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USATECOM Project No. 7-EG-175-009-001
Report No. APG-MT-3303

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FINAL REPORT ON

INITIAL PRODUCTION TEST

OF

AIR CONDITIONER, 9000 BTU PER HOUR

BY

JAMES E. BALDWIN

August 1969

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-GF

19 AUG 1969

SUBJECT: Final Report on Initial Production Test of Air Conditioner, 9000 BTU/HR, USATECOM Project No 7-EG-175-009-001

Commanding General
U. S. Army Materiel Command
ATTN: AMCMR-C
Washington, D.C. 20315

1. Approval Statement. The subject final report is approved except as noted herein.

2. Background of Test. The test item is a 9000-BTU/HR, 60-HZ, air-cooled, self-contained, base-mounted air conditioner designed to be mounted in a van or shelter. Aberdeen Proving Ground conducted the test during the period 15 October 1968 through 6 June 1969. The purpose of the test was to determine compliance with the initial production test requirements of the specification and suitability for release.

3. Test Results.

a. The test item met criteria for controls, operation and performance, leak, high-temperature storage and operation, humidity, radio-frequency interference, and abbreviated endurance subtests.

b. Test results show the equipment has two deficiencies and seven shortcomings as follows:

(1) Electrical shock hazard (deficiency). The high pressure liquid line passes under the mode selector switch and is within 1/16 inch of the terminal lug which is part of the hot lead coming directly from the power receptacle. Turning the switch "off" does not deenergize the terminal.

(2) Inadequate resistance to vibration (deficiency). During the laboratory vibration test the unit was vibrated in the transverse and longitudinal axes and the following failures were noted:

(a) The high pressure line from the compressor to the service valve broke 1-1/4 inches from compressor, which resulted in loss of refrigerant.

(b) The copper ell between the receiver and the sight glass broke. This same failure occurred during the endurance test.

(c) The left rear compressor mount broke.

(d) The grill covering the evaporator coils separated from the frame.

(e) The fresh air vent operating wire broke.

(f) The suction line broke at the compressor.

c. The seven shortcomings are as follows:

(1) The wire connecting the damper door to the control knob was not connected.

(2) The damper door would not close due to interference with the louvers on the side panel.

(3) During operation, the line coil above the compressor vibrated against the compressor on one unit and against the side louvers on another, producing a loud rattling noise.

(4) Water leaked under the top front cover during the rain test.

(5) The identification plate and interim TM 5-4120-282-15 state different refrigerant capacities.

(6) The grill core separated from the grill frame during the testing life cycle.

(7) Sand and dust penetrated into the van through the evaporator compartment during the sand and dust test.

4. Conclusion. The subject air conditioner is unsuitable for release.

AMSTE-GE 19 AUG 1969

SUBJECT: Final Report on Initial Production Test of Air Conditioner, 9000 BTU/HR, USATECOM Project No 7-EG-175-009-001

5. Recommendations.

a. Correct the two deficiencies and as many of the shortcomings as possible.

b. Submit two modified test samples for laboratory vibration retest.

FOR THE COMMANDER:

WILLIAM H. HUBBARD
Colonel, GS
Deputy Chief of Staff

AMCMS CODE NO. 4760.954515

USATECOM PROJECT NO. 7-EG-175-009-001

INITIAL PRODUCTION TEST OF AIR CONDITIONER, 9000 BTU PER HOUR

FINAL REPORT

BY

JAMES E. BALDWIN

August 1969

ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND
21005

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ABSTRACT

The initial production test of the 9000 Btu per hour air conditioner, model GAS 9000, was conducted at Aberdeen Proving Ground, Maryland from 15 October 1968 through 6 June 1969 to determine the ability of the test items to withstand environmental, transportation, durability, capacity, and radio-frequency tests. The results showed three deficiencies. One unit exhibited a shock hazard at the power receptacle. Prior to the cooling-capacity test, the refrigerant line ruptured. This same portion of refrigerant line and two other portions of refrigerant line, plus a compressor mount broke during the vibration test. The shortcomings included a damper door which would not operate because the control knob was not connected. During operation, two units had refrigerant lines which vibrated loudly against the compressor and side louvers. During the rain test, water entered the van under the top front cover. The run capacitor was severely rusted during the humidity exposure. The evaporator-grill core separated from the grill frame on two units. Sand and dust penetrated the evaporator side during the sand and dust test. It was concluded that the units do not fully meet the requirements of the specification and it is recommended that the shortcomings and deficiencies be corrected.

FOREWORD

Materiel Test Directorate was responsible for conducting the tests and preparing the report.

Cooling capacity test data were submitted in a report from Electrical Testing Laboratories, Inc., prepared by Mr. A. da Rosa and approved by Mr. E. J. Gmoser. The test was observed by a representative of Aberdeen Proving Ground.

ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005

USATECOM PROJECT NO. 7-EG-175-009-001

FINAL REPORT ON INITIAL PRODUCTION TEST OF AIR CONDITIONER, 9000 BTU PER HOUR

15 OCTOBER 1968 TO 6 JUNE 1969

SECTION 1. INTRODUCTION

1.1 BACKGROUND

The test item was procured under contract DA-23-195-AMC-00397. The applicable test document is MIL-A-14372A(MO), 6 May 1965.

No QMR or SDR is available for the test item.

1.2 DESCRIPTION OF MATERIEL

The test item is a 9000 Btu per hour, 60-Hz, air-cooled, self-contained type, base-mounted, air conditioner (FSN 4120-926-4118).

The unit is designed to be mounted in the wall of a van or shelter. It contains a hermetically sealed refrigerant circuit consisting of a compressor, condenser, thermostatic expansion valve, exaporator, sight glass, and a liquid line-dryer. A motor equipped with a double blower provides air movement to both the condenser and evaporator.

The unit has three operating controls: a selector switch for off, fan, and cool; a fresh-air control; and a thermostat control.

1.3 TEST OBJECTIVES

The objectives of the test are:

a. To provide the basis for verifying the quality of materiel incorporated in the test unit.

b. To determine suitability for issue in accordance with AMCR 700-34.

1.4 SUMMARY OF RESULTS

The following results were recorded:

a. Initial Inspection and Examination. The evaporator fan wheels were distorted. On one unit, the fresh air linkage was not connected. The fresh air damper would not close on either unit. On unit No. 6326, the liquid line passed within 1/16 inch of the terminal lug on the power receptacle.

b. Controls Test. Both units performed satisfactorily during the controls test.

c. Operational and Performance Test. One unit created excessive noise due to coiled refrigerant tubing above the compressor which vibrated against the intake louvers.

d. Leak Test. The total leak rate of the three leaks detected was 0.71 ounce per year.

e. Capacity Test. Net total room-cooling was 7940 Btu per hour.

f. High-Temperature Storage and Operational Test. No detrimental effects were noted due to the high-temperature storage and operational test.

g. Humidity Test. The unit operated satisfactorily after the exposure.

h. Radio-Frequency Interference Test. Radiated and conducted RFI emissions were within the allowable limits specified in the governing military document.

i. Rain Test. Rain penetrated the unit into the shelter by leaking under the unit identification plate and under the top front panel.

j. Sand and Dust Test. Dust penetrated through the unit into the van by entering between the top center panel and the bulkhead.

k. Laboratory Vibration. The following failures were noted:

   1) The high-pressure line from the compressor to the service valve broke.

   2) The line between the receiver and the sight glass broke.

   3) The left rear compressor mount broke.

   4) The grill core separated from the grill.

   5) The damper-door linkage wire broke.

   6) The suction line broke at the compressor.

l. Abbreviated Endurance Test. The unit scheduled for the abbreviated endurance test experienced a ruptured refrigerant line between the receiver and the sight glass during preparation for the capacity test. Another unit was substituted. No degradation in performance was noted during the rest of the abbreviated endurance test.

1.5 CONCLUSIONS

It is concluded that:

a. The test items met all the requirements of the initial production test specification except the examination test (ref par. 2.2.5).

b. The test items met all the requirements of the tests conducted to insure compliance with AMCR 700-34 with the following exceptions:

1) Initial inspection test (ref par. 2.2.5).

2) Capacity test (ref par. 2.6.5).

3) Rain test (ref par. 2.10.5).

4) Sand and dust test (ref par. 2.11.5).

5) Laboratory-vibration test (ref par. 2.12.5).

1.6 RECOMMENDATIONS

It is recommended that:

a. Insulation be applied to the refrigerant line in the proximity of the unit power receptacle.

b. Louvers be manually adjusted on each unit to prevent interference with the damper door.

c. The refrigerant line coil above the compressor be restrained with a clamp to prevent operational vibration.

d. The nameplate be changed to reflect the contractual capacity.

e. Gasketing be applied to the top edge of the frame to prevent rain penetration.

f. Gasketing be added to the bulkhead to prevent dust penetration.

g. The technical manual include instructions for restraining the compressor during shipment or transportation.

SECTION 2. DETAILS OF TEST

2.1 INTRODUCTION

The units were tested in accordance with the test specifications (Reference 1). Four air-conditioner units (Nos. 6150, 6326, 6248, and 6209), were used during testing. The examination test and performance test were performed on units 6150 and 6326. The controls test was performed on all four units.

To insure compliance with AMCR 700-34, the following tests were conducted: initial inspection (units 6150 and 6326); operational test (6150, 6326, 6209, and 6248); Leak test (6150); capacity test (6326); high-temperature storage and operational test (6326); humidity test (6326); Radio-interference suppression (6209); rain test (6150); sand and dust test (6248); laboratory-vibration test (6209); and abbreviated endurance test (6248).

The cooling capacity test was conducted at Electrical Testing Laboratories with observation by APG personnel.

2.2 INITIAL INSPECTION AND EXAMINATION

2.2.1 Objective

The objectives were:

a. To insure that the test item meets the requirements of the requested examination test.

b. To determine the condition of the unit when received in order to have a basis of comparison to use in succeeding tests.

2.2.2 Criteria

The criteria were:

a. The unit shall not show any evidence of damage which could affect operation or the results of any other tests (Inclosure 2, par. 1.2 of Reference 2).

b. Presence of one or more of the following defects shall constitute failure of the examination (Attachment 1 of Reference 2):

   1) Power supply cable, manuals, or other components specified in contract or order not furnished.

2) Evidence of exterior or interior damage incurred prior to or during shipment.

3) Paint flaking, blistering, peeling, or not smoothly applied.

4) Panel fasteners missing or insecure.

5) Metal shavings or other foreign material inside unit.

6) Fresh air and return air dampers not free to operate or operate improperly. (Fresh air does not open when return air closes or vice versa.)

7) Evidence of refrigerant or oil leaks.

8) Component mountings not secure.

9) Refrigerant piping not secure or clamps missing.

10) Electrical connections not secure, wires abraded or broken, wires not identified and marked.

11) Gasketing and insulation not secure.

12) Fans binding or contacting housings or other components.

13) Identification plate missing or insecure.

2.2.3 Method

The air conditioners were visually examined for the defects listed in paragraph 2.2.2.

2.2.4 Results

Unit No. 6326 had a liquid line that passed underneath the selector switch and was located 1/16 inch from one of the leads to the power receptacle. It was determined that this lead is always hot when the unit is plugged in, creating a shock hazard to the operator.

Results of the inspection for defects listed in paragraph 2.2.2b were as follow:

a. Satisfactory.

b. On units 6150 and 6326, the top flange on the evaporator coil end bracket was bent down 3/8 inch where the felt gasket crosses it in the middle of the set. This was caused by interference between this bracket and the middle screw of the front top cover. The evaporator-fan blower wheels on units 6326 and 6150 were badly distorted. They had a large amount of side wobble by as much as 11/64 inch.

c. Satisfactory.

d. Satisfactory.

e. Satisfactory.

f. On unit No. 6326, the brass piece which connects the evaporator air-inlet louver assembly to the fresh air linkage assembly was not connected. The damper door on unit No. 6150 would not close completely.

g. Satisfactory.

h. Satisfactory.

i. The coiled tubing above the compressor was not secure on any unit (Nos. 6150, 6326, 6248, and 6209).

j. Satisfactory.

k. Satisfactory.

l. Satisfactory.

m. Satisfactory.

2.2.5 Analysis

The possibility of electrical shock is a safety hazard and, therefore, a failure of the test criterion required by Reference 2 for testing in accordance with AMCR 700-34.

The evaporator fan distortion, damper door interference, and loose coiled tubing are failures of the initial production test requirements. The damper-door interference would lead to a reduced cooling effect and sand and dust introduced into a shelter could affect equipment or personnel being conditioned. The loose coiled tubing places stress on the ell at the receiver. Failures of the ell are described in Table 2.12-II and paragraph 2.13.4.

2.3 CONTROLS TEST

2.3.1 Objective

The objective was to insure that the controls operate as required in the requested controls test.

2.3.2 Criteria

When the switch is turned to its various positions, the unit components shall operate as described in paragraph 2.2.3.

2.3.3 Method

The air conditioners were placed in an ambient temperature between +75°F and +120°F and the selector switch was placed in the OFF position. The unit was checked to see that all components were de-energized and inoperative. Next, the switch was turned to the FAN position and the unit checked to see that only the fan motor was energized and operating. Then, the switch was turned to the COOL position with the thermostat to the maximum COOLER position and the unit was checked to see that the fan motor and compressor were energized and operating. The unit was run for 15 minutes to see whether or not there was an appreciable reduction in the evaporator discharge air.

2.3.4 Results

Both units were operated at an ambient temperature of +75°F and the results listed in Table 2.3-I were obtained.

Table 2.3-I. Control Test Data

	Unit No.			
	6326		6150	
Condition	Run 1	Run 2	Run 1	Run 2
Selector switch to OFF				
No components operating	Yes	Yes	Yes	Yes
Selector switch to FAN				
Fan motor operating	Yes	Yes	Yes	Yes
Compressor operating	No	No	No	No
Selector switch to COOL, thermostat to maximum COOLER				
Fan motor operating	Yes	Yes	Yes	Yes
Compressor operating	Yes	Yes	Yes	Yes
Decrease in evaporator air outlet	Yes	Yes	Yes	Yes

2.3.5 Analysis

Both units performed satisfactorily during the controls test, since they both controlled the operation of the components as specified.

2.4 OPERATIONAL AND PERFORMANCE TEST

2.4.1 Objective

The objective was to determine whether or not the unit is operating properly in all its modes of operation.

2.4.2 Criteria

The criteria were:

a. The unit shall operate as intended in all modes of operation (par. 2.2, Inclosure 3 of Reference 2).

b. Any one of the following shall constitute failure of this test:

   1) Failure to operate.

   2) Abnormal operation.

   3) Low refrigerant charge.

   4) Air temperature drop less than 17°F between evaporator inlet and outlet.

   5) Current drawn on cooling cycle more than 17 amperes.

2.4.3 Method

The units were placed in an ambient temperature between +75°F and +80°F. Sheet-metal ducts were installed on the evaporator return-air inlet and evaporator air-discharge opening. Each duct was 24 inches long and of the same cross-sectional dimensions as the respective openings. Two dry-bulb thermometers were located in each duct 18 inches from the front of the air conditioners. Instrumentation was connected for refrigerant pressure and electrical measurements. The units were operated for two hours in the cooling mode before measurements were recorded. During this time, the sight glass was observed for insufficient charge.

2.4.4 Results

The data shown in Table 2.4-I were recorded.

Table 2.4-I. Operating and Performance Data

Characteristic	Unit No. 6150	Unit No. 6326
Average air temperature, °F		
Evaporator inlet	+79	+80
Evaporator outlet	+56	+56
Condenser inlet	+88	+88
Condenser outlet	+107	+109
Suction pressure, psig	29.5	36.5
Discharge pressure, psig	150	149
Input voltage	122	122
Current, amps	13.7	13.5
Power consumed, kilowatts	1.16	1.23

The sight glass of each unit indicated sufficient charge. During operation, the coiled tubing of each unit No. 6326 vibrated against the intake louvers causing excessive noise.

2.4.5 Analysis

The unit passed the operational and performance test.

2.5 LEAK TEST

2.5.1 Objective

The objective was to insure that the components and lines have been assembled properly and have no leaks large enough to appreciably reduce the refrigerant charge in the system.

2.5.2 Criterion

The allowable leak rate of the unit shall not exceed two ounces of R-12 per year at 300 psi.

2.5.3 Method

The refrigerant system was evacuated to 30 psig of refrigerant. It was then charged with dry nitrogen to 300 psig. A halogen-sensitive leak detector was then used to check all joints or other points where leaks could occur. As each joint was checked, it was marked with a dab of paint. All leaks larger than 0.1 ounce per year were noted. The total leak rate was then determined by adding the individual leaks.

2.5.4 Results

Three leaks larger than 0.1 ounce per year were noted on unit No. 6150: at the sight glass, 0.17 ounce per year; and two leaks at the expansion valve connections, 0.27 ounce per year each. By addition, the total leak rate was 0.71 ounce per year.

2.5.5 Analysis

The leak rate was within the allowable limits as specified in the criterion.

2.6 CAPACITY TEST

2.6.1 Objective

The objective was to determine whether or not the unit will deliver its rated capacity.

2.6.2 Criterion

The unit shall have a total cooling capacity of at least its nameplate rating at a condenser-inlet air temperature of +120°F dry bulb and evaporator- inlet air temperature of +90°F dry bulb and +80°F wet bulb.

2.6.3 Method

The unit was tested at Electrical Testing Laboratories, Inc. A government representative observed the test. The test was conducted in accordance with ASHRAE Standard 16-61 (Reference 3) using the balanced calorimeter method. The unit was charged to 50 ounces with refrigerant. No external pressure was applied to the evaporator fan. Average

evaporator-inlet air temperature was +90.1°F dry bulb and +79.8°F wet bulb. Average condenser-inlet temperature was +124.7°F, dry bulb.

2.6.4 Results

Net total room-cooling on the evaporator side was 7940 Btu per hour. Net total sensible cooling was 4440 Btu per hour. Detailed results are contained in Reference 4.

2.6.5 Analysis

Since the unit did not perform at its nameplate rating, it failed the capacity- test criterion. It is noted that the revised military specification, MIL-A- 14372A(MO), requires a unit capacity of only 7480 Btu per hour.

2.7 HIGH-TEMPERATURE STORAGE AND OPERATIONAL TEST

2.7.1 Objective

The objective was to insure that the test item can be stored and operated under the storage conditions and hot, dry conditions of AR 705-15, C1.

2.7.2 Criterion

The unit shall be capable of storage at +155°F with no detrimental effects and shall cool properly at +120°F.

2.7.3 Method

The unit was instrumented and installed in an inclosure to simulate a user application. The inclosure was placed in a climatic chamber and the chamber temperature adjusted to +155°F. After stabilization of the chamber temperature within the inclosure at +155°F, the unit was stored for four hours, after which the chamber temperature was reduced to +120°F and the unit was inspected for any detrimental effects. After stabilization at +120°F, the unit was operated and upon initial turnon at +120°F, the power characteristics (steady state) were measured for maximum cooling operation. The operation of controls was evaluated. The unit was then operated in the cooling mode for a minimum of two hours to simulate a temperature pulldown test. During the pulldown test, the suction and discharge refrigerant pressures as well as evaporator and condenser air temperatures were measured.

2.7.4 Results

No detrimental effects were noted during the post-storage inspection. Upon initial turnon at +120°F, the steady-state power characteristics measured were: current draw, 11.5 amps; voltage, 116.5 volts; and power, 1.00 kilowatts.

After two hours of operation at +120°F the following were recorded: suction pressure, 32 psig; discharge pressure, 205 psig; evaporator-air discharge temperature, +80°F; evaporator-air intake temperature, +96°F; condenser-air discharge temperature, +137.5°F; condenser-air intake temperature, 118°F; current draw, 12.8 amps; voltage, 116 volts; and power 1.11 kilowatts.

2.7.5 Analysis

The unit passed the high-temperature storage and operation test.

2.8 HUMIDITY TEST

2.8.1 Objective

The objective was to insure that the test item has the proper finishes and materials to allow it to withstand a humid atmosphere.

2.8.2 Criterion

The unit shall exhibit no detrimental effects or evidence of corrosion which could be detrimental to its operation as a result of the humidity exposure.

2.8.3 Method

The air conditioner was placed in a chamber vented to the atmosphere to prevent the build-up of pressure. During the first 2-hour period, the temperature was raised to +155°F and then maintained for six hours. During the next 16 hours, the temperature was gradually reduced to between +68°F and +100°F. A total of ten cycles as described above was conducted. The relative humidity throughout each cycle was maintained between 95% and 99%' The air conditioner was then removed from the chamber, and operation was attempted according to paragraph 2.4.3.

2.8.4 Results

The unit operated satisfactorily in all modes. The running capacitor was excessively rusted indicating an insufficient protective coating. Operational data are contained in Appendix I.

2.8.5 Analysis

The unit passed the humidity test.

2.9 RADIO-FREQUENCY INTERFERENCE

2.9.1 Objective

The objective was to determine if the unit produces electrical disturbances beyond the limits outlined in military standards 461A, Table A-1.

2.9.2 Criteria

The criteria were:

a. The outside radiated levels of RFI shall not exceed the allowable limits of Military Standard 461A/462/463/, Subtest RE 02, as amended for MIL-E-55301(EL).

b. The electrical power line conducted levels of RFI shall not exceed the allowable limits of Military Standard 461A/462/463, Subtest ACE 2.

2.9.3 Method

The test item was placed in the test van and tests were conducted in accordance with Military Standard 461A/462/463, Subtests RE 02 and ACE 2.

2.9.4 Results

Radiated and conducted RFI emissions were within the allowable limits specified in the governing military standard.

2.9.5 Analysis

Not applicable

2.10 RAIN TEST

2.10.1 Objective

The objective was to insure that the air conditioner is tightly assembled, properly gasketed, and properly drained, so that it will operated during a rainstorm.

2.10.2 Criteria

The unit will operate properly during the exposure, will not draw water through the unit, and will have no accumulation of water which could be detrimental.

2.10.3 Method

The unit was mounted so that the evaporator-air inlets, evaporator-air outlest, and controls were shielded from the rainfall similar to the manner in which the unit will be used. The unit was then exposed to a simulated rainfall of 4 ± 1 inches of water per hour at an angle of 45° from the vertical for a 2-hour period. Half of this time was spent with the air conditioner operating in the ventilate mode and half was spent operating in the cooling mode. Also, during the ventilate- and cooling-mode exposures, the frest-air damper was varied from open to closed to determine whether or not water could be drawn in from the outside.

During the exposure, the evaporator side of the unit was observed for evidence of water penetration through the unit into the conditioned area. After the exposure, the unit was inspected inside and evidence of penetration into the unit was noted.

2.10.4 Results

When the fresh-air damper was varied, no water could be drawn in from the outside. During the exposure (both modes of operation), water penetration was noted on the evaporator side under the unit identification plate, and under the top front cover. During the test (both modes of operation), water penetration into the condenser was noted, but was not found to be detrimental.

2.10.5 Analysis

The air conditioner failed to pass the rain test due to the penetration of water through the unit as a result of inadequate cover gaskets.

2.11 SAND AND DUST TEST

2.11.1 Objectives

The objectives were:

a. To insure that the unit is assembled in a manner which will not allow wind driven sand and dust to penetrate through to the conditioned inclosure.

b. To insure that the unit will not suffer detrimental effects from these conditions.

2.11.2 Criteria

The unit will not allow the sand and dust to penetrate through the unit into the conditioned space and shall exhibit no detrimental effects during, or after, the exposure due to accumulations of sand and dust or penetration of sand or dust into the components.

2.11.3 Method

The test unit was installed in a test van to simulate a user application and only the condenser side was exposed. A mixture of sand and dust similar to that required in paragraph 7.a(8) of AR 705-15, C1 was wind-blown onto the condenser section at approximately 15 mph. The test was conducted with the unit operating in the cooling mode with the fresh-air damper closed. The unit was subjected to these conditions for a minimum of two hours. During the test, the unit was observed for any penetration of sand or dust through the unit. It was inspected internally for any accumulation of sand or dust and for any evidence of filter clogging or impairment of vent controls. During the test, the unit was observed for any evidence of improper operation.

2.11.4 Results

During the test, dust was noted in the test van and on the evaporator air outlet. During the post-operation inspection, sand was found in the evaporator side. It appeared to have entered where the top center panel mated the felt gasket over the bulkhead. This gasket did not contact the top panel at each end.

2.11.5 Analysis

The unit failed the sand and dust test due to an inadequate bulkhead gasket.

2.12 LABORATORY VIBRATION TEST

2.12.1 Objective

The objective was to insure that the test item is tightly assembled and all nuts, screws, bolts, rivets, etc., are tightened in a manner which will withstand use in military vehicles.

2.12.2 Criterion

The unit shall be built to withstand use and transport in military vehicles without any evidence of structural damage, misalignment or malfunctioning of components, leaks, abnormal vibration, or other irregular operation.

2.12.3 Method

The unit was mounted by its base on a 2-inch-thick aluminum plate utilizing four 5/16-18 NC bolts. The plate was bolted onto the slip table, driven by the C150 electrodynamic vibration in the horizontal plane, for vibration through the transverse and longitudinal axes.

Calibrated, piezoelectric accelerometers were mounted in the axis of the applied force on various components of the air conditioner to monitor the responses to the monitored input. All acceleration data were recorded on a visicorder.

The laboratory test in each axis simulated the vibration environment associated with 2000 miles of truck and semitrailer transportation as outlined in Figure 1 of MTP 4-2-804 (Interim Pamphlet 70-73). The test schedule for each axis (conducted at the prevailed ambient room temperature) was as follows:

a. Cycling Phase. The unit was cycled from 5.5 to 200 Hz at 1.5-g input at a sweep rate of 5.05 minutes, minimum to maximum frequency. During the first sweep from 5.5 to 200 Hz the accelerometer responses were recorded and from these records the approximate resonant frequencies were determined and then pinpointed.

b. Resonance Dwell. The air conditioner was subjected to a 5-minute dwell at each resonant frequency (not exceeding four per axis) at the input specified for the frequency in the cycling phase.

The unit was inspected following each resonance dwell and upon completion of cycling in each axis.

The air conditioner was vibrated in the transverse and longitudinal axes and the test was stopped at that point due to excessive damage.

2.12.4 Results

The major resonant frequencies and the input amplification factors are shown in Table 2.12-I.

The results of the vibration test are shown as a function of elapsed time in Table 2.12-II.

Table 2.12-I. Laboratory Vibration Test of Air Conditioner, 9000 BTU Per Hour

Resonant Frequencies and Input Amplification Factors

Axis	Resonant Freq, Hz	Input, g +10%	Amplification Factors for Accelerometer Locations[a]					
			5	6	7	8	9	10
Transverse	96	1.5	0	14.1	3.7	0	0	1.0
	27.5	1.5	1.3	4.5	3.8	1.2	10.8	2.1
	10	1.5	5.4	3.8	5.4	6.5	0	3.5
Longitudinal	66	1.5	0	0	11.1	0	0	1.9
	17.5	1.5	0	2.3	2.9	2.2	0	7.1
	17	1.5	0	1.7	2.9	1.7	5.3	0
	8	1.5	3.3	1.9	5.4	3.7	1.9	0

[a]Amplification Factor (Q) = $\frac{\text{Response g value}}{\text{Input g Value}}$

Table 2.12-II. Laboratory Vibration Test of Air Conditioner, 9000 BTU per Hour

Chronological List of Damage

Axis of Vibration	Phase	Event	Elapsed Time in Event, min	Total Elapsed Time in Test, min	Damage
Transverse	Cycling	200 Hz to 5.5 Hz at 1.5 g input	5	5	High-pressure line from compressor to service valve broke 1-1/4 inches from compressor, lost freon. Approximate frequency of vibration input at break was 8 Hz.
	Cycling	5.5-200-5.5 Hz at 1.5 g input	2	7	Copper ell from the receiver to the sight glass broke.
			8	15	No further damage.
	Resonance dwell	96 Hz at 1.5 g	5	20	No further damage.
		27.5 Hz at 1.5 g	5	25	No further damage.
		10 Hz at 1.5 g	5	30	No further damage.
Longitudinal	Cycling	200-5.5-200 Hz at 1.5 G	10	10	No further damage
	Resonance dwell	66 Hz at 1.5 g	5	15	Left rear compressor mount broken.
	Resonance dwell	17.5 Hz at 1.5 g	5	20	Grill work covering evaporator coils out of frame. Rubber on left front compressor mount showed abrasive wear.
	Resonance dwell	17 Hz at 1.5 g	5	25	Fresh-air vent operating wire broken. Remaining compressor mounts showed abrasive wear.
	Resonance dwell	8 Hz at 1.5 g	5	30	Suction line into top of compressor broken.

Test stopped at this point.

2.12.5 Analysis

The unit failed the test due to structural damage consisting of broken refrigerant lines, broken compressor mounts, grill-core separation, and broken fresh-air vent operating wire.

2.13 ABBREVIATED ENDURANCE

2.13.1 Objectives

The objectives were:

a. To insure that any delayed effects of the environmental test (such as the sand and dust test) will be found.

b. To insure that the test item is capable of 500 hours of failure free cooling operation.

2.13.2 Criterion

The unit shall operate 500 hours in the cooling mode without a malfunction and without any serious reduction of its ability to perform its mission.

2.13.3 Method

The unit was set up and operated 500 hours in the cooling mode. During this time, a heat load was applied to the evaporator-air intake and the unit was cycled so that, during each hour, it ran for 50 minutes in the cooling mode and then for ten minutes in the by-pass mode. The condenser side was exposed to an ambient between +65°F and ++100°F. During the 500 hours, the operational characteristics were monitored to insure that the unit was operation properly.

2.13.4 Results

The unit (No. 6326) operated for approximately five hours when the ell, 1/4-inch copper, in the line between the sight glass and the receiver broke. The test was continued on unit No. 6248. This unit completed over 500 hours of operation without malfunction.

2.13.5 Analysis

It is believed that the failure of the ell on unit No. 6326 occurred due to the concentration of vibration stress created by the unrestrained coiled tubing located over the compressor.

Since the failure occurred within hours after shipment by truck, it may have occurred due to shock or vibration encountered during this time. Further evidence of the need for a restraining clamp on the coiled tubing is described in paragraph 2.2.4i and Table 2.12-II. Since the replacement unit operated for 500 hours without failure, the unit passed the endurance test..

TEST DATA

DESCRIPTION 9000 BTU/HR AIR CONDITIONER

MFGR.
MODEL NO.
SERIAL NO.
REF:

GENERAL EQUIPMENT BRANCH
ELECTRONIC AND GENERAL EQUIPMENT DIVISION
DEVELOPMENT AND PROOF SERVICES

TEST
SHEET 1 OF 1
DATE
RECORDER
PROJ. ENGR. JEB

INST. →																	
READ NO. ↓	TEST TITLE		UNIT SERIAL		EVAPORATOR TEMPERATURE		CONDENSER TEMPERATURE			PRESSURE			VOLTAGE		CURRENT		POWER
UNITS			NO.		IN	OUT	IN	OUT		SUCTION	DISCHARGE						
SYM.					°F	°F	°F	°F		PSIG	PSIG		VOLTS		AMPS		KW
COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	OPERATIONAL TEST		6150		79	56	88	107		24.5	150		122.0		13.1		1.16
			6326		79	56	88	109		36.5	149		121.5		13.5		1.23
			6209		71	52	81	98		28.0	122		120.5		12.8		1.20
			6248		80	50	84	106		34.0	144		121.0		13.5		1.23
	POST-HUMIDITY TEST		6326		70	44	72	91		26.0	125		121.0		12.8		1.23
	HIGH-TEMP STORAGE		6326														
	START				111	105	121	128		21.5	155		116.5		11.5		1.10
	ONE HOUR				98	83	118	138		31.0	207		116.0		12.8		1.13
	FINISH				96	80	117	138		32.0	205		116.0		12.8		1.13

NOTES:

STEAP-DS Form 216, 10 Aug. 66

APPENDIX II - FINDINGS

Requirement	Source	Finding	Reported in Par. No.
All wiring shall have protective covers to prevent electrical shocks to operating personnel.	MIL-A-14372A(MO), par. 3.15	Unsatisfactory, unit No. 6326 had an electrical- shock hazard.	2.2.4
The units shall contain no defects listed in par. 4.6.1 of the military specification.	MIL-A-14372A(MO), par. 4.4	Unsatisfactory, evaporator fan blower wheels were distorted as much as 11/64 inch, No. 6326; the fresh air linkage was not assembled; each unit had loose refrigerant tubing.	2.2.4
The controls shall operate the unit as prescribed.	Test Plan, Attachment 2 (Reference 1)	Satisfactory.	2.3.5
The unit shall operate as intended in all modes of operation.	Test Recommendation, Inclosure 3, par. 2.2 (Reference 2)	Satisfactory.	2.4.4
The unit shall operate with sufficient charge, 17°F or more evaporator air differential, and contain no abnormal operation.	Test Plan, Attachment 3 (Reference 1)	Unsatisfactory, the refrigerant line coil on unit No. 6326 vibrated noisily.	2.4.4
Allowable leak rate shall be less than two ounces refrigerant per year at 300 psig.	MIL-A-14372A(MO), par. 4.6.2.1	Satisfactory	2.5.5

Requirement	Source	Finding	Reported in Par. No.
The unit shall have a total cooling capacity of at least its nameplate rating.	Test Recommendation, Inclosure 4, par. 3.2	Unsatisfactory, nameplate rating is 9000 Btu per hr. Unit delivered 7940 Btu per hr.	2.6.5
The unit shall be capable of storage at +155°F and cooling at +120°F with no detrimental effects.	Test Recommendation, Inclosure 6, par. 5.2	Satisfactory.	2.7.5
The unit shall exhibit no detrimental effects as a result of the humidity exposure.	Test Recommendation, Inclosure 8, par. 7.2	Satisfactory.	2.8.5
Radiated and conducted levels of RFI shall not exceed those specified in MIL-STD-461A/462/463.	Test Recommendation, Inclosure 10, par. 9.2	Satisfactory.	2.9.4
The unit will operate properly and will not draw water through the unit during the rain exposure.	Test Recommendation, Inclosure 11, par. 10.2 (Reference 2)	Unsatisfactory, water penetrated the unit under the top front cover.	2.10.4
The unit shall not allow sand- and dust-penetration during exposure.	Test Recommendation, Inclosure 12, par. 11.2 (Reference 2)	Unsatisfactory, sand and dust penetrator the unit under the top center panel.	2.11.4
The unit shall withstand transportation in military vehicles without damage.	Test Recommendation, Inclosure 13, par. 12.2 (Reference 2)	Unsatisfactory, unit refrigerant line broke in three places, compressor mount broke.	2.12.5

Requirement	Source	Finding	Reported in Par. No.
The unit shall operate 500 hours in the cooling mode without failure.	Test Recommendation, Inclosure 14, par. 13.2 (Reference 2)	Unsatisfactory, the unit failed after five hours of operation.	2.13.4

APPENDIX III - DEFICIENCIES AND SHORTCOMINGS

1. Deficiencies

Deficiency	Suggested Corrective Action	Remarks
The liquid line on unit No. 6326 passed within 1/16 inch of the terminal lug from the power receptacle.	Add insulation to the refrigerant line.	None.
After an elapsed time of five hours operation during the endurance test, the ell, 1/4-inch copper, between the receiver and the sight glass broke on unit No. 6326, with a resulting loss of refrigerant charge.	Restrain the refrigerant line with clamps.	Vibration of the refrigerant line during operation is concentrated at the ell.
During vibration testing, the liquid line to service valve broke at the compressor. Then the copper ell, 1/4 inch below the sight glass broke. Left rear compressor mount broke. Gas line broke at the compressor.	Restrain the refrigerant line with clamps.	None.

2. Shortcomings

Shortcoming	Suggested Corrective Action	Remarks
The wire connecting the damper door to the control knob was not connected.	Review assembly process.	None.
The damper door would not close due to interference with the louvers on the side panel.	Bend louvers away from the damper door with pliers.	None.

Shortcoming	Suggested Corrective Action	Remarks
During operation, the line coil above the compressor vibrated against the compressor on one unit and against the side louvers on another, producing a loud rattling noise.	Restrain the refrigerant lines with clamps.	None.
Water leaked under the top front cover during the rain test.	Add gasketing to the top edges of the unit frame.	None.
The identification plate and interim TM-54120-282-15 state different refrigerant capacities.	These capacities should be corrected to agree.	None.
The grill core separated from the grill frame on two units during the testing life cycle.	The core should be secured with screws rather than the present spring clips being used.	None.
During the sand- and dust-test, sand and dust penetrated into the van through the evaporator compartment. It entered under the top center panel at each end of the bulkhead.	Screws should be added to the top center cover for better fit with the bulkhead gasket.	None.

APPENDIX IV - CORRESPONDENCE

DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-GE
7-3-0026-11

19 DEC 1966

SUBJECT: Test Directive, USATECOM Project No. 7-3-0026-11, Initial Production Test of Air Conditioner, 9000 BTU/HR, DA 23-195-AMC-00397(T)

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-CO-P
Aberdeen Proving Ground, Md. 21005

1. REFERENCES:

a. USAMEC letter file AMSME-QX, 4 November 1966, subject: "Request Time and Cost Estimate: 9000 BTU/HR Air Conditioner; , DA 23-195-AMC-00397(T)," with three inclosures, copy attached, inclosure 1.

b. USATECOM Regulation 705-2.

c. AMCR 700-34.

2. BACKGROUND: Reference 1a identifies USAMEC letter which includes request for Initial Production test of subject air conditioner. This letter, together with the inclosures thereto, i.e., the contract and test procedures, constitute the only available background materiel on subject air conditioner. Information on tests that have been conducted in the past and on type classification action is lacking.

3. DESCRIPTION OF MATERIEL: See paragraph 1, Invitation for Bid portion of inclosure 1 to reference 1a.

4. TEST OBJECTIVES:

a. To provide the basis for verifying the quality of materiel incorporated in subject air conditioner.

b. To determine suitability for issue in accordance with reference 1c.

5. RESPONSIBILITIES:

a. Commanding Officer, Aberdeen Proving Ground is responsible for:

(1) Providing USAMEC at the earliest possible date with time and cost estimates as follows:

(a) For conducting an Initial Production test on subject air conditioner utilizing one or more units (depending upon time saving that may be realized in testing more than one unit).

(b) For conducting any additional tests deemed necessary to ensure compliance with the requirements of reference 1c. (Send info copy of these estimates to this headquarters).

(2) Conducting the test(s) as soon as the funds and test item(s) have been made available.

(3) Submitting reports directly to USAMEC with info copy to this headquarters.

b. Commanding General, U. S. Army Mobility Equipment Command is expected to:

(1) Provide this headquarters at the earliest possible date with information as to concurrence in time and cost estimates made available to USAMEC and the additional testing, if any, which may be recommended.

(2) Provide Aberdeen Proving Ground with any additional detailed reporting instructions on this test. Paragraph 8, reference 1a contains general instructions which may be adequate depending upon scope and nature of tests.

(3) Provide Aberdeen Proving Ground with disposition instructions for the test items at completion of all testing.

(4) Fund for the test.

19 DEC 1968

AMSTE-GE
7-3-0026-11
SUBJECT: Test Directive, USATECOM Project No. 7-3-0026-11, Initial Production Test of Air Conditioner, 9000 BTU/HR, DA 23-195-AMC-00397(T)

6. COORDINATION: Not used.

7. SPECIAL INSTRUCTIONS:

a. Subject project number, assigned this test, will be referenced in all correspondence, including reports.

b. Attached, inclosure 2, for your information and retention, are the forms used for entering this task in TSMS.

c. Request the test items at the completion of all testing be disposed of in accordance with instructions to be provided by USAMEC.

8. TEST PLANS AND REPORTS:

a. Test Plans. No test plan is required for the tests specified in reference 1a. The need for a test plan in connection with additional tests deemed necessary to ensure compliance with reference 1c will depend upon the nature and scope of tests involved and is therefore left to your discretion.

b. Reports. Report requirements and submission will be in accordance with paragraph 8, reference 1a plus any further detailed instructions which may be forthcoming from USAMEC. Reference 1b will govern, however, in the event of any conflict.

9. SECURITY: Unclassified.

FOR THE COMMANDER:

Burdell D. Spencer

BURDELL D. SPENCER
Acting Director
General Equipment Test
Directorate

2 Incls Incl 2 w/d
as

Copy furnished: (w/o incls)
CG, USAMEC

4 NOV 1966

Mr. Sanders/jw/636-2220

DEPARTMENT OF THE ARMY
U.S. ARMY MOBILITY EQUIPMENT COMMAND
4300 GOODFELLOW BOULEVARD
ST. LOUIS MISSOURI 63120

IN REPLY REFER TO:

AMSME-QX

SUBJECT: Request Time and Cost Estimate: 9000 BTU/HR Air Conditioner; Columbia Specialty Company, DA 23-195-AMC-00397(E)

TO: Commanding General
U. S. Army Test and Evaluation Command
ATTN: AMSTE-TA-M
Aberdeen Proving Ground, Maryland

1. Request your command schedule the following test for subject item and furnish this Directorate a time and cost estimate for conducting same.

TEST	NO. OF UNITS	REFERENCE	PARAGRAPH
IPT	one (1)	SMEFB-RDE-KC IP Test Procedure	

2. The subject item is manufactured by under contract number DA 23-195-AMC-00397, a copy of which is furnished herewith. Test item should arrive at test site about April 1967.

3. REQUEST THAT AN ESTIMATE BE MADE ON EXPEDITED TESTING AS SUBJECT ITEM HAS BEEN ASSIGNED AN 02 PRIORITY AND IS IN SUPPORT OF SEA REQUIREMENTS.

4. If testing could be further expedited by utilizing more test units than stated above, base time and cost estimate on increased number of units.

5. It is requested that your office also include a time and cost estimate for conducting any other tests which are deemed necessary to ensure compliance with the provisions of AMCR 700-34.

6. An interim report upon conclusion of all tests specified in the contract will be required whenever additional testing has been authorized.

7. Request all estimates be furnished this Directorate by COB 15 Dec 66.

4 NOV 1966

AMSME-QX
SUBJECT: Request Time and Cost Estimate: 9000 BTU/HR Air Conditioner; Columbia Specialty Company, DA 23-195-AMC-00397(T)

8. Reports will be sent to:

a. USAMEC, ATTN: AMSME-QX, as follows:

(1) Equipment Failure Reports - 8 copies.

(2) Interim Reports - 8 copies.

(3) Final Reports - 8 copies.

b. USAERDL, ATTN: SMEFB-CO, as follows:

(1) Equipment Failure Reports - 4 copies.

(2) Interim Reports - 4 copies.

(3) Final Reports - 4 copies.

c. USATECOM will make distribution to all other interested activities.

9. Request this Directorate be notified upon receipt of test item at your command.

FOR THE COMMANDER:

Leo W. Belleville

LEO W. BELLEVILLE
Acting Chief, Plans and Programs Office
Directorate of Quality Assurance

3 Incl w/d
1. DA 23-195-AMC-00397(T)
2. SMEFB-RDE-KC, Test Procedure
3. MIL-A-14372A (MD) (To be forwarded under separate cover)

AMSTE-GE (28 Oct 68) 1st Ind
SUBJECT: Time and Cost Estimate for Additional Tests for Initial Production Test of Air Conditioner, 9000 BTU/HR, USATECOM Project No. 7-3-0026-11

Headquarters, U. S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md. 21005 6 NOV 1968

TO: Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-QRT, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120

1. This headquarters concurs in the number and types of subtests recommended in the basic letter, and in the cost estimate for the recommended scope of testing.

2. The subject air conditioner is an urgently needed item in the field, and is included in the Overseas Accountability, Secondary Items System (OASIS), for status monitoring. An expedited review of the plan of test inclosed in the basic letter is requested.

3. Funds presently on hand will allow testing to proceed, pending USAMECOM approval and appropriation of the additional funds requested.

FOR THE COMMANDER:

Quellen D. Boller
QUELLEN D. BOLLER
Colonel, GS
Dir, GE Mat Test Dir

14 Incls w/d
nc

Copies furnished: (w/o incls)
~~LOO~~, APG, ATTN: STEAP-CO-P
CO, APG, ATTN: STEAP-MT-TF

COPY/bm

DEPARTMENT OF THE ARMY
ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005

Mr. Mohlhenrich/jc/895-3350-4287

STEAP-MT-TF

28 OCT 1968

SUBJECT: Time and Cost Estimate for Additional Tests for Initial Production Test of Air Conditioner, 9000 BTU/HR, USATECOM Project No. 7-3-0026-11

Commanding General
U. S. Army Test and Evaluation Command
ATTN: AMSTE-GE

1. References:

a. Letter, STEAP-DS-TF, 20 Jan 67, subject: "Time and Cost Estimate for Initial Production Test of Air Conditioner, 9000 BTU/HR, DA 23-195-AMC-00397(T), USATECOM Project No. 7-3-0026-11".

b. 1st Ind from AMSTE-GE, 11 Dec 67, to letter, SMEFB-RDE-KC, 22 Nov 67, subject: "Air Conditioner, 9,000 BTU/HR, Contract No. DA 23-195-AMC-00397(T), USATECOM Project No. 7-3-0026-11".

c. Telecon between Mr. B. L. Sove, STEAP-MT-TF, and Mr. William O'Connor, AMSTE-GE, 8 Oct 68, subject: "IPT of 9,000 BTU/HR Air Conditioner, DA 23-195-AMC-00397(T), USATECOM Project No. 7-3-0026-11".

2. Reference 1a describes testing which is already planned. Funds have been received in an amount of $5,000.

3. Reference 1c requested a re-evaluation of the testing already recommended in reference 1a.

4. Due to the problems encountered in the Pre-Production Test which was inclosed with reference 1a and due to the increased emphasis on AMCR 700-34, additional tests are deemed necessary in order to issue a recommendation on suitability for issue.

5. The inclosed Test Outline shows a complete list of tests to be performed on the two subject units now on hand. Additional tests now being recommended are 9, 10, 11 and 13 thru 20. The tests will tentatively be performed on the two units as shown. It may expedite the testing to deviate from the sequence shown, to solve scheduling problems; however, the sequences delineated in notes 1 through 5 of the Test Outline will be adhered to.

COPY/bm

28 OCT 1968

STEAP-MT-TF
SUBJECT: Time and Cost Estimate for Additional Tests for Initial Production Test of Air Conditioner, 9000 BTU/HR, USATECOM Project No. 7-3-0026-11

6. It is estimated that 7 months and $23,000 will be needed to complete the full Test Outline. This means an additional $18,000 in funding will be necessary.

7. Inclosed are Air Conditioner Test Procedures 1 through 13. Many of these are referred to in the Test Outline. It is expected that future recommendations for additional tests by this agency will refer to these procedures. Your comments on these procedures are therefore invited.

8. Funds for this program should be forwarded to Commanding Officer, Aberdeen Proving Ground, ATTN: STEAP-CO, Aberdeen Proving Ground, Maryland 21005.

FOR THE COMMANDER:

/s/ R. P. Witt
/t/ R. P. WITT
Associate Director
Materiel Test Directorate
(formerly Development and Proof Services)

14 Incls w/d
as

APPENDIX V - REFERENCES

1. First Ind from AMSTE-GE, 11 December 1967, to letter, SMEFB-RDE-KC, 22 November 1967, Air Conditioner, 9000 Btu/Hr, Contract No. DA 23-195-AMC-00397(T), USATECOM Project No. 7-3-0026-11.

2. Letter, STEAP-MT-TF, 28 October 1968, Time and Cost Estimate for Additional Tests for Initial Production Test of Air Conditioner, 9000 Btu/Hr, USATECOM Project No. 7-3-0026-11.

3. Method of Testing for Rating Room Air Conditioners, ASHRAE Standard 16-61, 1 September 1961.

4. Report, Cooling-Capacity Test of A 9000 Btu/Hr Air Conditioner, Electrical Testing Laboratories, Inc, 16 January 1969.

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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Materiel Test Directorate
Aberdeen Proving Ground, Maryland 21005

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

3. REPORT TITLE

INITIAL PRODUCTION TEST OF AIR CONDITIONER, 9000 BTU PER HOUR

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final Report 15 October 1968 through 6 June 1969

5. AUTHOR(S) *(First name, middle initial, last name)*

James E. Baldwin

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August 1969

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APG-MT-3303

9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*

10. DISTRIBUTION STATEMENT

This document may be further distributed by any holder only with specific prior approval of Commanding General, US Army Mobility Equipment Command, ATTN: AMSME-QRT.

11. SUPPLEMENTARY NOTES

None

12. SPONSORING MILITARY ACTIVITY

USAMECOM

13. ABSTRACT

The initial production test of the 9000 Btu per hour air conditioner, model GAS 9000, was conducted at Aberdeen Proving Ground, Maryland from 15 October 1968 through 6 June 1969 to determine the ability of the test items to withstand environmental, transportation, durability, capacity, and radio-frequency tests. The results showed three deficiencies. One unit exhibited a shock hazard at the power receptacle. Prior to the cooling-capacity test, the refrigerant line ruptured. This same portion of refrigerant line and two other portions of refrigerant line, plus a compressor mount broke during the vibration test. The shortcomings included a damper door which would not operate because the control knob was not connected. During operation, two units had refrigerant lines which vibrated loudly against the compressor and side louvers. During the rain test, water entered the van under the top front cover. The run capacitor was severely rusted during the humidity exposure. The evaporator-grill core separated from the grill frame on two units. Sand and dust penetrated the evaporator side during the sand and dust test. It was concluded that the units do not fully meet the requirements of the specification and it is recommended that the shortcomings and deficiencies be corrected.

DD FORM 1 NOV 65 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

Unclassified

Security Classification

Unclassified

Security Classification

14. KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Air conditioner, 9000 Btu per hour, Model GAS 9000						
Environmental tests						
Transportation tests						
Operation tests						
Specification performance						

END
9-69

Unclassified

Security Classification