INSTALLATION INSTRUCTIONS
FSM-1 FUEL SAVER MODULE

1. GENERAL DESCRIPTION

The FSM-1 Fuel Saver Module is a control package which permits the heat pump to operate below the thermal balance point to maximize the energy savings. For each application an analysis should be made to determine the economic balance point which is the outdoor temperature at which it becomes more cost effective to shut the heat pump down with an outdoor thermostat. This temperature varies with each combination of fuel cost, furnace efficiency and heat pump efficiency level. Refer to Section 5, How To Set The Outdoor Thermostat At The Economic Balance Point.

2. WHAT TYPE OF INSTALLATIONS AND FUELS SHOULD THE FSM-1 BE USED ON?

The FSM-1 module is designed for fuel oil, natural gas and propane gas furnaces.

3. WHERE TO LOCATE THE FSM-1 MODULE

The FSM-1 module can be located in any indoor dry location between the furnace and the outdoor section. It can be installed in any position most convenient for installation, wiring connections, and service considerations. DO NOT locate the module outside the building.

4. WIRING CONNECTIONS

All wiring is 24V. An eight (8) wire color coded thermostat cable is recommended. The electrical connection to the FSM-1 is quite easy. Simply cut the thermostat cable, with the wires coming from the furnace connected to the terminal block designated "FURNACE CONNECTIONS," and the wires from the heat pump to terminal block designated "HEAT PUMP CONNECTIONS." Refer to wiring diagram for complete details.

5. HOW TO SET THE OUTDOOR THERMOSTAT AT THE MOST ECONOMIC BALANCE POINT WHEN USING THE FSM-1 FUEL SAVER MODULE.

To determine the economic balance point using a FSM-1 module, do the following steps:

a. Locate the table for fossil fuel used by furnace. (Table 1 - Natural Gas; Table 2 - Propane; and Table 3 - Fuel Oil).

b. Now locate the furnace AFUE efficiency rating for the furnace on the bottom of table the heat pump is being matched with.

c. Next draw a line straight <u>up</u>, until it intersects the fuel unit cost curve for the fuel in your area. (Fuel unit cost scale on right side of table).

d. Then draw a horizontal line from the intersection point to the Btuh per $1.00 column on left side of table. You now have determined the Btuh output of heating per one dollar of energy cost for that fuel.

EXAMPLE 1: (Table 3)

An oil furnace with a 65% AFUE efficiency @ $1.30 per gallon would equal 70,000 Btuh per dollar of energy (oil) cost.

e. Now go to Table 4 (air source or water source heat pump) and locate the Btuh per dollar (step (d) above) on left side of table. Draw a horizontal line from the Btuh per $1.00 until it intersects the cost per kWh in your locality.

f. Then draw a vertical line down to the heat pump COP (Coefficient of Performance) scale at bottom of table. You now have found the lowest COP at which the heat pump should be operated economically.

EXAMPLE 2: (Table 4)

A 65% AFUE efficient oil furnace will supply 70,000 Btuh per dollar of fuel cost, at a fuel cost of $1.30 per gallon. A heat pump also will produce 70,000 Btuh output per dollar at an electric rate of $.06 per Kw. The heat pump will produce this at a COP of 1.21.

g. Refer to the "Heating Application Data" section of the heat pump specification sheet to determine at what outdoor temperature the heat pump will produce a 1.21 COP. This temperature is the "Economic Balance Point" at which the outdoor thermostat is set at to shut the heat pump off and operate entirely on the furnace.

h. Now set the outdoor thermostat to turn off the compressor at the "Economic Balance Point" temperature determined in (step g) above.

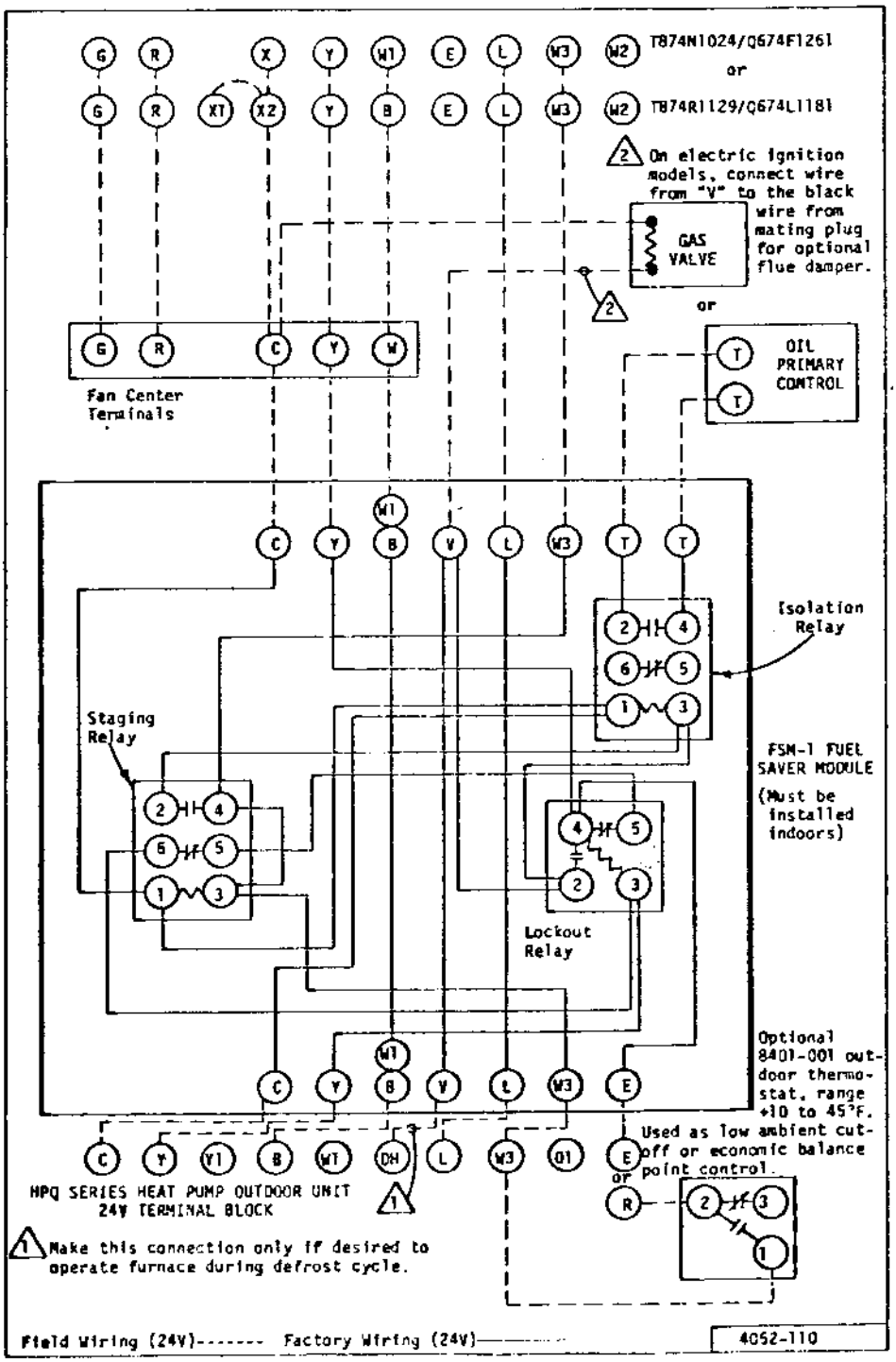
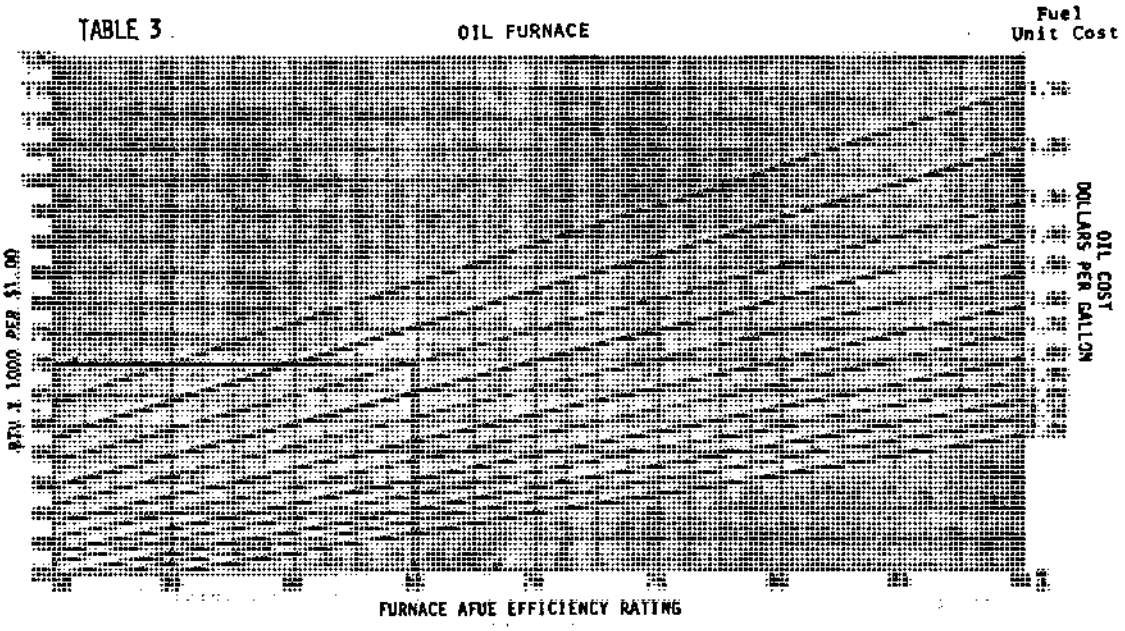
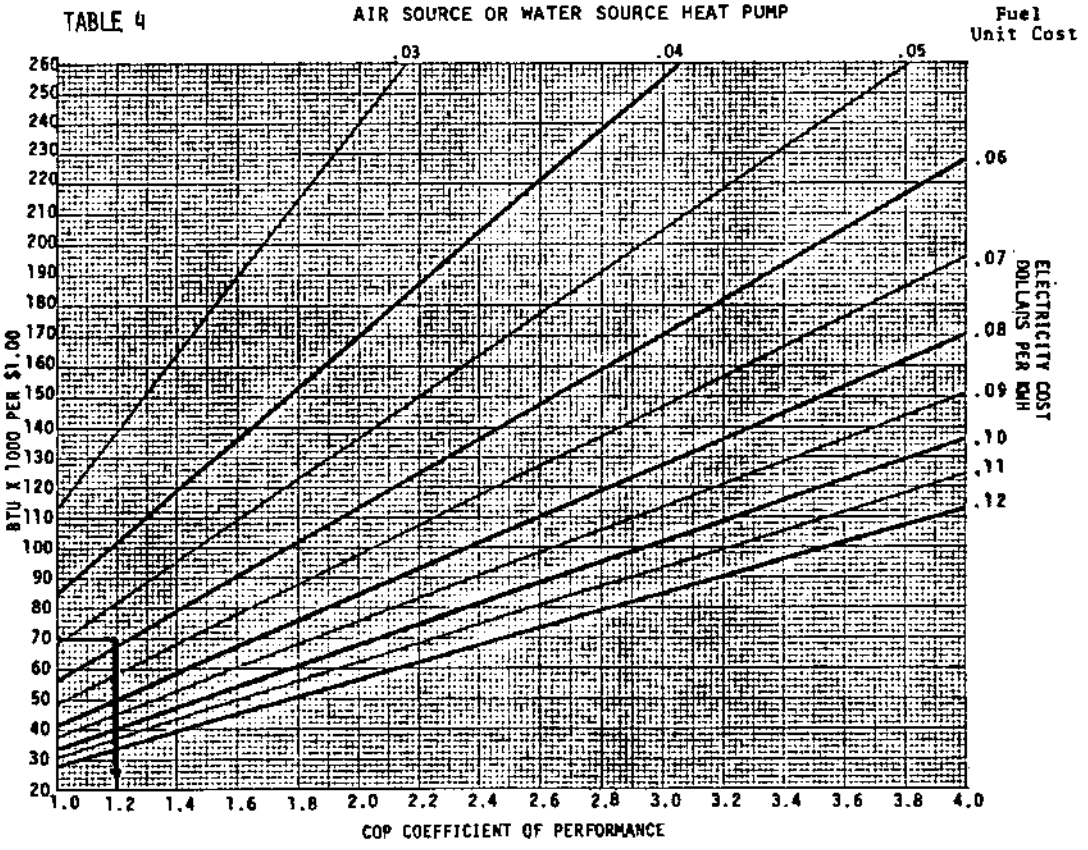

G R X Y W1 E L W3 W2 T874N1024/Q674F1261
or
G R X1 X2 Y B E L W3 W2 T874R1129/Q674L1181
2 On electric ignition models, connect wire from "Y" to the black wire from mating plug for optional flue damper.
GAS VALVE
or
G R C Y W
Fan Center Terminals
T T OIL PRIMARY CONTROL
C Y W1 B V L W3 T T
Isolation Relay
Staging Relay
FSM-1 FUEL SAVER MODULE
(Must be installed indoors)
Lockout Relay
Optional 8401-001 outdoor thermostat, range +10 to 45°F.
Used as low ambient cut-off or economic balance point control.
or
R
C Y Y1 B W1 DH L W3 O1 E
HPQ SERIES HEAT PUMP OUTDOOR UNIT 24V TERMINAL BLOCK
1 Make this connection only if desired to operate furnace during defrost cycle.
Field Wiring (24V)------- Factory Wiring (24V)———
4052-110

TABLE 3



Example 1. Assume a 65% AFUE oil furnace at $1.30 per gallon.

TABLE 4



Example 2. Determine Economic Balance Point for Heat Pump when used with an oil furnace of 65% AFUE @ $1.30 per gallon for oil from example 1 (oil furnace 70,000 Btuh/$) and electric rate of .06 kWh. A 1.21 COP, heat pump and oil is equal in operating cost.

TABLE 1

NATURAL GAS FURNACE

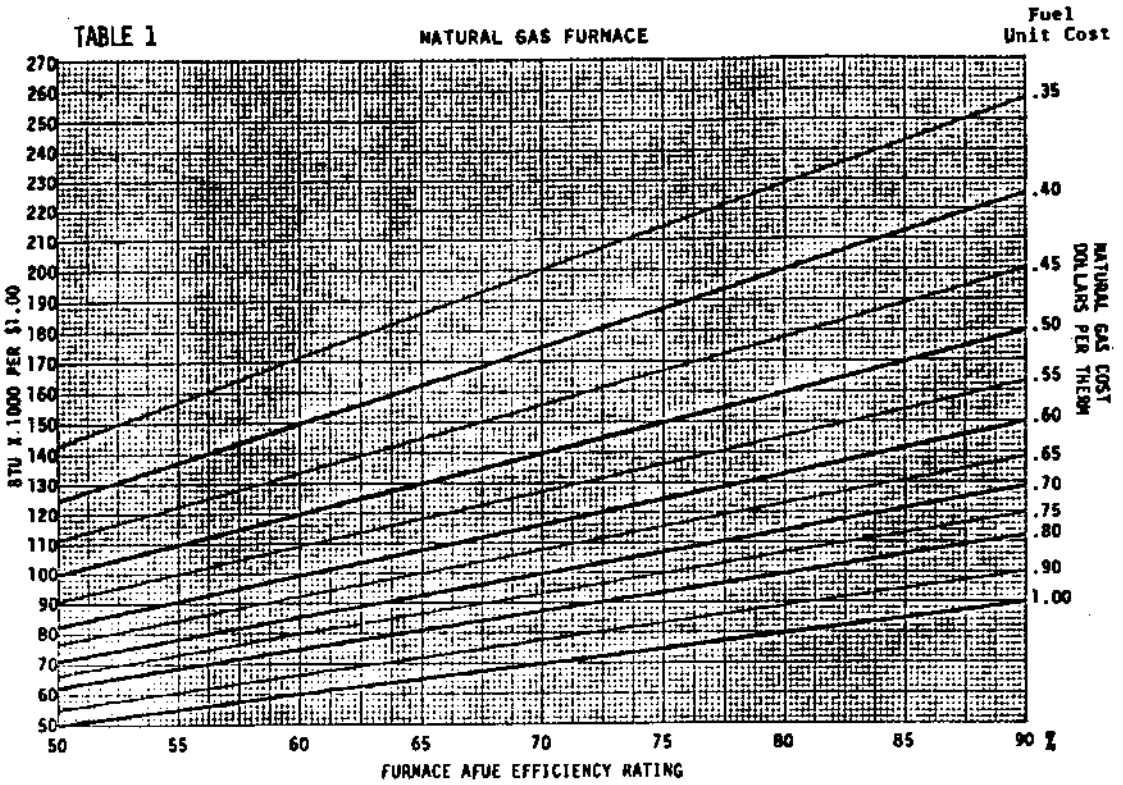


TABLE 2

PROPANE FURNACE