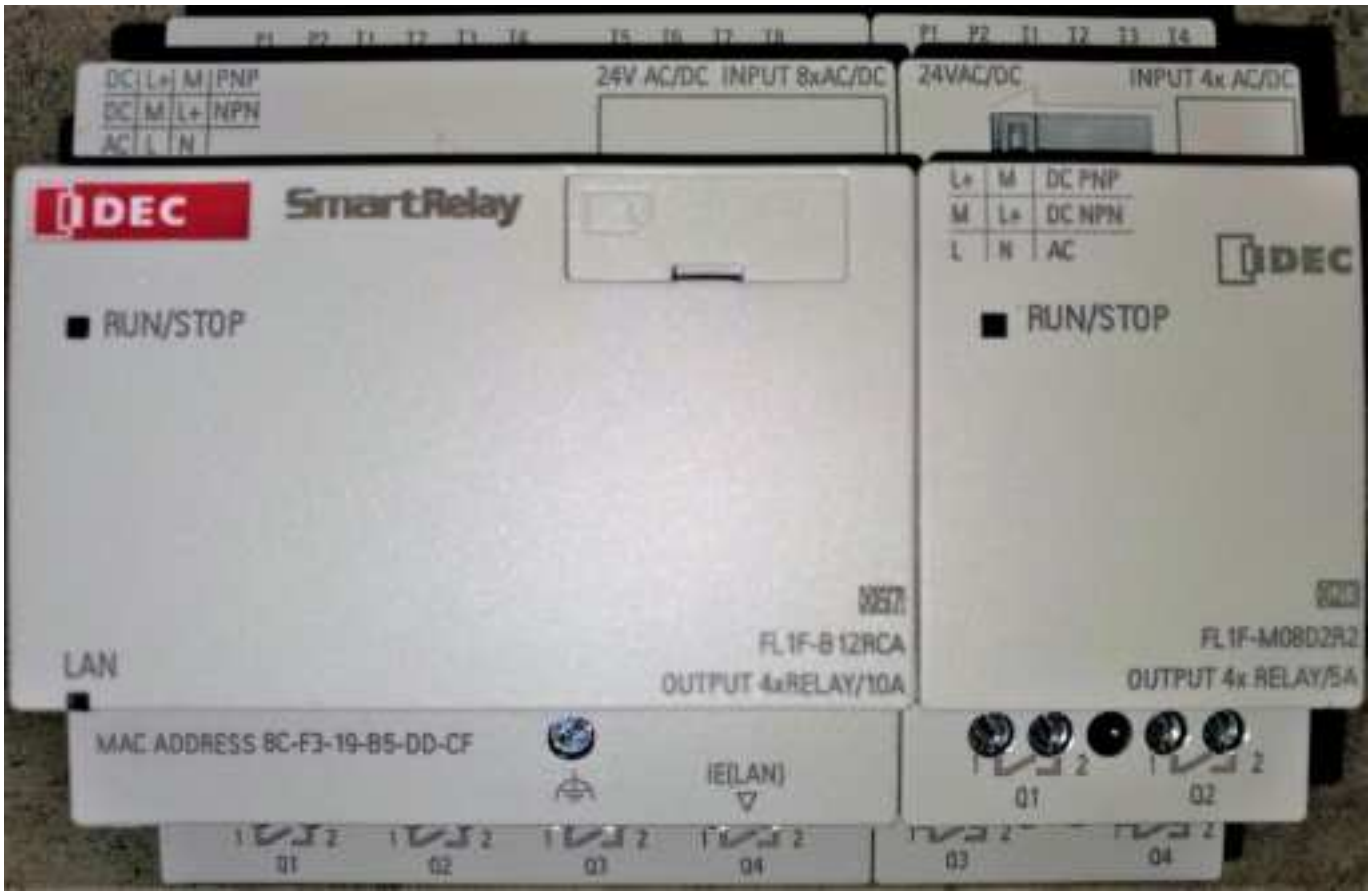
WATERLESS® GEOTHERMAL

Smart Logic Controller

(PLC FUNCTIONS & SEQUENCES)



Features & Instructions

LIT-149 110723

Disclaimer

Proper installation and servicing of the Total Green Mfg. Heat Pump is essential to its reliable performance. All Total Green Mfg. systems must be installed and serviced by a qualified HVAC contractor. Equipment sizing, selection and installation are the sole responsibility of the installing contractor.

Installations of equipment on an existing copper earth loop design that does not match a current Total Green Mfg. earth loop design is not permitted, will void all warranties on the equipment, and are the sole responsibility of the installing contractor. Installation must be made in accordance with the instructions set forth in this manual. Failure to provide installation by a qualified HVAC contractor in a manner consistent with this manual will void and nullify the limited warranty coverage for the system.

Total Green Mfg. shall not be liable for any defect, unsatisfactory performance, damage or loss, whether direct or consequential, relative to the design, manufacture, construction, application or installation of any field specified components.

All Total Green Mfg. 2 stage and multi-function units will have separate terminal strips labeled "thermostat/zone board" and "air handler/furnace" for low voltage and are PLC "controlled.

For proper equipment function, the thermostat or zone board must be tied to the "thermostat/zone board terminal" strip. The air handler or furnace must be tied to the "air handler/furnace" terminal strip. There will also be additional terminal strips for various functions based on the model type you may be working with. The information provided here is to supplement the installation manual specific to your unit.

IMPORTANT: For WG2A, WG1AH, WG2AH and WG2AD unit's, if using a cased coil over a furnace, do NOT program your thermostat for dual fuel mode or, use the furnace settings. Leave the thermostat set to electric aux. heat, otherwise, you may interfere with proper PLC function. Follow the dual fuel function option for the unit model you are installing. This information is detailed in your unit installation manual. You will also want to check the aux. heat cycle rate (CPH) setting in the thermostat and set this to 1 or, the lowest available value depending on your thermostat brand and model.

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WG2A Forced Air Only– List of functions

1) The PLC checks that the LOW/HIGH pressure and discharge temperature switches are made. An open pressure switch input has a 60 second delay before setting a lockout and fault signal to "X". During this 60 second time period, the compressor will only operate in 1st stage only giving the system a chance to recover before setting a hard lock out. This is to prevent nuisance calls, especially at the beginning of the cooling season when the Earth Loops are at their coldest. "X" is set with any hard lockout condition. Turning the low voltage to the compressor unit off then back on resets the lockout as long as the discharge temperature switch is not open. The discharge temperature switch has a manual reset button. An open discharge temperature switch will always require a manual reset along with a low voltage power cycle. The pressures switches are automatic.

2) A "Y1" call starts 1st stage heating or cooling which will continue for 20 minutes and then time to 2nd stage should that time elapse without the thermostat calling "Y2". If the unit is in heating mode, once 2nd stage starts, a 20-minute timer will bring on AUX heat should that time elapse without having satisfied the heating call. Once all stages have been called, they will stay called until the thermostat fully satisfies.

3) If more than 3 consecutive "Y1" calls take place without the thermostat calling for 2nd stage within 20 minutes or, before the 20 minute 2nd stage timer runs out, on the fourth "Y1" call, a maintenance cycle is started which will hold and lock the system into 2nd stage for 5 minutes to assure oil return to the compressor. If the system is air zoned, a Zone Override terminal "D" will energize to 24 volts. As described in your unit installation manual, this 24-volt signal can be used along with a field supplied isolation relay to call open the largest zone and hold that damper open so the blower doesn't see high static pressure during those 5 minutes. The maintenance cycle locks any other call out until completion. After the maintenance cycle, or if a "Y2" call is made before the maintenance cycle occurs, the counter resets back to zero. This makes our system zone friendly as it allows for true 2 stages heating and cooling.

4) There is an installed jumper on the field wiring terminal block marked "A" and "S". With the jumper installed, the unit will function with an aux heat strip as normal. If the jumper is removed, the PLC goes into dual fuel mode stopping the compressor when there is a call for aux heat. Once the aux heat call completes, a 5-minute cool down timer prevents the compressor from restarting on a "Y" call until the time elapses. This allows time for the furnace to cool so hot air doesn't cause high discharge pressure or a lockout when the compressor restarts.

5) When the thermostat is set to cooling mode, the "O" signal energizes the reversing valve and locks out the aux heat output.

6) In an effort the reduce energy consumption, the PLC turns power off to the crank case heater when the compressor runs.

7) This PLC program also allows the use of almost any heat/cool thermostat. Even if a single stage heat/cool only thermostat is used, the PLC program will control all functions staging 2nd stage and AUX Heat as needed.

WGxAH Single and Two Stage Forced Air with Hydronic Heating Function

In addition to the function and features as described for WG2A units, The PLC program for the WGxAH units allows for switching priority call from forced air to hydronic heating as well as a feature called "Split Zone" that are installer optioned by choosing jumper settings as described below.

A) A jumper is used on the field wiring terminal strip between the "R" and "AW" terminals to prioritize air heating over hydronic heating. When this jumper is removed, hydronic heating becomes the priority call.

B) Split Zone is a feature which allows you the ability to heat one zone or floor with hydronic heat and another zone or floor with forced air. Split Zone is active by removing the priority call jumper across "R" and "AW" moving it across the "R" and "SZ" of the field wiring terminal block.

C) While in "Split Zone" mode, the compressor unit will provided forced air heating to the air zone. When the buffer storage tank calls for heat, the compressor unit will shift to heat water. Should a call for the air zone take place while the compressor unit is heating water, the call goes directly to the aux heat source to maintain the air zone. Once the tank temperature is satisfied, the system diverts back to normal air heating with the compressor unit.

D) When a hydronic heat call from the buffer tank takes place, the compressor turns off if it is running. 1 minute after that, the circulator pump starts to establish good water flow, the 3 way valve energizes and the SV1 valve de-energizes. 1 minute after that the compressor starts. Once the tank thermostat is satisfied, the compressor stops and the pump will continue to run for 30 seconds before turning off to gain any residual heat from the heat exchanger. 1 minute after the compressor stops, the 3-way valve de-energizes. 1 minute after that the compressor can restart for an air zone call. These timed cycles reduce system component wear by not having to shift under pressure or load.

E) The Hydronic heating function is disabled anytime the "O' terminal is energized placing the unit in cooling mode.

WG2AD Forced Air with Domestic Water Heating Function

In addition to the function and features as described for WG2A units as described in the first section of this document, the PLC program for the WG2AD units allows for switching priority call from forced air to domestic water heating.

A) A jumper is used on the field wiring terminal strip between the "R" and "AW" terminals to prioritize air heating/cooling over domestic water heating. When this jumper is removed, domestic water heating becomes the priority call.

B) When a water heating call from the water tank takes place, the compressor turns off if it is running. 1 minute after that, the circulator pump starts to establish good water flow, the 3 way valve energizes and the SV1 valve de-energizes. 1 minute after that the compressor starts. Once the tank thermostat is satisfied, the compressor stops and the pump will continue to run for 30 seconds before turning off to gain any residual heat from the heat exchanger. 1 minute after the compressor stops, the 3-way valve de-energizes. 1 minute after that the compressor can restart for an air zone call. These timed cycles reduce system component wear by not having to shift under pressure or load.

C) An added functional PLC feature exclusive to the WG2AD model which allows water heating up 120 degrees, is the unit's ability to maintain compressor stability by throttling the compressor load as needed to control discharge pressure.

WG1H 100% Hydronic Heated and Chilled Water Only– List of functions

1) The PLC checks that the LOW/HIGH pressure, HX Low and Discharge temperature switches are made. An open safety switch input has a 60 second delay before setting a lockout and fault signal to "X". This is to prevent nuisance calls, especially at the beginning of the cooling season when the Earth Loops are at their coldest. "X" is set with any hard lockout condition. Turning the low voltage to the compressor unit off then back on resets the lockout as long as the discharge temperature switch is not open. The discharge temperature switch has a manual reset button. An open discharge temperature switch will always require a manual reset along with a low voltage power cycle. The pressure and HX Low temperature switches are automatic.

2) An "N" call starts the circulator pump for 30 seconds prior to the compressor to allow for full flow through the HX (heat exchanger) prior to starting the compressor. Once the call is complete, the pump will run an addition 30 seconds after the compressor stops to purge the HX of any residual heat. This occurs regardless of either a heated or chilled water call.

If you have any questions regarding any of these functions, please contact Total Green Mfg. at 419-678-2032 for technical support.