



DESIGNED & MANUFACTURED IN ITALY

By

NORTHERN FRIDGE

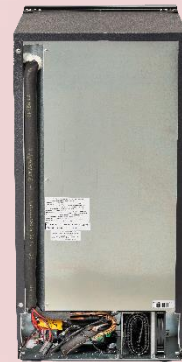


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1.0 GENERAL INFORMATION

1.1 Introduction

The *TF86DC* refrigerator has been designed and tested to give many years of performance and reliability. The 12/24 V power supply makes them especially versatile. The power source can either be a battery, a transformer or a photo-voltaic (Solar) panel. Provided with a totally watertight compressor, they offer a minimal power consumption and noise level. All the models are extremely easy to install. They can work even if they are assembled at a slant of up to 30°. In order to make sure that your *TF86DC* refrigerator works as efficiently as possible, please pay attention to the following general instructions:

- Never connect a battery charger directly to the refrigerator. A battery and in-line 15 amp fuse must be used to protect the compressor and Electronic Control Unit (ECU).
- Reduce opening the door of the refrigerator to reduce the waste of energy
- Proper ventilation of the compressor and of the condenser unit reduces the energy consumption and increases overall efficiency and performance.
- Ensure the wiring system of the vehicle is in proper condition. Routinely check the batteries and the charge level. Follow the instructions about the cable cross sections and the fuse connections strictly. See Section 3.5: *Wiring System: Function and Features* for details.
- Keep the inside of the refrigerator clean and dry. Remove any condensate water which might gather in the tray under the freezer compartment
- Keep the door of the refrigerator slightly open in order to air it out if you do not use it for a long time, for example in winter. (See 3.6 *TF86DC Door Assembly* for further details).

1.2 Notice

WARNING! Do not install the refrigerator near heat sources.

WARNING! Keep ventilation openings in the appliance enclosure or in the built-in structure, clear of obstruction.

WARNING! Do not use mechanical devices or other means to accelerate the defrosting process as this could damage the evaporator and result in leaks which are not covered under warranty.

WARNING! Do not damage the refrigerant circuit during handling.

WARNING! Do not use electrical appliances inside the food storage compartments of the appliance, unless they are of the type recommended by the manufacturer.

WARNING! Do not store explosive substances such as aerosol cans with a flammable propellant in this appliance.

WARNING! Risk of fire and electrical shock or fire.

WARNING! Do not let hot items to touch the plastic parts of the appliance.

WARNING! Do not store flammable gas and liquid in the appliance.

WARNING! Do not put flammable products or items that are wet with flammable products in, near or on the appliance.

WARNING! Do not touch the compressor or the condenser. They may be hot.

WARNING!

- The refrigerator is suitable for the preservation and/or storage of food items and maintaining already frozen food.
- Use the fridge exclusively for cooling and storing closed beverages and snacks.
- Food may only be stored in its original packaging or in suitable containers.
- The fridge is not intended to be brought into contact with food.
- The fridge is not intended for the proper storage of medicines.

2.0 COMPONENTS

2.1 Refrigeration System

Refer to 8.0 ILLUSTRATIONS: Figure 8.1 "TF86DC Parts Diagram".

2.1.1 Compressor

The TF86DC uses the new generation direct current Danfoss/Secop BD1.4F-VSD-HD Micro Variable Speed compressor that is specially designed for extraordinary performance at minimum power consumption, superbly silent-running, reliable operation even when tilted up to 30 degrees. The BD Micro series from Secop is 60% smaller than previous models and weighs in at only 2.3 kilograms.

The variable speed compressor minimizes compressor speed as input voltage varies to reduce power consumption. The BD1.4F-VSD-HD Heavy Duty can handle extreme vibrations.

(See 8.0 ILLUSTRATIONS: Figure 8.2: Danfoss/Secop BD1.4F-VSD-HD Specifications for complete details).

(See **WARNING** in 2.1.4: Evaporator).

2.1.2 Electronic Control Unit (ECU)

The Electronic control unit (ECU) of the compressor is a piece of electronic equipment which carries out all the controls and electrical protection of the compressor system. Its main features include;

- a) Protection of the battery with automatic turning off of the compressor when the feeding voltage reaches the minimum threshold (cut out) typically 10 volts. The compressor will start up automatically again when the voltage goes back to normal values (cut in). Typically 11 volts.
- b.) Thermal overload protection cut out. The compressor will shut down when temperatures exceed 125 deg F ambient to protect the compressor from overheating. It will cut in automatically when temperatures drop below this temperature.
- c.) Cooling fan operation will begin automatically when compressor starts and stop when compressor shuts off in normal operation.

The main functions of the 101N2100 ECU is to provide all controls for the BD1.4F-VSD-HD compressor systems including:

- Motor / Compressor speed control
- Condenser fan control including speed setting
- Battery protection functions

2.1.2.1 Replacing the ECU

The ECU can be simply removed and/or installed by removing a screw to release module for the side of the compressor to reveal the 3-pin plug that attaches the ECU to the compressor. Follow these simple steps;

Note. ECU and compressor shown in diagrams appear different than actual TF86DC ECU and compressor (For display purposes only) however the procedures is similar.

1. Disconnect all terminals (22) from the control ECU and, while doing so, mark them adequately, so as not to connect them wrongly during reassembly. See *Figure 2.1.2.1.1*
2. Unscrew the screw (23). See *Figure 2.1.2.1.2*.
3. Disconnect the connector (24) from the ECU, from the compressor (25). See *Figure 2.1.2.1.3*
4. Replace the damaged ECU by first assembling the left hand side and afterwards press the right hand side on the screw head on the bracket. In this way the ECU gets locked on the bracket and is securely fastened to the compressor.

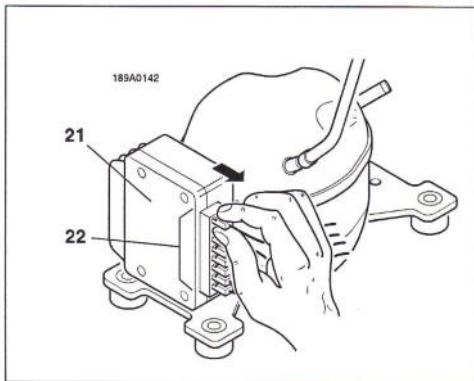


Figure 2.1.2.1.1

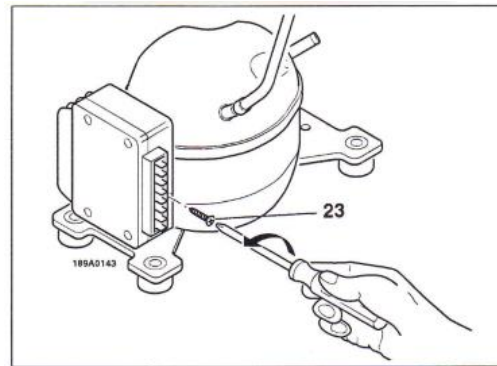


Figure 2.1.2.1.2

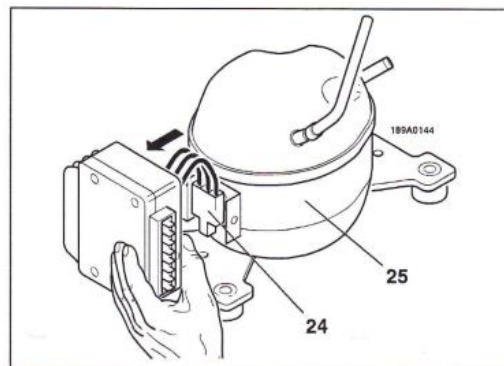


Figure 2.1.2.1.3

2.1.3 Condenser

The condenser may be of static or ventilated type. Since its function is to dissipate heat, it must be placed in a zone allowing for the maximum heat exchange with the environment and must not be clogged with dust or other substances preventing the exchange of heat. (See 3.4: *Ventilation*).

2.1.4 Evaporator

The evaporator is the element where the gas is expanded causing heat absorption thereby cooling the ambient air around it. The capillary pipe is an integral part of the evaporator that creates a narrow path for the gas causing a pressure difference between the circuit delivery and suction. If the capillary pipe gets obstructed, the entire evaporator must be replaced.

WARNING !!

DO NOT POWER ON THE FRIDGE FOR A MINIMUM OF 4 HOURS AFTER INSTALLATION

The compressor must normally stand in a vertical position. During shipping, the fridge may be turned on its side or upside down. This may cause the compressor oil to drain from the compressor into the capillary pipe thereby obstructing operation of the evaporator. You must allow time for the oil to drain back into the compressor for proper lubrication. FAILURE TO DO THIS MAY DAMAGE THE COMPRESSOR AND/OR EVAPORATOR AND VOID YOUR WARRANTY.

2.1.5 Thermostat

The TF86DC is provided with a manual thermostat located inside the refrigerator on the right side just below the freezer. Turn the knob clockwise to lower the temperature and turn it counter clockwise to raise the temperature and activate the ON-OFF switch in its end (0) position. In case of anomalies or fault, the thermostat cannot be repaired and must be replaced. See *Figure 2.1.5.1: TF86DC Thermostat.*



Figure 2.1.5.1: TF86DC Thermostat.

3.0 INSTALLATION

The refrigerators from TruckFridge are assembled to be installed in a standard factory cabinet. In some cases, if the truck was not equipped with a fridge from the truck factory, the cabinet may be slightly different and require a slight modification to install a fridge. Note any additional instructions included with the packing list when purchasing the fridge new. The fridge weight must always be sitting on its feet to support the weight. In some cases, a block may be needed under the bottom of the fridge to lift it off the floor of some cabinets to fill in gaps at the top. This allows air to enter the cabinet from the bottom. In other cases, a filler strip may be needed to make up gaps in the side of some truck cabinets that were not originally designed for fridge. (See *8.4 ILLUSTRATION: TF86DC Dimensional Diagram* for details).

Most models from TruckFridge can be installed by attaching the fridge installation trim frame to the trucks cabinet using the appropriate screws required for the material of the truck cabinet.

It is very important for the refrigerating unit, consisting of the compressor and the condenser, to be well ventilated, with the cool air coming in from the bottom and going out from the top. You must ensure proper ventilation of the refrigerating unit. The air inlets and outlets must have a free cross section of at least 10 square inches total. (See *8.0 ILLUSTRATIONS: Figure 8.5: TF86DC Ventilation Diagram* for details).

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Take great care when handling the fridge and avoid handling the refrigeration tubes in order to prevent breakages. The compressor must normally stand in a vertical position

WARNING !

If the fridge has been leaned over prior to installation, it must sit upright for at least 4 hours prior to connecting power and turning on. FAILURE TO ALLOW FRIDGE TO STAND UPRIGHT MAY DESTROY COMPRESSOR AND WILL VOID THE WARRANTY!

3.1 Installing the refrigerator with TF86FK Installation Kit.

The *TF86DC* is designed for built-in installation and can be fixed in place using the optional *TF86FK Installation Kit*. The *TF86FK* includes three flanges (two at the sides and one on top) and fixing screws. The side flanges are fixed to the refrigerator with 4 screws each, while the top flange is fixed with 3 screws. (See *Figure 3.1.1 "TF86DC Installation Diagram" below*).

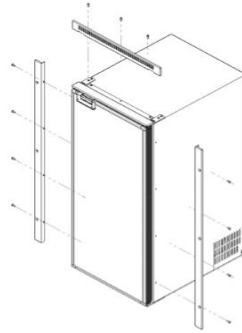


Figure 3.1.1: TF86FK Installation Diagram

3.2 Installing the refrigerator without TF86FK Installation Kit

Alternatively, the *TF86DC* may be installed without the use of the *TF86FK Installation Kit* following these instructions,

1. Build the cabinet as per the *TF86DC Line Diagram (8.0 ILLUSTRATIONS: Figure 8.4 TF86DC "Dimensional Diagram")* with at least $\frac{1}{4}$ " space on both the sides and top of the fridge.
2. Cut hole vents at the bottom/rear of both sides of the cabinet for ventilation.
3. Allow 1-2" at rear of cabinet for ventilation. Note. The better the ventilation the better the performance.
4. Use screws through the side walls of the cabinet and into the sides of the fridge to secure it in place.

WARNING

Screw cannot penetrate more than $\frac{1}{2}$ " into the sides of the fridge to avoid damage and void warranty.

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3.3 Installing the TF86DC refrigerator in the Freightliner “New” P4 Cascadia

The *TF86DC* can be installed in the Freightliner 2018+ P4 Cascadia using the OEM supplied base plate and two straps. Connect the 12VDC power using the *CPlug Extension Adapter Wire Harness* (Sold separately).

The *CPlug* is a 3' power adapter cable specifically designed for "New" P4 Cascadia installations where the *TF86DC* is being installed onto the OEM provided base plate behind the passenger seat. The *CPlug* extends the factory supplied "New" P4 Cascadia power connection under the bunk bed on the passenger end to the mounting plate behind the passenger seat. The *CPlug* is approximately 36 inches in length and consists of two (2) 12 gauge wires; Red (positive) and Black (negative). One end terminates in a female double spade Delph connector that connects to the *TF86DC* and the other end terminates in a male Delphi connector that connects to the "New" P4 Cascadia existing OEM connector under the bunk bed.

3.3.1 Installing the CPlug Extension Adapter Wire Harness for “new” Cascadia P4

Lift the bed, unplug the connector from the back of the outlet and connect to the Delphi connector end of the *CPlug* and run it along the under bunk wall and out at the rear of the platform to the *TF86DC* located behind the passenger seat.

3.4 Installing the TF86DC refrigerator in the Volvo

The *TF86DC* can be installed in the Volvo and/or can replace the existing Volvo OEM fridge.

NOTICE

The *TF86DC* does not include the OEM provided molded front panels or mounting hardware allowing for an OEM type installation. Tie down straps and hardware are provided by the customer. See "Fig 3.4: Volvo Installation Diagram".

Recommended installation using tie down strap like the FL Cascadia installation. Refer to "Figure 3.4: Volvo Installation Diagram" for details.

1. *Option 1.* Make a base plate (approximately 20" W x 24" D). Can be made of either plywood (3/4" thick) or metal (3/16" thick).
2. Drill a hole (size determined by what eye bolt/screw used) each side of the base plate to accommodate the "eye bolt or eye screw". See "Figure 3.4: Volvo Installation Diagram" for recommended measurements. Attach eye bolt/screw.
3. Screw or bolt the base plate securely to the floor of the truck.
4. Place the fridge on the base plate and secure to base plate eye bold/screws using aa adjustable strap.
5. *Option 2.* If not using a base plate the fridge can be secured directly to the floor of the truck using the appropriate eye bolts/screws and strap as described above.

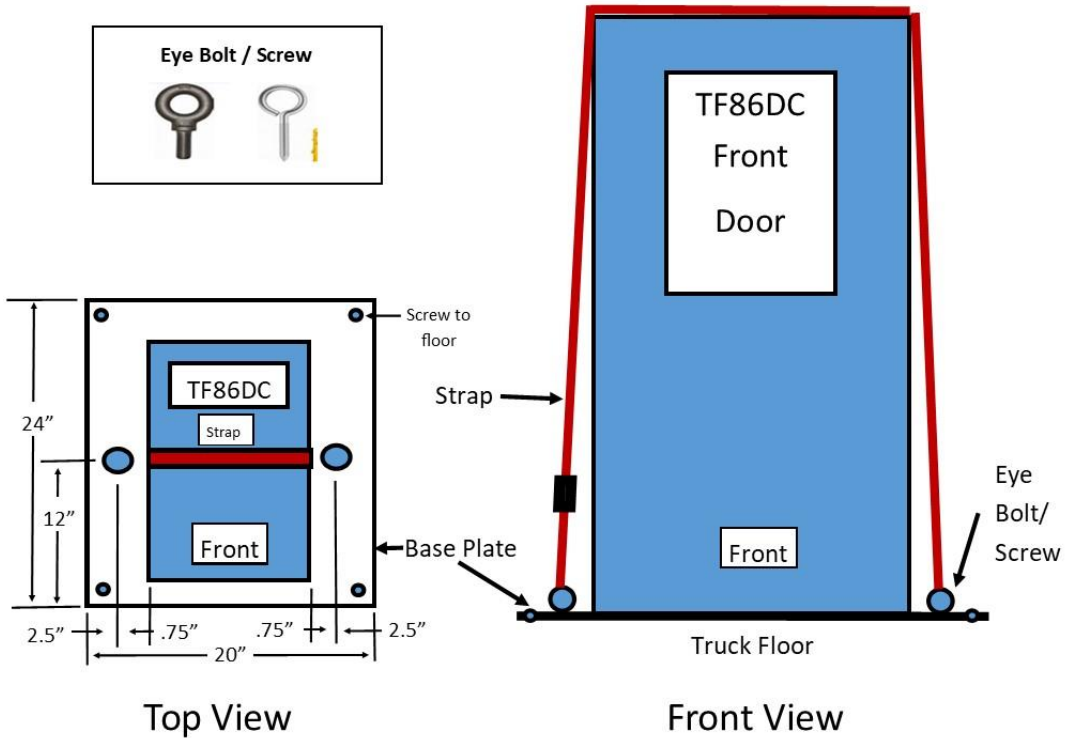


Figure 3.4: Volvo Installation Diagram

3.5 Ventilation

It is very important for the refrigerating unit, consisting of the compressor and the condenser to be well ventilated with adequate air flow into and out of the cabinet housing the refrigerator. (See 8.0 Illustrations: Figure 8.5 “TF86DC Ventilation Diagram” for details). Do not install the refrigerator near heat sources

3.6 Wiring System: Function and Features

The Electronic Control Unit (ECU) is a piece of electronic equipment which controls the motor of the compressor and carries out all the controls and electrical protection of the system. The ECU provides protection of the battery with automatic turning off of the compressor when the feeding voltage reaches the minimum threshold level (cut out). The compressor will start up automatically again when the voltage goes back to normal values (cut in). (See Table 3.5.1 “ECM Cut-Out / Cut-In Voltages”).

FEEDING	CUT IN	CUT OUT
12V	11.7V	10.4V
24V	22.6V	21.3V

Table 3.5.1: ECU Cut-Out / Cut-In Voltages

3.6.1 Wiring Connections

Typically, your TruckFridge will have the correct gauge wire and connector installed on the fridge to connect to the standard truck factory wiring. If the truck was not equipped with a fridge from the factory, the manufacturer would often connect the fridge wire to a 12v cigarette type receptacle. In these cases, unplug the connector from the rear of this receptacle and plug this into the connector on the fridge wires. NOTE: There are proper wire connectors available from TruckFridge for most truck wiring installations.

When you connect the refrigerator, you must remember the following:

- 1) Use cables having the proper cross section to make the feeding lines. If possible, such cables should be without any joints on the leads which could lead to voltage falls. (see "Table 3.6.1.1 "12VDC Wire Gauge Chart")

Cross-section (mm ²)	AWG Section	Max 12V Cable Length m/ft	Max 12V Cable Length m/ft
		BD1.4F / BD35F / BD50F	
2.5	13	2.5 / 8	5 / 16
4	11	4 / 13	8 / 26
6	9	6 / 19	12 / 39
10	7	10 / 33	20 / 66

Table 3.6.1.1: 12VDC Wire Gauge Chart

- 2) If the wiring system of the vehicle is insufficient or not properly sized for the refrigerator, we suggest you connect it directly to the battery. Note. The use of cables having an insufficient cross section may lead to the compressor stopping even when the battery is charged.
- 3) Any switches must have a breaking load not less than 20 A (10 A if powered at 24 Volt).
- 4) Make sure the polarity is right: connect the RED cable to the positive terminal (+) and the BLACK cable to the negative terminal (-).
- 5) For system protection, the fuse must be installed in the RED positive wires (+) as close as possible to the battery. We recommend using 15 A fuses for 12 V and 7.5 A fuses for 24 V. If using a main switch, it must be able to withstand a minimum current of 20 A. Avoid extra junctions in wiring to prevent voltage drops that can influence battery protection settings.

WARNING!

Never connect bare electric wire(s) and use only connectors of a size suitable to the cross section of the cable being used.

Never connect the refrigerator power to a cigarette lighter plug. Always connect directly to the battery.

3.7 TF86DC Door Assembly

The TF86DC “Click Lock” door has 3 shelves, replaceable front panel and reversible hinges.

The “Click Lock” door latch allows the door to be held open during defrosting and/or storage. Using a bunt instrument or coin, gently bend the “click lock” upwards slightly to protrude above door latch. (See Figure 3.7.1 “TF86DC Click Lock Door Latch”).



Figure 3.7.1: TF86DC Click Lock Door Latch

3.7.1 Replacing the Door Panel

You can replace the door panel without having to dismantle the door of the refrigerator, by proceeding as follows:

1. Take out the front two front screws (39) which hold the door latch in place and remove latch. Note. Do not need to remove the bottom screw.
2. Remove the profile strip which anchors the front panel located at the bottom of the door using a screwdriver as a lever. Gently remove the profile strip. See video at <https://www.northernfridge.ca/pages/door-panel-replacement>. Slide out door panel.
3. Slide in the new panel from the bottom, letting it slide up, and replace the profile strip.
4. Using a 5/64” drill, drill two new holes in the new front panel using the door latch to locate the position of holes. Drill approximately 1/2” deep.
5. Replace the door latch with front (2 x 7/8”) screw.

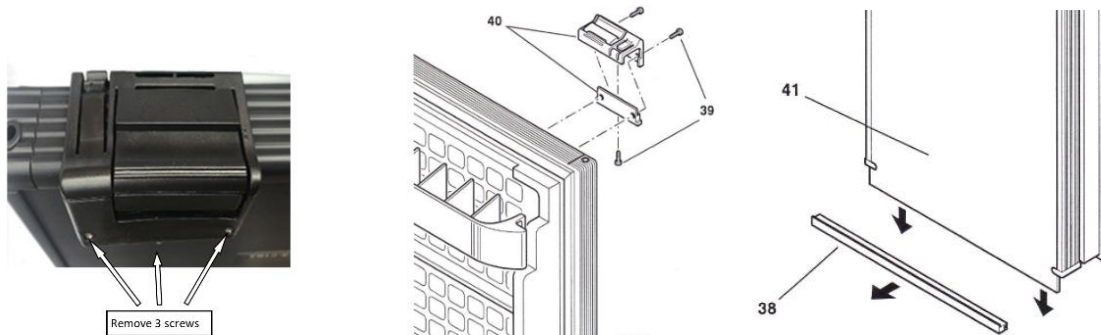


Figure 3.7.1.1: Replacing Door Panel

3.7.2 Reversing the Door Opening

The TF86DC door normally opens left to right. To change the side, move the door hinges and door latch as shown in *Figure 3.7.2.1 "Reversing Door Opening"*. Image of refrigerator shown is generic and not the TF86DC however the procedure is similar. Follow these instructions. (Time approximately 20 minutes)

Tools required include;

- 1- Electric drill
- 1- Robinson (star) screwdriver
- 1- 5/64" drill bit (door latch)
- 1 – 13/64 drill bit (Door assembly "pin" holes)

Procedure

WARNING

When replacing screws DO NO OVERTIGHTEN as you may strip the existing threaded hole. If screw will not tighten (ie. stripped), replace with #10x5/8 screw.

- 1 Before changing the door opening, verify that the door operates and latches correctly as is.
- 2 Remove (5-#8x5/8") screws and remove top flange.
- 3 Remove (4-#8x5/8") screws and remove top door "pinned" bracket/T1. Note. Has door pin.
- 4 Open door and lift up on door assembly to remove.
- 5 Remove (4-#8x5/8") screws and remove top door "flat" bracket/T2 on the opposite side. Note. Flat bracket with no pin. Move to the opposite side and refasten in place using (4-#8x5/8") screws.
- 6 Remove the two wire shelves and turn the fridge upside down.
- 7 Remove (4-#8x5/8") screws and remove bottom door "pinned" bracket/B1.
- 8 Remove (4-#8x5/8") screws and remove bottom door "flat" bracket/B2 on the opposite side. Note. Flat bracket with no pin. Refasten on opposite side using (4-#8x5/8") screws.
- 9 Refasten the bottom door "pinned" bracket/B1 in place on the opposite side using (4-#8x5/8") screws.
- 10 Using a 13/64" drill, drill top and bottom door "pin" holes deeper by approximately 3/4-1".
- 11 Reinstall the door assembly, bottom first, into the newly drilled bottom hole and then reinstall top door "pined" bracket/T1 into newly drilled hole and fasten bracket in place.
- 12 Remove (2 x 7/8") screws from front of door latch and slide door latch along door trim to opposite side, approximately 1.5" from side edge of door. Note. Do not need to remove the bottom screw.
- 13 Using a 5/64" drill, drill two new holes in front door panel using door latch to located position of holes. Replace 2-7/8" screws. Do not overtighten.
- 14 Reinstall top flange using (5-#8x5/8") screws.
- 15 Insert the 2 black plastic screw caps (supplied by Northern Fridge upon request) into the two exposed previously drilled holes in the front door panel that secured the door latch. Note. You can also replace the front panel with a new panel if you wish. See "3.6.1 - Replacing the Door Panel" for further details.
- 16 Replace the two wire shelves and test door for proper operation.
- 17 Contact Northern Fridge at support@northernfridge.ca or call (877) 322-7283 if you have any questions.

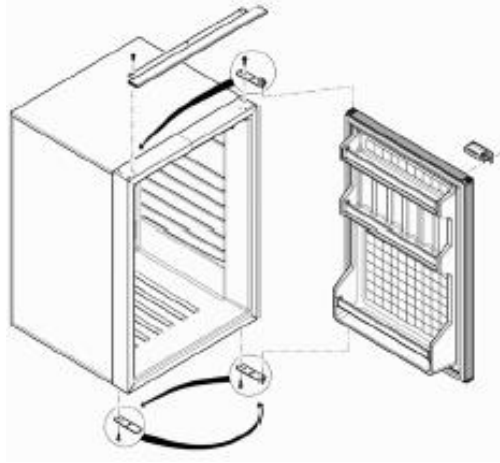


Figure 3.7.2.1: Reversing Door Opening

4.0 FEATURES

4.1 Setting the Inside Temperature

The *TF86DC* is provided with a manual thermostat. Turn it clockwise to lower the temperature and turn it counter-clockwise to raise the temperature and activate the ON-OFF switch in its end position. The knob of the thermostat is located inside the refrigerator. See *Figure 2.1.5.1 "TF86DC Thermostat"*.

4.2 Filling

Do not put hot food into the refrigerator. Place the products in a position where they do not hit each other or break while the vehicle is moving. Make sure the door is always well closed and reduce opening time to a minimum to reduce power consumption.

4.3 Defrosting

Defrosting is done manually and must be carried out when the ice layer is thicker than 3-4 mm (1/8"). Set the thermostat at the OFF (0) position. While defrosting, keep food and beverages in a cool place. Do not use any sharp metal object to remove the ice or frost. Do not start the refrigerator up again until it is completely defrosted and dry. Also empty the tray under the freezer compartment.

5.0 MAINTENANCE

The *TF86DC* is equipped with closed cooling system, which does not require maintenance or refrigerant refills. The compressor is of a domestic type, is highly efficient and has an extraordinarily long life. General maintenance consists simply of;

- Routinely cleaning the condenser from dust, at least once a year. Use a soft brush and no hard object.
- Regularly clean the inside and outside of the refrigerator using only warm water and a neutral detergent. Subsequent to washing, rinse with clean water and dry thoroughly using a soft cloth.
- Do not use the following: special glass and mirror cleaning products, liquid, powder, or spray detergents, alcohol, ammonia or abrasive products.
- If you are not using the refrigerator, we suggest cleaning it well inside and leaving the door ajar to ventilate the interior. To do, release the lock of the door using a coin or a small screwdriver. (See *Figure 3.6.1: TF86DC Click*

Lock Door Latch)

5.1 Useful Advise

1. If the *TF86DC* does not work properly, check the following before calling customer support;
 - a. Make sure power is not missing.
 - b. The voltage which reaches the ECU is equal to the one shown on the plate (minimum 11 volts, maximum 14 volts) .
 - c. The connections have the proper polarity and are secure.
 - d. The condenser fan is not jammed or obstructed.
 - e. The refrigerating unit is not near a source of heat.
 - f. The in-line fuse mounted on the feeding line is not blown.
2. Heavy frost buildup can be caused by several factors:
 - 1 Warm foods introduced into the freezer or fridge section.
 - 2 Fridge door frequently opened and closed (especially in a high humidity environment).
 - 3 Fridge door not properly aligned with fridge body as to affect the rubber seals ability to seal as designed.
 - 4 Failure of the putty seal between the back wall of the fridge and the evaporator tube. Would need to be examined and resealed with existing putty.
 - 5 Certain foods, mainly leafy vegetables, have a tendency to cause ice to form faster due to their high moisture content.

Note: If the ice builds up more than 1/8 inch on either side, it can interfere with the freezer door opening and shutting properly and can cause the freezer door to pop loose and reduces the ability of the fridge to cool properly and the fridge will need to be defrosted. It goes without saying, the fridge needs to defrost naturally by turning off power and opening the door.

WARNING !

The user needs to be reminded to not use ANY object to pry ice loose or to use any heat source to speed up the defrost process as damage will occur. Make sure the fridge is thoroughly dry inside before restarting and remove excess moisture from any food and/or food packaging.

6.0 TROUBLESHOOTING

6.1 Troubleshooting Guide

Use the troubleshooting guide below to determine the nature of the problem before calling Northern Fridge support.

Fault	Possible cause	Action
Fridge not cold, compressor will not start.	No power supply. Battery in poor condition. Faulty thermostat. Faulty electronic unit.	Check that power is present at electronic unit. Check fuse. Check polarity on connectors and cables. Bridge the thermostat over T-C, see wiring diagram. If compressor starts, this indicates a faulty thermostat. If the compressor does not start, this indicates a faulty electronic unit or compressor. Contact an authorized service agent. A possible leak in the cooling system, contact an authorized service agent.
Compressor makes only short start attempts.	Bad power supply, too low voltage or voltage drop at start attempts. Discharged batteries.	Check cables, terminals and other connections, possible verdigris or corrosion, Clean. Charge batteries, run the engine or connect a battery charger. Voltage must be kept above 11.0 V at start attempts.
Compressor runs but no refrigeration generated.	Loss of refrigerant. Leakage in pipes or evaporator. Pipes blocked.	Pressure and leak test. Check for pipe damages. Repair possible leak, evacuate and re-fill refrigerant. (All this to be made by refrigeration specialist).
Compressor runs long time but not generating enough cold.	Bad ventilation. Condenser too warm. Cooling fan not working Too much frost on evaporator. Door not closing well. Condenser blocked by dust.	Improve ventilation for compressor. Re-place fan. Defrost. Check/adjust door position and door seal. Clean condenser.
Fuse blows.	Wrong fuse size. Faulty electronic unit.	Check fuse, 15 A-12 V / 7,5 A-24 V Exchange electronic unit.

Figure 6.1.1: Troubleshooting Guide

6.2 Self-Diagnostics Procedure

LED (optional) *Figure 6.2: Electrical Schematic*

A 10mA light emitting diode (LED) (6) can be connected between the terminals + and D. In case the electronic unit records an operational error, the diode will flash a number of times. The number of flashes depends on what kind of operational error was recorded. Each flash will last ¼ second. After the actual number of flashes there will be a delay with no flashes, so that the sequence for each error recording is repeated every 4 seconds.

Diagnostic Procedure

1. Locate interior light connections (white connectors). See *Figure 6.2.2: TF86DC Interior Light Connection* below.
2. Disconnect the negative (-) black wire connector
3. Reconnect to terminal marked (D/I).
4. Observe the number of flashes of the interior LED light bulb.
5. See *Table 6.2.3: Error Code Chart* for error code description.
6. Disconnect from terminal “D/I” and reconnect black wire light connection (white connector).

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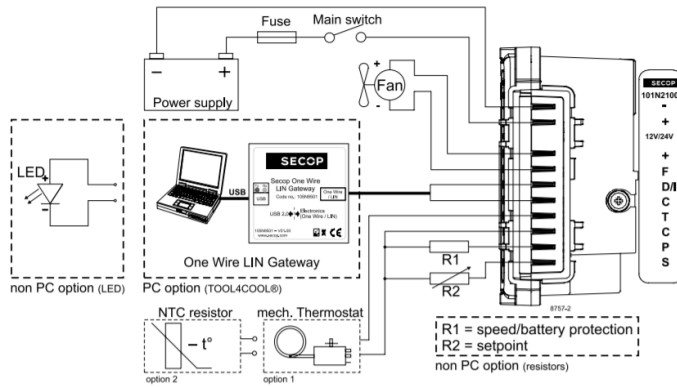


Figure 6.2.1: TF86 Electrical Schematic

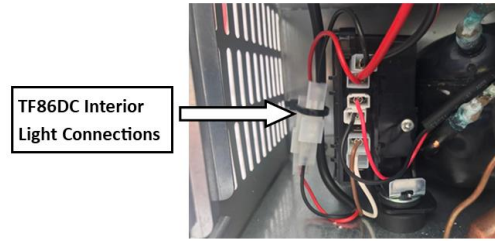


Figure 6.2.2: TF86 Interior Light Connection

No. of flashes	Error Type
5	Thermal cut-out of electronic unit (If the refrigeration system has been too heavily loaded, or if the ambient temperature is high, the electronic unit will run too hot).
4	Minimum motor speed error (If the refrigeration system is too heavily loaded, the motor cannot maintain minimum speed 1,850 rpm).
3	Motor start error (The rotor is blocked or the differential pressure in the refrigeration system is too high (>5 bar)).
2	Fan over-current cut-out (The fan loads the electronic unit with more than 1A peak).
1	Battery protection cut-out (The voltage is outside the cut-out setting)

Table 6.2.3: Error Code Chart

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6.3 Thermostat Test Procedure

If the thermostat is defective the refrigerator fan and compressor may not operate. To test the thermostat, jumper pins "T" and "C" using a jumper wire. (See 8.0 ILLUSTRATIONS: Figure 8.3.1 "101N2100 ECU Wiring Diagram" for details).

1. If the fan and compressor turn on, the thermostat is defective and must be replaced
2. If the fan and compressor do not turn on, contact Northern Fridge support for service.

7.0 SPECIFICATIONS

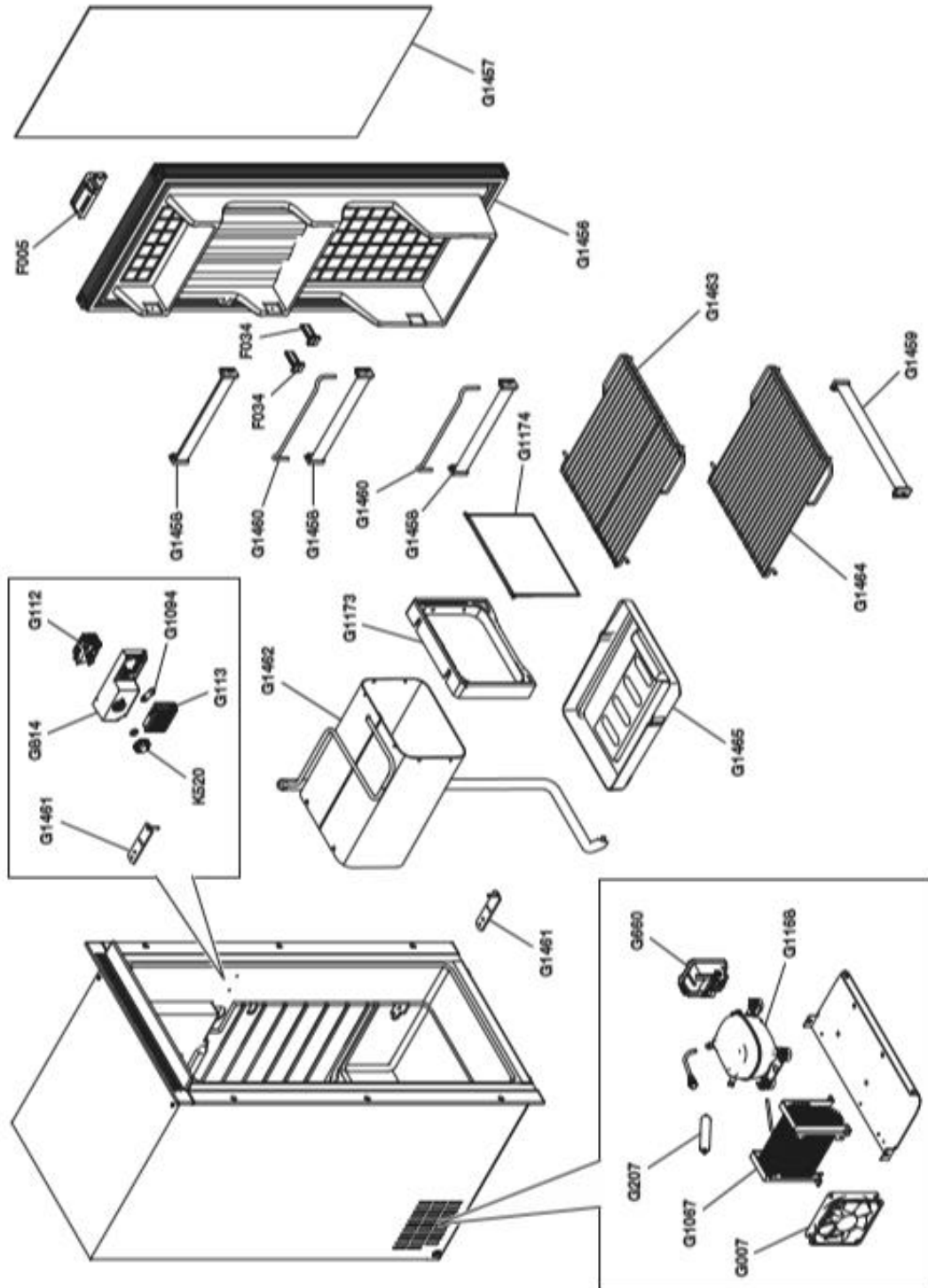
Description	TF86DC
Outside Dimensions (inches)	15"W x 34"H x 22"D
Inside Dimensions (inches)	
Fridge (Main)	12.5"W x 14.25"H x 17"D / 1.75 Cu.Ft.
Fridge (Lower/Step)	12.5"W x 5.25"H x 10.75"D / .43 Cu.Ft.
Freezer	9.5"W x 8.75"H x 17"D / .83 Cu.Ft.
Total Capacity	86 litre / 3.01 cu. ft.
Fridge (Upper/Lower)	63 Liter / 2.2
Freezer	23 Liter / .81
Nominal voltage	12-24Vdc
Nominal input power	60 watt/hour (5 amp/hour)
Average power consumption	45 Amps/24h. (1.9 amp/hour)
In-line fuse	15A (12VDC), 7.5A (24VDC)
Refrigerant	R134a
Temperature Range	+2°C to -7°C (35°F to 18°F)
Air cooling	Forced with fan
Standard Features	Interior light, adjustable thermostat, (2) wire shelves, (3) door shelves and low voltage cut-out.
Colour	Cabinet (Dark Grey); Door Panel (Dark Grey matt finish)
EMC conformity	Yes
Net weight (lbs)	55 lbs
Warranty	Two (2) year parts and labour

Note. If in doubt about the model for your truck, always confirm by measuring the height, width and depth of the cabinet opening before ordering.

Please note that models, prices, and availability is subject to change without obligation or notice.

8.0 ILLUSTRATIONS

Figure 8.1: TF86DC Parts Diagram



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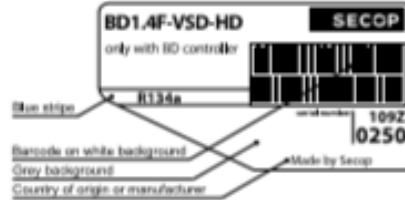
Figure 8.1.1: TF86DC Parts List/Description

INDEL B P/N	DESCRIPTION
F005	Handle
F034	Bottle Retainer
G007	Fan
G1067	Condenser
G1094	Lamp
G112	Thermostat
G113	Ceiling Light
G1168	Compressor
G1173	Evaporator Frame
G1174	Freezer Door
G1456	Door
G1457	Door Panel (black)
G1458	Bottle holder
G1459	Bottle holder
G1460	Metal Retainer
G1461	Hinge
G1462	Evaporator
G1463	Openable Grid
G1464	Grid
G1465	Drip Tray
G207	Filter
G660	ECU
G814	Box Light
K520	Thermostat Knob

Figure 8.2: Danfoss/Secop BD1.4F-VSD-HD Specifications



BD1.4F-VSD-HD Heavy Duty Direct Current Compressor R134a, 12-24V DC



General

Code number (without electronic unit)	109Z0250
Electronic unit - Variable Speed	101N2100, 30 pos: 101N2101
Approvals	-
Compressors on pallet	180

Application

Application	LBP/MBP/HBP
Evaporating temperature °C	-30 to 15
Voltage range VDC	9.6 - 17 / 19 - 34
Max. condensing temperature continuous (short) °C	80 (70)
Max. winding temperature continuous (short) °C	125 (135)

- S = Static cooling normally sufficient
- O = Oil cooling
- F₁ = Fan cooling 1.5 m/s (compressor compartment temperature equal to ambient temperature)
- F₂ = Fan cooling 3.0 m/s necessary
- SG = Suction gas cooling normally sufficient
- = not applicable in this area

Cooling requirements

Application	LBP	MBP	HBP
32°C	S	S	S
38°C	S	S	S
43°C	S	S	S

Remarks on application:
HD (Heavy Duty) version of the BD1.4F-VSD which can handle extreme vibrations.
 For more info please contact: mobile@secop.com.

Motor

Motor type	permanent magnet, brushless DC
Speed rpm	variable speed
Resistance, all 3 windings (25°C) mΩ	210

Design

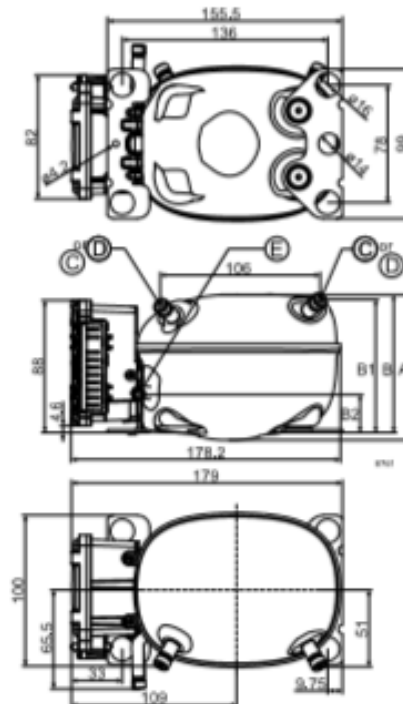
Displacement cm ³	1.41
Oil quantity (type) cm ³	75 (polyolester)
Maximum refrigerant charge g	150
Free gas volume in compressor cm ³	500
Weight - Compressor/Electronic unit kg	2.1/0.11

Standard battery protection settings (refer to 101N2100 Instructions for optional settings)

Voltage (0.1 steps)		Min. value	Default	Max. value
12V ± 0.3V DC, all values	Cut out VDC	9.6	10.4	17
	Cut In diff. VDC	0.5	1.3	10
24V ± 0.3V DC, all values	Cut out VDC	19	21.3	27
	Cut In diff. VDC	0.5	1.3	10

Dimensions

Height	mm	A	96.25
		B	91.25
		B1	88.00
		B2	25.20
Suction connector	location/I.D. mm angle	C	6.2 25°
	material comment		Cu-plated steel Al cap
Process connector	location/I.D. mm angle	D	6.2 25°
	material comment		Cu-plated steel Al cap
Discharge connector	location/I.D. mm angle	E	5.0 0°
	material comment		Cu-plated steel Al cap
Connector tolerance	I.D. mm		±0.09, on 5.0 +0.12/+0.20



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Capacity (EN 12800 Household/CECOMAF) 12V DC, static cooling watt

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		9	11	15	22	31	42	54	69	76	86	106
2,500	7	13	15	20	30	41	55	70	87	96	109	134
3,000	9	16	19	26	37	51	67	85	105	116	131	161
3,500	10	20	23	31	45	61	80	101	124	137	154	190
4,000	12	23	27	36	52	71	92	116	144	158	178	218

Capacity (A8HRAE LBP) 12V DC, static cooling watt

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		12	14	19	28	39	52	68	86	95	107	132
2,500	9	16	19	25	37	51	68	87	109	120	135	167
3,000	11	20	24	32	47	64	84	106	131	144	163	201
3,500	13	24	29	39	56	76	99	125	155	170	192	237
4,000	15	29	34	45	65	88	114	144	179	197	222	272

Power consumption 12V DC, static cooling watt

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		16	17	19	22	25	29	34	40	42	43	45
2,500	16	20	21	24	28	32	37	42	48	50	52	54
3,000	19	24	26	29	34	39	45	50	57	59	61	63
3,500	23	29	31	35	41	47	53	59	66	69	72	77
4,000	27	34	36	41	48	55	61	68	76	79	83	90

Current consumption (for 24V applications the following must be halved) A

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		1.25	1.33	1.48	1.74	2.02	2.32	2.65	2.74	2.85	3.00	3.28
2,500	1.25	1.53	1.63	1.83	2.15	2.48	2.84	3.22	3.69	3.84	4.00	4.20
3,000	1.49	1.84	1.96	2.20	2.59	2.98	3.40	3.82	4.38	4.56	4.77	5.09
3,500	1.77	2.19	2.34	2.63	3.07	3.53	4.00	4.47	5.06	5.26	5.51	5.89
4,000	2.08	2.58	2.75	3.08	3.59	4.10	4.63	5.16	5.87	6.07	6.31	6.63

COP (EN 12800 Household/CECOMAF) 12V DC, static cooling W/W

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		0.59	0.66	0.81	1.03	1.24	1.43	1.60	1.72	1.83	1.99	2.36
2,500	0.43	0.64	0.72	0.86	1.08	1.29	1.48	1.67	1.83	1.94	2.10	2.46
3,000	0.45	0.67	0.74	0.89	1.10	1.30	1.50	1.69	1.84	1.97	2.14	2.54
3,500	0.46	0.68	0.75	0.89	1.10	1.30	1.51	1.70	1.88	1.99	2.15	2.47
4,000	0.45	0.68	0.75	0.89	1.09	1.30	1.50	1.70	1.88	1.99	2.14	2.42

COP (A8HRAE LBP) 12V DC, static cooling W/W

rpm \ °C	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10	15
2,000		0.74	0.83	1.01	1.29	1.55	1.79	2.01	2.17	2.31	2.52	2.98
2,500	0.54	0.80	0.89	1.07	1.34	1.60	1.84	2.08	2.29	2.43	2.64	3.10
3,000	0.57	0.84	0.93	1.11	1.37	1.62	1.87	2.11	2.35	2.47	2.70	3.20
3,500	0.58	0.85	0.94	1.11	1.36	1.62	1.87	2.12	2.36	2.48	2.69	3.11
4,000	0.58	0.85	0.94	1.11	1.36	1.61	1.87	2.12	2.36	2.50	2.68	3.05

Operational errors (100L4C00L) or LbD flash/w

Error code or LbD flash/w	Error type
	Can be read out in the software (100L4C00L)
6	Thermostat failure (If the NTC thermostat is short-circuited or has no connection, the electronic unit will enter manual mode).
5	Thermal cut-out of electronic unit (If the refrigeration system has been too heavily loaded, or if the ambient temperature is high, the electronic unit will run too hot).
4	Minimum motor speed error (If the refrigeration system is too heavily loaded, the motor cannot maintain minimum speed at approximately 1,850 rpm).
3	Motor start error (The rotor is blocked or the differential pressure in the refrigeration system is too high (>5 bar)).
2	Fan over-current cut-out (The fan loads the electronic unit with more than 0.85A _{max}).
1	Battery protection cut-out (The voltage is outside the cut-out setting).

Wire Dimensions DC

Cable section (mm ²)	Size		Max. length* 12V operation		Max. length* 24V operation	
	AWG	[Gauge]	(m)	(ft.)	(m)	(ft.)
2.5	12		2.5	8	5	16
4	12		4	13	8	26
6	10		6	20	12	39
10	8		10	33	20	66

*Length between battery and electronic unit

Accessories for BD1.4F-V8D-HD	Code number
Bolt joint for one compressor	Ø: 18 mm 118-1917
Bolt joint in quantities	Ø: 18 mm 118-1915
Snap-on in quantities	Ø: 18 mm 118-1919
Terminal cover for electronic unit	105N9120
Automobile fuse	12V: 15A
DIN 7255	24V: 15A
Main switch	min. 20A
	Not deliverable from Secop

Test conditions	EN 12800 CECOMAF	A8HRAE LBP
Condensing temperature	55°C	54.4°C
Ambient temperature	32°C	32°C
Suction gas temperature	32°C	32°C
Liquid temperature	no subcooling	32°C

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Figure 8.3: 101N2100 ECU Specifications for BD1.4-VSD-HD

Name	Reference / Value / Standards
Type code	101N2100
IP class	IP Class 42
Humidity test passed according to	Static humidity according to IEC 60068-2-3
Damp heat	According to EN60068-2-30 test Db
Salt mist test passed according to	VW Standard VW 80101 dated 2009-03
Maximum Operating temperature	55 °C
Minimum Operating temperature	-10 °C
Storage temperature	- 40 °C to 90 °C
EMC approval/ conformity	According to 2004/104/EC
External fuse required	Max. 15 A Slow blow
Leakage current	3 mA
Fan output	5 W, nominal voltage 12 V <ul style="list-style-type: none"> • Use an approved fan with over/under-voltage protection • A 12V fan must also be used in 24V systems
NTC type to be connected	Epcos M800/5K
Input voltage	9.6 - 32 V DC
Starting Current	17 A @ 12 V DC
Current consumption under running conditions	Refer section 22

Figure 8.3.1: 101N2100 ECU Wiring Diagram

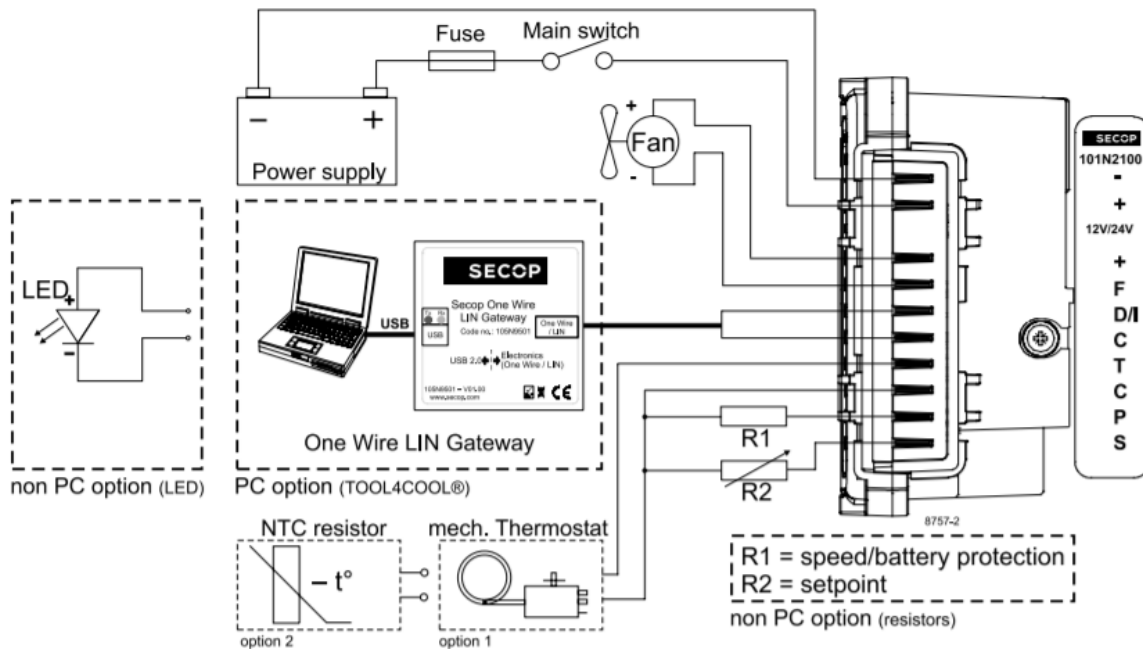


Figure 8.4: TF86DC Dimensional Diagram

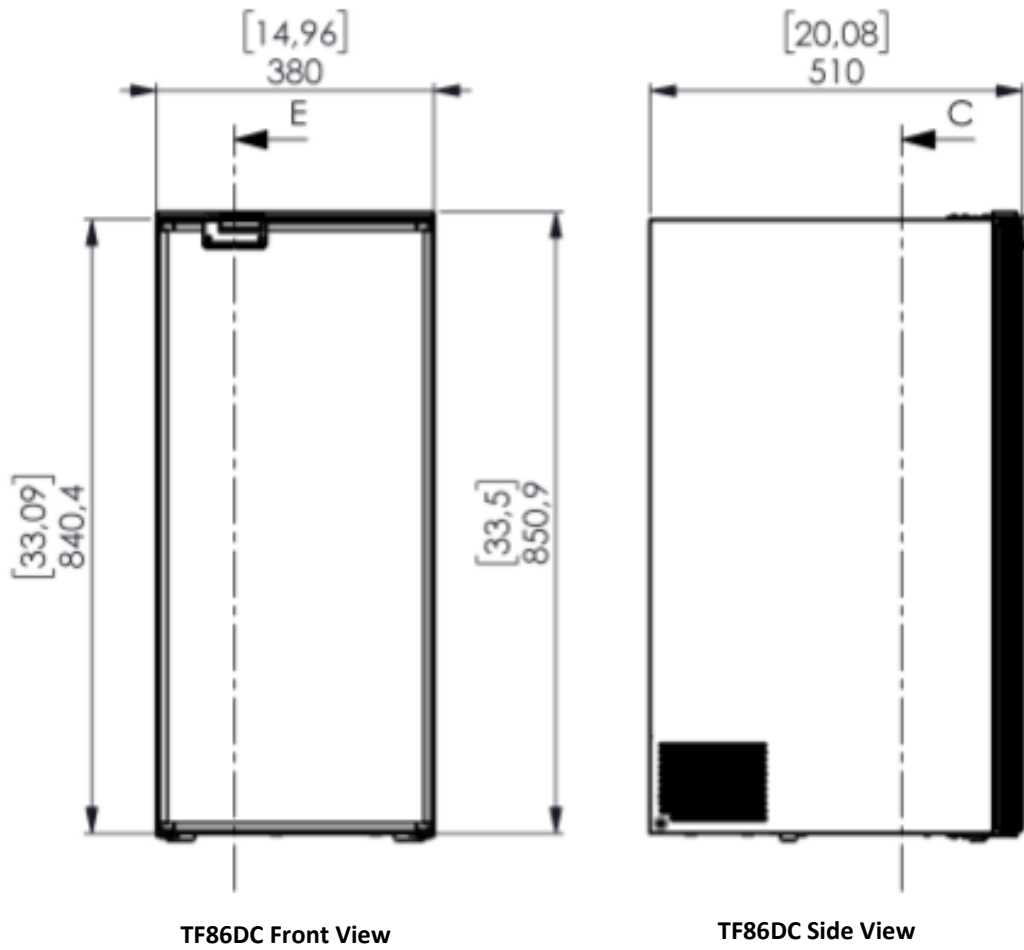


Figure 8.5: TF86DC Ventilation Diagram

