

# FD113 Oil Pressure Safety Control

## THE FLEXIBLE CONTROL

- The FD113 Oil Pressure Safety Control senses the effective oil pressure differential in compressors with positive displacement oil pumps. If inadequate oil pressure exists, a time delay is energized. If the oil pressure does not recover to safe levels within the time delay setting, the compressor is shut down. The time delay allows the compressor adequate time to establish oil pressure on start-up and avoids nuisance shutdowns on pressure drop of short duration during the run cycle.
- Maximum application flexibility is assured by providing an adjustable differential pressure switch which can be adjusted to the compressor's minimum required oil pressure needs and an adjustable time delay which allows you to select the length of time the compressor runs below the minimum pressure before shutdown. The minimum pressure setting and time delay values specified by the compressor manufacturer should be used when installing the FD113 control.

## FEATURES

- Pressure Range adjustable from 4 to 65 PSID.  
Timer start pressure – timer stop pressure is 3 PSID above timer start pressure.
- A SPDT switch is used in the pressure portion of the control which allows the addition of a "safe light" if desired.
- Timer is Time – Adjustable from 20 to 150 seconds.  
Supply voltage – 24 to 240 Volt AC/DC. Timing unaffected by voltage or ambient temperature variations.
- A SPDT Manual Reset Switch is used in the Timer Module. Upon time-out, the compressor is stopped and an alarm circuit is energized. To restart the compressor and de-energize the alarm circuit, the reset button is pushed.
- A factory installed Jumper allows the FD113 to be powered from a single power source. Should separate circuits be desired for the timer and "Lockout" switch, the Jumper can be removed.

## SAFETY INSTRUCTIONS

1. Read all Instructions thoroughly. Failure to comply can result in control failure, system damage or personal injury.
2. Do not use with ammonia or on hazardous or corrosive fluids.
3. Do not install in Hazardous Locations.
4. Disconnect electrical power before installation. Do not reapply power until control installation is complete, wiring connections secured and cover is in place.
5. Before making pressure control connections, depressurize system and make certain lines are at atmospheric pressure.

## CONTROL RATINGS

Pilot Duty Ratings:	120/240 VAC
U.L. B300	360 VA Maximum

## SPECIFICATIONS – ENCLOSURE

**NEMA CLASS I – Mount the control body in an area protected from the weather, water or excessive moisture, dirt, dust and corrosive or explosive atmospheres.**

## INSTALLATION INSTRUCTIONS—GENERAL

1. **Cover Removal**—Loosen cover screw, pull cover forward.
2. **Mounting**—Mount the control in a protected area on the mounting bracket or a flat surface with screws provided. **CAUTION:** If other screws are used, use 8-32 screws that do **not** penetrate into the control more than 1/8". Oil Pressure Safety Controls should always be mounted above the oil level in the compressor crankcase. The capillary tubes or pressure connections should be routed to allow them to be free—draining to the compressor crankcase. This will prevent oil logging in the capillary tubes during low ambient conditions.
3. **Capillary Tube Connections:** Proper installation of capillary tubes and/or pressure control lines will insure a trouble-free installation. **WARNING:** Before making any pressure control connections, depressurize system. Failure to do so can cause system damage or personal injury.
  - If the control is mounted on the compressor, all lines must be secured to the compressor so they do not vibrate independently from the compressor.
  - If the control is mounted remote from the compressor an open coiled vibration loop, 2 to 3 coils, 2 to 3" diameter should be provided between the compressor base and the moving compressor. The lines coming from the coil should be secured to the base and compressor so the coil takes all the vibration. Avoid any "violin string" runs of control capillary tubes.
  - Sharp bends or kinks **must** be avoided in the capillary or pressure lines. Do not allow the lines to rub and abrade against any moving surface. Avoid any excessive handling or reforming of the copper lines to minimize work hardening of the copper.
4. **Electrical Connections—WARNING:** Before making any electrical connections, disconnect all electrical power. Check with a voltmeter as more than one source of power may be supplied. Make certain the load to connected is within the electrical rating of the control (see Table 1).
  - All wiring should conform to National Electrical Code and/or local codes. Use **14AWG or larger copper conductors ONLY**.
  - The terminals are of a clamp design. Loosen the terminal screws with a small screwdriver, insert approximately 3/8" stripped wire and securely tighten.

## SPECIFICATIONS – FD113ZU/ZUK

**Ambient Temperature Range** –5°F to +140°F

**Pressure Range** – PSID – Adjustable

**Timer Energize:** 4 to 65 PSID net effective oil pressure on pressure drop.

**Timer De-energize:** 3 PSI above timer energize setting on pressure rise.

### Timer

**Voltage:** 24 to 240 volts AC or DC

**Timing:** 20 to 150 seconds – Adjustable

**Maximum Over Pressure:** During installation and service, the control's power element should not be exposed to pressures exceeding 330 PSIG.



## EFFECTIVE OIL PRESSURE

Effective net oil pressure is the difference between the oil pump outlet pressure and the compressor crankcase pressure.

EXAMPLE:

<b>Oil Pump Outlet Pressure</b>	40 PSIG	20 PSIG
<b>Crankcase Pressure</b>	10 PSIG	8" vacuum
<b>Net Effective Oil Pressure</b>	30 PSIG	24 PSIG

The FD113 measures the differential pressure between the oil pump outlet pressure and the compressor crankcase pressure.

## CONTROL CALIBRATION/ADJUSTMENT

The FD113–ZU/ZUK is factory preset to—

**Pressure Energize Timer:** 10 PSID on falling pressure

**De-Energize Timer:** 15 PSID on rising pressure

**Time-Lockout** after 120 seconds of energized time

(This is Copeland factory specifications)

### Manufacturer's Setting Specifications (Typical)

Manufacturer	Time Delay (seconds) <sup>①</sup>	Low Event PSID (Energize timer on falling PSID)
<b>Copeland</b>	120	9 – 10*
<b>Bitzer</b>	90	9 – 10*
<b>Carrier</b>	45	6.5**

\* Standard factory setting – 9/10 PSID Low Event. No adjustment required.

\*\* Requires adjustment approximately 1/2 turn to left per "Checking and Adjusting Pressure" instructions.

① Standard factory setting 120 seconds (Copeland). Adjust as required to other manufacturer's specifications. See figure 1 "Timer Adjustment Button" – Verify timing utilizing either "Checking and Adjusting Timer" procedure or "Control Checkout/Timer Checkout" procedure and readjust as required.

**NOTE:** After pressure and time settings have been made and verified, a piece of tape should be placed over the pressure setting disc slot and timer adjustment button to prevent tampering. (Reference figure 1)

## CHECKING AND ADJUSTING PRESSURE

### Pressure Check—BENCH TEST NO VOLTAGE APPLIED

- 1) Attach "Oil" connection to pressure source (100 PSIG Max) with a low pressure gauge.
- 2) Leave "Low" connection at atmospheric pressure (unattached).
- 3) Connect Continuity Tester between terminals 11 and 14 (safe light connection). No continuity should be shown.
- 4) Pressurize oil connection to 100 PSIG. Continuity light should energize.
- 5) Slowly depressurize. Continuity light should de-energize at approximately 10 PSIG (factory).
- 6) Slowly re-pressurize. Continuity light should re-energize approximately 5 PSI above de-energize pressure.

### Pressure Adjustment—

- 1) To change pressure adjustment from factory setting, remove control cover. Rotate notched pressure setting disc in the control – right to increase, left to decrease settings (see figure 1). Repeat steps 4-6 to determine settings. Adjust/Repeat as necessary to obtain desired timer start (minimum oil pressure setting). Note: Control should not be set to below minimum effective oil pressure recommended by the compressor manufacturer.

## CHECKING AND ADJUSTING TIMER

The timer is factory preset to 120 seconds (Copeland Specification).

### Timer Checkout

- 1) Remove Jumper between 11 & 22.
- 2) Connect a continuity light across terminals 21 and 24. No continuity should be shown (if it does, press reset button).
- 3) With no pressure to the "Oil" or "Low" bellows connections, apply 24 to 240 Volt AC/DC across terminals 11 and "N". The timer should trip out and continuity should start between terminals 21 and 24 after approximately 120 seconds.

### Timer Adjustment

- 1) Remove power from terminals 11 and "N". Push reset button, adjust timer button to time desired.
- 2) Re-energize terminals 11/"N", observe time to trip-out (continuity between terminals 21 and 24).
- 3) Repeat steps 1 and 2 until desired trip-out time is obtained. NOTE: Control should not be set below the minimum time specified by the manufacturer.
- 4) Remove power and continuity light and reinstall 11/22 Jumper, if required.

## FD113 INSTALLATION

### Pressure Connections

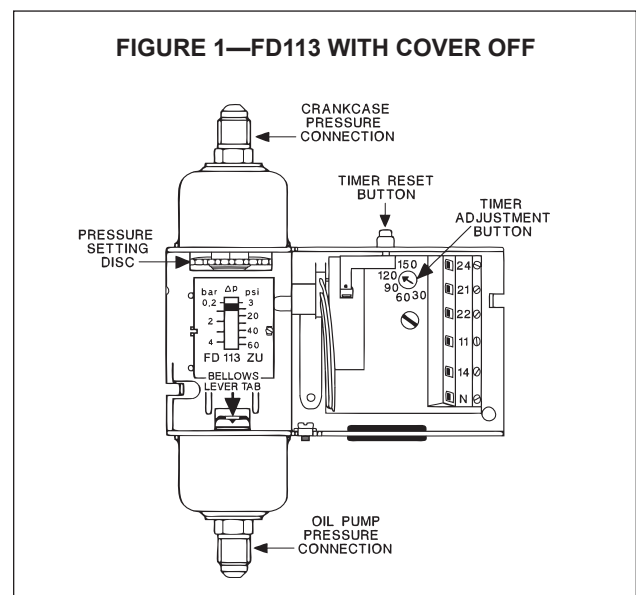
- 1) With the compressor depressurized (0 PSIG), connect the bottom power element marked "Oil" to the oil pump outlet connection.
- 2) Connect the top power element marked "Low" to the compressor crankcase connection.

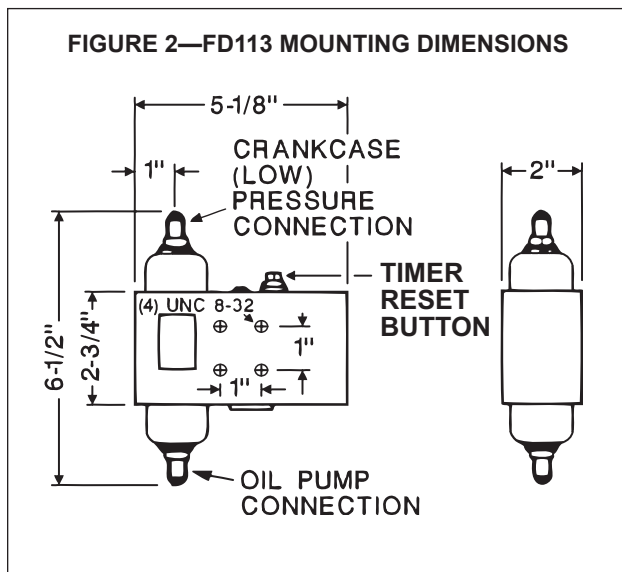
### Electrical Wiring

- 1) When replacing a Ranco, Penn, or Robertshaw control, use the following wiring cross reference.

Penn	Ranco	Robertshaw	To ALCO Terminal
L	L	L	21
M	M	M	22
(Alarm when present)	A	S	24
V/V1		A or B	
120	120	120	N
240	240	240	
2	2	T2	11
None	None	None	14 "Normal" light

The wiring of the FD113 is illustrated in figures 4 & 5.





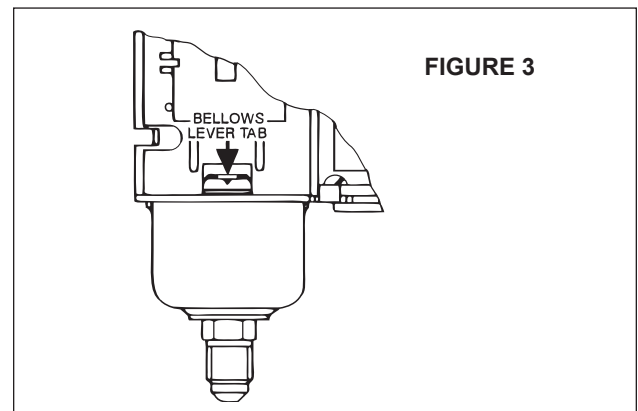
## CONTROL CHECKOUT

### Timer Checkout

- 1) De-energize compressor/control circuit. Insert small screwdriver to hold bellows lever tab down (no pressure position), see figure 3.
- 2) Re-energize compressor/control circuit – timer should then be energized and stop the compressor in the preset time period. After checkout, the FD113 timer must be reset.

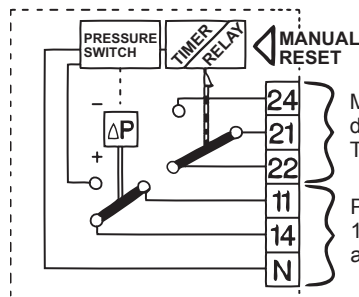
### Pressure Checkout

- 1) To accurately check the operating pressure of the FD113, the compressor must be de-pressurized, the FD113 "Oil" and "Low" pressure lines disconnected and a check performed as outlined in "pressure check" under the checking and adjusting procedure.



Contacts below are shown in normal run condition with oil pressure.

**FIGURE 4**

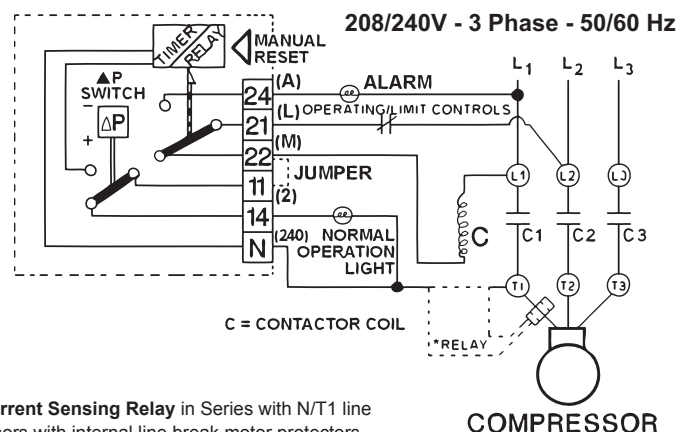


Manual reset timer contacts. Terminal 21 to 22 closed during normal run and during time-out – open on time-out. Terminals 21/24 (signal) closed after time-out.

Power to Timer thru pressure switch contacts. During normal run, 11/14 closed for "safe light" circuit. On loss of pressure, 11/14 open and timer is energized for time delay period until trip-out.

## Typical Old Copeland 3-Wire Oil Pressure Safety Control Wiring

**FIGURE 5**

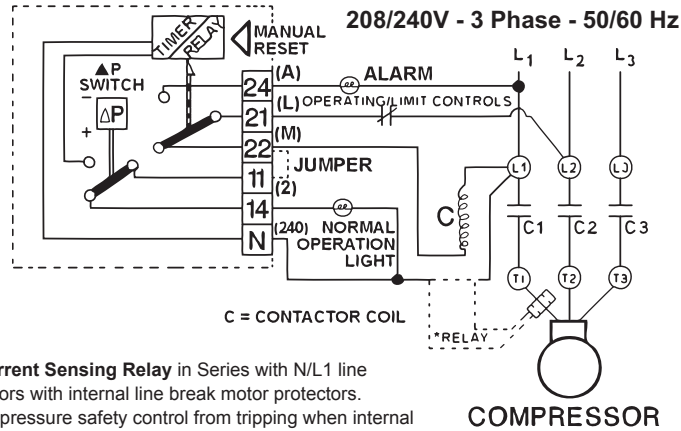


\* **Optional Current Sensing Relay** in Series with N/T1 line for compressors with internal line break motor protectors. (Prevents oil pressure safety control from tripping when internal line-break motor protector trips.)

### Typical New Copeland 3-Wire Oil Pressure Safety Control Wiring

This circuit eliminates nuisance trips of the OPSC from “sneak” voltages on the “T” side of the contactor from auxiliary devices connected from the “T” side to “L” or neutral of the contactor, or minor voltage-leakage paths from the compressors connections/winding to ground.

FIGURE 6

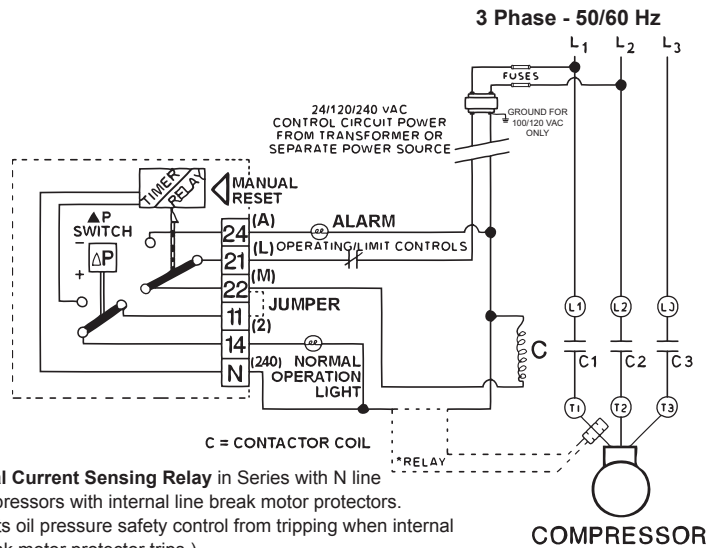


- \* **Optional Current Sensing Relay** in Series with N/L1 line for compressors with internal line break motor protectors. (Prevents oil pressure safety control from tripping when internal line-break motor protector trips.)

### Typical 3-Wire Separate Power Source

NOTE: Contactor Coil, Alarm and Normal Light must be same voltage as the control circuit voltage.

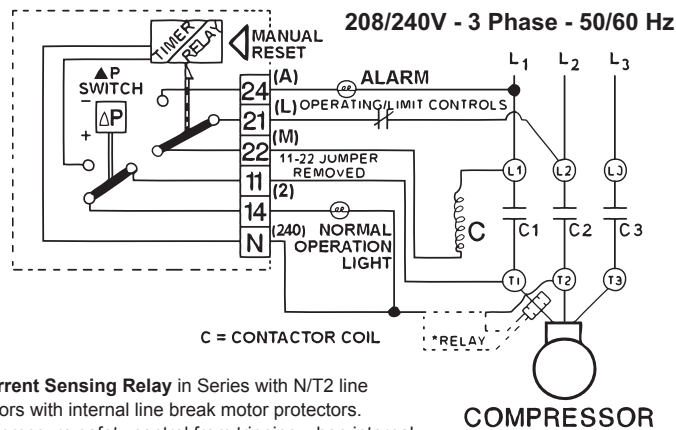
FIGURE 7



- \* **Optional Current Sensing Relay** in Series with N line for compressors with internal line break motor protectors. (Prevents oil pressure safety control from tripping when internal line-break motor protector trips.)

### Typical 4-Wire Wiring – 208/240 Oil Pressure Safety Control Power Common to Compressor

FIGURE 8



- \* **Optional Current Sensing Relay** in Series with N/T2 line for compressors with internal line break motor protectors. (Prevents oil pressure safety control from tripping when internal line-break motor protector trips.)