Cab & Cowl

Systems

DVC-10

The DVC-10 is an on-board computer based module. This module, using the program that has been loaded into it and a series of sensors, controls the following functions:

- Monitor the vehicle's load weight for each of the four quadrants monitored by pressure sensors.
- Display the load's relative center of gravity as measured by the pressure sensors.
- Interlock to low gear when the relative center of gravity, total load or the bed height is outside prescribed limits.
- Engage the contingency steering hydraulic pump if vehicle is in motion and engine power or hydraulic pressure is lost.
- Displays all and records some of the other operating variables as specified performance data, i.e. weight currently transported, mileage, ton miles, and operational profiles such as time, date and engine hours.
- The "Operations Mode" is intended for use when the Transporter is performing its normal function of material transport. The "Service Mode" should only be used by a knowledgeable service technician when the Transporter is out of service.

HVAC

Operation - Air Conditioning

The air conditioner is a RED DOT unit. All controls are located on the unit itself. Fan speed is controlled by the main selector switch and a 3 stage resistor.

When the thermostat knob is rotated, this activates the cooling circuit and the supply feeds through the safety pressure controls to a pair of relays; one for the condenser fans and the other for the clutch.

If the thermostat calls for cooling, and system pressures are within normal operating ranges, the clutch will be engaged and the condenser fans run.

Heating

Heating functions are performed by two seperate heaters located ahead of the front cab bulkhead, one on the left and one on the right. The heater on the left is used for floor heat and the heater on the right is connected to two ducts for winshield defrost. Heater air is recirculated.

At times it may be necessary to clear moisture from the windows. This is best done by running the air conditioning cooling and heating together. The cold evaporator coil condenses water vapor, while the heater warms the air that lowers its humidity, thereby increasing the rate of evaporation of condensate. There are two remote defrost fans (front and rear). The master switch, located on the right side dash switch panel, supplies power to both fans. Individual controls are located at the base of each fan.

Specifications

Evaporator Air Flow	430 CFM, 24 VDC
Heating	46,000 BTU/hr @150 ° water to air differential
Power Required	22.5 Amps @ 13.6V 4 amps for A/C Clutch
Cooling Capacity	33,000 BTU/hr with 36 °F refrigerant and 80 °F wet bulb entering air, air flow;
Refrigerant	R134A

Service

Although the system has been designed for industrial use, it still requires routine service. It will improve performance, reliability and life.

Routine Inspection

- Compressor, mount, drive, and bracket for alignment, tightness, belt tension.
- System for leaks.
- Mounting bolts for tightness.
- Fastening bolts for tightness.
- Any sign of malfunction.
- Motor brushes for signs of abnormal wear.
- Fans for tightness on shaft.
- Electrical connections for tightness.
- Hoses for signs of chafing or rubbing.

These are based on an “average” site conditions and may be adjusted according to duty, dust loadings, etc.

Daily Inspection

- Clean return air and pressurizer filters.
- Check over system for signs of any abnormality.

Monthly Inspection

- All daily services.
- Leak check.
- Flush out drains.
- Check seals.
- Flush out condenser area and coil.
- Check all connections.
- Check compressor mount, drive and bracket for alignment, tightness, and belt tension.
- Check hoses.

Quarterly Inspection

- All daily and monthly services.
- Check motor brushes and blow out motor.
- Replace pressurizer filter.
- Replace return air filter media.

Annual Inspection

This is probably best scheduled immediately prior to the cooling season.

- All daily, monthly, and quarterly checks.
- Replace compressor drive belt.
- Replace pressurizer motor.
- Replace receiver and solid core drier.

  Note: On 134a systems this is very important as the synthetic oils absorb far more moisture than the mineral oils used on R12 systems. Although refrigerant hoses should be barrier type, they still allow moisture to be absorbed into the system.

These filters can best be changed by “pumping the system down”. With the engine idling, close the valve in the liquid line between the condenser and receiver. Close the lid, and operate on cool until the system cuts out on “Low Pressure” (10 psi), and stays cut out. Open the evaporator cover and close the valve in the liquid line leading to the TX valve.

The refrigerant between the two valves should be all vapor. The filters can then be removed, replaced, and the short section between the valves evacuated, and then pressure charged with 134a.

There should be no need to add more refrigerant, and filter replacement can be done in a fraction of the time and cost than if the whole charge was lost.

- Check motor commutator and brushes and repair, or replace, as required. Condenser motors require particular attention as they are exposed, and if one fails it will cause operational problems with other areas. In most cases, it is cost effective to put 2 new motors in at the start of each year. Motors can typically have 1 brush change, and the second set of brushes will only last half the time of the first.
- Replace internal heater hoses.
- Thoroughly flush out evaporator and condenser coils and chambers.
- Check and replace cover seals if necessary.
- Check fan blades and replace if damaged.

Troubleshooting

Many of the problems can be diagnosed by tracking the power line throughout the system. Schematic 584813 is very simple.

Power comes in to a terminal and splits; one to the control switch, the other to condenser fan circuit breaker and clutch circuit breaker.

The switch has 3 positions; HIGH/MEDIUM/LOW. These leads go to the resistor and once power is supplied from the switch, the thermostat is also supplied.

Supply is taken from the speed resistor to the evaporator fan and pressurizer fan circuit breakers, then to the individual motors.

Fault finding is a process of elimination.

It is assumed that the mechanic understands the basics of air conditioning procedures and practices.

System Dead -Totally

- Check supply to RED terminal in return air plenum.
- Check ground.
- Check circuit breakers.

Fan Speed Problems

- Check power to W1 on Low, W1 & O1 on med., W1, O1, B1 on High.
- Check center tapping O1 makes contact with resistor. This may be adjusted to suit.

Intermittent Cooling

- Check thermostat; is it cycling correctly? Thermostat can be bypassed by bridging W1 to Y1.
- Check if it is cycling on high pressure or low pressure controls. Gauges will indicate which one. If suction cuts down to 10 psi; it is low side, if discharge gets to 350 psi it is high side.

If it is low pressure cut out check the following:

- Refrigerant charge, is there a full sightglass?
- Is there a blockage in the system? (e.g. - drier, TX valve) A blockage can sometimes be identified by a drop in temperature after the blockage.
- Are liquid line valves wide open?
- Is return air filter blocked?
- Is evaporator fan running? In right direction?

If it is high pressure check the following:

- Is condenser coil blocked? If so clean it.
- Are both fans running? In right direction?
- Is system overcharged? Full sightglass even after recovering some refrigerant.
- Are liquid line valves open?
- Is there a blockage in the liquid lines?
- Is there air in the system? Has system been opened and not evacuated properly?
- Are both condenser fan and clutch relays operating in unison? They are interchangeable and cycle on and off according to cooling.

Insufficient Cooling

At times performance may be less than expected, and the following should be checked:

- Charge, is there a full sightglass?
- Is the condenser area and coil clean?
- Is TX valve operating satisfactory?
- Is thermostat calling for cooling?
- Has tail of thermostat fallen out of coil, and coil is half blocked with ice? (Allows some air through, but at very high velocities and very little temperature drop)
- Does compressor have good pressure differential between high and low side at normal speed? Discharge should be 175-250 psi and suction 15-25 psi. If you get, for example, 125 discharge, 60 suction there could be a valve problem in the compressor or TX failure. The TX will be responsible if floodback (sweating) to the compressor, and noisy operation, and it would be the compressor if the system equalizes rapidly and is not absorbing much power.

Excessive Cooling

- Check that thermostat tail is inserted into coil and that thermostat cycles cooling. Isolate lead Y1 at terminal strip. Cooling should stop. If thermostat is the problem, it should be replaced.
- Check the operation of condenser fan and clutch relays. Contacts can become fused. This is identified by either the fans or clutch running continuously.

Recovery of Coolant

By Section 609 of the Clean Air Act, it is necessary to recover 134a from November 1995 in the USA. This will require dedicated equipment.

Notes on 134A Refrigerant

134A is a single molecule refrigerant and we have chosen it over blends for a number of reasons.

Firstly, it's properties do not change if the system has a leak as do blends due to fractionation and smaller molecules leaking out easier.

Secondly, most blends contain other refrigerants which are on the controlled substance list (e.g. - R12).

Thirdly, the level of expertise required with a blend is higher than a single molecule refrigerant.

It's temperature and pressure characteristics closely match R12. It is also "as safe" as R12. (Courtesy Du Pont)

Oils

Lubrication is the biggest problem and we have chosen to go with the Polyol Ester (POE) group rather than the Polyalkalene Glycols (PAG's) which the auto manufacturers use. The reasons are simply:

- POE is the only oil we use on conversions as PAG will fail when mixes with residual R12 and mineral oil.
- POE's do not absorb as much water (1200 ppm) as do PAG's (20,000 ppm=2%).
- POE's are the only oil used for 134A in semi-hermetic and full hermetic electric systems.
- POE's are more forgiving.