STATE OF CALIFORNIA EDMUND G. BROWN JR., Governor

AIR RESOURCES BOARD
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January 22, 1980

MANUFACTURER'S ADVISORY CORRESPONDENCE

Procedure for Demonstrating an Alternative Diurnal Temperature Profile for Motorcycles; Suggestions for Bench Testing.

At the August 23, 1979 Executive Officer Hearing to consider the evaporative emission test procedure for motorcycles, the staff agreed to provide an Advisory Correspondence outlining an acceptable method for demonstrating an alternative diurnal heating profile for the evaporative emissions test. In addition, the staff agreed to hold a workshop to discuss bench testing procedures.

Alternative Profiles

An acceptable demonstration of an alternative heating profile could be accomplished as follows:

1) Equip several motorcycles which have the proposed alternative fuel tank design with temperature sensors located as required in the test procedure.

2) Attach a pre-weighed carbon canister to any vents in the fuel tank evaporative emission control system.

3) Place the motorcycles outside for several typical Southern California days (about 92°F peak temperature) and record the fuel and vapor temperature profiles and the changes in canister weight.

4) Duplicate the heating profile which results from the outside tests in the SHED to determine the actual emissions.

5) The proposed alternative heating profile should provide similar maximum temperatures and emissions to the outdoor and SHED tests above, although the time scale may be changed for experimental convenience.

Bench Testing Procedure

The bench testing procedure used for automobile evaporative emission

MANUFACTURER'S ADVISORY CORRESPONDENCE #80-1

control systems by General Motors is attached to show a typical approach to the bench testing requirement.

The staff recommends that the manufacturer establish the bench testing deterioration factors by bench cycling the various emission control system components to the total test distance, then to the useful life distance. At these distances the components are installed on a motorcycle for SHED testing and the deterioration factor is calculated per the test procedure. No pressure checks upon the evaporative emission control system on the durability motorcycle may be performed unless they are performed on the assembly line.

If after reviewing the attached material a manufacturer determines that a workshop is still needed to discuss the bench testing requirement, it may contact the ARB staff and one will be arranged.

If you have any questions concerning this matter, please contact Robert Cross of our staff at (213) 575-6344.

K. D. Drachand
Acting Chief
Mobile Source Control Division

GENERAL MOTOR TEST PROGRAM FOR DETERMINING VEHICLE EVAPORATIVE EMISSION SYSTEM DURABILITY AND DETERIORATION FACTORS IN ACCORDANCE WITH 1980 CALIFORNIA EVAPORATIVE EMISSION STANDARDS AND TEST PROCEDURES

The demonstration of evaporative emission control systems durability and the establishment of deterioration factors will be the accumulated result of vehicle testing, bench testing and specific part material specifications.

General Motors has determined that the satifactory durability of the evaporative emission system parts be established as indicated under the following three categories:

EXHAUST EMISSION DURABILITY VEHICLE	EVAPORATIVE EMISSION BENCH TEST VEHICLE	MATERIAL SPECIFICATIONS
Fuel Tank	Vapor Storage Canister	Rubber Hoses
Steel Fuel Lines	Carburetor	
Fittings	Fuel Filler Cap	
Connectors	Bowl Vent Valve	
Clamps	Purge Control Valve	
	Thermal Vacuum Switch (Purge)	
	Carbon Element Air Cleaner	
	Tank Pressure Control Valve	

The performance level of evaporative emission system parts tested on the exhaust emission durability vehicles will be demonstrated by their SHED test results.

In regard to the bench test, General Motors has for years set internal test standards and procedures for component part evaluation to determine that our products do perform satisfactorily in the customers hands.

These "validation" tests have been used as a baseline in establishing the conditions and procedures needed for this "bench" test program. All of the component part tests set forth in this test program do reflect the flow of liquid and gaseous fuel through the evaporative emission control system and the exposure to cyclic loads, heat, vibration, and other environmental factors expected through 50,000 miles of typical customer use.

The material specifications of the rubber hoses will be provided as requested.

"BENCH" TEST PROGRAM

The General Motors evaporative emission control system "bench" test program has been patterned after the suggestions set forth in Mr. G. C. Hass' letter of February 11, 1977. Basically, selected components will be bench tested to an equivalent of 4000 miles. They will then be installed on a background stabilized vehicle and SHED tested. The components will be further bench tested to an equivalent 50,000 total miles and SHED tested on the same stabilized vehicle. The evaporative emission system deterioration factors shall then be determined.

We shall eventually establish a "GMECS Bench Test Fleet" that represents our full California production vehicle offering. However, we are submitting this procedure to implement early testing of some carlines. It is planned that the vehicle(s) tested, using this procedure, will adequately prove the durability of their respective evaporative family-system combinations to be marketed by General Motors in 1980.

For each fleet vehicle, there will be three sets of bench test components tested during the 1980 bench test program. No maintenance will be performed on the bench test components during the testing program.

The detailed description of our Bench Test Fleet test procedure is presented below.

Bench Test Fleet Test Procedure

1. A special vehicle fleet will be selected representative of the evaporative emission families requiring testing and will be referred to as the "GMECS Bench Test Fleet".

   These vehicles will have been prepared similar to certification data vehicles, with special emphasis placed on obtaining vehicles with stabilized evaporative emission background.

2. Each fleet vehicle will then run "Durability Driving Schedule" (AMA) stabilizing mileage followed by three SHED tests to establish the soundness of each test vehicle. These vehicles will then be retained by our Vehicle Emission Laboratory for the "bench" test program.

3. While the test fleet is being built and during AMA run-in mileage accumulation, the selected evaporative emission control components will be cycled for an equivalent of 4000 miles on the bench test.

4. When the selected components have completed an equivalent 4000 mile bench test, the test vehicle will be prepared for test by accumulating a maximum of four hours of AMA mileage.

   The first set of bench test components will then be installed on the vehicle and one hour of AMA mileage will be run followed by three SHED tests. After the SHED tests with the first set of bench test components, the second set of identical components will be installed and evaluated in similar manner. This procedure will be followed for each of the three sets of components.

5. Following the 4000-mile SHED tests, the bench test components will continue their bench cycling to represent the additional 46,000 miles of operation. The test fleet cars will be parked during this period.

6. When the components have completed the additional 46,000 miles of bench testing, the test vehicle will again be prepared for test by accumulating a maximum of four hours of AMA mileage.

7. Three SHED tests of the non-bench test components will be run to confirm the stability of each test vehicle.

8. The first set of bench test components will be installed on the test vehicle. One hour of AMA mileage will then be run followed by three SHED tests. This procedure will be followed for each of the three sets of components.

9. At the conclusion of bench testing, evaporative emission system deterioration factors shall be determined for each evaporative family. These bench test deterioration factors shall be averaged with the deterioration factors of evaporative families required to be run under exhaust emission durability testing requirements to determine a single evaporative emission deterioration factor for each evaporative family.

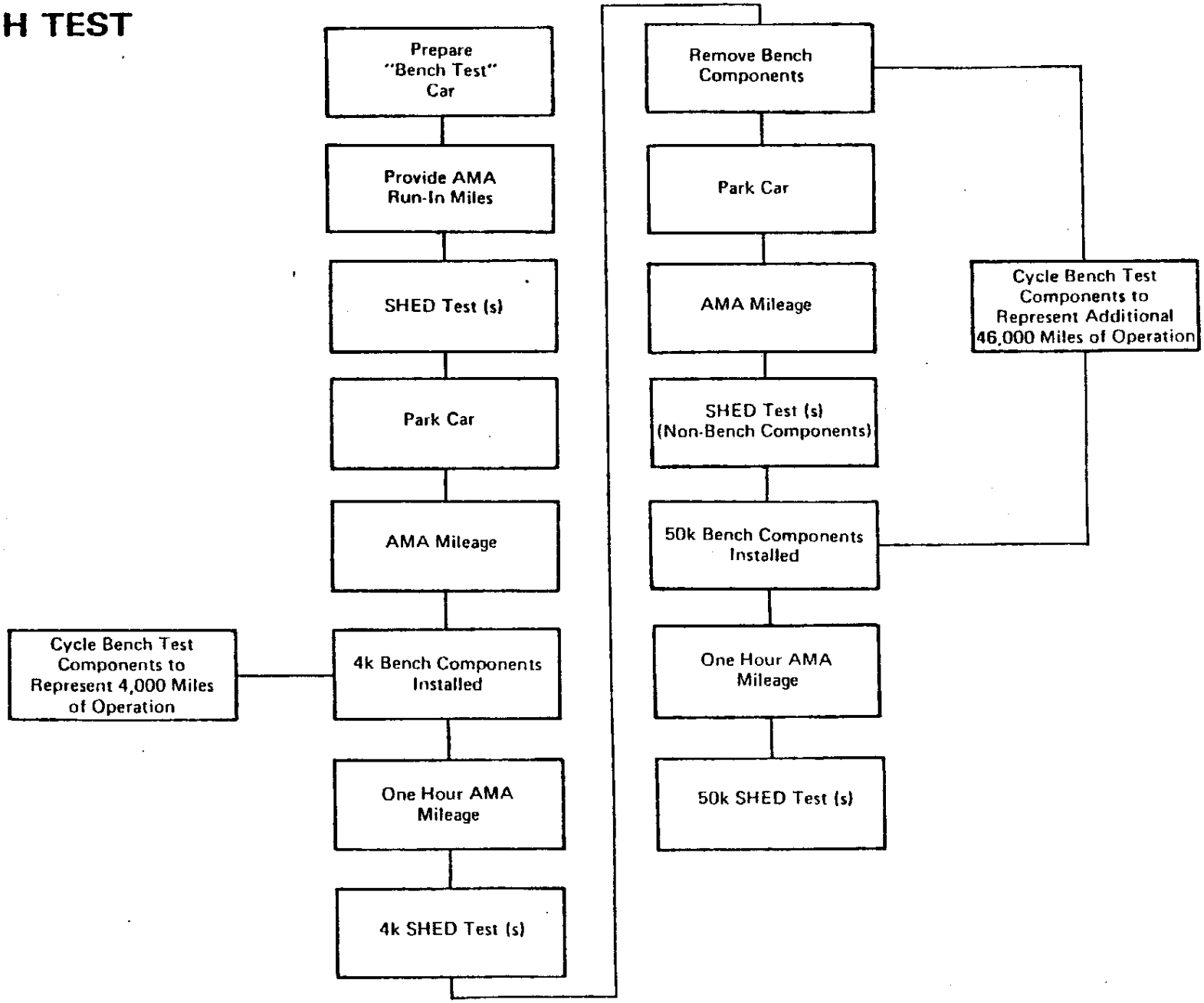
A flow diagram of the GMECS bench test is shown in Figure I.

In addition to the preceding "Bench Test Fleet" test procedure, the individual bench test procedure for each required component part and representative flow diagrams of each are presented on the following pages. These specific component parts are:

Vapor Storage Canister, Including
  Bowl Vent Valve
  Purge Control Valve
  Tank Pressure Control Valve
Carburetor
Fuel Filler Cap
Thermal Vacuum Switch (Purge)
Carbon Element Air Cleaner

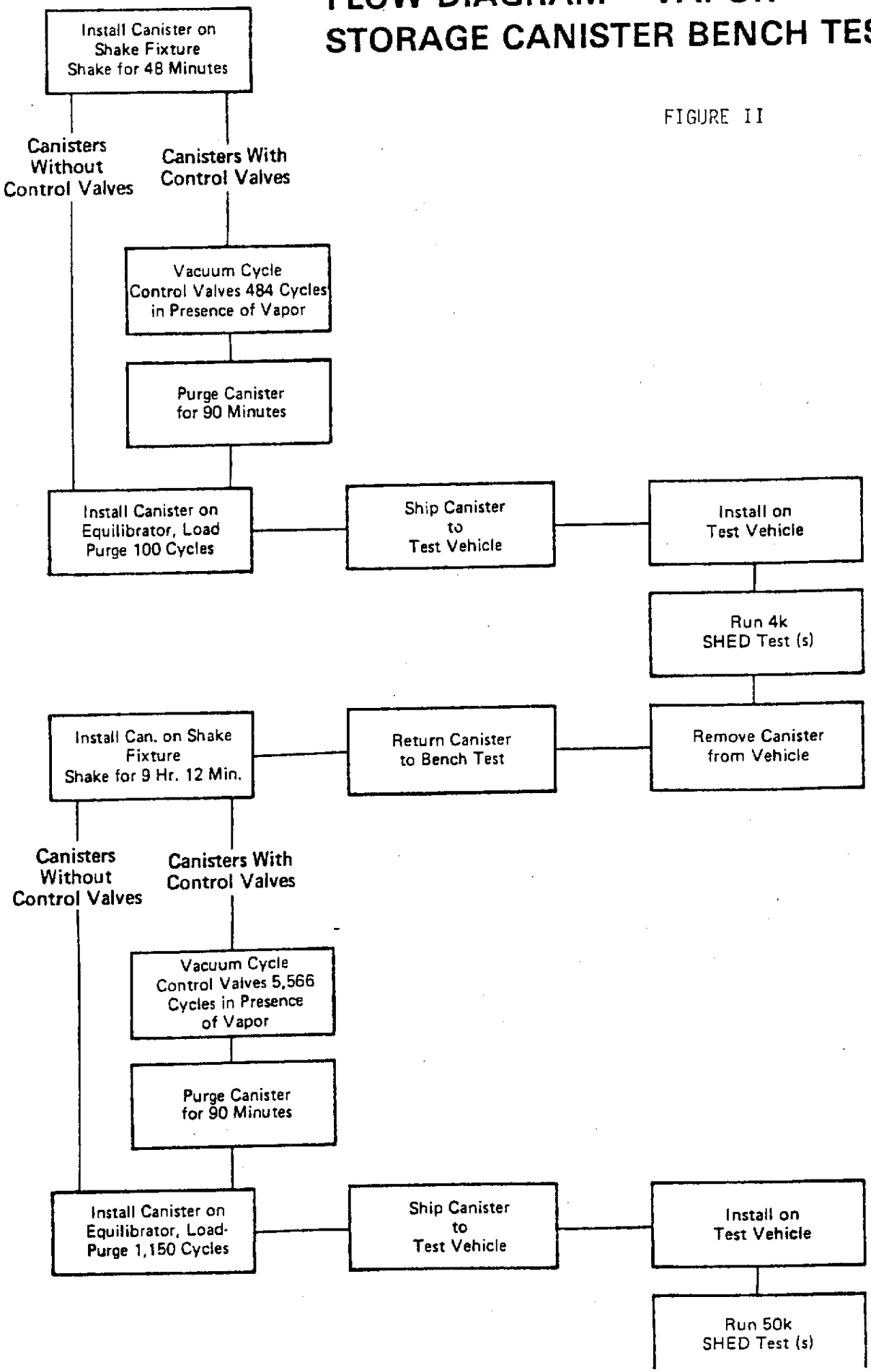
FLOW DIAGRAM—EVAPORATIVE EMISSION CONTROL BENCH TEST

FIGURE I



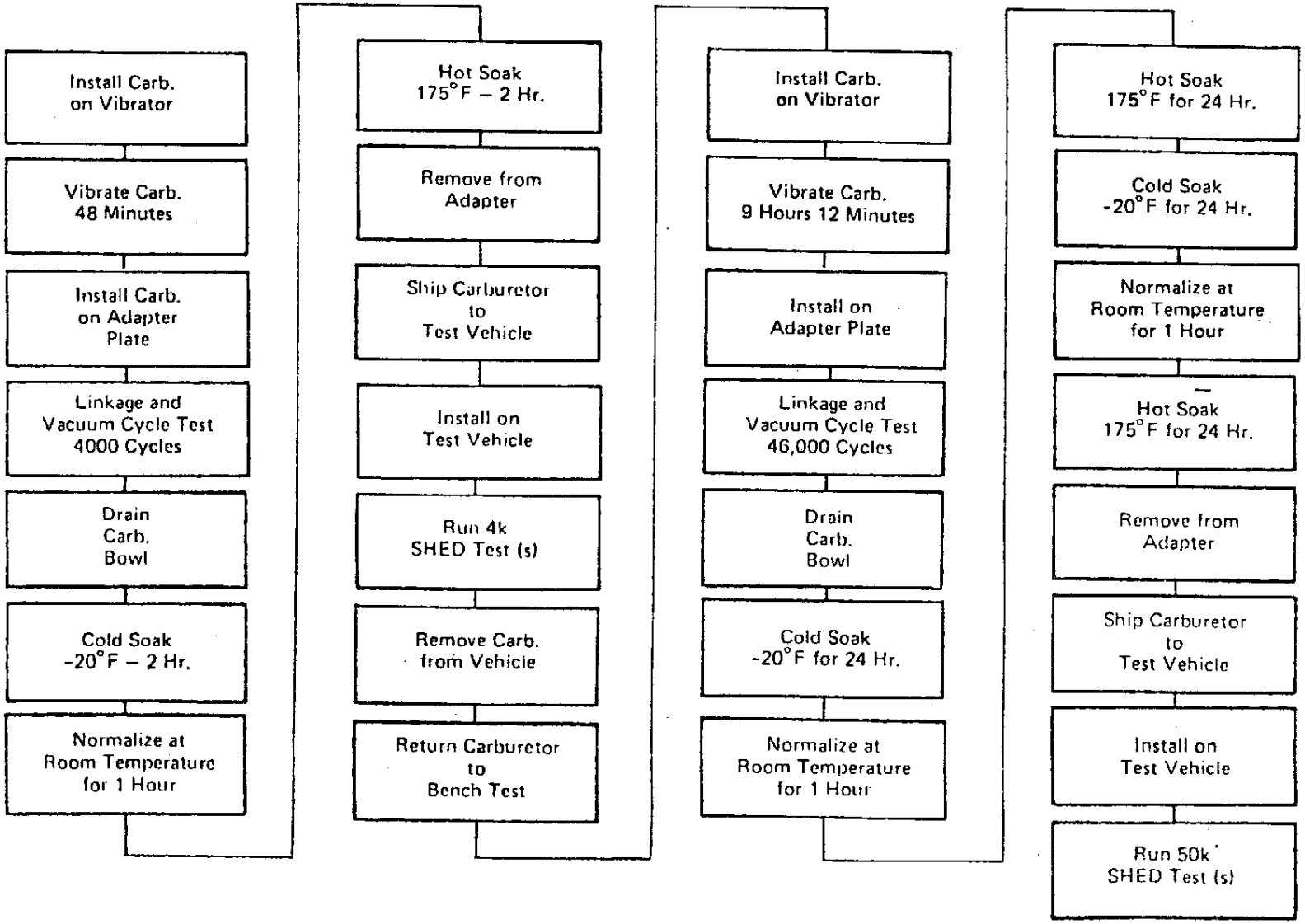
FLOW DIAGRAM— VAPOR STORAGE CANISTER BENCH TEST

FIGURE II



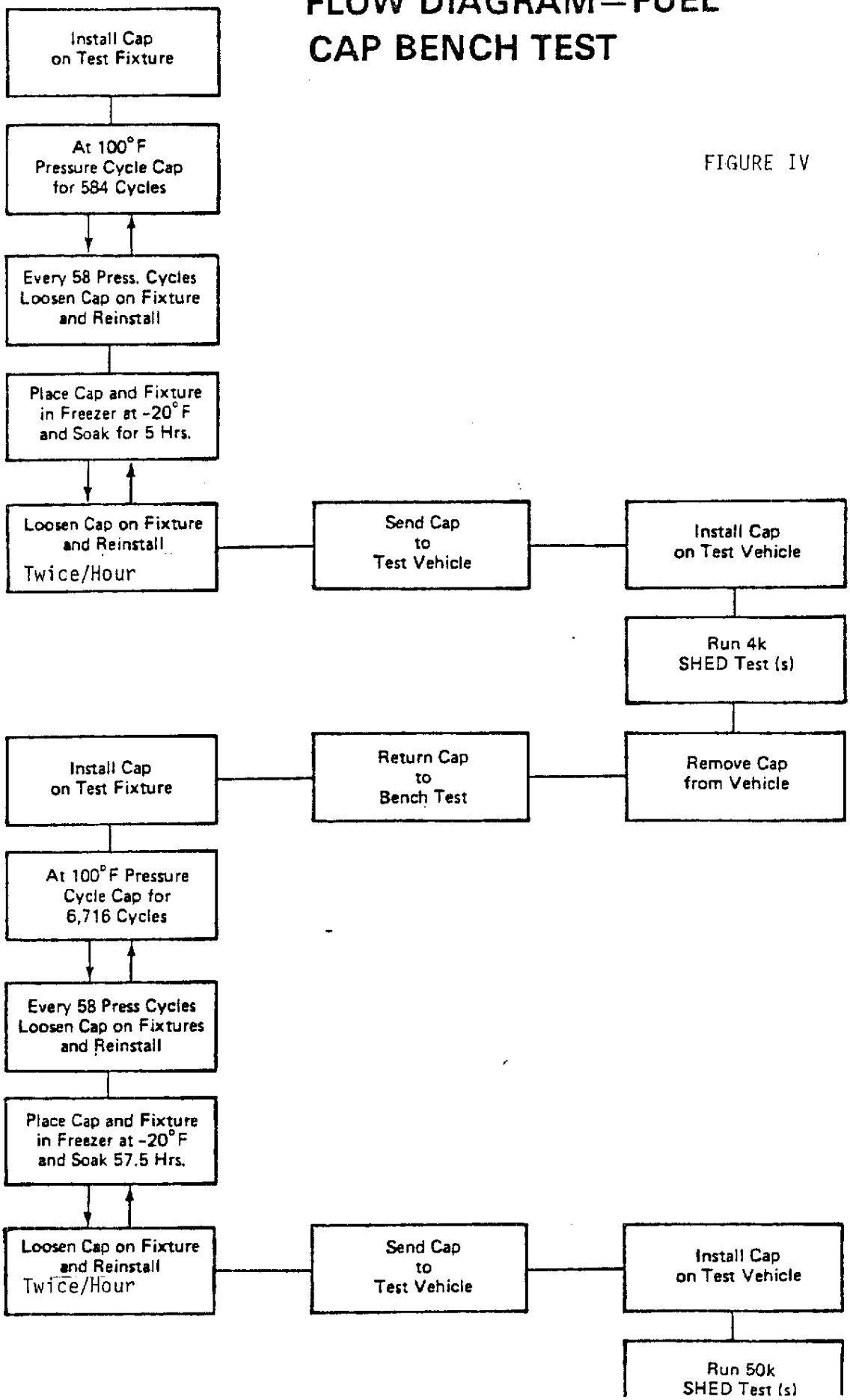
FLOW DIAGRAM—CARBURETOR BENCH TEST

FIGURE III



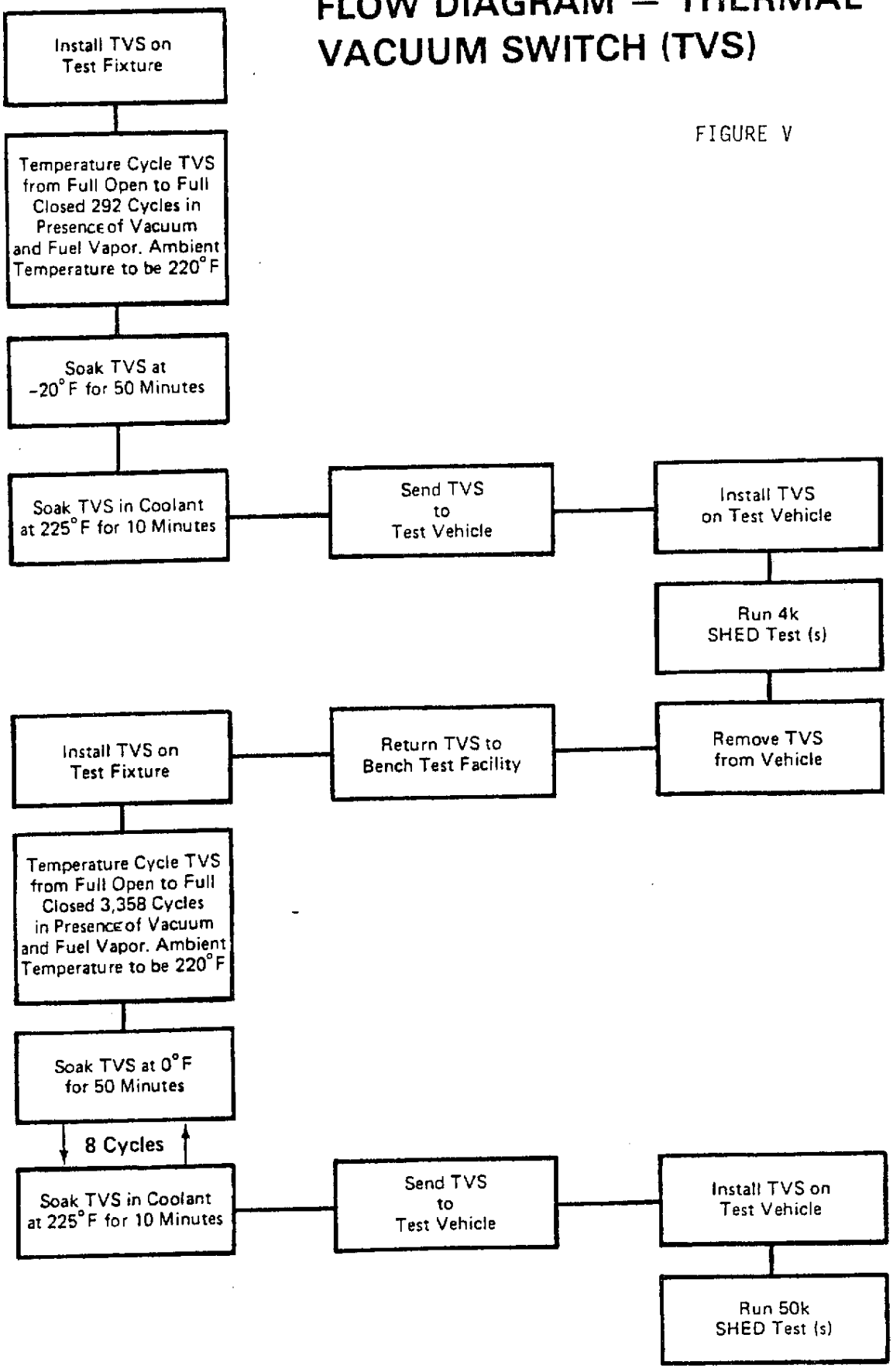
FLOW DIAGRAM—FUEL CAP BENCH TEST

FIGURE IV



FLOW DIAGRAM – THERMAL VACUUM SWITCH (TVS)

FIGURE V



BENCH TEST FLOW DIAGRAM

CARBON ELEMENT AIR CLEANER

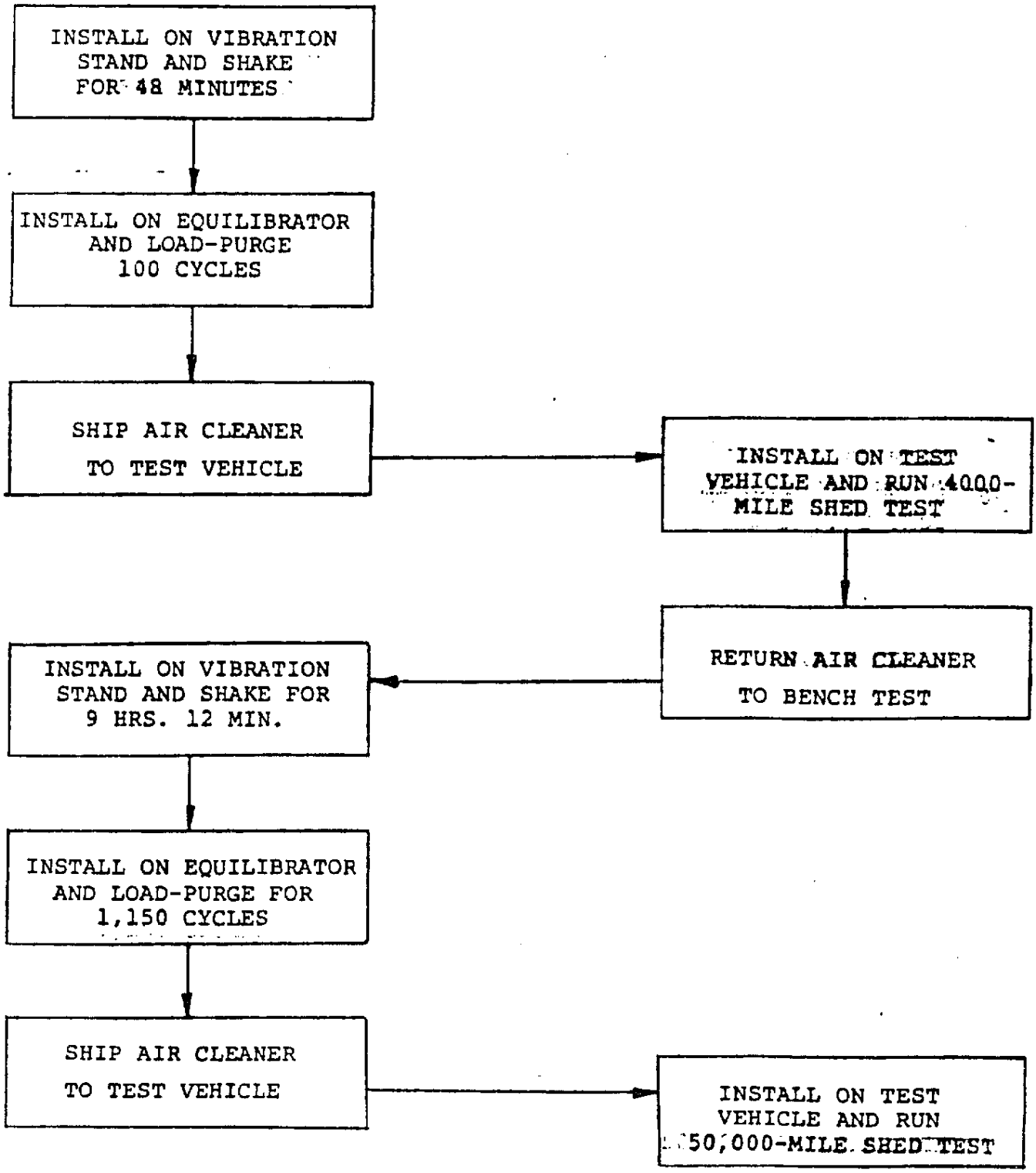



FIGURE VI