

WARMFLO® II

Dual Heat System

Furnace Interface Controller and Control Voltage Installation and Operations

Application – Heat Pump Multi-Wire Thermostat Basic or Single Speed Heat Pump WF-LGR4

As in previous interface modules, this is the plug-in controller for Electro-Mate EM-WU***** or EM-WD***** plenum heater. Mechanical installation information is contained within companion installation manual EI703 or EI707.

Also accompanying each system is a specific control program “chip”. This is typically part of ordering information and should be listed on packing slip. A listing of these “chip codes” is in the controller setup sections of this document.

This is an upgraded and improved WF-LGR3. Improvements are the response of field requests.

- Thermostat wiring terminal block, pass through
- Improved stat emergency heat function, no longer requiring extra relay
- Reversing valve detection relay, positive WarmFlo and gas furnace interrupt during cooling (RV logic pin jumper setup required)
- Front panel “cool” light
- Equipped for ECM blower motor, direct Y connection
- Faster defrost response
- Easier single cable plug-in to the upgraded (10-pin connector) WarmFlo II board

Reference Field Service Bulletin 1094 which relates to heat pump units with RV logic high for heating – this unit identified as “Rev A” and has a control board identifier “WFIH46708A” includes revisions relating to stat emergency “E” hookup and operation, cool light function, etc. Also study page 7, determine the need for “stat-B” pin jumper.

Any application – this design assumes the connected room thermostat cannot and does not output an emergency “E” function during cooling. During any and all cooling operations, this controller board “E WF” and “E GAS” tab must be at 0 volts.

Drawings: **HH340**
 HD320
 HH339 page 1



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INTRODUCTION

Prior to installation we recommend that the installer verify the product intended application is applicable to your current installation needs. The system application for this model combination is dual heat, gas or oil furnace as standby, outdoor heat pump unit, and the heat pump manufacturer's room thermostat. If your application does not include dual heat with standby furnace, but electric heat with an air handler, do not use this WarmFlo II series or this installation manual. Contact factory for other models (EM-WE series, WF-DH*** kits, etc.).

EM-WU***** – WarmFlo Electro-Mate ranging from 10 kW to 25 kW. Can be installed in upflow applications only.

EM-WD***** – WarmFlo Electro-Mate ranging from 10 kW to 25 kW. Can be installed in downflow and horizontal applications.

Caution, Heat Pump Application: Depending upon mechanical positioning and airflow, in all cases (heat pump) the electric element, Electro-Mate, unit must be on the supply or warm side of the HP refrigerant coil.

First-time or non-routine user – before attempting installation or setup, suggest studying the last section of this manual, operational information and terminology definitions. Attached HD320 is also a training document. Also if you have not attended a WarmFlo training session, call the factory for other descriptive documents or PowerPoint.

****Installation Notice** - Upon installation it is necessary that all the components of the heating system are in place and functional. This controller is designed to operate the complete heating system - heat pump, backup furnace (gas or oil), Electro-Mate, room thermostat, WF outdoor sensor, etc. If one of these components is missing or not initially installed, improper performance of WarmFlo II and the system may be experienced. In other words, if the gas furnace doesn't exist, LP tank not yet installed or filled, and the WarmFlo II is operating on a cold day; do not be disappointed if there is no heat.

Warranty/Checkout – Attached to this manual is a warranty certification and checkout procedure. This must be completed and returned for warranty coverage.

INSTALLATION REQUIREMENTS

1. All installation work must be performed by trained, qualified contractors or technicians. Electro Industries, Inc., sponsors installation and service schools to assist the installer. **Visit our web site at electromn.com for upcoming service schools.**
2. All electrical wiring must be in accordance with National Electric Code and local electric codes, ordinances, and regulations.
3. Observe electric polarity and wiring colors. Failure to observe could cause electric shock and/or damage to the equipment.
4. This unit can only be used for its intended design as described in this manual. Any internal wiring changes, modifications to the circuit board, modifications or bypass of any controls, or installation practices not according to the details of this manual will void the product warranty, the ARL certification label, and manufacturer product liability. Electro Industries, Inc., cannot be held responsible for field modifications, incorrect installations, and conditions which may bypass or compromise the built-in safety features and controls.
5. The only approved installation for this Electro-Mate series is upflow and horizontal furnace and above or downstream from the air conditioning or heat pump A-coil. Any other configuration or furnace plenum/ducting installation voids warranty and manufacturers product liability.

MECHANICAL INSTALLATION

WF Furnace Interface, WF-LGR4

The mounting location from this enclosure is flexible to any convenient location where the thermostat connection is easily accessible. The distance between this controller and WF II is limited only by the provided 4' cable.

The housing has also been arranged for easy attachment directly to the right side of the Electro-Mate cabinet. Depending upon furnace surroundings, you can explore mounting this controller directly to the Electro-Mate, right cabinet end.

EM-WU*** Electro-Mate Upflow Application**

Electro-Mate nameplate or companion installation manual EI703 is required for correct mechanical installation. If you do not have manual #EI703 do not attempt to do the mechanical installation, contact the factory for a replacement manual. The primary installation concerns focusing on the existing furnace and ducting system's airflow capacity and necessary plenum baffling required by the specific Electro-Mate for correct installation. It is true that the WarmFlo II modulating control and the supply sensor adjust the electric heat or element capacity based upon temperature. But if you do not have the required CFM airflow (example 20 kW, 1400 CFM), you could have a situation where you cannot heat the house. Another even more serious situation (because of improper airflow) is when all stages are on at colder temperatures and the unit is cycling on mechanical safety hi-limit. When cycling on the hi-limit probe, the WarmFlo II supply sensor basically gets confused because at one point it is way up in temperature and then the elements simply disappear and it dips down, the net result probably is switching over to standby at premature intervals. There is no substitute for adequate airflow capacity and plenum baffling.

EM-WD*** Electro-Mate Horizontal Application**

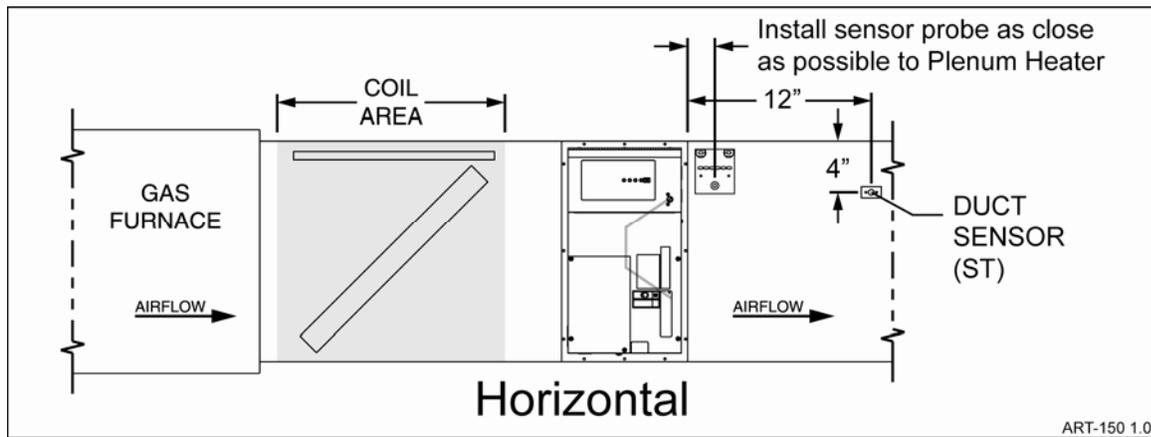
NOTE: It is **not** permissible to rotate the WarmFlo Electro-Mate 180°. These instructions apply to only rotating the Electro-Mate unit 90°.

With WarmFlo, IT IS permissible (and authorized by the manufacturer) to turn the Electro-Mate unit 90° for horizontal application. However, you must follow the instructions below relating to temperature sensor positioning, etc.

The reason this practice is acceptable is because the element power and temperature is controllable by the WarmFlo sensor. When placing the sensor at the top of the duct as stated below, heat rise will keep the elements off even without the blower.

Installation steps

- Ideally, the WF II Electro-Mate should be inserted on an appropriate duct side so that the circuit breakers are at the bottom.
- Locate the WF II Electro-Mate as high as possible in the horizontal duct. At the top, the elements should almost touch the top of the duct.
- If the vertical dimension of the horizontal duct is greater than the WF II Electro-Mate element area, baffle at the bottom.
- If the horizontal duct is deeper than the electric elements, baffling at the back is required.
- Locate and install the WarmFlo duct sensor approximately 4" down from the duct top and 12" away from the Electro-Mate elements.
- Checkout and operation should be identical to standard WarmFlo system.



EM-WD*** Electro-Mate Downflow Application**

Electro-Mate nameplate or companion installation manual EI707 is required for correct mechanical installation. If you do not have manual #EI707 do not attempt to do the mechanical installation, contact the factory for a replacement manual. The primary installation concerns focusing on the existing furnace and ducting system's airflow capacity and necessary plenum baffling required by the specific Electro-Mate for correct installation. It is true that the WarmFlo II modulating control and the supply sensor adjust the electric heat or element capacity based upon temperature. But if you do not have the required CFM airflow (example 20 kW, 1400 CFM), you could have a situation where you cannot heat the house. Another even more serious situation (because of improper airflow) is when all stages are on at colder temperatures and the unit is cycling on mechanical safety hi-limit. When cycling on the hi-limit probe, the WarmFlo II supply sensor basically gets confused because at one point it is way up in temperature and then the elements simply disappear and it dips down, the net result probably is switching over to standby at premature intervals. There is no substitute for adequate airflow capacity and plenum baffling.

Generally, a base adapter or raised plenum is required for installation of this DOWNFLOW Electro-Mate. The instructions in manual EI707 for the field design and fabrication of this base adapter must be followed in detail.

WIRING INSTALLATION

High Voltage

Please reference manual EI707 pages 2 and 3.

Low Voltage

WarmFlo II Sensors

Located within each WarmFlo control are two sensing probes, **OT (outdoor sensing)** and **ST (supply sensing)** necessary for proper operation and installation of the WarmFlo systems. **Without proper installation of these probes the WarmFlo system will not operate correctly.**

Note : With WF-EMA chip the outdoor sensor(OT) is not required. Installation is optional. If at some later date this system is converted to heat pump or another chip code, the sensor would be available for use at that time.

Outdoor Sensor (OT) is identified by the longer cable and the metal mounting bracket.

1. Determine best location for the OT sensor using the following ground rules.
 - a. Locate on the outside of the house to sample outside temperature least affected by sun.
 - b. Locate sensor away from other objects that produce a heat or cool effect such as heat pump freon line sets, drier vents, direct sunlight, steel siding, or other miscellaneous objects that affect the air temperature.
 - c. Do not install sensor in an enclosure which may have a “heat build up” or insulation effect.
2. Disconnect OT and ST sensor cable from Warmflo Controller noting the screw locations for future re-hookup.
3. The factory supplied OT cable is approximately 25'. Determine necessary length of cable to route to the predetermined outside location. If the sensor wire cable is too short, you must use the following rules for extending the cable.
 - a. Use unshielded (low capacitance, prefer twisted) 3 or 4 wire low voltage cable, **35 foot** maximum.
 - b. Do not under any circumstances use leftover wires within the thermostat cable going to the outdoor unit.
4. Mount OT sensor with sensor tip up (cable downward)
5. Drill ¼” hole near the outside sensor location. Routing the cable along the freon tubing often makes the easiest installation.
6. Route wire from outside making sure not to crimp, cut, staple, or damage cable in any way.
7. Keep the sensor cables at least 12” away from any line voltage wiring, Romex, etc. Do not, under any circumstances, use part of existing thermostat cable, leftover wires, for the sensor cable.
8. Do not reconnect sensor wires to the 4-screw terminal block until both sensors are properly installed.

Warm Air Supply Sensor (ST)

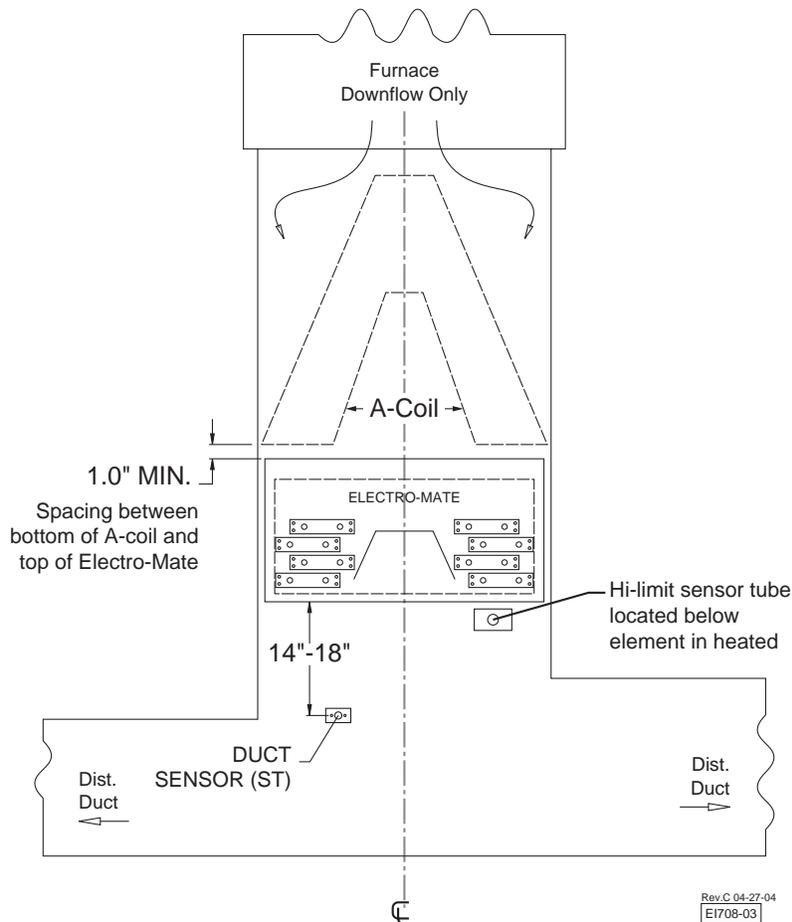
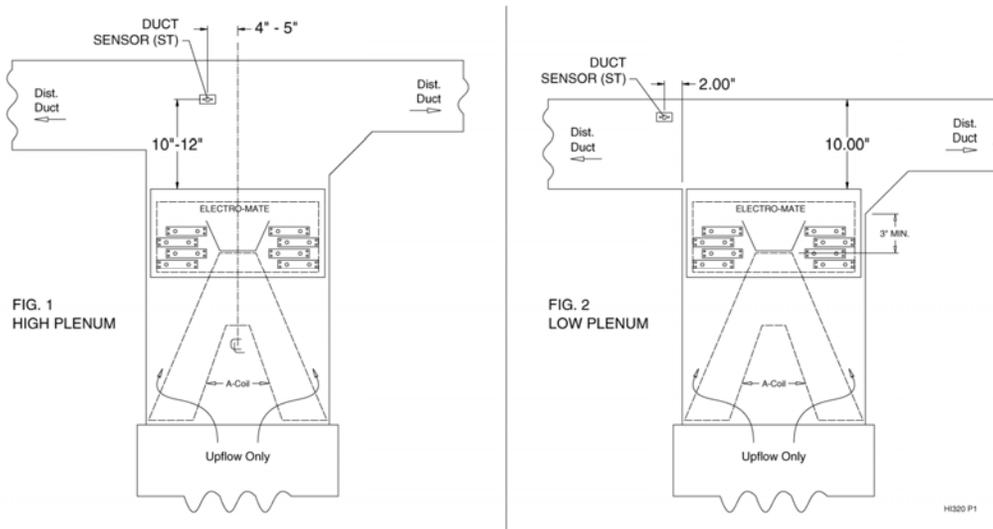
1. Determine best location for ST sensor using the sketches below (horizontal is on previous page).
2. Locate directly above Electro-Mate element, preferably left side for upflow models. Locate directly below Electro-Mate element, preferably left side for downflow models. If you do not have the 12” height, locate in the major distribution duct, but as close as possible to the plenum and so there is a direct airflow path from the electric element to the sensor.
3. Drill ½” hole in the hot air distribution duct about 14 to 18 airflow inches away from the Electro-Mate element.
4. Prior to inserting ST white tube verify tip position

Note: The black tip inside of the white tube is the temperature sensor itself. It must be positioned slightly sticking out of the white tube. The only purpose of the white tube is physical protection; once it is installed it is okay to push out the sensor ½”to make it more sensitive and faster responding.
5. Mount ST white tube using two mounting holes.

OT & ST Sensor Reconnection

1. A plug-in terminal block is provided for wiring convenience.
2. Both red wires are terminated in the same single screw (+), and both white or green wires are terminated in the single common screw (COM). Each appropriate black wire is terminated in the appropriate OT and ST screw.

WARNING - If the black and red sensor wires are crossed or incorrectly installed at the terminal block and power is turned on, burnout damage can result within the sensor probe



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WF-LGR4 & WF II WIRING & SETUP

WF-LGR4

Application – Standard heat pump room thermostat, heat pump, WF II Electro-Mate, gas/oil furnace. HP manufacturer's fossil fuel kit is **not** required.

Reference Drawing HH340

1. The provided 10-wire cable includes all connections and functions between WF-LGR4 and the WF II main board within the Electro-Mate unit.
 - a. The 10-pin connector on the main WarmFlo II board originated manufacturing date 08-04-04 (ARL 3074). On the 10-pin connector may be a dummy cap plug, remove and expose all 10 pins.
 - b. If with this installation you do not have WarmFlo II main board with the 10-pin header, you can either update the WarmFlo board or call factory for special instructions for cutting up the cable and terminating with female ¼" tabs.
 - c. If this installation is with the new upgraded WarmFlo and the new WF+ control board, there is no thermostat, heat pump, furnace, load control wiring or field hookup on the WF+ board. All thermostat, load control, etc. connections are on this separate enclosure board. Even though the WF+ board is larger, when plugging in the 10-wire cable the WF+ board functions identical to the normal WarmFlo II main board.
2. All field connections and wiring from thermostat/heat pump/furnace are now directly at this controller, there are no bypass wires.
3. **Room Thermostat Connections** – upper left terminal block, 5 or 6-wire cable.
 - a. Terminology is universal, should match most any heat pump room thermostat.
 - b. The W at the roomstat is **not used**.
 - c. Since this controller is single speed only, there should only be a Y1.
 - d. **Do not use** "dual fuel" or complex/sophisticated room thermostat.
 - e. If you desire to use the roomstat emergency lever or function, you have a choice to connect the "E" screw to either WF or GAS tab. Electro recommends WF (full plenum heater output) and use the override switch in the front of this controller as your gas switchover.
4. **Heat pump outdoor unit** – upper right terminal block, 4 or 5-wire cable. Terminology should be universal, but some units provide colored wires only. Installer will need to match the wire color to these lettered functions.
 - R – 24-volt power
 - C – 24-volt common
 - Y – compressor contactor coil
 - RV (O) – reversing valve, typically orange
 - a. As an option (if the installer is absolutely confident of this function), the defrost output wire can be connected to DF (W1) tab to increase the plenum heater kW output (all stages on immediate) when the outdoor unit initiates defrost.
 - b. Since this controller can only be used for single speed equipment, there should only be a single Y function.
 - c. These are the only connections or wires needed from the outdoor unit.
5. **Furnace terminal block** – bottom center terminal block, 4 or 5-wire cable. Terminology should be universal.
 - a. The Y is only needed for variable speed, ECM motor, type blowers.
 - b. The power for this controller and the Electro-Mate/WarmFlo comes from the furnace transformer and is R and C at this bottom terminal block.
6. **Utility Load Control** – if utility load control applies, remove the blue jumper from the bottom left terminal block and connect the utility NC contact receiver or device.
 - a. If opposite control logic is required, contact factory for other wiring instructions.

Caution – 24 volts common grounding – the installer must determine whether the furnace fan center COM screw terminal has a good ground bond (not simply furnace skin). If the fan center COM is not adequately grounded, use the pigtail green wire (WarmFlo board, upper, C tab) for a ground bond to the Electro-Mate cabinet power source ground lug. The upper right circuit board mounting screw is a static ground protection point.

CONTROLLER SETUP OR PROGRAMMING

RV Logic Selection, Setup Required

Since this model uses the reversing valve thermostat wire to disable WarmFlo and the gas furnace during cooling, it is extremely important the installer knows the RV logic of the installed HP unit and the pin jumper at the center top of this controller board is properly selected.

- The HEAT and COOL represents when the reversing valve is high or at 24 volts. Example – pin jumper between center and “COOL” means the reversing valve wire is at 24 volts during cooling.
- The factory default is pin jumper setup for cool = high.
- **Important** – if there is operational difficulty during defrost with the reversing valve (O) wire changing states during defrost or a RV logic high during heating application using stat B screw, you must have a wire connected to the DF (W1) tab representing a high voltage during the outdoor unit defrost mode. A high input at the DF (W1) tab disconnects the RV (O) input wire and also affects the WarmFlo “E” tab.

Using roomstat “B” function for units which are setup as heating = high RV logic – with this arrangement you **must** provide the shorted pin jumper on the upper left side of the board marked “Stat-B”. When received or all applications using cooling = high RV logic, the two pegs are open and the pin jumper is simply “hanging” on one of the pins. For this application the two pins must be shorted.

Important - Located on the WF II board is a firmware chip that determines a specific set of defaults (see table below). However, this can be programmed (altered) with optional PC software (ET-SOFT-WF) or a plug-in WarmFlo analyzer (WF-ANZ*). As part of the WF II system this chip represents critical defaults and settings that make your system operate correctly. It is a critical portion of the installation to verify that the chip code sent with your WF II is correct for your intended application.

The table below represents the typical WF II chip codes and defaults for use with a WF-LGR4. Please use this table as a reference as you setup your WF II. See Operational Information and last section of this manual for further information on these defaults.

Chip Code Reference Table

Code	Stg. Enable	MU Time	ODT Mode	OT Function
HPDH	50°, 38°, 36°, 34°	90	HP	DT cal.
HPDF	50°, 38°, 36°, 34°	30	EL to SB	DT cal.
HPEL	50°, 38°, 36°, 34°	00	HP	DT cal.

MU Time - Standby or Gas Furnace Operation - Whenever all four stages are full on (if it is not a four-stage Electro-Mate, this simply means full Electro-Mate output), and operating at a continuous 100% for a fixed delay (see Chip Code Reference Table, MU Time); the WarmFlo II controller automatically terminates all electric and starts the gas furnace. The gas furnace will be used to complete the heating cycle until room thermostat heat call ends.

During the next heat call, the heat pump and Electro-Mate stages again attempt to produce the WarmFlo II desired temperature. Again, if everything is at 100% plus the MU time, the gas furnace takes over.

HPDH Chip Code – Electro-Mate Sized for Complete Heating Load

Application: 8-wire standard heat pump thermostat, WF II Electro-Mate, Heat Pump, gas/oil furnace using ODT to control heat pump only – The WarmFlo II controller with this chip has outside temperature reference for enabling the electric heat staging (except “E” tab). The outside temperature (actual sensor) must be below these values before the stage will come on, independent of supply sensor requirement.

Stage 1 = 50°F 2 = 38°F 3 = 36°F 4 = 34°F

MU Time – Set to 90 minutes

WF II DIAL SETTINGS

Lower right dial switch – min. warm air – The yellow screwdriver adjustment dial sets a “floor” or level minimum operating temperature. The supply temperature will never go below this point independent of outdoor temperature. In other words, this is the flat horizontal line on the warm air versus outdoor temperature curve. Reference manual “heat loss curve graph”.

0 = 90 4 = 98 Factory set on #3.
 1 = 92 5 = 100
 2 = 94 6 = 102
 3 = 96 7 = 104

Top right dial switch - Built-in ODT or Low Temperature Switch-Over – The yellow screwdriver adjustment dial can be set to **terminate the heat pump** or via special programming can terminate heat pump and electric to allow total gas operation below ODT temp. (reference manual WF-ANZ*).

The temperature settings related to the “ODT dial” are:

Ø = Disabled, no ODT switch-over Factory set on #3.
 1 = -15°F 5 = 10°F
 2 = -10°F 6 = 20°F
 3 = 0°F 7 = 30°F
 4 = 5°F

COMMENT: If you are using outdoor compressor built-in ODT, set the dial to “0”.

Temperature (Efficiency Dial) – Located on the front cover of the WF II Electro-Mate, the red center screwdriver adjustment dial has a selection of A through G. These A through G selections represent a supply temperature point at 0° outdoor. The closer the user or installer selection is to A, the flatter the heat loss curve or the higher the operating efficiency. The closer a selected setting is to G, the steeper the heat loss curve or the lower overall heat pump system efficiency. If knob is turned to “full” the WF II will automatically go to “DT flat”.

WF-LGR4 adjustments and settings – The normal/standby switch provides the standard user override function (some power companies request inactivation or deletion of this switch).

Requires selection of the proper RV logic at the LGR4 board top center, see page 7.

Reference “WarmFlo Handheld Analyzer/Laptop Software” section in this manual for changes to your chip functions.

HPDF Chip Code – Electro-Mate Undersized

Application: 8-wire standard heat pump thermostat, WF II Electro-Mate, Heat Pump, and gas/oil furnace using ODT setting as full electric control – The WarmFlo II controller with this chip has outside temperature reference for enabling the electric heat staging (except “E” tab). The outside temperature (actual sensor) must be below these values before the stage will come on, independent of supply sensor requirement.

Stage 1 = 5Ø°F 2 = 38°F 3 = 36°F 4 = 34°F

Electro-Mate or strip heat undersizing – there are provisions within WarmFlo and within Electro’s various heating products to add partial resistance heating section to heat pumps. To provide optimum operation and comfort, the setup functions need to be activated accordingly. Default program code chip “HPDF” has been designed for this application. As a field setup, you probably want MU to be relatively short (30 minutes), the ODT mode will be “EL to SB” with a dial switch temperature selection at about the combination heat pump and Electro-Mate output energy (probably 0°) or position #3.

MU Time – Set to 30 minutes

WF II DIAL SETTINGS

Lower right dial switch – min. warm air – The yellow screwdriver adjustment dial sets a “floor” or level minimum operating temperature. The supply temperature will never go below this point independent of outdoor temperature. In other words, this is the flat horizontal line on the warm air versus outdoor temperature curve. Reference manual “heat loss curve graph”.

0 = 90 4 = 98 Factory set on #3.
1 = 92 5 = 100
2 = 94 6 = 102
3 = 96 7 = 104

Top right dial switch - Built-in ODT or Low Temperature Switch-Over – The yellow screwdriver adjustment dial can be set to **terminate all electric** to allow total gas operation below ODT temp. Electric will stay on until thermostat is satisfied. The only time gas will be used is in utility control (reference manual WF-ANZ* for special programming).

The temperature settings related to the “ODT dial” are:

Ø = Disabled, no ODT switch-over

1 = -15°F 5 = 10°F Factory set on #3.
2 = -10°F 6 = 20°F
3 = 0°F 7 = 30°F
4 = 5°F

This arrangement provides low temperature interrupt of **both** the heat pump and the Electro-Mate elements. If you desire to interrupt only the heat pump, this is the wrong chip code or can be altered with Handheld.

Temperature (Efficiency Dial) – Located on the front cover of the WF II Electro-Mate, the red center screwdriver adjustment dial has a selection of A through G. These A through G selections represent a supply temperature point at 0° outdoor. The closer the user or installer selection is to A, the flatter the heat loss curve or the higher the operating efficiency. The closer a selected setting is to G, the steeper the heat loss curve or the lower overall heat pump system efficiency. If knob is turned to “full” the WF II will automatically go to “DT flat”.

WF-LGR4 adjustments and settings – The normal/standby switch provides the standard user override function (some power companies request inactivation or deletion of this switch).

Requires selection of the proper RV logic at the LGR4 board top center, see previous page.

Reference “WarmFlo Handheld Analyzer/Laptop Software” section in this manual for changes to your chip functions.

HPEL Chip Code – Maximum Electric Gas Only Operates with Utility Control

The primary intent for this default arrangement is total electric heat pump without standby gas/oil furnace. However, there are some specific dual heat applications where HPEL could apply.

1. On a temporary basis gas furnace is not operative.
2. Gas/oil furnace is intended or used only during load control function.

Application: 8-wire standard heat pump thermostat, WF II Electro-Mate, Heat Pump, and gas/oil furnace. This code will only allow gas/oil on during utility control – The WarmFlo II controller with this chip has outside temperature reference for enabling the electric heat staging (except “E” tab). The outside temperature (actual sensor) must be below these values before the stage will come on, independent of supply sensor requirement.

Stage 1 = 50°F 2 = 38°F 3 = 36°F 4 = 34°F

MU Time – disabled or 00

WF II DIAL SETTINGS

Lower right dial switch – min. warm air – This is the screwdriver adjust which sets a “floor” or level minimum operating temperature. The supply temperature will never go below this point independent of outdoor temperature. In other words, this is the flat horizontal line on the warm air versus outdoor temperature curve. Reference manual “heat loss curve graph”.

0 = 90	4 = 98	Factory set on #3.
1 = 92	5 = 100	
2 = 94	6 = 102	
3 = 96	7 = 104	

Top right dial switch - Built-in ODT or Low Temperature Switch-Over – This is the screwdriver adjustment dial that can be set to **terminate heat pump** below ODT temp. The only time gas will be used is in utility control (reference manual WF-ANZ* for special programming).

The temperature settings related to the “ODT dial” are:

Ø = Disabled, no ODT switch-over

1 = -15°F	5 = 10°F	Factory set on #3.
2 = -10°F	6 = 20°F	
3 = 0°F	7 = 30°F	
4 = 5°F		

COMMENT: If you are using outdoor compressor built-in ODT, set the dial to “0”.

Temperature (Efficiency Dial) – Located on the front cover of the WF II Electro-Mate, the center red screwdriver adjustment dial has a selection of A through G. These A through G selections represent a supply temperature point at 0° outdoor. The closer the user or installer selection is to A, the flatter the

heat loss curve or the higher the operating efficiency. The closer a selected setting is to G, the steeper the heat loss curve or the lower overall heat pump system efficiency. If knob is turned to “full” the WF II will automatically go to “DT flat”.

WF-LGR4 adjustments and settings – The normal/standby switch provides the standard user override function (some power companies request inactivation or deletion of this switch).

Requires selection of the proper RV logic at the LGR4 board top center, see previous page.

Reference “WarmFlo Handheld Analyzer/Laptop Software” section in this manual for changes to your chip functions.

OPERATION INDICATORS

WF-LGR4 Front Monitor LED's

- **Utility, off-peak** – utility load management receiver is not interrupting.
- **HP call** – the output “Y” screw terminal is active at 24 volts high. The outdoor unit should be on and running. This LED will be off when the OT sensor is below the setup ODT value.
- **T-stat call** – the room thermostat Y or E is active or 24 volts high.
- **Cool mode** – follows the reversing valve wire, top center pin jumper selects the high logic. If installed and setup correctly this light is always on when the roomstat lever is in cool.
- **Gas call** – the furnace “W” or terminal block feeding fan center W is 24 volts high.
- **Monitor LED Comments** – the “utility, off-peak” LED is a true representation of the load control blue wires. It will not react to the override switch, A1 tab, program MU timeout, SOT-S, etc. However, the main WF II board “EL ON” is a true representation of what's going on within the WarmFlo logic.

Override Switch – the front panel slide switch (very similar to standard Electro-Mate DFC) is a direct hardware disabling of any WarmFlo and electric elements functions. The room thermostat heat call wire or function is directly controlling the fossil fuel or gas furnace. This totally resides within this controller, the WarmFlo II main board could be completely disconnected or completely non-functional but the override switch will still allow fossil fuel furnace operation. This function can also be on a remote switch, see page 16 “SB” tab.

Blower Operation – the blower function is totally within this controller and has nothing to do with the main WarmFlo board. The stat “G” function is directly channeled to the furnace “G”. The thermostat “Y” and “E” activate an internal “furnace G” with an approximate 10-second turn on delay and a 1-minute turn off delay.

The furnace “Y” is also activated when the internal blower relay is on from an HP heat or cool call.

WarmFlo II Main Board

Strip Heat Disable – To maximize heat pump system energy efficiency and preventing “accidental” unnecessary resistant strip heat when it is not required, this WarmFlo II disables or locks out strip heat elements based upon outdoor temperature.

Depending upon program code chip and information in the colored sections, the strip heat may not activate or operate unless the WF outdoor sensor is below the ODT dial setting. Typically for a heat pump, factory settings are:

- Stage 1 - 50°F
- Stage 2 - 38°F
- Stage 3 - 36°F
- Stage 4 - 34°

Monitor LED's on WF II Board

Green LED - When illuminated WarmFlo II is receiving 24V power. Under all normal operating modes, this should be solid green.

- As a secondary function this green LED provides status of the two remote sensors. If a sensor is inoperative, incorrectly wired, or malfunctioning; this monitor light is in a blinking or pulsing mode. By checking the pulsing pattern, the appropriate sensor can be identified.
- OT sensor - 1000 ms blink every second.
- ST sensor - two, 1000 ms blinks every second.
- Both bad - ½ second on, ½ second off, alternating.

Amber LED – When illuminated WarmFlo II is in the electric heat operating mode.

Inside Warmflo Board, Red LED's - The four red LED's next to the output connector, indicate Stage 1, 2, 3, and 4 operation (Stage 1 is on the bottom).

EM-WU***/EM-WD*****/ Inside Relay Board Monitor Light**

COMMENT: This relay board relates to standard Electro-Mate, if this WF-LGR4 is connected to the new Electro-Mate with a WF+ board, the internal relays and relay driver board are totally different. The following does not apply, see description within the Electro-Mate manual itself.

Inside Red LED - Illuminates when the low voltage hi-limit sensor probe opens. This applies only after thermostat heat call and WarmFlo II controller is activating the various element stages. If there is a hi-limit condition, red LED is illuminated. As soon as the hi-limit cools and snaps back in, red LED extinguishes.

Triac Relay Module (under inside relay board)

This module has its own built-in LED. When the LED is on, the triac switch is closed, elements will be heating. This LED shall operate coincident with Stage 1 on the WarmFlo board.

COMMENT: The relay board activates from the WarmFlo II main board as WarmFlo II interprets the "Y" input voltage in relationship to both temperature sensor requirements. However, the "Y" input also directly controls the Stage 1 triac and the staging relays. Whenever the "Y" input goes to 0 volts (at the end of the cycle) the relay output immediately goes off and strip heat is turned off and not necessarily stepped down as shown by the WarmFlo II monitor Red LED's. This is a safety feature; strip heat cannot be accidentally kept on by WarmFlo II internal logic if there is no "Y" input.

STAT OVERRIDE TIMER (SOT)

This is a field option internal timer which can be field programmed with WF analyzer to select a roomstat cycle run time. If this downloaded run time (typically 90 minutes) is exceeded before the thermostat is satisfied, the system automatically switches to either full electric elements or standby.

- SOT S – this is the longer set timer which allows transfer to standby if something might have happened to the electric system unmonitored.
- SOT E – this must be shorter time than above, is typically used to overcome morning setback pickup issues. In other words, if you would field download 30 minutes and you program the **setback stat** to begin bringing up the temperature 30 minutes prior to the wakeup time; and the system is not at the new higher temperature at the 30-minute point it will automatically jump to all stages full on (DT flat) in order to more rapidly raise the building temperature. **However**, this also means you will be “short cycling” the HP compressor during **other** heat calls. The maximum run time for the compressor is then about 30 minutes at any time of the day or at any particular heat call.

Notice: Effective program code chips after 7-7-04 the SOT S has been factory set at 90 minutes. This is an added safety feature to minimize house freeze-up if something is wrong with the electric section, switching over to standby furnace.

HANDHELD ANALYZER/LAPTOP SOFTWARE

This test tool and/or software is available for temperature offset, field altering the program chip parameters and setup, and general assistance for troubleshooting.

See the enclosed “WarmFlo Information” document (HD320) for functional details.

- Blower speed
 - Both the ST and the OT can have temperature entries which provide a SPD A and SPD B signal within the 10-pin cable for further interface with optional relays to further control ECM variable speed motors. See next section.

SPECIAL APPLICATION/INSTALLATION

For Various Heat Pump, Multi-Speed, Multi-Stage Furnaces, Blower Options, Oil Furnace, etc.

Typical Oil Furnace Comment

This controller is designed to interface directly with a furnace fan center containing 24-volt transformer (40VA or larger), blower relay, and a “W” function to operate the fossil fuel furnace. If this installation is for an **oil furnace** with only oil control “T and T” terminals, a fan center will need to be added plus an isolation relay at the “W” terminal so only isolated contacts are connected to the oil burner master control “T and T”. Another choice is to use a standard fan center and order EE-5053 relay with accompanying HD001 instruction sheet.

Wood Furnace or Other Non-Automatic Standby Furnace

WarmFlo II works ideally with a wood furnace because it modulates (or adds to) the electric element to maintain a fixed temperature output. Thus the wood fire can “die down” and the supply sensor (ST) will make up electric element heat to keep the building comfortable. The other operating extreme is a “hot” wood fire where it is adequate to heat the building. In this case the supply sensor will be measuring temperature greater than required and turn off all elements automatically. However, there must be adequate controls on the wood furnace so that the discharge temperature does not exceed 180°F.

2-Stage Gas Furnace – from Electro’s experience all 2-stage gas furnaces must have a W1 before reacting to a W2 or special variable burner second control wire. Realizing this, any of these W2 functions from a special roomstat can go directly to the furnace terminal block. This LGR4 properly handles W1 which is the main control function for the furnace.

2-Stage or 2-Speed Compressor – this WF-LGR4 must only be used on single stage equipment. If you have 2-speed compressor equipment, use and order controller built for the application – WF-HP2.

Variable speed, ECM motor, blower – standard within this controller, the furnace Y connection will always have voltage relating to the cooling speed requirement. This Y function voltage is not present during standby. With this basic and provided feature the ECM motor basically has two speeds – continuous air, G only and G and Y combination for full cooling speed.

Load control, other products or hardware – if there is a need to “pass on” the utility load control receiver function to other heating equipment, radiant floor boiler, peak interrupter, etc. the addition of a plug-in EE-5051 switching relay can easily accomplish this extra load control function. Simply connect the high impedance DC coil to tab R and common. Drawing HH339 provides wiring information.

Caution: You cannot use “any relay coil” for this function. Suggest one of the above model numbers or special DC high impedance 24-volt relay.

OPTIONAL ACCESSORIES

Standby Override – The front switch provides a very effective override switch to fossil fuel furnace capability. This is a hardware override switch and does not depend upon the WarmFlo board, microprocessor, electronics, etc. Typically this takes the place of dual fuel heat pump thermostat “emergency lever” function.

Remotely located standby override switch – on the left side of the I/F board is a “SB” tab. Using an external switch between this “SB” tab and a common tab provides the same function as the front override switch. Whichever switch is in the up or override position takes priority. In other words, they **both** need to be in the down position during **cooling**.

Note: All override switches must be in normal or electric position during cooling.

Load Shedding, Electrical Service Entrance Not Adequate - When using the 10 kW Electro-Mate on a 100-amp service with other major appliances, there are very simple techniques to make sure the 100-amp service is not overloaded. These are based upon inserting one 240 wire from either or both the electric dryer/electric range through a small donut CT. This detection of appliance turn-on immediately drops out a secondary 5 kW load. Both techniques have the necessary input detection delay window to compensate for pulse modulation stove top burners.

- EM-LV104L* – Order EZ-Mate plenum heater with load shed capability – 5 kW firm, 5 kW shed.
- PI-ØA1DYMO – Sensor CT (1 or 2, ½” donut), 4 wire low voltage connection to standard Electro-Mate or WarmFlo II/ Electro-Mate – drops 1 stage or typical 5 kW (reference drawing PH510).
- PI-Ø31DYHO – Sensor CT (1 or 2, ½” donut), service panel wiring, drops electric water heater or any 25-amp circuit appliance/electric heater.

TROUBLESHOOTING

Comment: Also see the “WarmFlo Information” document (HD320) included with this manual.

Sensor Temperature Calibration - Both remote sensors are digital electronic and factory calibrated. Normally these do not require field calibration or verification. However, if sensor temperature error is determined, there are two field calibration techniques. Proceed with extreme caution.

1. The outdoor sensor can be calibrated with ice (32°F). Notice a small push button next to the sensor terminal block, with the sensor at 32°F, push and hold for approximately ten seconds. When green LED “blinks” at you, release and now the outdoor sensor is set at 32°F.

Caution: This is not a temperature checking situation. If you proceed with this function, the sensor automatically goes to 32°F.

2. Use WarmFlo II Analyzer test set or purchase special PC software disc and PC serial port cable. These plug-in devices allow direct readout of both temperatures, allows a visual determination of WarmFlo II internal temperature settings, and can be used to offset either temperature sensor for troubleshooting and demonstration purposes. This is especially valuable during summer installation. Call factory and order test set device.

Outdoor Sensor (OT) Location – direct sunlight has a definite affect on sensor temperature reading. The sensor white tube must be “shadowed” from direct sun rays.

Troubleshooting/Repair Helps

1. This WarmFlo II controller contains several interference suppression components, but as an electronic logic product, unpredictable and unusual transients or interferences may sometimes cause strange results. If the WarmFlo II controller is “acting strange”, one immediate step would be power down reset. Simply turn off the 24-volt source power (probably furnace or air handler circuit breaker), when the green LED goes out, count to 10, and re-energize power supply.

2. The terminal blocks for control wire hook-up are designed for a wire insertion and screw clamp down. If there is no wire connected and the screw is loose, the screw may not necessarily make a good electrical contact to the inside components. Example – if you are jumpering the thermostat terminals without thermostat wire connection or if you are attempting to measure voltage on the screw head, you may get erroneous or unpredictable results if the screw is not tightened down.
3. Use general heating system logic information and basic understanding of the terminal block wiring functions when measuring voltage to determine proper operation of this module.
4. The outdoor sensor must be located outdoors for this controller to correctly operate. Do not leave the outdoor sensor “hang in conditioned space” and attempt to run this system.
5. Acquiring the WarmFlo II Analyzer test set or the PC software and serial port hook-up cable (see previous page) is a positive tool for understanding and troubleshooting the WarmFlo II controller. Either test set device can display all temperatures, real time evaluation of WarmFlo II functions, provide temperature offsets for assimilating winter conditions, and reprogram the control chip (program stays with the actual controller board).

Bad sensor, safety – if the internal logic detects open sensor wire, incorrectly wired sensor, or some bad sensor transmitted value conditions; the green LED reverts to a pulsing mode. Basically the appropriate sensor is set internally to a 0° value and the WarmFlo main board only allows stage 1 and stage 2 on.

- OT sensor – approximately 1/10 second blip every ½ second
- ST sensor – two, 1/10 second blips every ½ second
- Both bad – ½ second on and ½ second off, alternating

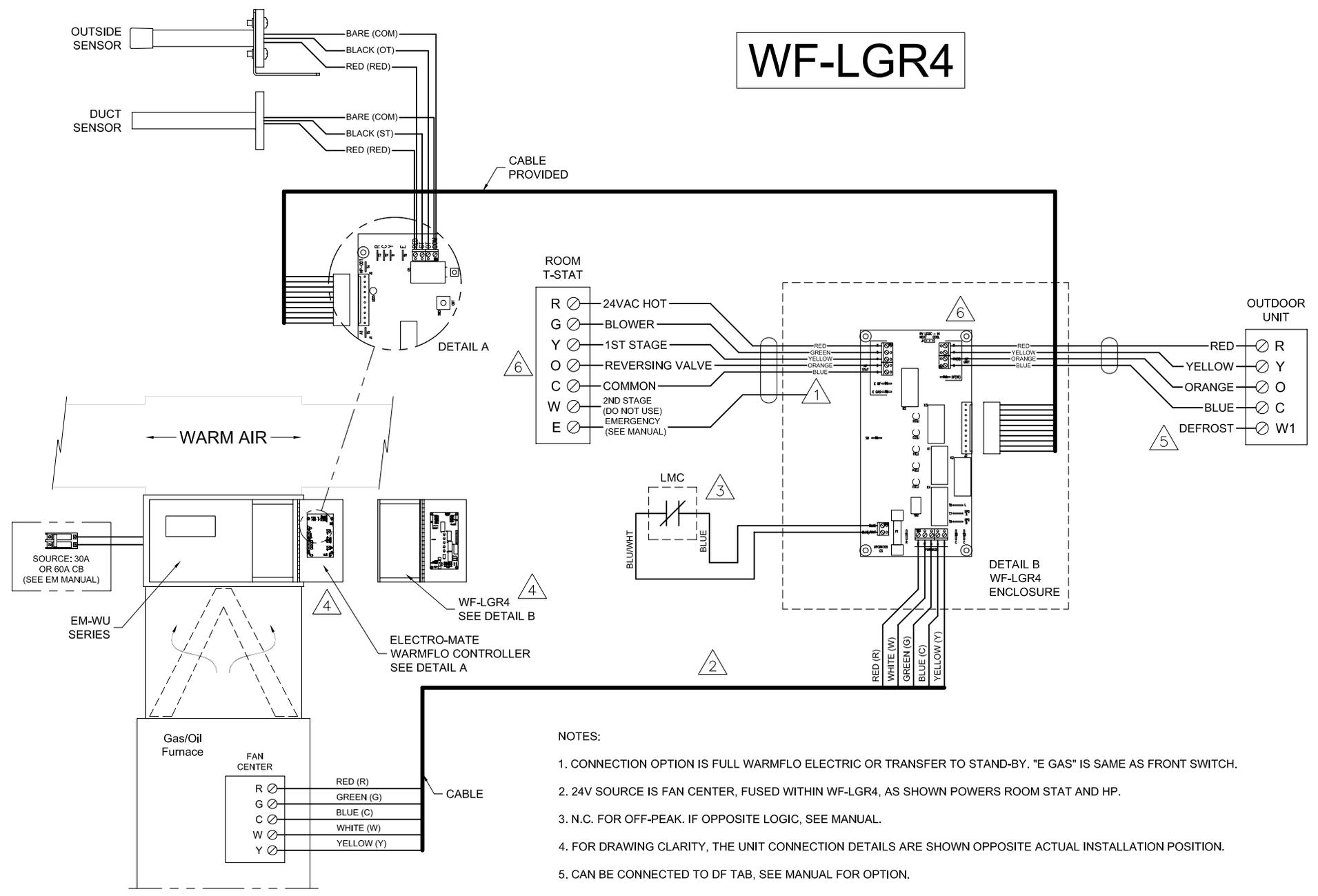
Bad sensor, could disable cooling – depending upon the ODT setting a bad sensor, even during cooling, can affect the ODT of the compressor and the compressor will be off. Temporary fix is to set the ODT dial to “0” position and get the sensor fixed. Verify with plug-in Analyzer and/or no blinking green LED.

Analyzer readout, sensor temperature constant 32° or 0° – these two values represent digital bit patterns that are hard to predict an error function. A blinking green light may or may not be experienced. Typically the cable is too long, wrong type of sensor wire, or some electrical interference on the sensor cable.

24-Volt Fuse – the internal fuse is between the fan center “R” and all other WarmFlo II functions, including the “R” going to the outdoor unit. Use only two amp, fast blow.

WF-DUAL HEAT STD. HP STAT

WF-LGR4



Electro-HELPS IV

WarmFlo Terminology, Key Terms

ST – supply temperature sensor. This is the warm air or duct sensor (boiler – supply outlet water).

OT – outdoor temperature sensor. Provides the WarmFlo board with outdoor temperature information.

DT – desired temperature to overcome building heat loss, the diagonal line on heat loss curve. The front panel efficiency knob selects one of 8 curves to determine DT at specific real time OT.

DT Flat – this is an internal reference point, as WarmFlo establishes this mode it in essence sets the operating point at 125° F. (Analyzer or software may have any value from 123 to 125). Electric element modulation and staging are still in effect. The staging will be based upon the ST sensor detecting and operating around the 125° point.

Note: All four stages do not automatically go to full on.

HL – actually this is the same as “DT Flat”. This perceived hi-limit temperature value (130°) within the control logic, measured by the ST. This is over and above the 155° probe or 170° mechanical hi-limits.

Full electric (or Full EL) – this setting causes the modulation and staging to operate at “DT Flat”. When first selected or turned on, the WarmFlo logic may first go through a process of building up to the “DT Flat” value. Do not expect the outlet temperature to immediately jump up to this highest value. However, on consecutive thermostat calls it will immediately step to the “DT Flat” temperature value.

Note: This is essentially the same as DT Flat and again all four stages do not automatically go to full on.

Staging Disable Temperature – in all OT active sensor applications (DT cal) there is a setup program temperature to "hold off" each stage for warmer heating conditions. In other words, the OT sensor must be reporting a temperature below these values before the stage is allowed to come on. In WarmFlo Analyzer or PC software terminology this is called – STG1 DIS, etc.

The stage-up situation relating to all of the above "DT Flat" operation is controlled by these stage enable temperature set points. This statement must be carefully related to all of the above.

- In other words, if the OT is reading 42° and the front panel is set to "full electric" the ST is looking to operate at 125°, but only stage 1 will be on.

If for heat pump applications Stg 1 is set at 50°, there will be no electric element or standby furnace above 50° OT.

Note: For HP roomstat multi-wire thermostat application, the OT temp. set point must be below normal desired cooling.

E tab (board top center) – in most WarmFlo products and TS Series boiler products there is a troubleshooting tab marked "E". When applying 24-volt (or jumpered to "W" tab) this input function immediately forces all four stages on and bypasses all temperature sensing or element modulation sequences. If used verify blower also functions properly.

- New 2008 – version 2.38, 10.03, 12.04, 15.03, etc. – once activated, it remains for the completion of the heat call. Thus it only needs to be a temporary jumper (5 seconds or more) to step on all stages. User needs to remember to cycle the roomstat to cancel this E tab function.
- A potential convenience or secondary usage for this upgraded E tab function is to provide an easy manual means for rapidly bringing up the building or room temperature if the system has been set for non-occupancy. By installing a pushbutton between W and E tab, the homeowner can easily activate all stages on to the end of the thermostat cycle.
Warning: This is all stages on, no temperature monitor. This should only be used in this manner when it is a very cold building from non-occupancy, the outdoor temperature is quite low with low temperature rise coming from the heat pump.

Stat override timer (SOT) – this is an option WarmFlo internal timer which can be programmed with WF analyzer to select a roomstat run time. If this downloaded run time (typically 90 minutes) is exceeded before the thermostat is satisfied, the system automatically switches to either full electric elements or standby.

- SOT S – this is the longer set timer which allows **transfer to standby** if something might have happened to the electric system.
- SOT E – this must be shorter time, is typically used to overcome morning setback pickup issues. In other words, if you would field download 30 minutes and you program the **setback stat** to begin bringing up the temperature 30 minutes prior to the wakeup time; and the system is not at the new higher temperature at the 30-minute point it will automatically jump to DT Flat in order to more rapidly raise the building temperature. **However**, this also means you will be “short cycling” the HP compressor during **other** heat calls. The maximum run time for the compressor is then about 30 minutes at any time of the day or at any particular heat call.

Note: Beginning approximately 7-04 the SOT S has been factory default at 90 minutes for all dual heat chip codes.

MU – this is an internal timeout function which begins when **all stages** are on at 100%. Anytime the electric section is operating with all stages on at 100% for a continuous operating time greater than the programmed MU (3 initial minutes), the system automatically switches to standby. MU = 00 is a disable setting. The amber LED on the main WarmFlo board will correctly follow electric or standby. On the Interface module (EZ3, etc.) the “gas call” LED also will be on, but the “utility off-peak” LED remains on.

Electro-Mate or strip heat undersizing – there are provisions within WarmFlo and within Electro’s various heating products to add partial resistance heating section to heat pumps. To provide optimum operation and comfort, the setup functions need to be activated accordingly. Default program code chip “HPDF” has been designed for this application. As a field setup, you probably want MU to be relatively short (30 minutes), the ODT mode will be “EL to SB” with an ODT dial switch temperature selection at about the combination heat pump and Electro-Mate output energy (probably 0°) or position #3.

Electro-Mate only, no heat pump – there are two default chip codes, EMW or EMA.

- EMW – all normal WarmFlo functions and modulation, front dial, etc.
 - Must be auto standby, no wood furnace.
- EMA – does not use an OT sensor, at each thermostat call outlet temperature goes to a preset value (commonly called electronic aquastat). This value is the “min. warm air” adjustment (inside main board).
 - The decal table shows the outlet temperature at the various “temperature” settings.
 - The plug-in Analyzer OT Function must be “disable” (no OT sensor).

Note: With an Electro-Mate it is assumed there is always standby or gas furnace. For non-automatic or wood, suggest using EMA and select the desired outlet temperature.

ODT dial switch mode – within the program chip default and Analyzer/software programming this function defines the use of the dial switch on the circuit board labeled “ODT”. The dial switch selects the temperature, the setup function selects what the temperature does.

- EL to SB – interrupts all electric elements **and** the heat pump
- HP – interrupts only the outdoor compressor unit, electric energy continues without an OT temperature shut down reference

Note: "0" position does not disable outdoor sensor. This only disables the built-in heat pump ODT function. With the dial switch "0" position the heat pump becomes a direct function of the room thermostat and/or standby mode.

Standby (SB) – the WarmFlo control system has transferred the thermostat or heat active function to the standby furnace via the appropriate Furnace Interface module (WF-EZ3, etc.). These actions cause SB.

- SOT-S timeout – thermostat continuous run time.
- MU timeout.
- ODT dial switch value – EL to SB mode.
- A1 tab at 24 volts – any switching device which raises A1 tab to 24VAC.

In addition the Furnace Interface module (EZ3, EM3, etc.) sends a signal via J2-4 (blue, high DC)

- Load Control interrupt (open blues)
- Front panel switch
- Added remote switch, “SB” tab to common

Note: *Electro-Helps V* has additional troubleshooting conditions that will help evaluate standby.

SB (Gas) 5-Minute Safety – when in the standby mode (see previous section) there is a 5-minute timer which begins at each heat call. If after the 5 minutes the ST sensor is less than 80°, the logic board itself goes into an automatic reset and restart. This simply means it attempts to begin the heat cycle using electric in case the furnace did not ignite or “out of gas”. However, if it is in the SB mode because of Load Control it will still remain SB and try the gas furnace again. The system will never go back to electric if Load Control is set for on-peak or A1 tab high.

- Typically this is disabled for boiler control applications.
- Analyzer or PC software can disable this function.
- As an added non-freeze safety feature, the program counts these 5-minute resets. If the count reaches 40 (200 minutes) and each time the ST is still less than 80°, the system will revert back to electric to bring up the temperature of the building, one thermostat cycle only.

Delay, transfer from electric to standby – because there are a multitude of gas furnaces which turn off the blower during their internal heat exchanger warm-up, there is a 1-minute delay before the gas furnace receives the W input. During this 1-minute the gas furnace G function remains high allowing the blower to purge out the heat on the Electro-Mate elements. After the 1-minute the G function drops and the gas furnace W function goes high.

Delay, transfer from standby to electric – if the unit was operating in SB for more than 1 minute, the follow-up transfer back to electric engages a 2-minute delay before the HP compressor relay is activated and any of the electric stages are activated. The blower will react to the call for heat, but the elements will stay off for 2 minutes in order for the blower to cool down the furnace heat exchanger. In addition the WarmFlo logic stages up from stage 1 through the various temperature/delay staging sequences.

Blower operation – the air handler or fossil fuel furnace blower is operated from its own fan center (G screw). The activation of this “G” input is either directly from a heat pump (total electric system) roomstat “G” screw or in the case of dual heat from the Furnace Interface module (WF-EZ3, LGR4, EM3, etc.). The Interface module and its wiring or association with the room thermostat completely controls the blower. There is nothing on or within the WarmFlo control board itself which has anything to do with the blower function.

- Delay on/delay off – within all Interface modules there is an approximate 10 to 15 second blower on delay and a 1-minute blower off delay. In the case of a heat pump stat, this can be bypassed by taking the stat “G” screw directly to the interface module tab “G1” (multi-wire stat only).
- Multi-speed blower – newer furnaces having multi-speed blower functions can be stepped up to the proper high speed with an appropriate (special relay contact) jumper between the furnace fan center “G” and “Y”. See the installation manual sketch and paragraph for adding the necessary wiring jumpers associated with the Interface module special terminals (BL, NO, NC). Also *Electro-Helps VIII* provides details on all the various wiring arrangements for ECM variable speed blower.
- Using E tab with HP stat emergency output – see previous “E-tab” section for blower operation caution.

Bad sensor, safety – if the internal logic detects open sensor wire, incorrectly wired sensor, or some bad sensor transmitted value conditions; the green LED reverts to a pulsing mode. Basically the appropriate sensor is set internally to a default value and there will be an attempt to cause the electric heat output to go “DT Flat”.

- OT sensor – approximately 1/10 second blip every ½ second
- ST sensor – two, 1/10 second blips every ½ second
- Both bad – ½ second on and ½ second off, alternating

Bad sensor default heating – when above condition is detected electric unit has limited staging output.

WarmFlo Analyzer or Software Bad Sensor Indicators

- 255 or NA - OT function is disabled, EMA/EBA type operation
- 254 or BAD - controller cannot read a value from the temperature sensor
- 31° (assuming it is not 31°) - new software (2.3* and up chip) with previous sensor, "D" ring (DS2434)
- 0° (assuming it is not 0° F) - previous software (2.2* chip) with new sensor, "E" ring (DS18B20), green LED should also blink

Cal. pushbutton, on board upper right – function is unchanged, holding for 10 seconds forces the OT sensor to 32° value.

Power-Down Reset – there are some data entry or setup modes which require power-down reset - WF+ board configuration selection, cancelling pulsing bad sensor green LED, etc. If in doubt do a complete 24-volt system power-down reset after WarmFlo Analyzer save operations. Reset always verifies the proper handling of a software modification.

HANDHELD ANALYZER/LAPTOP SOFTWARE

PC software (ET-SOFT-WF) or Handheld (WF-ANZ*) – now has provisions for the following setup or reprogramming functions. Caution – do not attempt to reprogram a forced air (Electro-Mate) chip for boiler application.

- Select proper product application – dial switch on the back
- MU time, or disable
- SB RESET – disable/enable
- SOT S time, or disable – switches to standby
- SOT E time, or disable – all stages on
- Stage disable temperature – 1, 2, 3, 4
- OT sensor function
 - DT cal.
 - Flat DT or HL (suggest not using)
 - Disable
- ODT dial switch mode
 - EL to SB – interrupt all electric energy (Electro-Mate and HP)
 - HP – Outdoor compressor interrupt only
- OT SPD A/B and ST SPD A/B – special temperature sensing speed settings, relates only to variable speed motor interface arrangements (WF-ANZ5 and up)
- WF-ANZ7 adds a EB-WO or EB-MO function for establishing the baseline or beginning point for modulation temperature ramp-on

Warning, field reprogramming – within WarmFlo II internal logic and non-volatile memory, it can detect whether it is operating from a pre-programmed chip (see table, following pages) or if it has been modified (reprogrammed) with PC software or Handheld. Once the user or field technician has downloaded (save), the WarmFlo II physical control board is no longer governed by the chip code written on the plug-in chip, etc. In other words, power up/power down or reset does not affect any altered reprogrammed functions. It is smart enough to know it is no longer the original chip and that **specific physical** board, from this time forward, must be under the control of the PC software/Handheld.

However, a new totally different coded chip with the same or different revision date will automatically wipe out any of the previous setups and can restart the same physical board based on the defaults within this newly added or different coded chip. After power-up reset the internal program reads the chip code and the version number. If either changes it begins new with the defaults and revision code of the specific replaced chip.

OPERATIONAL INFORMATION

In order for the installer to completely understand the WF II functions and operational sequence it is recommended to thoroughly read and understand the information below. This knowledge can help in determining settings that can be set according to the end customers needs.

Normal Heating Operation – Whenever the WarmFlo II Y tab is at 24 volt (with reference to “C”), the WarmFlo II controller begins turning on the Electro-Mate elements (assume outdoor temperature is below disable value) and automatically controls the warm air temperature as sampled by the warm air sensor (ST). However, if added heat is **not** required, no element power is used.

Depending upon Electro-Mate model, the heating section may have one, two, three, or four stages. Stage one is pulse modulated (approximate 10-second cycle) based upon the WarmFlo II controller automatic requirement. Stages 2, 3, and 4 are turned on and off with a relay. However, Stage 2, etc. is only used when needed by the WarmFlo II supply air temperature calculations.

When the warm air sensor is calling for more than the heat pump and Stage 1 100% output, Stage 2, etc. turns on. Stage 1 may not necessarily remain at 100%, but can be modulated downward to meet the requirements of the warm air sensor.

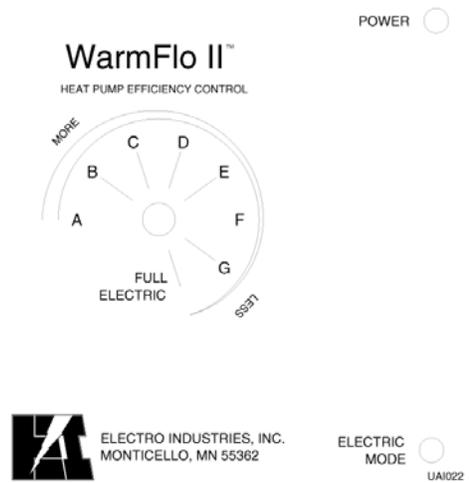
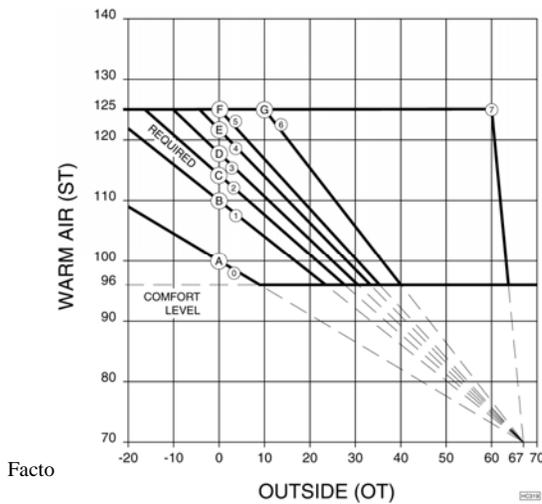
Also on the next call for heat, the WarmFlo II controller remembers what stages were on and starts at that point. A clamp-on amp meter at the service input can be used to “visualize” the Stage 1 modulation and/or Stages 2, 3, and 4 functions.

Note: Power-up reset or return from standby (SB) resets all staging memory and temperature cycling begins new.

Efficiency* – the characteristic of a heat pump dual heat system is the heat pump’s ability to deliver warm air at efficiencies greater than 100%. Gas and oil systems are always less than 100% (60% through 90%), resistance electric (Electro-Mate) is always exactly 100%, but the heat pump is always at least 100% (-20°F) or greater, up to about 200% for air source.

The user needs to realize it is to his advantage to run the heat pump either continuously or at the longest possible thermostat call cycles. This is contrary to the basic understanding of most users. However, realizing again the heat pump is a device that delivers greater than 100%, this system can only deliver greater than 100% if it’s running, let it run. Because of WarmFlo’s design concept and its internal “brain” the heat loss curve (diagonal lines, below) allows the compressor to operate with a minimal amount of electric resistance supplement or temperature boost.

Heat loss curve* – within the “brain” of the WarmFlo controller is a relationship of supply temperature (ST) to outdoor temperature (OT) measurement. As it gets colder outside, the higher needed the supply temperature in order to properly overcome the heat loss within the structure. This is the diagonal line between 67° outdoor and maximum Btuh (heat loss) at the coldest outdoor temperature. The slope of this line or the exact warm air position at the coldest temperature is established by the “efficiency” adjustment knob or dial.



Temperature (Efficiency Dial)* – the red center screwdriver adjustment dial has a selection of A through G. These A through G selections represent a supply temperature point at 0° outdoor. The closer the user or installer selection is to A, the flatter the heat loss curve or the higher the operating efficiency. The closer a selected setting is to G, the steeper the heat loss curve or the lower overall heat pump system efficiency. If dial is turned to “full electric” the WF II will automatically put all stages of electric to full capacity.

***Does not apply to chip codes such as EMA and EBA.**

Outdoor sensor reference or heating requirement level* – the outdoor digital sensor “tells” the WarmFlo “brain” its desired (DT) value or decision making capability. This is for desired or required supply temperatures greater than the “min. warm air” horizontal line setting. At each internal calculation cycle a DT is determined by reading the outdoor temperature (OT) and then finding the appropriate warm air point on the appropriate or selected diagonal line. See Figure 1 for the various diagonal lines associated with the A through G “temperature” selection knob.

Example – if the temperature knob is set on Position C, at 20° outside the DT or the supply delivery temperature is 100°. The WarmFlo controller now automatically adjusts and maintains electric element power to keep the supply temperature at 100°. Likewise if it - 10° outside the DT or supply delivery temperature is 120°. The elements are re-adjusted to provide a constant 120° temperature.

Where should I set the efficiency dial? – As you can visualize from the curves above, the lower the setting, the flatter the curve, the less electric resistance is added to the heat pump compressor warm air. Therefore, the efficiency knob setting is based upon comfort and efficiency. The lower the setting the higher the overall operating annual efficiency, the higher the setting the warmer the air at the register.

Chip code/field programming – your unit was ordered and supplied with a “coded” program chip, one of the selections shown in each Chip Code Reference Table for your application (within the various colored page sections). These tables show the various defaults associated with that particular code. With WarmFlo II a number of field re-programming possibilities and options exist using either PC software or WarmFlo analyzer, reference “WarmFlo Handheld Analyzer/Laptop Software” section. Chip code is located on the WarmFlo II controller board white label.

Note: There are certain things such as SOT’s, MU time, etc. which are only field programmable. If the item is not shown in the chip code table, that feature or item is default set as disable.

WarmFlo Select, WarmFlo+, EZ-Mate, WF II

Selection Dial	Code	Stg. Enable	MU Time	ODT Mode	OT Function	SOT-S
Dual	HPDH ²	50°, 38°, 36°, 34°	90	HP	DT Cal.	90
ANZ-set	HPDF ²	50°, 38°, 36°, 34°	30	EL to SB	DT Cal.	90
No Gas	HPEL	50°, 38°, 36°, 34°	00	HP	DT Cal.	00
ST & OT	EMW	90°, 50°, 36°, 34°	60	EL to SB ¹	DT Cal.	90
ST	EMA	-	00	EL to SB ¹	Disable	90
-	HPFU	50°, 38°, 36°, 34°	30	HP	DT Cal.	90

¹ODT dial switch must be set on 0 = disable.

²EZ-Mate – dual is HPDF, not HPDH.

Other defaults, all Forced Air models.

SB RESET – enabled
 SOT-E – 000 (disabled)
 OT SPD A – N/A
 OT SPD B – 30°

ST SPD A – N/A
 ST SPD B – 105°
 CT STG DISABLE – all 0, except EZ-Mate = 3
 CT STG DISABLE – all 0, except EZ-Mate = 4



ELECTRO INDUSTRIES, INC.

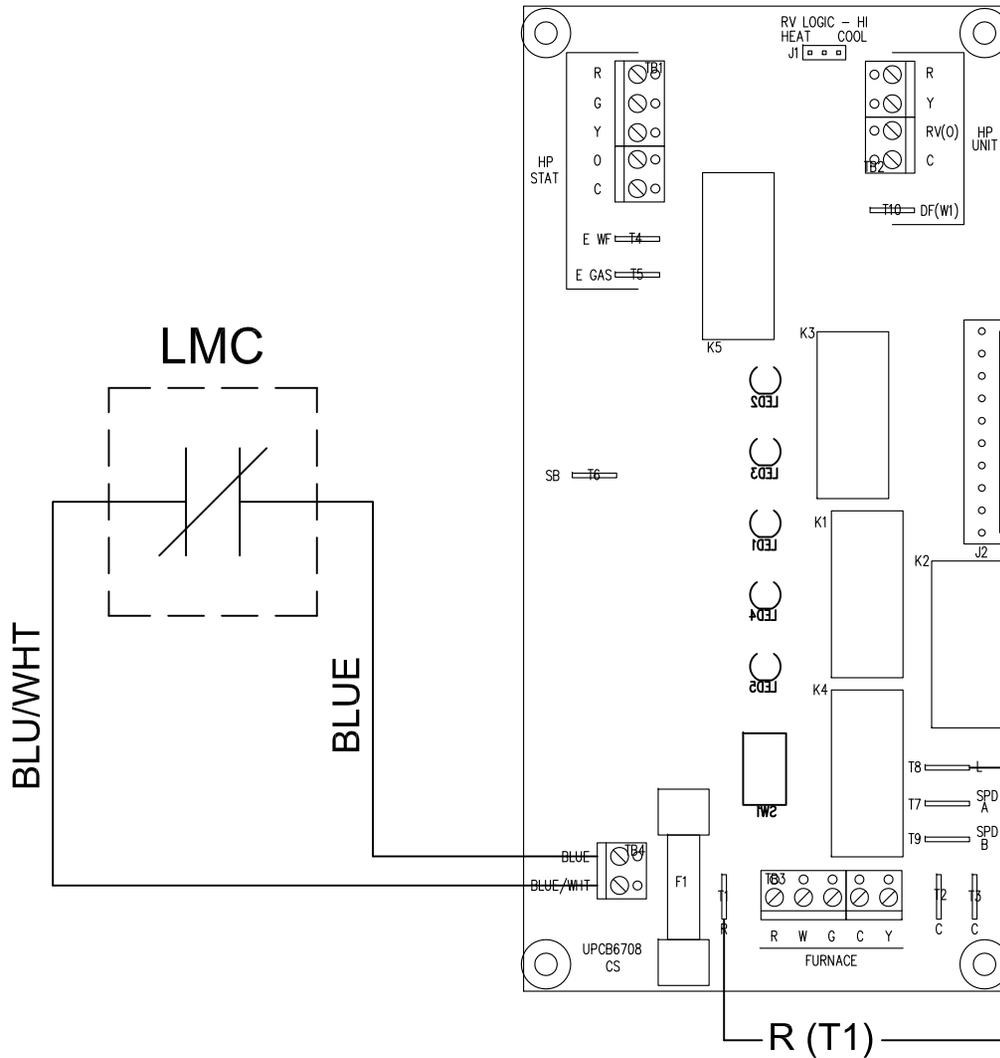
2150 West River Street, PO Box 538, Monticello, MN 55362

763.295.4138 • 800.922.4138 • fax 763.295.4434

sales@electromn.com • www.electromn.com

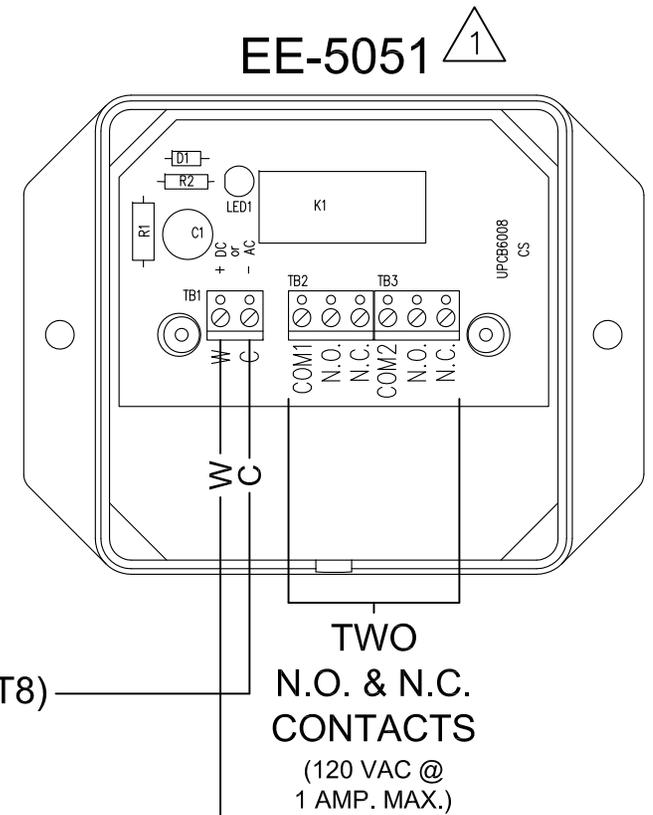
CONTROLLING EXTRA LOADS EXTERNAL TO WF-LGR4, WF-EZ3, WF-EM3

WF-LGR4



NOTES:

1. CAN USE EE-5053 SINGLE CONTACT IN PLACE OF EE-5051, SEE PAGE 2.



Electro Industries, Inc.

Limited Product Warranty

Effective February 5, 2009

Electro Industries, Inc. warrants to the original owner, at the original installation site, for a period of two (2) years from date of installation, that the product and product parts manufactured by Electro Industries are free from manufacturing defects in materials and workmanship, when used under normal conditions and when such product has not been modified or changed in any manner after leaving the plant of Electro Industries. If any product or product parts manufactured by Electro Industries are found to have manufacturing defects in materials or workmanship, such will be repaired or replaced by Electro Industries. Electro Industries shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Electro Industries may request that the materials be returned to Electro Industries at the owner's expense for factory inspection. The determination as to whether product or product parts shall be repaired, or in the alternative replaced, shall be made by Electro Industries or its authorized representative. Electro Industries will cover reasonable labor costs to repair defective product or product parts for ninety (90) days after installation.

TWENTY YEAR (20) LIMITED WARRANTY ON BOILER ELEMENTS AND VESSELS

Electro Industries, Inc. warrants that the boiler elements and vessels of its products are free from defects in materials and workmanship through the twentieth year following date of installation. If any boiler elements or vessels are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.

TWENTY YEAR (20) LIMITED WARRANTY ON SPIN FIN ELEMENTS

Electro Industries, Inc. warrants that the spin fin elements of its products are free from defects in materials and workmanship through the twentieth year following date of installation. If any spin fin elements are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.

FIVE YEAR (5) LIMITED WARRANTY ON OPEN WIRE ELEMENTS

Electro Industries, Inc. warrants that the open wire elements of its products are free from defects in materials and workmanship through the fifth year following date of installation. If any open wire elements are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.



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THESE WARRANTIES DO NOT COVER:

1. Costs for labor for removal and reinstallation of an alleged defective product or product parts, transportation to Electro Industries, and any other materials necessary to perform the exchange, except as stated in this warranty. Replacement material will be invoiced to the distributor in the usual manner and will be subject to adjustment upon verification of defect.
2. Any product that has been damaged as a result of being improperly serviced or operated, including, but not limited to, the following: operated with insufficient water or airflow, allowed to freeze, subjected to flood conditions, subjected to improper voltages or power supplies, operated with airflow or water conditions and/or fuels or additives which cause unusual deposits or corrosion in or on the product, chemical or galvanic erosion, improper maintenance or subject to any other abuse or negligence.
3. Any product that has been damaged as a result of natural disasters, including, but not limited to, the following: lightning, fire, earthquake, hurricanes, tornadoes or floods.
4. Any product that has been damaged as a result of shipment or handling by the freight carrier. It is the receiver's responsibility to claim and process freight damage with the carrier.
5. Any product that has been defaced, abused, or suffered unusual wear and tear as determined by Electro Industries or its authorized representative.
6. Workmanship of any installer of the product. This warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
7. Transportation charges for any replacement part or component, service calls, normal maintenance; replacement of fuses, filters, refrigerant, etc.

CONDITIONS AND LIMITATIONS:

1. If at the time of a request for service the original owner cannot provide an original sales receipt or a warranty card registration then the warranty period for the product will have deemed to begin thirty (30) days after the date of manufacture and **NOT** the date of installation.
2. The product must have been sold and installed by a licensed electrical contractor, a licensed plumbing contractor, or a licensed heating contractor.
3. The application and installation of the product must be in compliance with Electro Industries' specifications as stated in the installation and instruction manual, and all state and federal codes and statutes. If not, the warranty will be null and void.
4. The purchaser shall have maintained the product in accordance with the manual that accompanies the unit. Annually, a qualified and licensed contractor must inspect the product to assure it is in proper working condition.
5. All related heating components must be maintained in good operating condition.
6. All lines must be checked to confirm that all condensation drains properly from the unit.
7. Replacement of a product or product part under this limited warranty does not extend the warranty term or period.
8. Replacement product parts are warranted to be free from defects in material and workmanship for ninety (90) days from the date of installation. All exclusions, conditions, and limitations expressed in this warranty apply.
9. Before warranty claims will be honored, Electro Industries shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Remedies under this warranty are limited to repairing or replacing alleged defective product or product parts. The decision whether to repair or, in the alternative replace, products or product parts shall be made by Electro Industries or its authorized representative.

THESE WARRANTIES DO NOT EXTEND TO ANYONE EXCEPT THE ORIGINAL PURCHASER AT RETAIL AND ONLY WHEN THE PRODUCT IS IN THE ORIGINAL INSTALLATION SITE. THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED WITH RESPECT TO ALL PURCHASERS OR OWNERS. ELECTRO INDUSTRIES, INC. IS NOT BOUND BY PROMISES MADE BY OTHERS BEYOND THE TERMS OF THESE WARRANTIES. FAILURE TO RETURN THE WARRANTY CARD SHALL HAVE NO EFFECT ON THE DISCLAIMER OF THESE IMPLIED WARRANTIES.

ALL EXPRESS WARRANTIES SHALL BE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTIES SET FORTH HEREIN AND EXCLUDE ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM THE BREACH THEREOF. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY. PRODUCTS OR PARTS OF OTHER MANUFACTURERS ATTACHED ARE SPECIFICALLY EXCLUDED FROM THE WARRANTY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY UNDER THE LAWS OF EACH STATE. IF ANY PROVISION OF THIS WARRANTY IS PROHIBITED OR INVALID UNDER APPLICABLE STATE LAW, THAT PROVISION SHALL BE INEFFECTIVE TO THE EXTENT OF THE PROHIBITION OR INVALIDITY WITHOUT INVALIDATING THE REMAINDER OF THE AFFECTED PROVISION OR THE OTHER PROVISIONS OF THIS WARRANTY.