Specifications:

Solenoid & Trip Valve Type: Direct acting poppet style
Maximum operating pressure: 3,000 PSI
Seal Material: Viton®
Coil Voltage: 24 VDC, 125 VDC, 115 VAC, others upon request
Transmitters: ABB, Foxboro, Yokogawa, Honeywell and Rosemount
Failure mode: De-energize to trip (energize to latch)

or
Energize to trip (de-energize to latch)

2003 Triple Redundant Trip Manifold (Product No. T25112XX)

The TR Trip Manifold controls the state of the trip header. Pressurizing the header permits all valves to be controlled open and conversely depressurizing the header trips the valves to the closed position. See below for the manifold schematic and installation arrangement drawings.

The TR Trip manifold consists of three pairs of poppet valves mounted in parallel, providing two-out-of-three redundancy for the system. In each pair of poppets, a 125-VDC solenoid valve (SOL-1, 2, or 3) operates the first poppet valve in that pair and the second poppet valve from another pair. Each solenoid controls the fluid path to the control port on the poppet. By energizing a solenoid valve (turbine reset), fluid is directed to the top chamber of the poppet, thereby maintaining the closed position. When the solenoid de-energizes, fluid from the top of the poppet drains to tank and the poppet opens. When all the solenoid valves are de-energized, the poppet valves dump fluid from the trip header to the reservoir via a vented drain line. This is the state of the device on a trip.

The solenoid and poppet valves are arranged in a two-out-of-three redundant logic such that any two of the three solenoid and poppet pairs must operate in order to dump the trip header to the reservoir. The solenoids are designed for a de-energize-to trip condition.

Test logic is used to exercise and verify the operability of the solenoids and poppet valves. The test logic is part of the turbine control system. Each pair of poppet valves has two orifices (e.g. orifice 1A, 1B) and a transmitter (PT) in its flow line to provide testing feedback. Conduct testing of the manifold components periodically to insure operability of the trip system. The transmitter assembly features a block and bleed valve arrangement in the manifold to isolate or replace a transmitter during operation.

Three hydraulic ports connect the TR Trip manifold to the system. The supply port, “P” on the manifold, connects to the trip header. The return port “R” connects to an atmospheric drain line in the lube oil reservoir. The drain port “DR” also connects to a atmospheric drain line in the oil reservoir. The two drain lines run separately to the reservoir.

During flushing of the hydraulic system, remove the TR Trip manifold orifices and solenoid valves to prevent clogging. Remove the orifices, located under the six plugs stamped ORIFICE 1A, 1B, 2A, 2B, 3A, and 3B on the manifold block and replace the solenoid with a blanking plate. The solenoids and orifices are identified by stampings on the manifold. Label the wires, solenoids, and orifices during disassembly to permit reassembly in the correct manner.
Testing

The Triple Redundant Trip Manifold design allows on-line testing of the individual solenoid valves. On-line testing does not require any additional solenoids or valves. This configuration assures the testing state is the same as the normal operation of the system. While performing on-line testing, the turbine trip system is fully functional and the operator can process a turbine trip at any time. The operator initiates all testing and the sequencing is completed automatically by the turbine control system.

Periodic Maintenance

As with all mechanical systems, a minimal level of preventive maintenance is required for long-term reliability and availability. The following periodic maintenance items should be scheduled by Plant Maintenance staff.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>INTERVAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Fluid</td>
<td>Monthly</td>
<td>Sample and analyze</td>
</tr>
<tr>
<td>All Orifices</td>
<td>Annual</td>
<td>Inspect</td>
</tr>
<tr>
<td>Pressure Transmitters</td>
<td>Annual</td>
<td>Calibrate</td>
</tr>
<tr>
<td>Trip Solenoid Valves</td>
<td>3 years</td>
<td>Replace</td>
</tr>
<tr>
<td>Manifold Logic Valves</td>
<td>5 years</td>
<td>Replace</td>
</tr>
</tbody>
</table>
Hydraulic Schematic
(Shown for "De-energize to Trip Failure Mode)
Installation Drawing