

PERFORMANCE REQUIREMENTS
TH RADIO TUBE COOLING SYSTEM
GENERAL EQUIPMENT REQUIREMENTS
POWER SYSTEMS

1. GENERAL

1.01 This section covers the performance requirements which the TH radio tube cooling system shall meet before turnover to the telephone company.

1.02 This specification is reissued to incorporate previous addendum changes.

1.03 It is expected that these tests will be made after installation is completed. The radio bays shall be connected to the system air ducts. The sources of power are assumed to be normal and working properly. Power to the radio equipment shall be turned off during the tube cooling system tests and adjustments.

1.04 The minimum pressure attained in these requirements shall be that shown in Fig. 1.

1.05 The requirements are based on the use of the following test equipment or its equivalent:

- 1 — Manometer capable of measuring a 15-inch water column
- 1 — 0- to 200-volt dc Voltmeter with an accuracy of ± 4 volts
- 1 — 81A Test Set equipped with batteries and test leads
- 1 — Stopwatch

2. ADJUSTMENT PROCEDURE

2.01 Preliminary Preparation

(a) Before connecting any power, the three blower control switches on the blower control cabinet should be in the nonoperated position. The four lever-type keys should be in their NOR positions. The ACS1 and ACS2 controls should be in the extreme clockwise

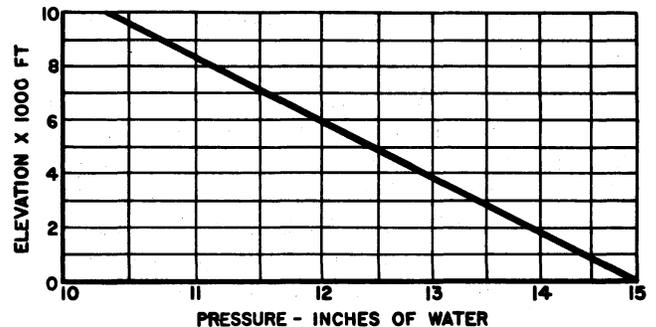


Fig. 1 - Minimum Pressure in Tube Cooling System for Altitudes From Sea Level to 10,000 Feet

positions. The AC1 and AC2 controls should be in the extreme counterclockwise positions. The TD1, TD2, and TD3 ADJ controls should be in the extreme clockwise positions. The MON INPUT switch should be on CAL, and the MON CAL control should be in the extreme counterclockwise position. The 81A test set should be connected between ground and pin 7 of the TD3 relay socket in the control cabinet. The ALM CO key should be in the operated position.

(b) The main air duct is equipped with five shutoff valves (dampers). Three of these dampers are located in the risers to each of the three blowers, and the other two are located in the ducts leading to each of the two rows of radio equipment. The dampers associated with the blowers are required to permit the removal of the blowers with a minimum of air loss from the system. The other dampers are required to permit a second row of radio equipment to be installed at stations where only one row was equipped at the time of the initial installation. These dampers are equipped with a handle, which can be operated through 90 degrees, and a wing nut to secure it at any angle of rotation. When the damper is closed the handle is at right angles

to the axis of the duct, and when it is open it is parallel to the duct axis. *The dampers at each blower and in the duct leading to each row of radio equipment installed must be fully open and securely locked in position.* At the conclusion of the following adjustment procedures, the dampers shall again be checked to ensure that they are securely locked in the proper position.

2.02 AC Monitor Circuit Adjustment

- (1) Apply the 208-230 volt, 3-phase, ac power service.
- (2) Turn the AC BLO control switch to the operated position and note that the fan is rotating in the direction of the arrow on the fan housing. With the PHASE SEL switch and the PWR SERV VOLTS meter read the voltage of each of the three phases. These should be between 208 and 230 volts each.
- (3) Set the PHASE SET switch in the MON CAL position and adjust the MON CAL control until a reading of 200 volts is obtained on the PWR SERV VOLTS meter. Adjust the AC1 control in a clockwise direction until the AC1 relay operates. This is noted by observing the relay. Reduce the voltage by adjusting the MON CAL control until the AC1 relay releases and note the voltage indication on the PWR SERV VOLTS meter. In successive trials, adjust the ACS1 control until the AC1 relay releases at 180 volts. It may be necessary to readjust the AC1 control with each new setting of the ACS1 control for the AC1 relay to operate at 200 volts. Operate the AC FAIL TST 1 key to the test position and note that the AC1 relay releases. This relay should operate when the AC1 FAIL TST 1 key is returned to its normal position.
- (4) In a similar manner, the AC2 and ACS2 controls should be adjusted and the AC FAIL TST 2 key operated for the operation of AC2 relay.
- (5) Set the MON INPUT switch to the NOR position.

2.03 Time Delay Relay Circuit Adjustment

- (1) The 130-volt dc connections to the 410B power plant as well as the 208-230 volt, 3-phase, ac power service connection shall be made.

(2) The AC BLO control switch should be in the operated position and the blower operating for these adjustments. The DC BLO 1 and DC BLO 2 control switches should be in the nonoperated position.

(3) Operate the PR FAIL TST key to the test position and lock in place. Using a 0- to 200-volt external dc voltmeter, connect the negative (-) lead to the GRD pin jack and the positive (+) lead to the BAT pin jack and note the voltage reading. This should be 152 volts, the battery float voltage. The negative lead should then be transferred to the TD1 pin jack, and the TD1 ADJ control adjusted until the indication on the voltmeter is 123 volts. Similarly, with the voltmeter connected between the BAT and TD2 pin jacks, adjust the TD2 ADJ control; and with the voltmeter connected between the BAT and TD3 pin jacks, adjust the TD3 ADJ control. In each case the voltmeter reading should be 123 volts. The PR1 and PR2 relays will operate and lock up, and the buzzer of the 81A test set will sound during these adjustments. Return the PR FAIL TST key to its NOR position. After a nominal cooling period, operate the PR RESET key to release the PR1 and PR2 relays.

(4) After a minimum cooling period of 5 minutes, operate the PR FAIL TST key and, with a stopwatch, note the operate time of the TD1 relay. The timing cycle starts with the operation of the PR FAIL TST key to the test position and ends when the PR1 relay operates. The operate time for the TD1 relay should be 7 ± 2 seconds. Return the PR FAIL TST key to its NOR position. If the operate time does not fall within these limits, the TD1 ADJ control should be adjusted in small steps, clockwise for a longer operate time and counterclockwise for a shorter operate time, and the test repeated until the operate time is centered in the above range. Between each test, a minimum cooling period of 5 minutes should be allowed, and the PR RESET key operated to release the PR1 relay.

(5) In a like manner, the TD2 relay operate time should be adjusted by means of the TD2 ADJ control. During these adjustments, the operation of the PR2 relay should be observed. The operate time of this circuit should be 16 ± 5 seconds. The operate time difference

between the TD1 and TD2 relays should be a minimum of 6 seconds.

(6) The operate time of the TD3 relay should be adjusted as in 2.03(4) by means of the TD3 ADJ control. There is no PR relay in this circuit. It will be necessary to listen for the sounding of the buzzer of the 81A test set for the completion of the timing cycle. The operate time of this circuit should be 35 ± 10 seconds.

(7) At the completion of these adjustments, a cooling period should be allowed to permit the TD relays to recycle, and the PR RESET key operated to release the PR relays. All lever-type keys, except the ALM CO key, should be in their NOR positions.

(8) Turn the DC BLO 1 switch to the operated position and the AC BLO switch to the nonoperated position. Note that the fan of DC BLO 1 is rotating in the direction of the arrow on the housing.

(9) Turn the DC BLO 2 switch to the operated position and the DC BLO 1 switch to the nonoperated position. Note that the fan of DC BLO 2 is rotating in the direction of the arrow on the housing.

3. REQUIREMENTS

3.01 General: Before testing can be started, the controls must be properly adjusted as shown in Part 2, Adjustment Procedure. The 81A test set should be connected between ground and pin 7 of the TD3 relay socket in the control cabinet. The lever-type keys, except the ALM CO key, should be in the normal positions. The ALM CO key should be in the test position. The AC BLO switch should be in the operated position. The PR RESET key should be operated to release the PR relays. The DC BLO 1 and DC BLO 2 switches should be in the operated position. The system should now be operating normally with only the AC blower in operation.

3.02 Normal Operation — AC Blower: Measure the air pressure by connecting the manometer to the valve provided at either of the pressure switches.

Requirement: The pressure indicated should be that shown in Fig. 1.

3.03 Stand-by Operation — DC Blower 1: Turn the AC BLO control switch to the nonoperated position. Connect the manometer as in 3.02.

Requirement 1: DC BLO 1 only should be in operation.

Requirement 2: The minimum pressure indicated should be that shown in Fig. 1.

3.04 Stand-by Operation — DC Blower 2: With the AC BLO control switch in the nonoperated position, turn the DC BLO 1 control switch to the nonoperated position. The manometer should be connected as in 3.02.

Requirement 1: DC BLO 2 only should be in operation.

Requirement 2: The minimum pressure indicated should be that shown in Fig. 1.

3.05 AC Failure Test

(1) The three blower control switches should be in the operated position. The AC blower should be the only blower operating.

(2) Turn the AC BLO switch to the nonoperated position. After approximately 2 minutes turn the AC BLO switch to the operated position.

Requirement 1: When the AC BLO control switch is in the nonoperated position, the AC blower should stop and DC blower 1 should operate without delay.

Requirement 2: When the AC BLO control switch is returned to the operated position, the AC blower should operate and the DC blower should stop.

(3) Turn the DC BLO 1 and AC BLO switches to the nonoperated position. After approximately 2 minutes turn the AC BLO switch to the operated position.

Requirement 1: When the AC BLO control switch is in the nonoperated position, the AC blower should stop and DC blower 2 should operate without delay.

Requirement 2: When the AC BLO control switch is returned to the operated position, the AC blower should operate and the DC blower should stop.

3.06 Pressure Failure Test

- (1) The three blower control switches should be in the operated position. The AC blower should be the only blower operating.
- (2) Turn either AC FAIL TST 1 or AC FAIL TST 2 key to the test position and hold in this position. Turn the AC BLO switch to the nonoperated position.

Requirement: The AC blower should stop and the pressure decrease. The TD1 relay should heat up and operate the PR1 relay. DC blower 1 should start and the pressure should build up to its normal value. The PR2 relay and DC blower 2 should *not* operate.

- (3) Release the AC FAIL TST key. Turn the AC BLO switch to the operated position. Operate the PR RESET key. This should start the AC blower and stop the DC blower.
- (4) Turn the DC BLO 1 switch to the nonoperated position. Remove the TD1 relay from its socket. Turn either AC FAIL TST 1 or AC FAIL TST 2 key to the test position and hold in this position. Turn the AC BLO control switch to the nonoperated position.

Requirement: The AC blower should stop and the pressure decrease. The TD2 relay should heat up and operate the PR2 relay. DC blower 2 should start, and the pressure should build up to its normal value.

- (5) Release the AC FAIL TST key. Turn the AC BLO switch to the operated position. Operate the PR RESET key. The AC blower should start and DC blower should stop. Install the TD1 relay in the socket.
- (6) Turn the DC BLO 1 switch to the nonoperated position. Turn either AC FAIL TST 1 or AC FAIL TST 2 key to the test position and hold in this position. Turn the AC BLO control switch to the nonoperated position.

Requirement: The AC blower should stop and the pressure decrease. The TD1 relay should heat up and operate the PR1 relay. DC blower 2 should start and the pressure should build up to its normal value. The PR2 relay should *not* operate.

(7) Release the AC FAIL TST key. Turn the AC BLO switch to the operated position. Operate the PR RESET key. The AC blower should start and the DC blower should stop. Turn the DC BLO 1 switch to the operated position.

(8) Turn the DC BLO 1 and DC BLO 2 switches to the nonoperated position. Turn the AC BLO switch to the nonoperated position.

Requirement: The AC blower should slow down and stop. The pressure should fall. Approximately 40 seconds after the pressure reaches 9 inches of water, the buzzer on the test set should sound.

(9) Turn the AC BLO switch to the operated position. Remove the 81A test set. Operate the PR FAIL TST key. Turn the DC BLO 1 and DC BLO 2 switches to the operated position. The AC blower should start and be the only blower running.

3.07 Pressure Switch Test

(1) Turn the DC BLO 1 and DC BLO 2 switches to the nonoperated position. Remove the cover of PRESS SW 1 and remove the external lead from terminal 2 of the terminal strip within this switch. Connect the 81A test set to terminals 1 and 2 of this terminal strip. Connect the manometer to the valve provided, in the air line, just below the pressure switch. Turn the AC BLO switch to the nonoperated position.

Requirement: As the pressure drops, the contacts of the pressure switch should close and the buzzer sound when the height of the water column of the manometer is between 9.0 and 8.5 inches, regardless of altitude.

(2) Restore the AC BLO switch to the operated position.

(3) Connect one lead from the 81A test set to terminal 1 of the terminal strip in PRESS SW 1 and the other lead from the test set to the external lead which was on terminal 2. If the buzzer sounds, operate the PR RESET key. Connect the manometer to the valve in the air line just below PRESS SW 2. Turn the AC BLO switch to the nonoperated position.

Requirement: As the pressure drops, the contacts of the pressure switch should close and the buzzer sound when the height of the water column of the manometer is between 9.0 and 8.5 inches, regardless of altitude.

- (4) Restore the AC BLO switch to the operated position. Remove the manometer and 81A test set. Restore the external lead to ter-

minal 2 in PRESS SW 1. Replace the cover on PRESS SW 1. Operate the PR RESET key. Restore the DC BLO 1 and DC BLO 2 switches to the operated position, and the ALM CO key to its NOR position.

4. TEST REPORTS AND RECORDS

- 4.01 The required record of these tests shall be entered on the proper form.