Yellow Coolant Light Does Not Turn Off - HS2500R2

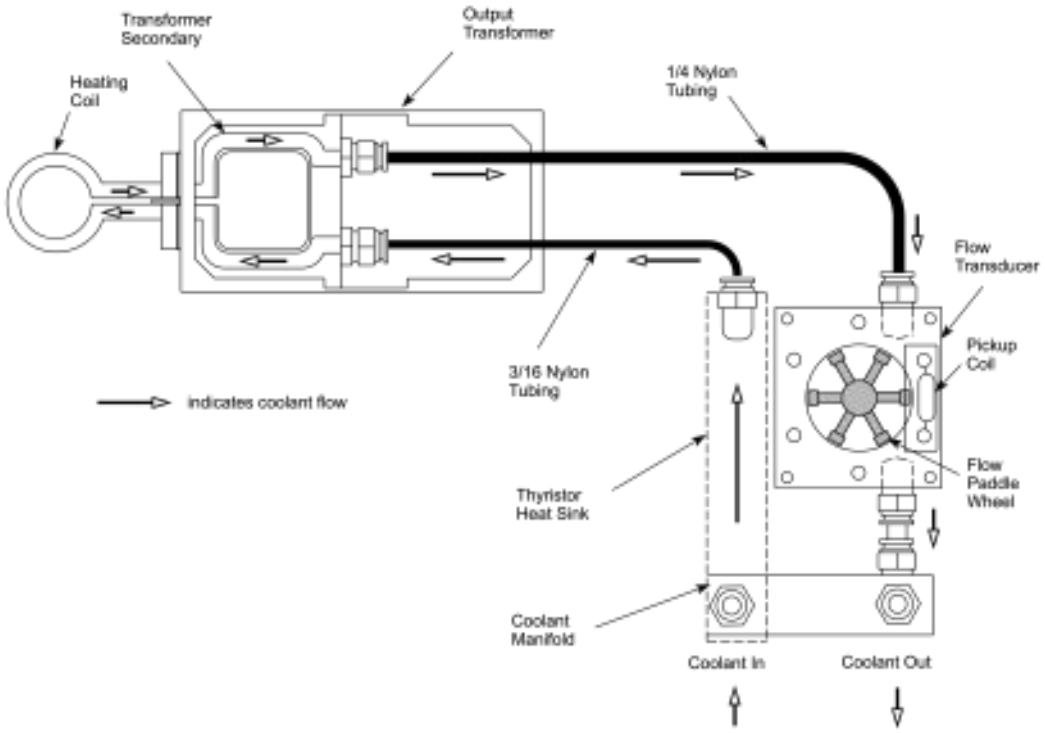
1. General

The HS2500R2 induction heating system requires water cooling for proper operation. Cooling is needed for the semiconductor heat sink located inside the power supply enclosure, the output transformer and the heating coil. Without cooling, these components would rapidly overheat and fail.

Proper coolant flow is indicated by the yellow "Coolant" light on the front panel of the power supply. When the power supply is turned on (and the coolant source is off) the yellow Coolant light will be ON. When the coolant source is turned on, the yellow Coolant light will turn off. The yellow Coolant light MUST BE OFF in order for heating to take place. If the yellow Coolant light is ON, the system will not heat, even if the green "HEATING" light is on.

This procedure discusses possible causes and solutions if the yellow Coolant light does not turn off. If also describes the coolant circuit used in the HS2500R2.

2. Coolant Circuit Description



The coolant flow path of the HS2500R2 induction heating system is illustrated in the drawing below. As shown, the coolant flow path is described as follows:

2.1 Coolant is brought into the power supply at the COOLANT IN port located on the bottom left side of the exterior of the power supply enclosure.

2.2 Coolant flows into and through the Thyristor Heat SInk inside the power supply. Mounted on this heat sink are the P/N 32120 Thyristor/Diode module and the P/N 21450 Bridge Rectifier. Both of these components produce heat during operation and they must be cooled to prevent them from failure due to overheating.

2.3 Coolant exits the heat sink and then flows out of the power supply enclosure to the output transformer via nylon tubing in the P/N 21110 power cable assembly.

2.4 Coolant flows around the transformer secondary shell, through the heating coil, out the other side of the secocondary shell and then returns to the power supply via nylon tubing in the power cable assembly.

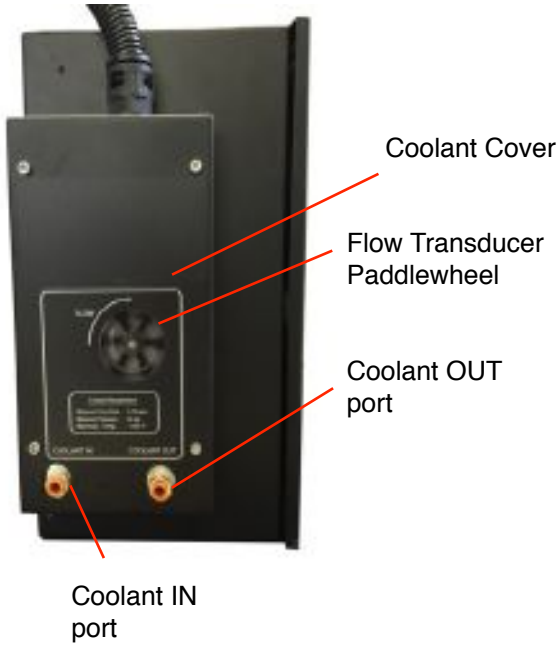
2.5 The returning coolant then flows through the P/N 31650 flow transducer causing the paddlewheel to spin. The paddlewheel MUST spin in a clockwise direction.

2.6 The rate of spin of the paddlewheel is read by the pickup coil that is a part of the flow transducer. This coil generates a voltage that is proportional to the rate of spin. The voltage is then read by circuitry on the main control circuit board inside the power supply. If the rate of spin and corrsponding voltge is high enough, the yellow Coolant light will turn off and the system will be permitted to heat.

2.7 A temperature switch on the thyristor heat sink inside the power supply monitors the temperature of the coolant. If the temperature is too hig, the switch will cut off the signal from the flow transducer and the coolant light will not turn off.

3. Possible Causes and Solutions

There are several reasons why the Coolant light will not turn off. They include:



3.1 Coolant supply and return lines are hooked up backwards.

The coolant tubing must be connected to the ports as shown in the picture to the right. If the supply lines are reversed, the paddlewheel will spin counterclockwise and the Coolant light will not turn off.

3.2 Low Coolant Flow or Pressure

The minimum coolant flow required is 0.25gpm at a minimum pressure of 40 psi. If coolant flow is too low, adequate coolant is not flowing through the system. This will be indicated by the rate of spin of the paddlewheel. It should be spinning fast enough where you cannot see the individuals vanes.

Check the following:

3.2.1 Check the coolant source.

If using a recirculating system, such as the Dynaflux system supplied by Magneforce, make sure that it is filled with coolant and that it is hooked up correctly. Measure the output pressure of the recirculator by connecting a pressure gauge to the Coolant Out port on the recirculator. The gauge should read at least 50 psi when the system is turned on. If it does not, the rotary vane pump may require adjustment or replacement. If using another type of water source, check its' flow and pressure characteristics. Most centrifugal style pumps do not operate at the pressure required to circulate coolant through the system.

3.2.2 Check for a Clog or Sediment Buildup in the System

Sediment can build up in the system over time. The sediment can come from mineral buildup from the coolant water that is being used. It can also occur through electrolytic action of the coolant flowing through the copper tubing and other metals in the system. This buildup can restrict or even stop the flow of coolant. Clogs can also occur if dirt particles or other particulate matter get into the system. This typically occurs when water is added to the reservoir of the coolant system. Sediment can build up in the bottom of the tank and adding coolant stirs up the sediment. A filter should be used between the coolant out port of the coolant system and the coolant in port of the induction heater.


Paddlewheel Stopped


Paddlewheel Spinning

3.2.2 Continued

The most likely area for buildup to occur is in the output transformer and/or the heating coil. This is because these components are typically constructed from small diameter copper tubing bent into a variety of configurations with many bends and corners.

To try and to clean and flush the system, do the following:

Coolant Filter

• Inspect the cartridge in the coolant filter. If it is dirty, replace it.

Recirculating Coolant System

• Empty the coolant in the system by disconnecting the coolant out hose and pumping it out.
• Fill the coolant system with clean tap water. Rock the system back and forth to free up any sediment buildup on the bottom.
• Pump out the newly added water. Repeat this a couple of times until the water comes out clean.
• Re-fill the coolant system with a mixture of 75% deionized water and 25% inhibited ethylene glycol. Defense coolant from Dynaflux Inc. and sold by Magneforce Inc. can also be used. (Do not use automotive antifreeze. It contains additives tht can gum up the coolant paths.

Heating Coil

• Remove the coil from the output transformer. Inspect it for any signs of kinks that could prevent coolant flow. Blow compressed air through the coil in one direction and then again in the other direction. try and flow water through the coil.
• If another coil is available, put it on the transformer and see if the flow improves.
• Before replacing the coil, make sure that the coil and transformer terminal blocks are clean.

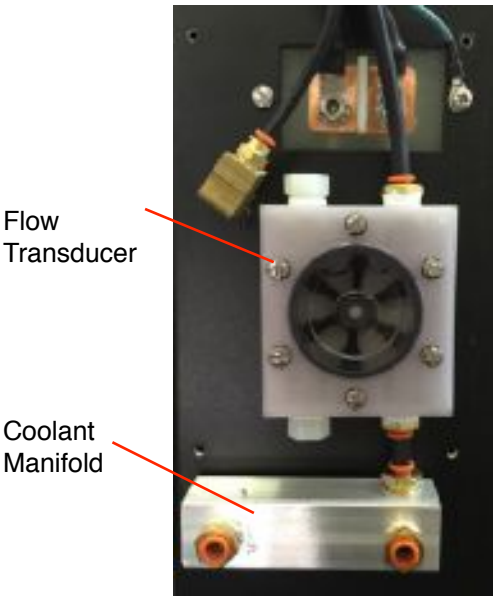
Power Supply and Output Transformer

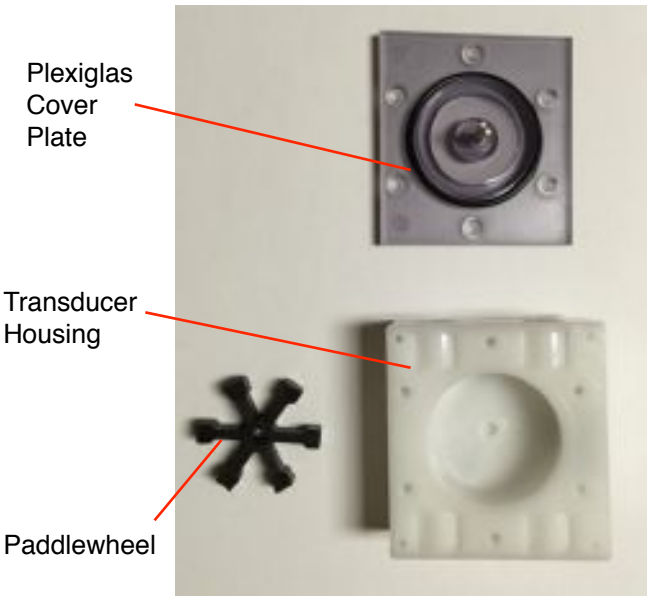
• Reverse the Coolant In and Coolant Out hoses leading to the power supply. Turn on the coolant source to back flush the system. In many cases if there is a clog in the system, back flushing will remove it.
• Remove the heating coil from the output transformer. Attach a source of clean water to the COOLANT IN port on the power supply. If possible, use a continuous flow of fresh water, e.g. from a city water supply. If not, use a recirculating system with clean water. Allow water to pump through the system for a few minutes. Water should exit from one side of the output transformer. Switch the hose to the COOLANT OUT port and repeat. Water should come out the other side of the output transformer. Re-attach the heating coil. Flow coolant through the entire circuit for a few minutes. Repeat as required.
• If the flows does not improve, replace the 1/4" and 3/16" nylon tubing in the power lead assembly. If this does not improve the flow, there is probably a solid clog inside the aluminum thyristor heat sink inside the power supply, at the aluminum coolant manifold or inside the output transformer. Return the system to Magneforce Inc. for repair.

3.3 The paddlewheel inside the flow transducer is stuck

Sediment can build up inside the flow transducer housing and inhibit the spinning of the paddlewheel. The paddlewheel can be removed and the inside of the transducer cleaned as follows:

- Remove the 4 screws attaching the coolant cover to the power supply. Remove the coolant cover.
- Take off the 6 screws retaining the plexiglass cover on the flow transducer.
- Remove the paddlewheel from the housing by pulling straight back on it. Note the front side of the paddlewheel as you pull it out. It must be replaced in the same direction. (The front side has numbers stamped on it.)
- Clean the paddlewheel and interior of the flow transducer. Reassemble it by replacing the six screws. Be careful not to overtighten the screws or you will crack the housing.





Pickup Coil
(on back of
transducer
housing)

3.4 The pickup coil is bad

The pickup coil (shown above, located on back of transducer housing) picks up the signal from the spinning paddlewheel and converts it to a low level DC voltage signal that is sent to the main control board. If it fails,no signal is produced and the yellow Coolant light will not turn off. To check the pickup coil, proceed as follows:

- Turn off and disconnect power to the unit. Wait 5 minutes for internal voltage to drop.
- Open the power supply door and locate the pickup coil on the left side of the cabinet.
- Remove the white and black wires. Connect a voltmeter across the leads of the pickup coil. Set meter to read AC voltage.
- Turn on the coolant source (the power supply does not have to be turned on). The meter should read 0 mv.
- When coolant is turned on, the reading should be approximately 50 mv AC. The actual reading will depend on flow rate.
- If there is no reading, the pickup coil or the flow transducer assembly should be replaced.

3.5 Coolant is too hot

The temperature of the coolant should not exceed 100ºF. If the coolant is too hot the performance of the thyristor/diode module inside the power supply will be reduced. A normally closed temperature switch is mounted on the thyristor heat sink inside the power supply. If the coolant is too hot this switch will open, the yellow COOLANT light will trun on and the system will stop heating, even when the green “Heat On” light is on. Over temperature conditions usually occur when the ambient temperature exceeds 90ºF.

The switch will self reset when the coolant temperature drops. This will typically take about 20 minutes after the power supply has been turned off. If the yellow Coolant light turns on during operation but then shuts off after 20-30 minutes, the problem is most likely that the coolant is too hot.

Thyristor
Heat Sink

Temperature Switch
(located at bottom left corner on top of the thyristor heat sink

3.6 The Temperature Switch is Bad

Too check if the temperature switch is defective or not, connect an ohmmeter across the terminals of the temperature switch. This should be done when the system has been shut down for at least 30 minutes and the coolant has cooled down. The ohmmeter should show continuity across the temperature switch. (less than 20Ω). If it does not the temperature switch should be replaced.

3.7 The flow transducer wiring to the main control board is not connected.

Verify that the flow transducer to control board wiring connections are correct and plugged in. The polarity of the white and black wires as shown in the pictures below must be correct.

Flow transducer wiring

Flow circuit connector
to main control board

3.8 The flow rate circuitry on the main control board is defective.

If the flow transducer paddlewheel is spinning at a fast rate in a clockwise direction, the pickup coil is OK, the temperature switch is OK and the wiring connections are OK, the problem may be in the flow rate circuitry that is located on the main control board. The control board or the complete power supply should be returned to the factory for evaluation and repair.