod ID	T1-T0:	T2-T0:	T3-T0:	T4-T0:	TL-T2:	Tsgd:
1	H06	271	575	771	1264	95	-12
2	H10	272	574	772	1262	109	6
3	F08	270	575	770	1267	118	11
4	K08	276	576	776	1265	116	10
5	F02	271	575	771	1270	119	12
6	**B10	277	577	777	1272	**149	44
7	K14	271	575	771	1267	125	18
8	P06	270	574	770	1270	125	17
9	**B06	272	573	772	1285	**127	22
10	**F14	271	575	771	1262	**130	23

Example of Anomalous CRDM Withdrawal Step



Plant Benefits

- Recover Critical Path Time
- Decrease Troubleshooting Time
- Detect Rod Binding
- Identify Performance Degradation
- Identify Stuck Rods and Other Movement Problems
- Monitor System Reliability

Equipment Benefits

- Connect to All Rods at One Time
- Portable, Lightweight, Quick Hookup
- Collect Data in as Little as 15-20 Minutes
- Collects both CRDM and Slave Cyclers / Logic Cabinet Current Order Data

Software Benefits

- Timing, Sequencing, and Latching Identified Automatically
- Full Pull Data Collection Provides Information on All CRDM Steps (Up & Down)
- Monitor Coil Current Regulation
- Quick Reporting Flags Any Anomalies

Diagnostics Enabled By Acquiring Voltage and Current Data

- Coil Temperature Maps
- Gripper Load Transfer Analysis
- Coil Resistance Calculations - Rod Movement Algorithms
- Firing Angle Calculation

Coil Temperature Map

