

FD-400™ Fire Detection Monitor

Owner's manual

with installation instructions

Revision 1.0 (8/11/12)



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Product Description

The DM-400 Fire Detection Monitor measures and displays the temperature of two selected areas. It has two levels of alarms to warn of over-temperature conditions. In the highest level, there is a very high probability that a fire has been detected. The unit contains a dry contact relay which is activated if a “high” alarm is triggered. This internal relay can be used to activate a fire suppression system and/or other actions.

The faceplate is 7 inches by 4 1/2 inches. It is attached to a box (6 inches by 4 inches) that contains the circuit board and electronic components. The faceplate/box is designed to be panel mounted. All components are made of black anodized aluminum.

There are six LEDs which show the system status, a digital temperature readout, and five push button switches which control the operation of the unit.

Provision is made for two separate power supplies. Normal applications will only use one power supply. The circuit board has a power regulator that allows input DC voltages from 10V to 30 V

There are fail-safe features designed into the monitor. If one of the sensors, or sensor wires, short out, the device will activate the “low level” (yellow) alarm for the affected circuit and display “SHO”. If one of the sensors has an open circuit (broken wire or sensor failure), the display will read “OPE” and will sound a low-level alarm. Please note, both sensors need to be wired into the system to avoid a false “OPE” alarm.

The unit is shipped with the following components:

- DM-400 Monitor.
- Two temperature transducers with approximately three feet of twisted high temperature wire.
- Owner/Installation Manual

Operation of the DM-400

The functions of the DM-400 switches are described below:

- The mode switch allows the user to:
 - Enter the calibration mode to select temperature measurement in degrees F or C.
 - Enter the calibration mode to set the temperature for the "low" warning alarm for each compartment within a selected range. This allows the unit to be tailored for each application. The low-warning alarm is an indicator that the compartment has exceeded the default or owner's pre-set value and that further monitoring is suggested. Whichever sensor triggers the low alarm will be shown on the LED bank and the digital temperature readout will be switched to the sensor triggering the alarm.
 - Return to the run, or monitor, operation (the unit will automatically return to the run mode from the calibration mode after a short waiting period).
- The “Up” and “Down” switches are:
 - Used to make changes in the values during the setting mode
 - Used to switch between T1 and T2 temperatures in the run mode. Each time the up or down switches are toggled, the sensor temperature being displayed will be indicated by the T1 or T2 LED. Note, that while only one sensor temperature is displayed, both sensors are monitored continuously.
- The dim switch will allow the owner to dim the brightness of the display. If used in a vehicle, this allows lower levels of display intensity. It also significantly reduces current draw in the “standby mode”. It is estimated that the monitor “standby current” is 120 milliamps in the normal mode and 20 milliamps in the “dim” mode
- The silence switch can be used to silence a "low" alarm for a short period of time to allow the owner to monitor the situation without the disturbance of the alarm. The alarm will again sound after a pre-set time. The silence switch will not work for the pre-set "high" alarm. The high alarm is triggered by a temperature which is sufficiently high to indicate a very high probability of a serious operation problem or fire.

The operation of the DM-400 is very straight forward. The unit will come pre-set with default values for the “low” alarm which are considered to be acceptable for the majority of owners (250 degrees F/120 degrees C). Provisions are made to allow the user to tailor the unit to specific conditions for each application (see next paragraph). Once the unit is adjusted for the specific conditions, no other adjustment is needed. The owner can quickly select the compartment to monitor. If an abnormal condition develops with either sensor, the owner will be given preliminary warning via the "low" (operator selected value) warning

alarm. The unit will immediately switch to monitor that sensor. The unit will be locked on that sensor until the abnormal condition is resolved (or until an alarm is detected on a higher priority channel). By locking on the sensor with the abnormal condition, the owner can monitor the temperature to determine if inspection is needed. The owner can silence the alarm for short periods of time while evaluating the situation.

It is strongly recommended that the owner set the “low” alarm trigger temperatures for his unique application. The process involves observing the temperature for each sensor under conditions that would produce a high operating temperature. Once the maximum temperatures are observed, the “low” alarm triggering temperature can be set using the calibration mode. It is suggested that the triggering temperatures be set only slightly above the highest observed temperature. This will give the earliest possible warning of a problem. If the “low” alarm activates frequently for a compartment, the triggering temperature can be adjusted in the calibration mode.

If the temperature increases to a pre-set "high" temperature, a very abnormal condition is indicated and the owner must inspect the monitored area immediately, as the possibility of a very serious problem is indicated. In this condition, the silence switch will not function, since the situation is considered critical.

The unit also provides a dry contact relay which is designed to trigger a fire suppression system and/or other actions. The relay only activates on the “high” (critical) alarm. The dry contact relay is designed to handle 0.7A. It is strongly recommended that the internal relay be used to activate an exterior relay to assure sufficient current to activate the suppression or other systems. The external relay must have a diode in the coils circuit. We recommend the common Mini ISO relay with a diode – source listed on page 9.

.Now for a word from our legal advisers

Warning: it is very important that the owner periodically check the digital readout and LEDs to make sure the unit is working properly and that no error codes exist. When power is first applied to the unit, the LED's should light and the "speaker" should sound a quick alarm. Failure to verify that the unit has power, the unit is monitoring the compartment temperatures, and that the speaker is working; could result in a situation where the unit does not detect or notify the owner that a fire exists.

Warning: this unit has fail-safe displays warning of open or shorted conditions in the sensor circuits. Failure to determine the cause of the problem and immediately repair the situation will render the FD-400 useless and prevent detection of a fire in the area affected by the wiring problem.

Warning: as soon as a low-level temperature alarm is activated, it is imperative that you monitor that channel to determine if the temperature is continuing to climb. If the temperature continues to climb, that is strong evidence that a fire potential exists. The high-level alarm is set to activate at 400 degrees F, but temperatures in the 300 degree F range are abnormal and demand immediate inspection of the indicated compartment.

Warranty: This unit is warranted for a period of one year from the date of purchase. The warranty covers parts and workmanship. The warranty does not cover damage occurring from improper use/handling or incorrect installation. The owner must contact us for approval to return the defective unit.

Installation

Mounting the monitor

The design of the faceplate and enclosure facilitates flush or panel mounting. The faceplate is 7.0 inches by 4.5 inches. The enclosure is 6.0 by 4.0 inches.

The monitor is designed for normal ambient conditions that would be found in a factory or most vehicles. The faceplate and enclosure are designed to withstand high temperatures, but electronic component life can be reduced when subject to very high temperatures.

The unit should be mounted in a location where it can be monitored easily. This assures that the owner can see that the unit is functioning properly and can quickly determine the channel causing an alarm. It also permits operation of the switches.

Wiring installation

Listed on the last page of this manual are the wiring connection instructions.

Wire for the power supply connections should be at least 22 ga. Wire for connecting the sensors to the monitor should be at least 22 ga. twisted pair “communication cable” or “sound and security cable” wire. The sensors are supplied with special high temperature wire. The connections to the high temperature wire should be made outside of the compartment, if possible. This will assure that only high temperature wire is exposed to the temperatures of the compartment being monitored

Normal wiring practice should be followed. Care should be exercised not to run the twisted pair wire parallel with 120 volt wiring for distances over four feet, since the alternating frequency could affect the temperature reading.

Electrical connections should be made consistent with acceptable wiring practice. Soldering or crimped connectors are the desired methods, along with good closure of the connection with heat shrink tubing or good electrical tape. If the sensor connections are not correct, the internal fail-safe software will indicate which set of connections have a problem and if the problem is a short or open circuit.

The FD-400 is a very low current device. It has a ½ amp internal fuse in its system, and thus, does not require that a fuse be installed in the power supply wiring. If the owner does choose to install a fuse, it should have a capacity of 2 amps or less.

Mounting and locating of the sensors

The sensors should be mounted as high as possible in the compartment. It is best to have the sensor mounted in a “dead air space”. While there is a probability that there may not be a true dead air space in many compartments, it is best to mount the sensor where it is shielded from significant air flow – especially air flow from the radiator fan in a vehicle. Placing the sensor in a high air flow area will significantly delay detection of a rising temperature condition caused by a fire in the compartment. It is also important to have the sensor as far away as possible from high heat sources such as exhaust manifolds and turbo housings so that false alarms are avoided.

The sensors can be mounted using any device which will not cause damage to the sensor or the wire. As is the case with any wire mounting, the cable should be well supported and protected from damage – this is especially important with mobile applications because of the constant movement and vibration. Typical mounting methods include: tie/cable wraps and wire/cable clamps. Consideration should be given to avoiding a mounting failure in the event of a fire. All of the components in the sensor/sensor wiring leads are rated for 400 degrees F and as noted above, connections to this high temperature wire should be made outside the monitored compartment.

The actual sensor is at the end of the twisted high temperature wire and is very small in size. At first glance, it looks like the wire is simply joined together. It is best not to cover the sensor during the mounting process. Any material on the outside of the sensor will insulate it from the heat and delay its reaction to temperature changes. Conversely, it is not necessary to mount it on any type of temperature “gathering” surface. It works best if it is separated from direct contact of any material so that it can detect air temperature rather than surface temperature.

Wiring information and color codes for DM-400 wire cable:

Red:	12/24 volt positive (*) Primary power source
Black:	12/24 volt negative (*)
Orange:	12/24 volt positive (*) Auxiliary power source – not used in most intallations
Brown:	12/24 volt negative (*)
Green:	T1 temperature sensor (**)
White:	T1 temperature sensor (**)
Blue:	T2 temperature sensor (**)
Gray:	T2 temperature sensor (**)
Yellow:	Alarm “signal” relay (positive from power supply) (***)
Purple:	Alarm “signal” relay (output power from relay)(***)

A schematic is shown on the next page.

(*) Two power supply circuits (red/black and orange/brown) are provided. Only one power supply is needed. It does not matter which set of input wires is hooked to either supply. However, the input is polarity sensitive. Input can be 12 or 24 volts. The wiring does not need to be fused as the unit has an internal fuse. It is strongly recommended that the power to the monitor be from a separate, non-interpretible source

(**) These connections are not polarity sensitive. The temperature sensors must be connected to the DM-400 with the twisted pair communication wire. One suggested supplier is Carol C6348, but any twisted pair “communication” or “sound and security” wire is acceptable. Any conventional connection method is acceptable. Connection to the sensors should be made outside the compartment if possible, as the sensor wire is a special high temperature wire intended to withstand possible extreme temperatures.

(***) This is a dry contact relay. The relay is rated at 0.7 A. This relay should be used to trigger a power relay with a diode in the coil circuit – see page 9

Notes:

1. All wire should be at least 22 ga.
2. Any acceptable connection can be used, but soldering or crimping is preferred.

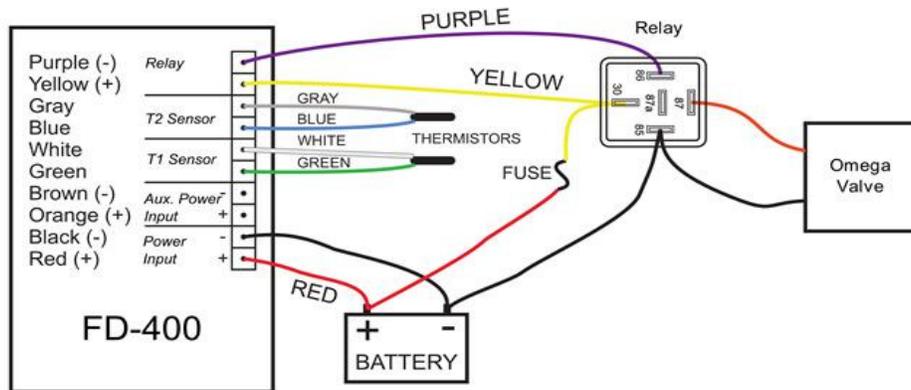


Fig. 1: Wiring Schematic for FD-400

Notes:

1. The wire colors shown on FD-400 are the colors of the cable from the box.
2. The power connections are polarity sensitive
3. The wiring for the internal relay is “polarity” sensitive
4. The wires for the sensors are not polarity sensitive
5. The power supply to the FD-400 does not have to be fused (unit has internal fuse). However, for ease of shutting off the dedicated power supply, it may be convenient to install a 2 amp fuse in the positive line.
6. The fuse for the exterior relay should be chosen to reflect the load that the relay will see. It is suggested that a 5 amp fuse would easily handle the Omega Valve.
7. The suggested exterior relay is a Mini ISO and must have a diode (see schematic and source information below). Wiring for this relay is polarity sensitive.

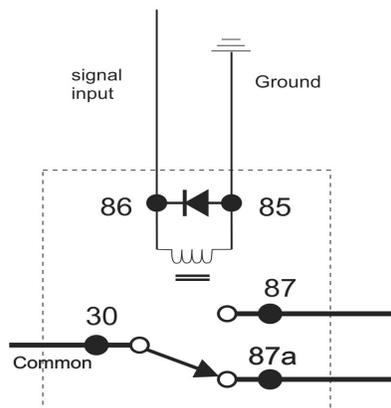


Fig. 2 Exterior Mini ISO relay with diode

Source: Digi-Key (www.digikey.com)
 Tyco, digikey part number PB682-ND (12V with diode)
 Tyco, digikey part number PB684-ND (24V with diode)