



### 3. OBJECTIVE

To verify compliance with established criteria that insures durability in a specific application. This document describes a system to thermally induce stresses into a heat exchanger at specified rates and temperatures. The process is accomplished by heating and cooling the heat exchangers in a specified manner.

### 4. FACILITY REQUIREMENT

The facility should provide the following as required:

- 4.1 Source of "HOT" fluid capable of delivering the fluid to the test unit at specified temperature and pressure.
- 4.2 Source of "COLD" fluid capable of delivering the fluid to the test unit at specified temperature and pressure.
- 4.3 Compressed air at specified pressure and temperature.
  - 4.3.1 Charge air cooler test media.
  - 4.3.2 Determination of product integrity.
  - 4.3.3 Evacuation of steam condensate after heating cycle if required.
- 4.4 Means of moving these fluids to and from the test unit in a specified manner.
- 4.5 Means of checking heat exchanger integrity.
- 4.6 A control system adequate to control the thermal cycle as specified. It may include the following:
  - a. Flow measuring devices
  - b. Pressure gauges
  - c. Pressure switches
  - d. Fluid filters
  - e. Temperature indicators
  - f. Pressure regulators for each fluid
  - g. Relief and back pressure regulators
  - h. Automatic energy shut-downs
  - i. Electrical relays, timers, switches, indicator lights, and related items as required
  - j. Thermal cycle counters
  - k. Safety features as specified by regulatory codes and common practices
  - l. Heaters and controls
  - m. Automatic data logging equipment

(See Figure 1 for typical control system for reference.)

## 5. TESTING

- 5.1 Check heat exchanger for integrity. For charge air coolers, use the methods described in SAE J2679, Charge Air Cooler Leakage, to verify that leakage does not exceed acceptable levels..
- 5.2 Install test heat exchangers as specified (orientation and support as in service, if possible) in a safe manner.
- 5.3 Set up control system to obtain specified cycle (see Figure 2 for typical thermal cycle).
- 5.3.1 Typical Thermal Cycle Test Temperature Differential

(See Table 1.)

TABLE 1 - TYPICAL THERMAL CYCLE TEST TEMPERATURE DIFFERENTIAL

Type of Heat Exchanger	Temperature Differential <sup>(1)</sup>
Radiator (Liquid-to-Air)	80 °C (144 °F)
Air Cooled Oil Cooler (Oil-to-Air)	110 °C (198 °F)
Liquid Cooled Oil Cooler (Oil-to-Liquid)	110 °C (198 °F)
Air Cooled Charge Air Cooler (Air-to-Air)	175 °C (315 °F)
Liquid Cooled Charge Air Cooler (Air-to-Liquid)	140 °C (252 °F)

1. Differential temperatures are typically modified and agreed to in accordance with customer's reliability targets. An example is increasing the temperature differential to reduce the test duration.

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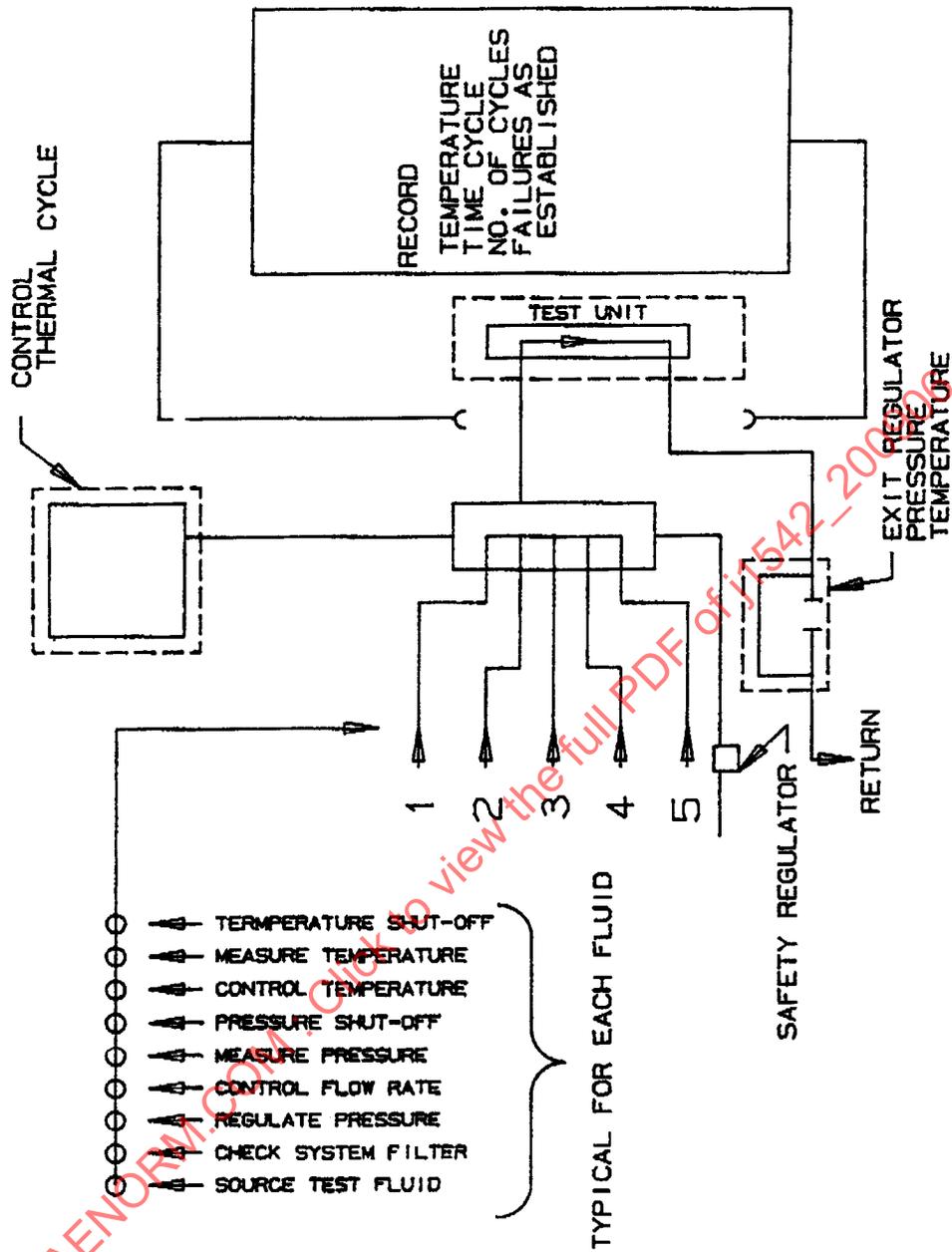


FIGURE 1 - TYPICAL CONTROL SYSTEM