DETROITAIR

COMPRESSED AIR INNOVATION THROUGH TECHNOLOGY

Air Dryer

OPERATION MANUAL

DT-10AV TO DT-300AV AND
DT-125AV to DT- 400AV WITH TOUCH SCREEN CONTROLLER

GENERAL

This manual will help the user operate this equipment safely and correctly. Correct operation of this Air Dryer will reduce maintenance costs and extend the working life of all systems and parts in this unit.

Local law should be adhered to when importing, exporting, transporting, installing, running, and maintaining this machinery. It is up to the user to ensure proper adherence of local law.

General technical specifications and safety laws need to be adhered to when working with any machinery.

WARRANTY

Please make yourself familiar with this operating manual before operating the dryer system, otherwise your warranty may be void.

If this dryer is not used within the scope of its operating specification no claim against defect will be entertained.

The following will result in a void warranty:

- Operation beyond design specification.
- Improper maintenance of the unit or its pre/after filters.
- No pre/after filters installed.
- Usage of generic replacement parts not supplied by Detroit Air.
- Changing of the refrigerant gas.

This is a specialist piece of equipment and needs to be treated as such.

Safe Operation Specification

Operation regulations must be strictly obeyed.

Technical Modification

Detroit Air and its subsidiaries reserve the right to modify the dryer system in any way without prior notice.

CONTENTS

1. Installation Requirements

A: ***Standard requirement for this dryer:***
No ground bolts are needed, but the surface must be horizontal and solid and allow for the drainage system in the unit to function correctly.

B: The distance between the dryer and other machines or any wall, should not be less than one metre for efficient operation and maintenance.

C: The dryer must not to be installed outside of a building or in direct sunlight, rain, high temperature, badly ventilated areas, or in areas where heavy dust is present.

D: While installing, avoid excessively long pipes, too many elbows, and insufficient pipe diameters. All of these will contribute to excessive pressure drops.

E: At the inlet and outlet, bypass valves should be installed for easy maintenance of the unit.

F: Pay special attention to the power requirements of the dryer:

1. Rated voltage should be within ±5%.
2. Installers of electric cables should take into consideration the length and load the cable will have to sustain.

G: The cooling or cycling water must be clean with pressure not less than 0.15Mpa, and temperature not higher than 32^{o}C for water cooled models.

H: At the inlet of the dryer, a pre-filter is required to be equipped which may prevent solid impurities and oil from polluting aluminium or copper tube surfaces. Dirty air may affect heat-exchanging ability and can cause blockages.

I: The dryer should be installed following an after-cooler and pressure vessel in order to reduce the compressed air inlet temperature.

2. Maintenance Requirements for Refrigerated Type Dryers

It is vital to service and maintain the dryer to ensure efficient operation and long life.

A: ***Maintenance to the surface of the dryer:***

- The cabinet should be cleaned with a damp cloth or the like.
- Please check for rust and other water damage.
- Should the cabinet be rusting, apply a rust inhibitor.
- Do not clean the cabinet with a high-pressure water hose as electrical damage may occur.
- Use a paintbrush/airgun/hand broom (not wire brush) to clean the heat exchange unit/fan/electrical box.
- Never wet the electrical components.

B: ***Maintenance of the automatic drain system:***

- Operators should examine the water drainage system and remove dirt stuck to the filter mesh-work.
- Dirt build-up could prevent the drain from functioning correctly.

⚠ NOTE

ONLY SUDS OR CLEANING AGENTS MAY BE USED FOR CLEANING THE DRAIN-MESH. NO SOLVENTS OR FLAMMABLES SHOULD BE USED.

C: Supposing a manual drain valve is equipped, the user should drain at least twice every day at set intervals.

D: Use an airgun or paintbrush to clean dust from the condenser unit as dust build-up will cause inefficient operation.

E: ***Maintenance for water-cooled type filters:***

- The water filter will prevent solids from entering the condenser and guarantee good heat exchange.

  Ensure this filter is cleaned regularly to prevent slow water cycle and heat radiation.

F: ***Maintenance of internal parts:***

- Dust should be removed on a regular basis to extend the life of the machine.

G: The dryer should be shut down for servicing and maintenance.

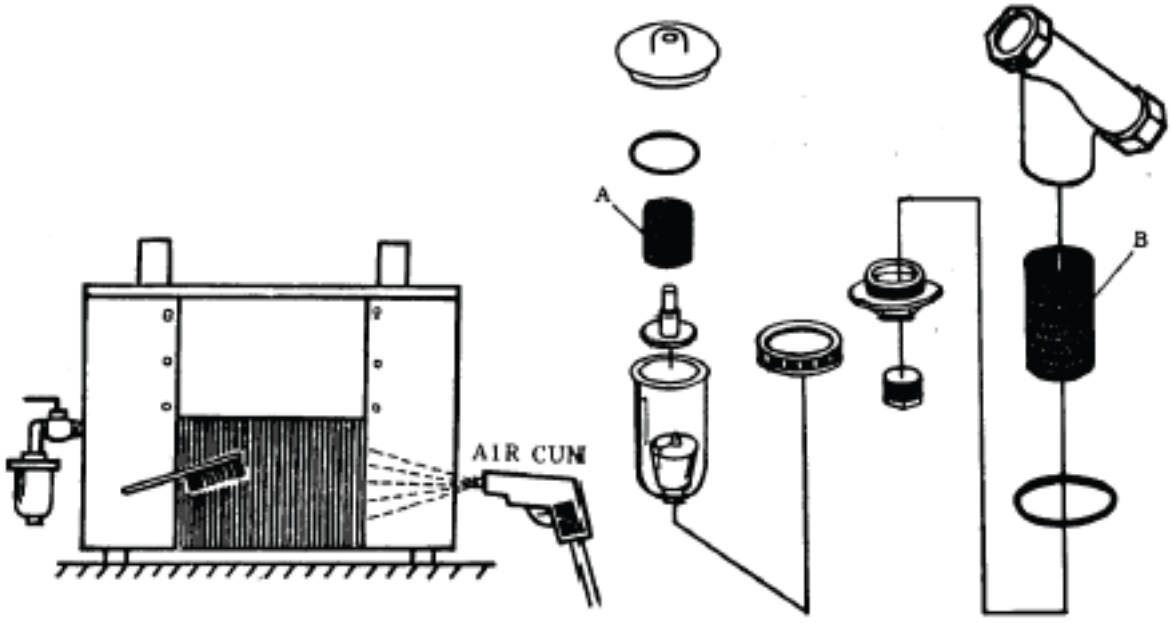


CHART 1 **CHART 2** **CHART 3**

CHART 1

- Cleaning illustration for the condenser.

CHART 2

- Critical cleaning points for the automatic drain:

CAUTION Gasoline, toluene, turpentine or other solvents are prohibited to perform this step.

CHART 3

- Water filter disassembly illustration.

3. Dryer Operation

3.1 Before Start-up

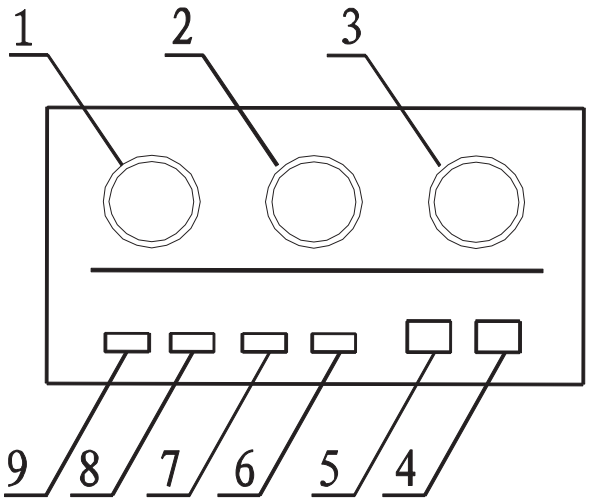
1. Ensure power voltage is normal; within 5% of the machine's requirements.

2. Check the refrigerant system: Watch the high and low pressure gauge on the refrigerator unit; it will reach a point where it will settle - it may fluctuate by ½ to 1Mpa temperature-dependent.

3. Check if the pipeline is as required: The inlet air pressure should not be higher than 1.6Mpa (except in some specific installation types) and its temperature should not be higher than the set value while selecting this type.

4. If water-cooled systems are used, the operator needs to ensure the water pressure requirements are met (0.14 to 0.4Mpa) as well as a temperature below 32^{0}C is maintained.

3.2 Operating Instructions



Instrument control panel specification
- Panels may vary from illustration

1. Low pressure gauge on the refrigerant (pressure dew point gauge), which will indicate saturated pressure value.
2. High-pressure gauge which will show condensation pressure value for the refrigerant.
3. Air outlet pressure gauge which will indicate the compressed air pressure value at outlet.
4. Stop button.
5. Start button.
6. Power indication light – Illuminated indicates power on.
7. Operation indication light (Run). When on, it indicates the dryer is running.
8. High/low pressure protection on/off indication light for refrigerator (Ref H.L.P). When illuminated the unit is in protection mode.
9. Indication light for Current Overload (O.C.TRIP). When illuminated, working current has exceeded current load limits dryer will shut down.

3.3 Operating Procedure of the Dryer

1. Switch on main power supply; the on/off and power indication light will be red on the power control panel.
2. If the water-cooled type is used, the inlet and outlet valves for cooling water should be open.
3. Push the green button (START). Operation indication light (Green) will be illuminated. The compressor will start running.
4. Check if the operation of the compressor is normal, i.e. check for error/protection lights and whether the high/low pressure gauge is reading correctly.
5. Assuming everything is normal, open the inlet and outlet valve; air will flow into the bypass valve. At this moment the air pressure indication gauge will show air outlet pressure.
6. Watch for 5-10 minutes to make sure that the treated air will meet requirements.
   The low-pressure gauge on the refrigerator indicates a pressure of 0.3-0.5Mpa., the high-pressure gauge will indicate 1.2-1.6Mpa, and the dew point gauge will show 2-10°C.
7. Ensure the auto drain is functioning correctly.
8. The air source should be shut off before shutting the dryer down. Open the drain valve and completely drain waste condensed water.

3.4 While in operation, take note of the following:

1. Prevent the dryer from running with no load.
2. Avoid starting and stopping the dryer within a short period of time as the refrigerant compressor may be damaged.

4. Troubleshooting

Dryer problems mainly exist in electrical circuits and refrigeration systems.

The results of these problems are:

1. System shutdown.
2. Reduction of cooling capacity or equipment damage.

To locate the problem correctly, and take practical measures, concerns theories of refrigerant and electrical backgrounds. Most problems are caused by lack of correct installation or maintenance. When a dryer unit gives problems, make sure to solve the actual cause of the problem and not just fix the result of the problem. A problem may cause multiple failures, so be sure to check for all possible damages and causes.

The common problems and fixes are as follows:

1. The dryer fails to start:

	PROBLEM		SOLUTION
A	No power supply or low voltage	A	Check power supply
B	Circuit fuse blown	B	Replace the fuse, check for short circuit
C	Wires disconnected	C	Find the disconnected wires and repair
D	Wires loose	D	Check that all wires and connectors tightly connect

2. The compressor fails to start:

	PROBLEM		SOLUTION
A	Dropped phase in power supply; improper voltage	A	Check power supply has proper voltage
B	Bad contact on the contactors	B	Replace contactor
C	High- and low-pressure (or voltage) protective switch problem	C	Regulate voltage switch set value, or replace damaged switch
D	Overheat or overload protection relay problem	D	Replace thermal or overload protector
E	Wires disconnected in control circuit terminals	E	Find disconnected terminals and reconnect
F	Mechanical trouble in the compressor, such as a jammed cylinder mechanical failure	F	Replace compressor
G	If the compressor is started using a capacitor, the capacitor could be damaged and will need to be replaced	G	Replace start capacitor

Troubleshooting (cont.)

3. The refrigerant pressure is too high and causes the pressure switch release; (REF H,L,P,TRIP) indicator goes on:

	PROBLEM		SOLUTION
A	The inlet air temperature is too high	A	Improve the heat exchange of after-cooler to lower the inlet air temperature
B	The heat exchange of air-cooled condensers is not sufficient; may be caused by insufficient cool water flow or bad ventilation	B	Clean pipes of condenser and water-cooling system and increase cool water cycling volume
C	Ambient temperature is too high	C	Improve ventilation; clean the heat exchanger
D	Overfilling of refrigerant	D	Discharge surplus refrigerant
E	Gas pollution in the refrigerating system	E	Vacuum the refrigerant system once more; fill refrigerant to correct pressure

4. The refrigerant low-pressure is too low and causes pressure switch release; (REF H,L,P,TRIP) indicator goes on:

	PROBLEM		SOLUTION
A	No compressed air flowing	A	Increase air consumption/flow.
B	Airflow is too little	B	Increase airflow and heat load.
C	The hot air bypass valve is not open or is faulty	C	Regulate hot air bypass valve, or replace bad valve
D	Insufficient refrigerant or leaking	D	Refill refrigerant or find leak. Repair and vacuum once more; refill with refrigerant

5. Operating current is exceeded, causing the compressor to overheat and the overheat relay releases; (O,C,TRIP) indicator goes on:

	PROBLEM		SOLUTION
A	Excessive air load; bad ventilation	A	Lower the heat load and inlet air temperature
B	High ambient temperature and bad ventilation	B	Improve ventilation conditions
C	Too much mechanical friction within the compressor	C	Replace lubrication grease in the compressor; or replace the compressor
D	Insufficient refrigerant causes high temperature	D	Fill refrigerant to proper pressure
E	Overload for the refrigerant compressor	E	Reduce start and stop times
F	Bad contact of main contactor set	F	Replace contractor set

Troubleshooting (cont.)

6. Water in the evaporator has frozen. Consequently, when the waste valve is opened, ice particles are blown out:

	PROBLEM		SOLUTION
A	Little airflow/ low heat load	A	Increase compressed airflow
B	The hot air bypass valve is not opened	B	Adjust hot air bypass valve
C	The inlet of the evaporator has been jammed and too much water has collected; ice-particles have formed and restrict airflow	C	Drain the auto-drain and completely drain the waste water into the condenser.

7. Dew point indication is too high:

	PROBLEM		SOLUTION
A	Inlet air temperature is too high	A	Improve heat radiation in the after cooler and lower inlet air temperature
B	Ambient temperature is too high	B	Lower ambient temperature
C	Bad heat exchange in air-cooled systems; the condenser is blocked; in water-cooled systems, water flow is not sufficient or the water temperature is too high	C	For air-cooled models, clean the condenser. For water-cooled models, remove the dirt on the condenser
D	Too much airflow but too low pressure	D	Improve air pressure
E	No airflow	E	Improve air consumption conditions for compressor

8. Excessive pressure drop in the compressed air output:

	PROBLEM		SOLUTION
A	Pipeline filter blocked	A	Clean or replace the filter
B	The pipeline valves have not been fully opened	B	Open all valves through which air must flow
C	Insufficient diameter of pipe OR too many elbows OR too long a pipeline	C	Correct airflow system
D	The condensed water has frozen and caused gas tubes in the evaporator to be blocked	D	Follow as mentioned above

Troubleshooting (cont.)

9. The dryer may run normally, but does not perform efficiently:

If the demands on the system change, it may cause problems and the dryer may need to be adjusted to correct the imbalance. If the flow rate exceeds the range in which the expansion valve operates, you will need to adjust the expansion valve manually.

When adjusting the valve, you should only turn it 1/4 - 1/2 turn at one time.

Check operation 10 – 20 minutes later. Adjust further only if necessary.
We know that the dryer a is complex system which consists of four main systems and many accessories that form part of a larger system. It is logical that if a problem arises, one needs to analyze and eliminate possible causes in each part of the system.

In addition, when repair or maintenance work is performed on the dryer, users must pay attention to prevent the refrigeration system from being damaged, especially damage to capillary tubes, otherwise refrigerant leaking may occur.

5. Technical Specification

Temperature display range	-20°C~100°C (The resolution is 0.1°C)
Power supply	220V±5% or 380V±5%
Temperature sensor	NTC R25=5kΩ,B(25/50)=3470K
Output contact capacity	3A/250VAC (pure resistive load)

6. Operating Guide DT-Series Dryer

6.1 Meaning of the Index Lights on the Panel

INDEX LIGHT	NAME	LIGHT	FLASHING
	Refrigeration	Refrigerating	Ready to refrigerate, in the state of compressor start delay procedure
	Fan	Fan in operation	-
	Defrost	Defrosting	-
	Alarm	-	Alarm state

6.2 Meaning of the LED Display

The alarm signal will alternately display temperature and a warning code. (A xx)

1. Press and hold the "▼" key to display the condensation temperature
2. Press and hold the "▲" button for 1 second to manually drain the water

TO CANCEL THE ALARM, RESTART THE CONTROLLER.

Display codes as follows:

CODE	MEANING	ILLUSTRATE
A11	External alarm	
A21	Dew point probe alarm	
A22	Condensation probe alarm	
A31	Dew point temperature alarm	
A32	Condensation temperature alarm	
A61	DC_PEAK (IPM protection)	A61-76 is an inverter alarm
A62	Compressor drive failure, start-up failure	
A63	Compressor overcurrent failure	
A64	Missing phase fault	
A65	Compressor current sampling is faulty	
A66	The heat-sink temperature is too high	
A67	Emergency shutdown (including high pressure alarms, PFC failures, EEPROM failures)	
A68	The DC voltage is too high	
A69	The DC voltage is too low	
A70	AC overvoltage and undervoltage	
A71	Input overcurrent	
A72	Input current sampling is faulty	
A73	DC fan failure	
A74	The temperature sensor is faulty	
A75	Phase-out fault (only for three-phase electricity supply)	
A76	Communication failure with the main controller	
A99	Maintenance time lapsed	

Parameter settings

Press the "M" button for 5 seconds to enter the parameter setting state. The parameter codes are shown in the table below:

CODE	PARAMETER	SETTING RANGE	FACTORY SETTING	UNIT	NOTES
F11	Dew point temperature alarm point	-20.0 -100	25.0	ºC	
F12	Condensation temperature alarm point	-20.0 -100	65.0	ºC	
F33	Drainage time	1 - 6	3	s	
F34	Drainage interval time	0.1 - 99.9	1.0	Min	
F42	Fan start temperature	-20.0 - 100	40.0	ºC	
F43	Fan stop return difference	0.5 - 10.0	1.0	ºC	
F60	Working mode	0 - 2	1	-	0: high efficiency 1: auto 2:Energy
F61	Dew point temperature setting	2.0 - 10.0	5.0	ºC	Works only in automatic mode (F60=1)
F82	Remote mode	Yes/No	Yes	-	
F83	Auto-restart	Yes/No	Yes	-	
F90	Display model and version number	-	-	-	

Manufacturer Parameters

Press and hold the "Set" + "Drain" buttons for 5 seconds to enter the manufacturer's parameter setting state. The parameter codes are shown in the following table:

CODE	PARAMETER	SETTING RANGE	FACTORY SETTING	UNIT	NOTES
F11	Dew point temperature alarm point	-20.0 -100	25.0	ºC	
F18	Dew point temperature correction	-20.0 - 20.0	0	ºC	
F19	Condensation temperature correction	-20.0 - 20.0	0	ºC	
F21	Compressor shutdown protection time	0 - 20.0	0.5	Min	Minimum downtime between two starts
F22	Compressor shutdown return time	0 - 20.0	1.0	Min	If the compressor runs at low speed before shutting down, it will run at high speed for a period of time before shutting down
F41	Fan mode	0 - 3	1	-	0: Turn off the fan 1: Condensation temperature control 2: Pressure Control 3: Follow the compressor
F48	The temperature at which the inverter cooling fan is turned on	0 - 120	40.0	ºC	
F49	Inverter cooling fan closes the difference	1.0 - 50.0	5.0	ºC	
F51	whether the machine shut down when dew point temperature alarm	0 - 1	0	-	0: No shutdown 1: Shutdown
F52	whether the machine shuts down when condensation temperature alarms	0 - 1	1	-	0: No shutdown 1: Shutdown
F53	High pressure alarm mode	0 - 1	1	-	0: normally open 1: normal close
F54	Low pressure alarm mode	0 - 1	1	-	0: normally open 1: normal close
F62	p-band	0.1 - 100	10.0	ºC	The error value that maximizes the output of the actuator
F63	Integral time	1.0 - 999	60.0	s	
F64	Derivative Time	0 - 999	10.0	s	
F90	Display model and version number	-	-	-	
F95	Testing compressor	-	-	-	
F98	Test input signal	-	-	-	
F99	Test relay	-	-	-	This function will sequentially actuation all relays, and online use is strictly prohibited

Operating Guide (cont.)

6.3 Temperature Display

After power-on self-test, the LED displays the dew point temperature value. When pressing on"T", it will display the temperature of the condenser. Releasing it will revert the display the dew point temperature.

6.4 Cumulative Working Hours Display

Pressing on the " ▲▼ " at the same time will display the compressors' accumulated operational time. Unit: hours.

6.5 Higher Level Functions

Press and hold"M"for 5 seconds to enter parameter settings. If command set is on, it will display the word"PAS"to input the command. Press " ▲▼ " to input the command. If the command is set, it will display the parameter code.

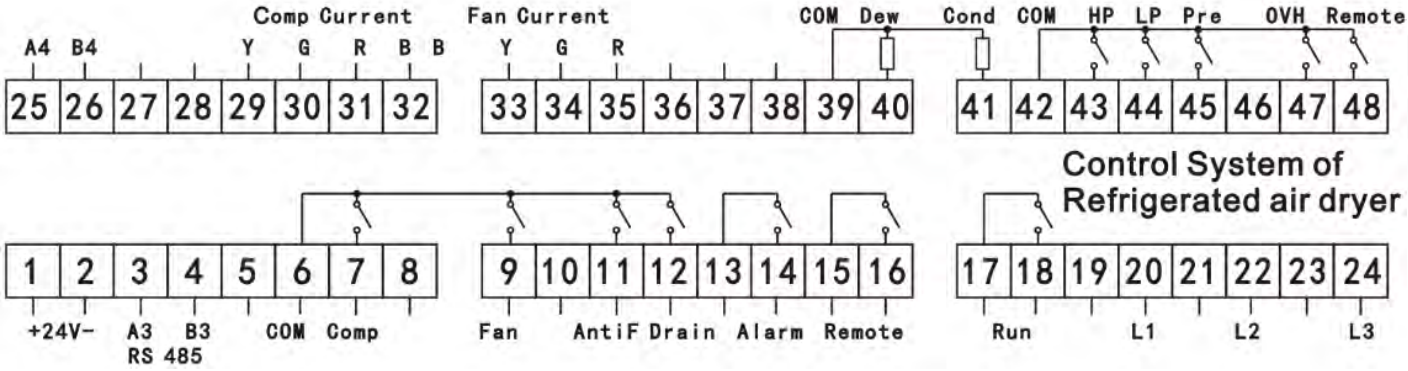
Parameter code as follows:

CATEGORY	CODE	PARAMETER NAME	SETTING RANGE	FACTORY SETTING	UNIT	REMARK
Temperature	F11	Dew point temperature warning point	10 - 45	20	°C	It will warn when the temperature is higher than the set value
	F12	Condensation temperature warning point	42 - 70	65	°C	
	F18	Dew point sensor amendment	-20.0 - 20.0	0.0	°C	Resolve dew point sensor error
	F19	Condensation sensor amendment	-20.0 - 20.0	0.0	°C	Resolve condensation sensor error
Compressor	F21	Sensor delay time	**0.0 - 10.0**	**1.0**	Minute	
Fan / Antifreezing	F31	Start defrost procedure temperature	**-5.0 - 10.0**	2.0	°C	It will start when the dew point temperature is lower than the set value
	F32	Antifreezing return difference	1 - 5	2.0	°C	It will stop when dew point temperature is higher than F31+F32. OFF
	F41	The second output mode	OFF 1 - 3	1	-	No fan 1. The fan is under the control of condensation temperature 2. Fan works with the compressor 3. Antifreezing output mode
	F42	Fan start temperature	32 - 55	42	°C	Fan will start when condensation temperature is higher than the set value; fan will stop when lower than set return difference
	F43	Fan stop temperature return difference	0.5 - 10.0	2.0	°C	

Operating Guide (cont.)

CATEGORY	CODE	PARAMETER NAME	SETTING RANGE	FACTORY SETTING	UNIT	REMARK
Alarm	F50	External alarm mode	0 - 4	4	-	0: without external alarm 1: always on, unlocked 2: always on, locked 3: always off, unlocked 4: always off, locked
	F51	**Response to dew point temperature alarm**	**0 - 1**	**0**	**-**	**0 : Only alarm, not shutdown** **1: Alarm and shutdown**
	F52	**Response to condensation temperature alarm**	**0 - 1**	**1**	**-**	**0 : Only alarm, not shutdown** **1: Alarm and shutdown**
System Menu	F80	Password	OFF 0001-9999	-	-	OFF means no password; 0000 System means clear password
	F83	**Switch machine state memory**	**YES - NO**	**YES**	-	-
	F85	Display the compressor accumulated operational time	-	-	Hour	-
	F86	Reset compressor accumulated operational time	NO - YES	NO	-	NO: not reset YES: reset
	F88	Reserved				
Testing	F98	Reserved				
	F99	Test-self	This function will activate all relays together; do not use it when the controller is running!			
	END	EXIT				

7. Controller wiring diagram



RS 485

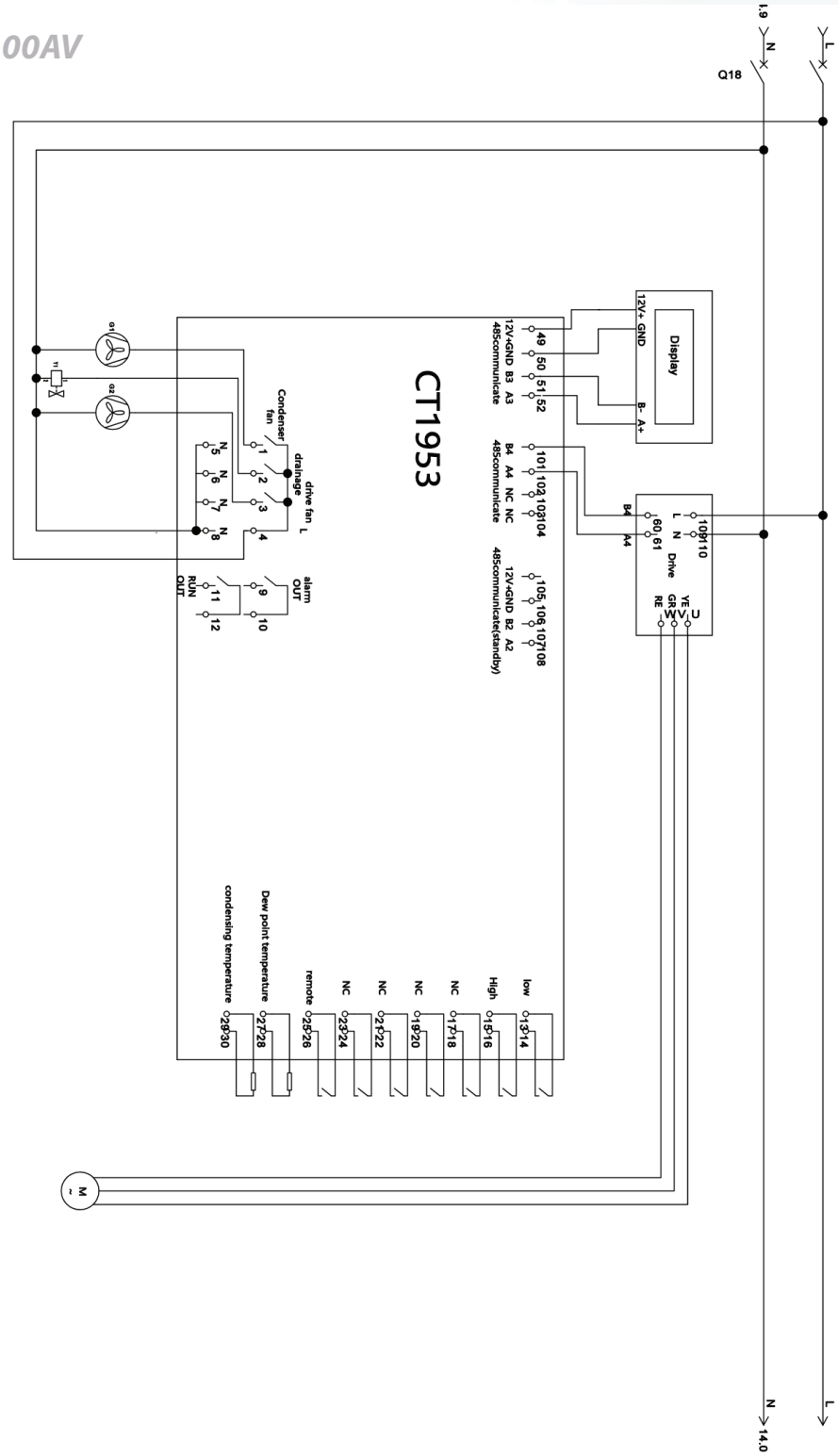
MODBUS	RTU
Slave ID	1
Baud	9.6kbps
Parity	None
Date	8
Stop	1

System	
41101	ON/OFF
	0 OFF 1 ON
41102	State
	0 OFF 1 Waitting 2 Running 3 Alarm
41110	Switch on/off
	Write "1" to switch on/off
Reset	
41120	Reset
	Write "1" to reset
Analogs	
30011/48011	Dew
30012/48012	Cond
48210	Comp average current
48214	Fan average current
Relays	
46001	Comp
46003	Fan
46005	Run
46006	Alarm
46007	Remote
46008	Antifreeze
46009	Drain

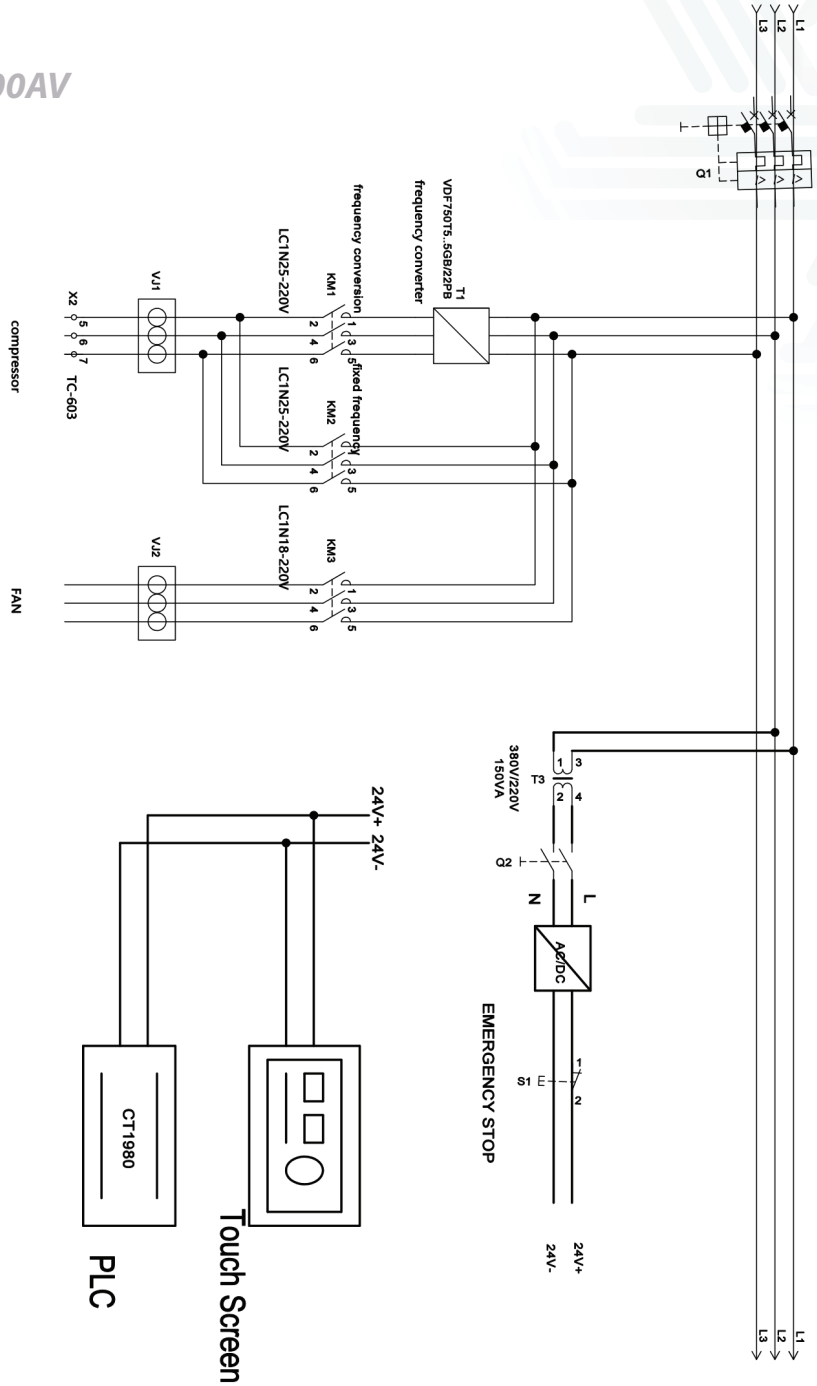
Switchs	
47013	HP
47014	LP
47015	Pre
47018	Remote
Alarms	
41121	Dew sensor alarm
41122	Cond sensor alarm
41123	H-pressure
41124	L-pressure
41125	Dew temp alarm
41126	Cond temp alarm
41129	Comp overload
41130	Comp phase loss
41133	Comp overheat
41135	Power phase loss
41136	Phase sequence alarm
41137	Fan overload
41138	Fan phase loss
41149	Parameter error

8. Wiring Diagram

8.1 DT-10AV~100AV



8.2 DT-125AV~400AV



8.3 Notes

- Please use the temperature sensor supplied by Detroit Air only.
- If the compressor motor power is less than 1.5HP, it can be directly controlled by an internal relay. Otherwise, it needs to be connected via an AC contactor.
- Fan load must not exceed more than 200W.