

Specification no. ODC-VFJ/ARMY/MPV/Upgrade/01

Specification of Split type air conditioning system for MPV Upgrade (Army) dtd 27.04.2019

1. Scope:

Design, Installation, commissioning and providing split air conditioning system of capacity of 2.85 Ton/10KW for special vehicle having engine model HA57L165 BS-III engine with pulley and compressor of capacity 313cc with refrigerant R134a (required for AC as a whole job at VFJ for rugged applications. AC unit should be able to achieve air moisture conditions during all seasons using appropriate thermocouple/ thermostat in the passenger compartment. AC fitted has to satisfy the specification JSS: 55555. Layout of AC system is provided as Annexure-I.

2. Technical description of the AC system

- i. Compressor – capacity 313cc with refrigerant (CFC free) R134a (to be supplied along with engine manufacturer as AC kit), 24V, DC
- ii. Condenser 24V, DC with 2 no fans
- iii. Evaporator - 24V, DC with two blowers with air flow of min. 2000 cfm (Dimension of condenser and evaporator in maximum is attached as annexure II)

3. Temperature range to be maintained in the vehicle passenger compartment between 22°C to 26°C. Automatic Temperature and humidity control to be provided. For ambient temperature more than 45°C, the temperature difference between ambient and cabin will be min. 18°C. Relative humidity 65 to 75 %. When the outside temperature is below 10°C, the heating cable will maintain comfortable temperature inside the passenger cabin.

4. Evaporator will be placed near the rear door. It should have sufficient air flow capacity to provide early cooling up to driver compartment.

5. Material to be supply: -

- i. Supplier will supply condenser, evaporator & HP/LP switch along with other items required for successful commissioning in the vehicle as per attached layout.
- ii. Suction lines and discharge pipes of length 7.2 meters to be supplied along with the system.
- iii. Heating hose pipes (inlet & outlet) 2 nos. length 7.2 meters each of any standard specification.
- iv. Wiring: Complete wiring and switches as required to be supplied along the length of vehicle 7.5 meters and for fixing evaporator, condenser at rear end of vehicle on the roof.
- v. Supplier shall provide Schematic Wiring diagram, Installation drawings and Operation & Service Manuals with each set of AC.

6. AC charging

(19)

The firm should do the installation of AC on the vehicle and gas filling and charging will be done at VFJ. All necessary equipment will be brought by supplier.

7. Acceptance Criteria

- i. Supplier will provide performance test report for the performance of minimum 10KW as mentioned in Sl. No. 1-Scope.
- ii. The following tests are to be carried as type tests at firms' premises or at NABL Labs and a certificate to be issued to this effect for one in 50 numbers supplied.
 - a. Low temperature test to be carried out as per specification JSS:55555 (L2H). test procedure number 20 with test condition "J"
 - b. High temperature test to be carried out as per specification JSS:55555 (L2H) test procedure number 17 with test conditions "M"
 - c. Vibration test to be carried out as per specification JSS:55555 (L2H) Test procedure Number 28 with frequency range from 5 to 500 Hz
 - d. Bump test to be carried out as per specification JSS:55555 test procedure number 5 with 250 peak acceleration (m/Sq.Sec)
- iii. Functional test is to be carries out as Annexure-III

8. Inspection:

Inspection by GM/VFJ or his authorised representative.


9. General condition:

- i. The supplier will provide the guarantee for 2 years.
- ii. The firm should confirm about spare back up as and when required at the site wherever the vehicles are deployed.

10. Note: Supplier should provide break up cost for equipment, installation and fitment


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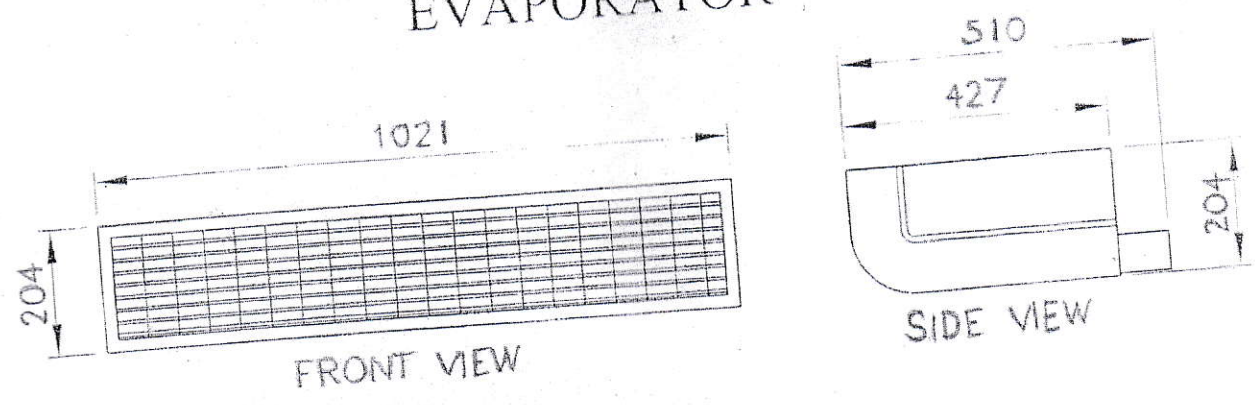
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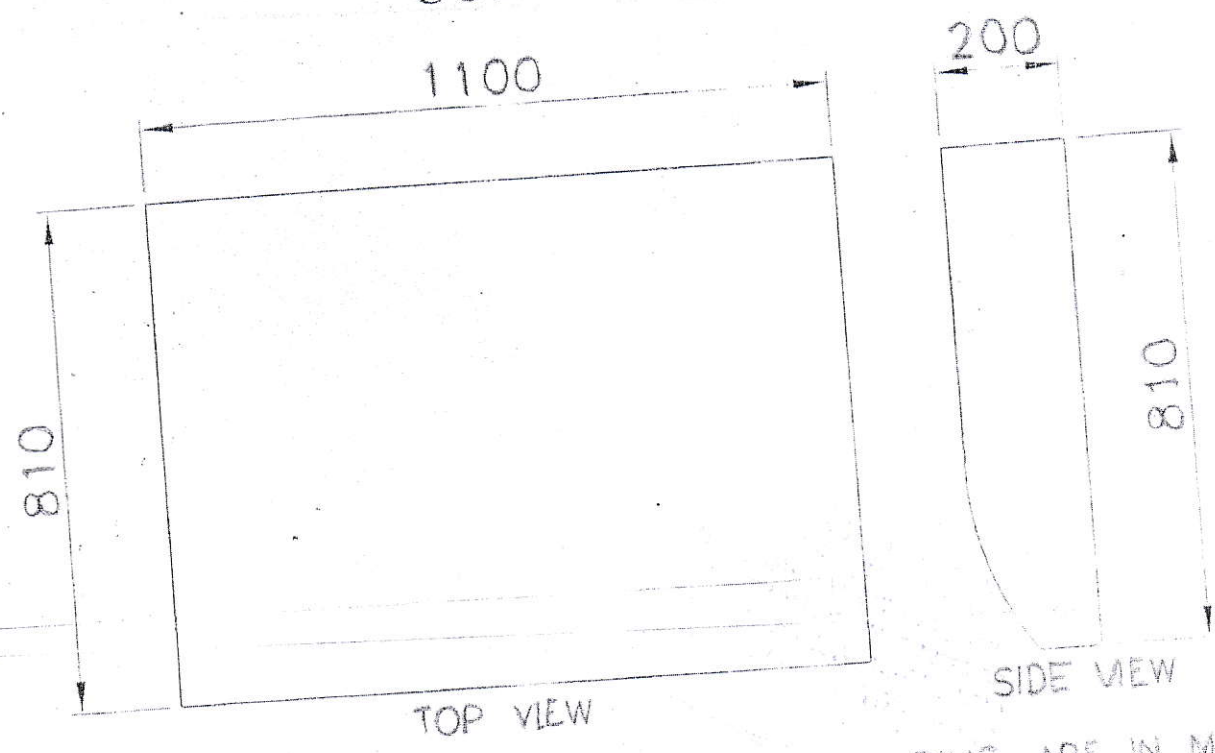
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AC dimensions

EVAPORATOR



CONDENSOR



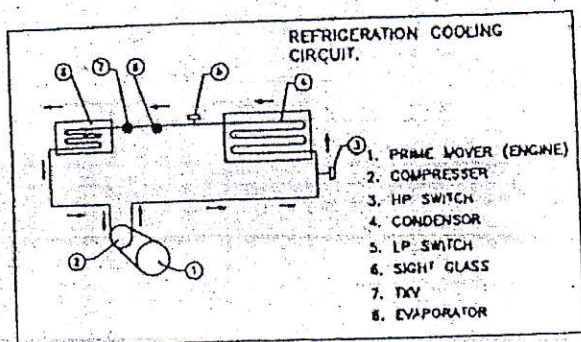
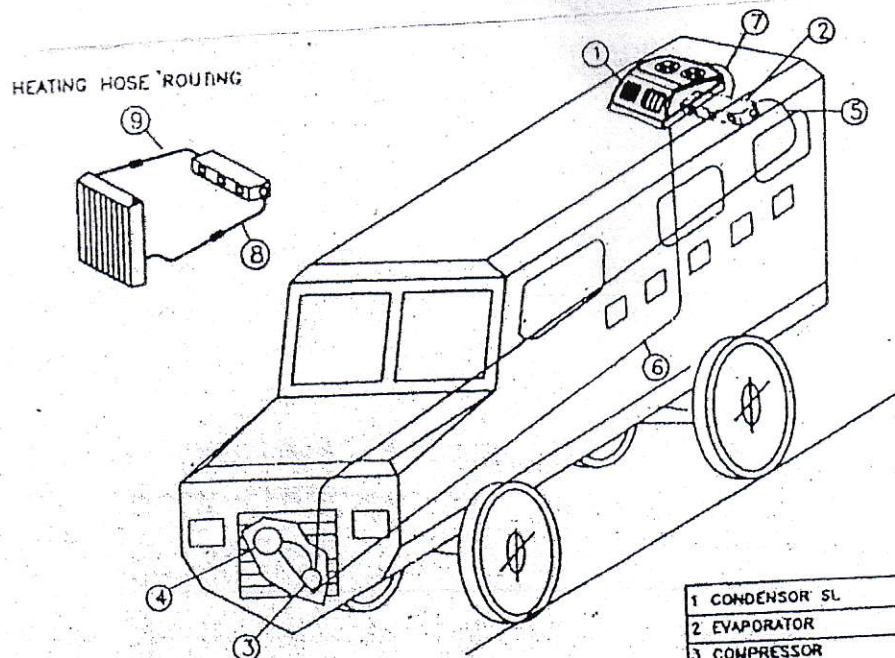
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Annexure-II

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AC Layout



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ACCEPTANCE TEST PROCEDURE
FOR CHECKING OF AC FUNCTIONAL TEST ON MINE PROTECTED VEHICLE
AND ITS VARIANTS IN PREVAILING AMBIENT CONDITIONS AT SITE
COVERING MAX & MIN TEMPERATURE CONDITIONS

Objective:

Following is the 'ATP' prescribed for testing and evaluation the AC system for MPV and its variants at the field level at VFJ/Field /Site as the ambient conditions will be varying through the year and the evaluation may to be carried out at the prevalent ambient conditions.

Test for cooling capacity performance in the prevalent ambient condition range of (21°C to 50°C)

Test to be carried out after bringing inside compartment temperature within the range of 22°C to 25°C by running the AC unit with the vehicle in static condition (However, in case of ambient temperature above 45°C the gradient to 18°C minimum difference between the ambient temperature and the temperature inside the compartment is allowed).

Measure the dry bulb and wet bulb temperature at return air grill temperature and supply air grill temperature at one-inch distance from the grill respectively, (Remove the duct pieces, if any, while measuring these)

Take the above mentioned temperature reading for every 5 minutes over a period 30 minutes.

Calculate cooling capacity in BTU / Hr using enthalpies and specific volume (plotting the same from the Psychometric Chart) and the designed rated air flow of evaporator. This will be called Measure Cooling Capacity.

Formula:

Measured cooling capacity in KCal/Hr -
$$\frac{(E1-E2) \times \text{Evaporator Air Flow @ in Cu mt/Hr}}{\text{Specific Volume}}$$

- * E1 - ENTHALPY (in kCal/Kg) of return air to the A.C.
- * E2 - ENTHALPY (in kCal/Kg) of supply air from the A.C.
- * @ - Evaporator air flow: Designed rated air flow in Cu mt/Hr

* # -

Specific volume of supply air plotted from psychometric Chart (copy enclosed) in Cu mt per Kg of dry air.

NOTE:

ENTHALPY (in kCal/Kg) is measured corresponding to the "WET BULB" temperature in Degree Centigrade from the table of "ENTHALPY" (copy enclosed). For practical calculation of cooling capacity: 1 Ton = 3000 KCal/Hr = 12000 BTU/Hr. The best cooling capacity observed in this way is to be selected for comparison. The same should be equal or more than the designed cooling capacity.


For example, in case of unit with designed cooling capacity of 1.5 TR, the above said "Measured Cooling Capacity" should be 1.5 TR (=18000 BTU/HR = 45000 Kcal/Hr) or more.

In case the measured cooling capacity is less than 1.5 TR (18000 BTU/HR=4500 KCal/Hr) the firms representative should be advised to rectify for confirmatory test purpose.

Encl : (a) Copy of Psychometric Chart

(b) Copy of "ENTHALPY" table.


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ENTHALPY CHART (IN K CAL/KG)

W.B.T (°C)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2.0	5.411	5.4617	5.5124	5.5631	5.6138	5.6645	5.7152	5.7659	5.8166	5.8673
3.0	5.518	5.5687	5.6194	5.6701	5.7208	5.7715	5.8222	5.8729	5.9236	5.9743
4.0	5.625	5.6755	5.7262	5.7769	5.8276	5.8783	5.9290	5.9797	6.0304	6.0811
5.0	5.732	5.7822	5.8329	5.8836	5.9343	5.9850	6.0357	6.0864	6.1371	6.1878
6.0	5.839	5.8892	5.9399	5.9906	6.0413	6.0920	6.1427	6.1934	6.2441	6.2948
7.0	5.946	5.9963	6.0470	6.0977	6.1484	6.1991	6.2498	6.3005	6.3512	6.4019
8.0	6.053	6.1030	6.1537	6.2044	6.2551	6.3058	6.3565	6.4072	6.4579	6.5086
9.0	6.160	6.2097	6.2604	6.3111	6.3618	6.4125	6.4632	6.5139	6.5646	6.6153
10.0	6.267	6.3168	6.3675	6.4182	6.4689	6.5196	6.5703	6.6210	6.6717	6.7224
11.0	6.374	6.4235	6.4742	6.5249	6.5756	6.6263	6.6770	6.7277	6.7784	6.8291
12.0	6.481	6.5302	6.5809	6.6316	6.6823	6.7330	6.7837	6.8344	6.8851	6.9358
13.0	6.588	6.6371	6.6878	6.7385	6.7892	6.8399	6.8906	6.9413	6.9920	7.0427
14.0	6.695	6.7438	6.7945	6.8452	6.8959	6.9466	6.9973	7.0480	7.0987	7.1494
15.0	6.802	6.8505	6.9012	6.9519	7.0026	7.0533	7.1040	7.1547	7.2054	7.2561
16.0	6.909	6.9572	7.0079	7.0586	7.1093	7.1600	7.2107	7.2614	7.3121	7.3628
17.0	7.016	7.0639	7.1146	7.1653	7.2160	7.2667	7.3174	7.3681	7.4188	7.4695
18.0	7.123	7.1706	7.2213	7.2720	7.3227	7.3734	7.4241	7.4748	7.5255	7.5762
19.0	7.230	7.2773	7.3280	7.3787	7.4294	7.4801	7.5308	7.5815	7.6322	7.6829
20.0	7.337	7.3840	7.4347	7.4854	7.5361	7.5868	7.6375	7.6882	7.7389	7.7896
21.0	7.444	7.4907	7.5414	7.5921	7.6428	7.6935	7.7442	7.7949	7.8456	7.8963
22.0	7.551	7.5974	7.6481	7.6988	7.7495	7.8002	7.8509	7.9016	7.9523	8.0030
23.0	7.658	7.7041	7.7548	7.8055	7.8562	7.9069	7.9576	8.0083	8.0590	8.1097
24.0	7.765	7.8108	7.8615	7.9122	7.9629	8.0136	8.0643	8.1150	8.1657	8.2164
25.0	7.872	7.9175	7.9682	8.0189	8.0696	8.1203	8.1710	8.2217	8.2724	8.3231
26.0	7.979	8.0242	8.0749	8.1256	8.1763	8.2270	8.2777	8.3284	8.3791	8.4298
27.0	8.086	8.1313	8.1820	8.2327	8.2834	8.3341	8.3848	8.4355	8.4862	8.5369
28.0	8.193	8.2380	8.2887	8.3394	8.3901	8.4408	8.4915	8.5422	8.5929	8.6436
29.0	8.300	8.3447	8.3954	8.4461	8.4968	8.5475	8.5982	8.6489	8.6996	8.7503
30.0	8.407	8.4518	8.5025	8.5532	8.6039	8.6546	8.7053	8.7560	8.8067	8.8574
31.0	8.514	8.5585	8.6092	8.6599	8.7106	8.7613	8.8120	8.8627	8.9134	8.9641
32.0	8.621	8.6652	8.7159	8.7666	8.8173	8.8680	8.9187	8.9694	9.0201	9.0708
33.0	8.728	8.7719	8.8226	8.8733	8.9240	8.9747	9.0254	9.0761	9.1268	9.1775
34.0	8.835	8.8786	8.9293	8.9800	9.0307	9.0814	9.1321	9.1828	9.2335	9.2842
35.0	8.942	8.9853	9.0360	9.0867	9.1374	9.1881	9.2388	9.2895	9.3402	9.3909
36.0	9.049	9.0920	9.1427	9.1934	9.2441	9.2948	9.3455	9.3962	9.4469	9.4976
37.0	9.156	9.1987	9.2494	9.3001	9.3508	9.4015	9.4522	9.5029	9.5536	9.6043
38.0	9.263	9.3054	9.3561	9.4068	9.4575	9.5082	9.5589	9.6096	9.6603	9.7110
39.0	9.370	9.4117	9.4624	9.5131	9.5638	9.6145	9.6652	9.7159	9.7666	9.8173
40.0	9.477	9.5184	9.5691	9.6198	9.6705	9.7212	9.7719	9.8226	9.8733	9.9240
41.0	9.584	9.6251	9.6758	9.7265	9.7772	9.8279	9.8786	9.9293	9.9800	10.0307
42.0	9.691	9.7318	9.7825	9.8332	9.8839	9.9346	9.9853	10.0360	10.0867	10.1374
43.0	9.798	9.8385	9.8892	9.9399	9.9906	10.0413	10.0920	10.1427	10.1934	10.2441
44.0	9.905	9.9452	9.9959	10.0466	10.0973	10.1480	10.1987	10.2494	10.3001	10.3508
45.0	10.012	10.0519	10.1026	10.1533	10.2040	10.2547	10.3054	10.3561	10.4068	10.4575
46.0	10.119	10.1586	10.2093	10.2599	10.3106	10.3613	10.4120	10.4627	10.5134	10.5641
47.0	10.226	10.2653	10.3160	10.3667	10.4174	10.4681	10.5188	10.5695	10.6202	10.6709

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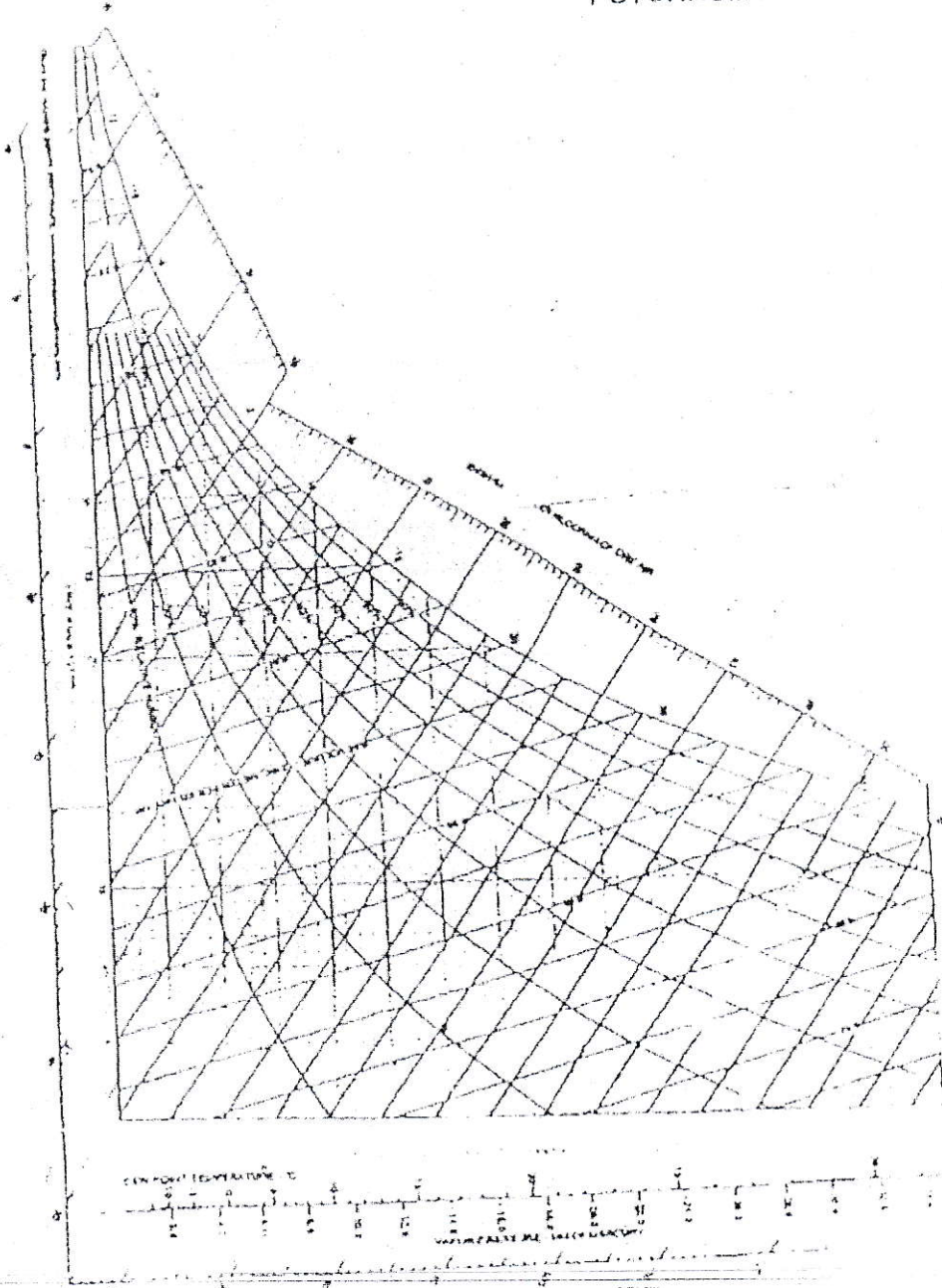
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PSYCHROMETRIC CHART



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