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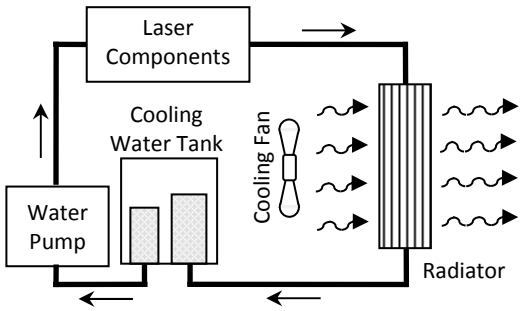
E10: High Temperature of Coolant

Troubleshooting Water Temperature Errors

An "**E10 – High Temperature of Coolant**" alarm indicates that the water temperature in the Laser is above 40°C (104°F). In order to maintain proper Laser function, the operating temperature must be maintained within a specific operating temperature range.

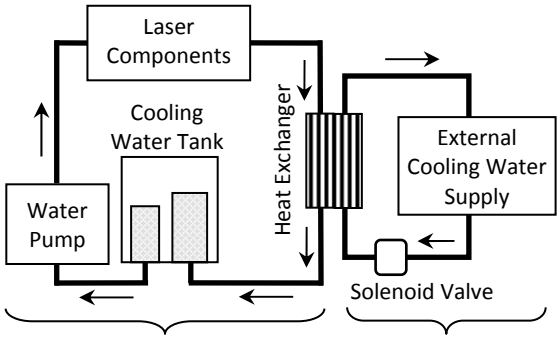
Air-Cooled Lasers – LW5A / 5AM / 15A / 25A / 50AC / 70AC / LW2AG / LW5AG

In the smaller A-Series Lasers, the operating temperature is maintained through the use of forced-air convection and a closed-loop water system. Variable speed fans are used to keep the Laser electronics cool and to provide air-flow for the cooling water system. As the cooling water cycles through the Laser, heat is drawn from the internal components and then passed through a radiator. Then through forced-air convection, air is drawn through the radiator where the internal heat is removed.



Water-Cooled Lasers – LW50A / 70A / 150A / 300A / 400A / 500A / 600A

In the larger Lasers (LW50A-600A), the operating temperature is maintained through the use of forced-air convection and two independent water systems; (1) a secondary cooling water system and (2) a primary cooling water system. Variable speed fans are used to keep the Laser electronics cool through forced-air convection. The water from the secondary cooling water system cycles through the Laser, heat is drawn from the internal components and then passed through a heat exchanger. The primary cooling water system is a (customer supplied) external cooling water supply whose flow is regulated by the Laser through the use of a solenoid valve. When the solenoid valve is open, the primary cooling water flows through the heat exchanger where the internal heat is removed. In addition to cooling capabilities, a submersible heater is also present inside the Cooling Water Tank used to raise the operating temperature of the secondary cooling water when the Laser is used in colder environments.



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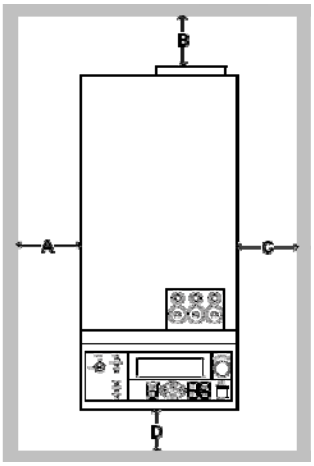
An **E10: High Temperature of Coolant** error can be caused by many things including:

1. Confined Operating Space
2. Dirty Air Filters
3. High Ambient Temperature
4. Dirty or Plugged Solenoid Valve (LW50A-600A)
5. Poor or no Primary Cooling Water Flow (LW50A-600A)
6. Faulty Connection
7. Incorrect Laser Setting
8. Faulty Power Supply
9. Faulty RTD Sensor
10. Faulty Cooling Fan(s)
11. Faulty Solenoid Valve
12. Faulty Heater / Heater Control
13. Faulty Water Pump / Water Pump Control
14. Faulty Heat Exchanger / Radiator

1. Confined Operating Space

In order for the Laser to maintain a normal operating temperature there must be adequate space around the Laser in order for the forced-air convection to work. Operating a Laser in a confined space will cause an **E10** alarm. Verify the Laser installation site meets the minimum space requirements, as noted in the table below.

Laser Model	Minimum Space Requirement				
	Left "A"	Rear "B"	Right "C"	Front "D"	Top
LW2AG **LW5AG**	1000mm (39.4")	500mm (19.7")	1000mm (39.4")	260mm (10.2")	300mm (11.8")
LW5A(M) **LW15A/25A**	1000mm (39.4")	500mm (19.7")	1000mm (39.4")	260mm (10.2")	300mm (11.8")
LW50A/70A **LW150A**	200mm (7.9")	500mm (19.7")	200mm (7.9")	500mm (19.7")	500mm (19.7")
LW50AC/70AC **LW150A**	500mm (19.7")	500mm (19.7")	200mm (7.9")	500mm (19.7")	500mm (19.7")
LW300A(H) **LW400A**	1000mm (39.4")	1000mm (39.4")	1000mm (39.4")	500mm (19.7")	500mm (19.7")
LW500A **LW600A**	500mm (19.7")	500mm (19.7")	500mm (19.7")	500mm (19.7")	500mm (19.7")



2. Dirty Air Filters

All A-Series Lasers implement forced-air cooling to help maintain a normal operating temperature. Every Laser uses air filters to prevent dust and other contaminants from entering the Laser Welder. If the air filters are dirty, the air flow will be restricted and an **E10** alarm may occur. Refer to the *Maintenance Section* of the appropriate Operator's Manual for instructions on how to check and clean the air filters. Replace if necessary. For convenience, a summary of the air filters and their locations are provided in the table below:

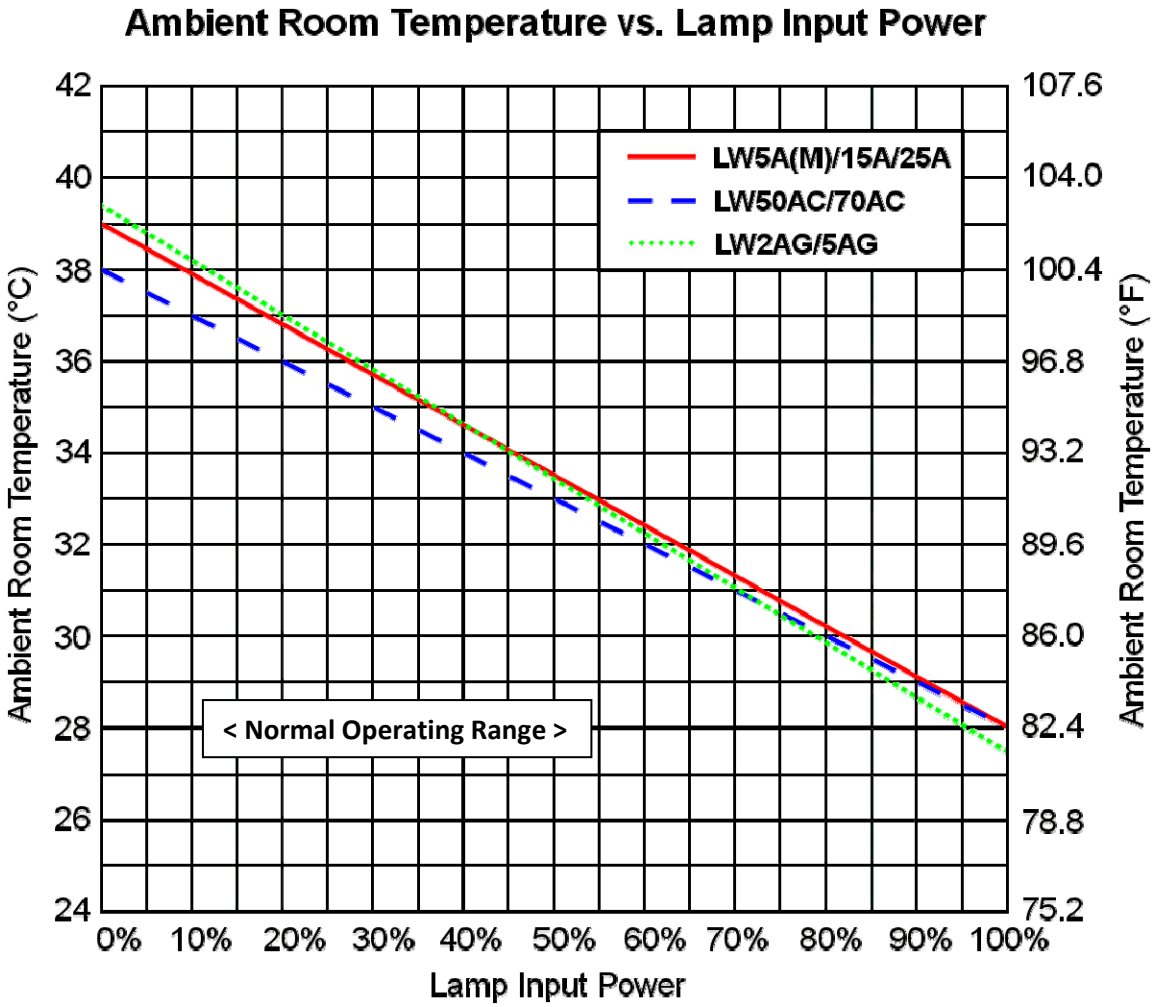
Laser Model	Operator Manual	Filter #	Filter Location (size)
LW2AG(E)	990-544	MLF-0007	Left Panel (200mm x 210mm x 15mm)
		451-046	Rear Panel (135mm x 180mm x 10mm)
LW5AG(E)	990-558	MLF-0007	Left Panel (200mm x 210mm x 15mm)
		451-046	Rear Panel (135mm x 180mm x 10mm)
LW5A(M)(E) **LW15A(E)/25A(E)**	990-534	MLF-0007	Left Panel (200mm x 210mm x 15mm)
		451-046	Rear Panel (135mm x 180mm x 10mm)
LW50A(E)/70A(E)/150A(E)	990-535	451-136	Rear Panel (170mm x 270mm x 15mm)
LW50AC(E)/70AC(E)		451-136	Rear Panel (170mm x 270mm x 15mm)
		Z-01641-001	Side Panel (white filter covers radiator)
LW300A(E)/400A(E)	990-538	451-049	Rear Panel (350mm x 250mm x 20mm)
LW500A(E)/600A(E)	990-539	451-136	Upper Rear Panel (170mm x 270mm x 15mm)
		451-047	Lower Rear Panel (265mm x 250mm x 20mm)

3. High Ambient Temperature

In order for the Laser to maintain a normal operating temperature, the surrounding ambient temperature must be low enough to allow for adequate cooling. The more power the Lasers produce, the more cooling capacity needed. The first step is to measure the ambient temperature and determine if it is within the standard operating range.

The larger Lasers (LW50A-600A) are primarily water-cooled, so they are not as affected by higher ambient temperatures. The larger Lasers should be operated in an environment ≤ 35°C (95°F). See *Section 5,* "**Poor or no Primary Cooling Water Flow**" for more details on the cooling water requirements in the larger Lasers.

The performance in the smaller air-cooled Lasers (LW5A(M)/15A/25A, LW2AG/5AG and LW50AC/70AC) are directly affected by the ambient temperature. There is a limit to the output power available based on the ambient temperature. If the Laser has been operating correctly and is now starting to report **E10** errors, determine the *Lamp Input Power* of your schedule (located on the Monitor screen) and then determine where on the graph you are operating. If your point is above the respective line, you are exceeding the natural capability to cool the Laser. If you are exceeding the cooling capabilities, either operate at a lower ambient temperature, or lower your *Peak Power* and/or *Pulse Width* settings on your weld schedule.



4. Dirty or plugged solenoid valve (*LW50A-600A only*)

The water-cooled Lasers (LW50A-600A) regulate the operating temperature by allowing the (external) primary cooling water supply into the Laser through a solenoid valve. If the solenoid valve is dirty or plugged, it may not allow the Laser to cool.

Refer to the *Maintenance Section* of the appropriate Operator's Manual for instructions on how to clean the solenoid valve. If the solenoid valve needs to frequently be cleaned, then a water filter should be added to the external water supply to prevent contaminants from entering the Laser.

Laser Model	Operator Manual
LW50A/70A/150A	990-535
LW300A(H)/400A	990-538
LW500A/600A	990-539

If there are algae in the primary cooling water system, it may clog the solenoid valve. Flush cooling water system and use the **AMYA # 900-349** corrosion inhibitor to prevent algae contamination. Once the solenoid valve is clean, verify operation or continue with the next troubleshooting step.

5. Poor or no Primary Cooling Water Flow (*LW50A-600A only*)

In order to adequately keep the Laser at a normal operating temperature, the water-cooled Lasers (LW50A-600A) must have a primary cooling water system connected to properly remove heat from the Laser. Typically an external water chiller is used to provide the external cooling. If the Laser generates an **E10** error:

- Verify the chiller is powered "on".
- If there is a water filter on the chiller, check to make sure it is not clogged (replace as necessary). A clogged water filter may restrict the water flow enough to cause an **E10** error.
- Verify the temperature threshold is properly set on the chiller. Refer to the chiller operation manual for more details on set-up and operation.
- When the solenoid valve is open, visually inspect the cooling water hoses to determine if there is water flow in the hoses (look for bubbles). If you are unable to determine if there is water flow, a flow meter may need to be added to the water line.

If the chiller is operating correctly and the Laser recently started with the **E10** errors (after operating correctly for some time), continue with the next troubleshooting step. If this is a new installation or if the set-up has changed, verify the chiller is adequate enough to keep the Laser cool. Using the information in the table below, verify that the specifications on the chiller meet with the Laser requirements.

Laser Requirements

Parameter	LW50A/70A	LW150A	LW300A(H)/400A	LW500A/600A
Laser Water Inlet Pressure[1]	14.2 to 42.6 psi (98 to 294 kPa)			
Flow Rate Required	Water temperature dependent, refer to the graphs below			
Coolant Temperature required[2]	5°C - 32°C (41°F – 89.6°F)	5°C - 32°C (41°F – 89.6°F)	5°C - 35°C (41°F – 95°F)	5°C - 35°C (41°F – 95°F)
Minimum Heat Removal Required	8,538 BTU/Hr 2.50 kW 2,150 kcal/Hr	18,783 BTU/Hr 5.50 kW 4,730 kcal/Hr	40,299 BTU/Hr 11.80 kW 10,150 kcal/Hr	80,257 BTU/Hr 23.50 kW 20,160 kcal/Hr

Note 1: A pressure greater than 42.6 psi (294 kPa) at the Laser water inlet may prevent the solenoid valve from closing.
Note 2: Coolant temperature is measured at the Laser water inlet.

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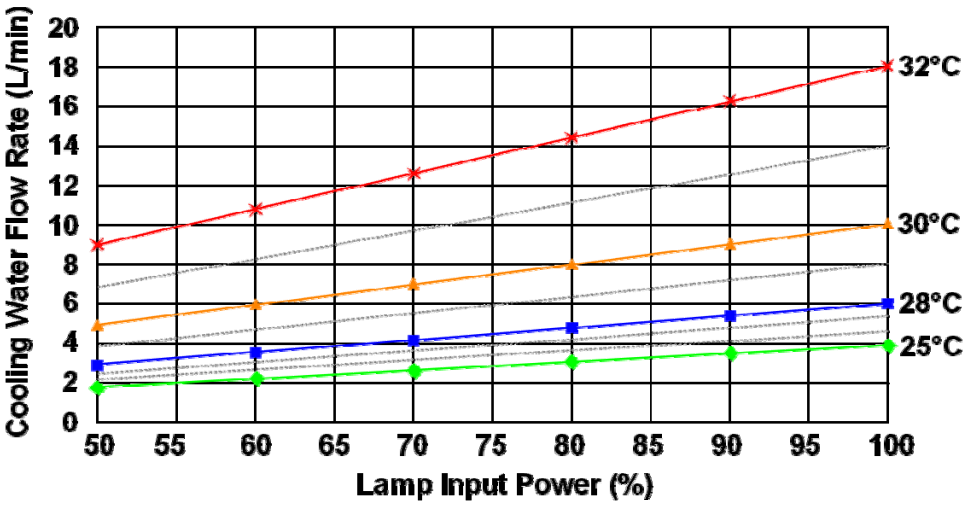
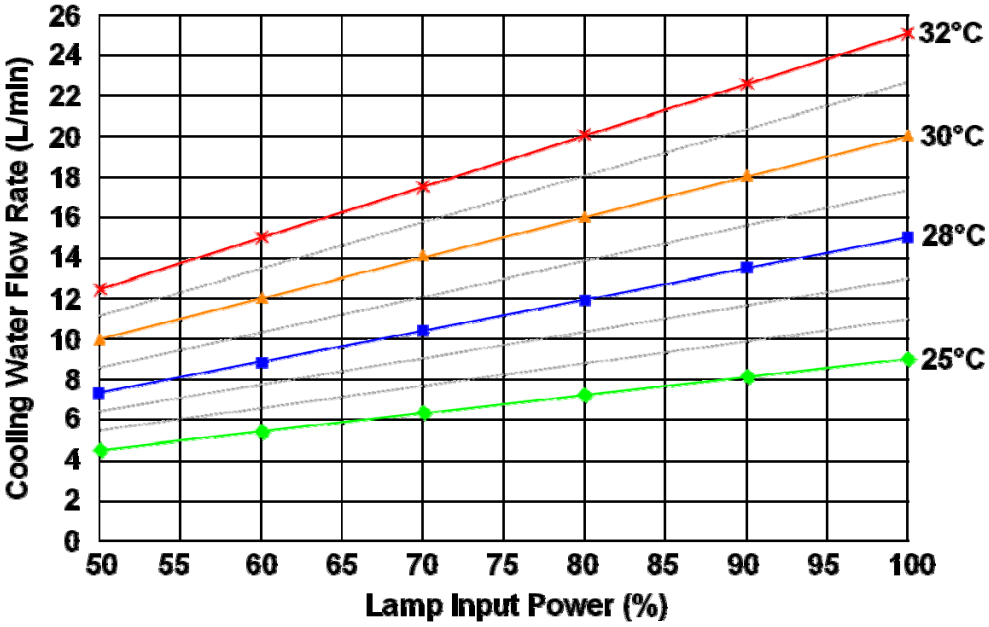
The “Flow Rate Required” at the Laser water inlet is based entirely on the chiller water temperature and the Lamp Input Power (i.e. power output). If your Laser has recently reported an **E10** error, determine the *Lamp Input Power* of your schedule (located on the Monitor screen) and the temperature of the chiller water (located at the water inlet). Find the graph below that represents your Laser Model and determine the required water flow rate. Verify the chiller is producing the required flow rate. If the chiller cannot produce the required flow rate, either lower the water temperature or lower your *Peak Power* and/or *Pulse Width* settings on your weld schedule.

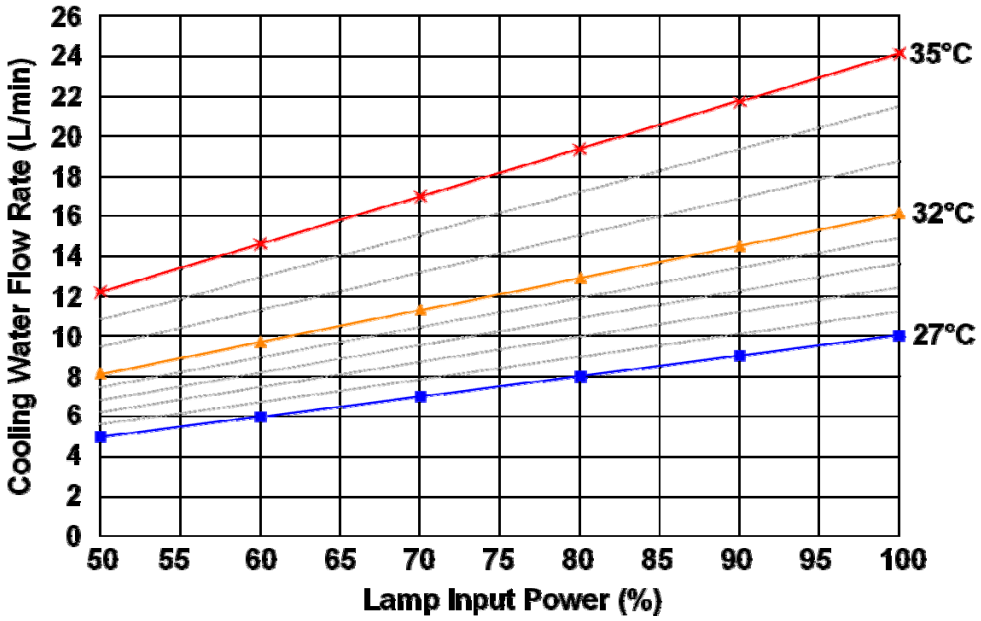
LW50A(E) / LW70A(E)
Required Flow Rate of Primary Cooling Water



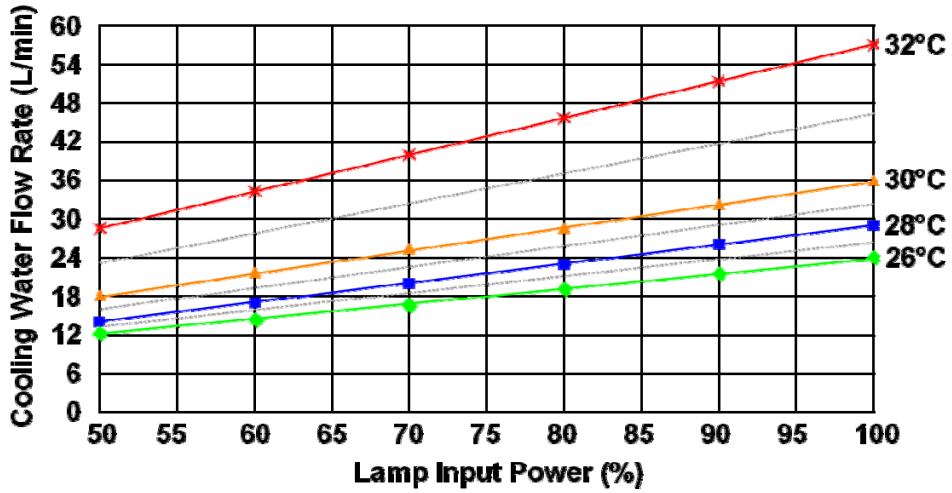
LW150A
Required Flow Rate of Primary Cooling Water



LW300A(H)/400A
Required Flow Rate of Primary Cooling Water



LW500A/600A
Required Flow Rate of Primary Cooling Water

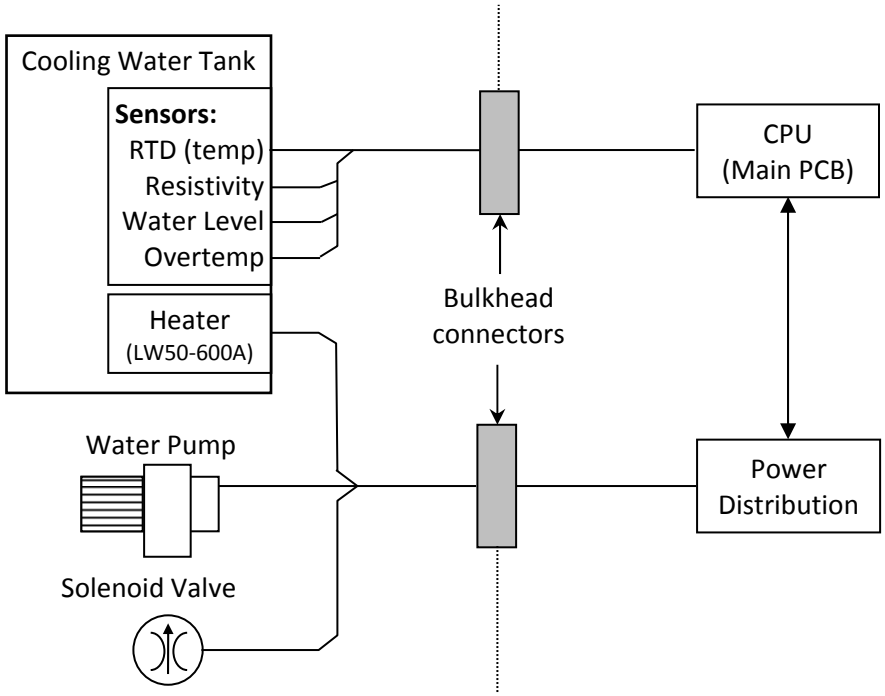


In new installation sites, the distance between the chiller and Laser will affect the cooling capacity. When large distances exist between the Laser and chiller or they are physically at different elevations, proper piping must be selected to minimize the pressure drop. In general the pressure drop between the Laser and chiller is affected by elevation, piping length/diameter, fluid density, viscosity, wall drag and curves/bends in the piping. Verify the facility piping in the table meets the flow rate requirements from the graphs above.

Pipe Size	Maximum Flow Rate	
	(gallons/min)	(liters/min)
½”	2	7.6
¾”	5	18.9
1”	10	37.9
1 ¼”	20	75.7

6. Faulty Connection

Occasionally a connection problem may arise between the cooling components and the CPU (Main PCB) / Power distribution PCB(s). All primary sensors/components responsible for maintaining the normal operating temperature are physically located in or near the Cooling Water Tank. All of these sensor/component connections are wired to bulkhead Molex style connectors that are physically mounted near the water pump assembly. Sometimes these bulkhead connectors get corroded (especially in harsh operating environments). If the bulkhead connector is corroded, the contacts can be cleaned with contact cleaner or simply repetitive connect/disconnects. The locations of the bulkhead connectors vary among Laser models, but they can be found by following the wiring harnesses to the appropriate bulkhead connector.



If these bulkhead connections cannot be verified, continue with this troubleshooting procedure in order to test each sensor / component section. The results of the tests below will verify these bulkhead connections.

7. Incorrect Laser Setting

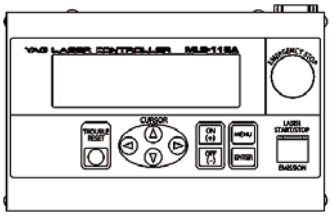
Laser performance is directly affected by the operating temperature. In order to maintain the ideal operating temperature, the laser is programmed with user-defined temperature parameters. These parameters affect the cooling water temperature / cooling fan speeds and are programmed in the Initialization Screen. Verify the parameters as defined below. DO NOT set the values to anything other than the values specified below:

Water Temperature Settings:

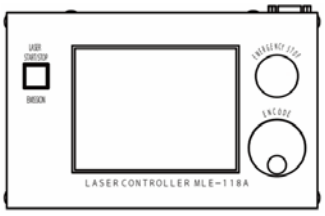
Laser Welder Model	Reference Temperature (Temp Cont)	Alarm Setting	
		Alarm "L"	Alarm "H"
LW2AG/5AG	30°C (unused)	20°C	40°C
LW5A(M)/15A/25A			
LW50A(C)/70A(C)/150A	30°C	25°C	40°C
LW300A(H)/400A			
LW500A/600A			

Cooling Fan Speed Settings (LW50A(C)/70A(C)/150A/300A(H)/400A/500A/600A):

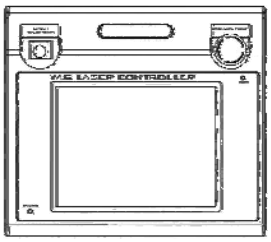
Laser Controller Setting (Initialization Settings)			Value
MLE-115A	**MLE-118A**	**MLE-116A**	
B	High ON	Medium ON	50%
D	High OFF	Medium OFF	50%
A	Low ON	Low ON	20%
C	Low OFF	Low OFF	80%



MLE-115A



MLE-118A

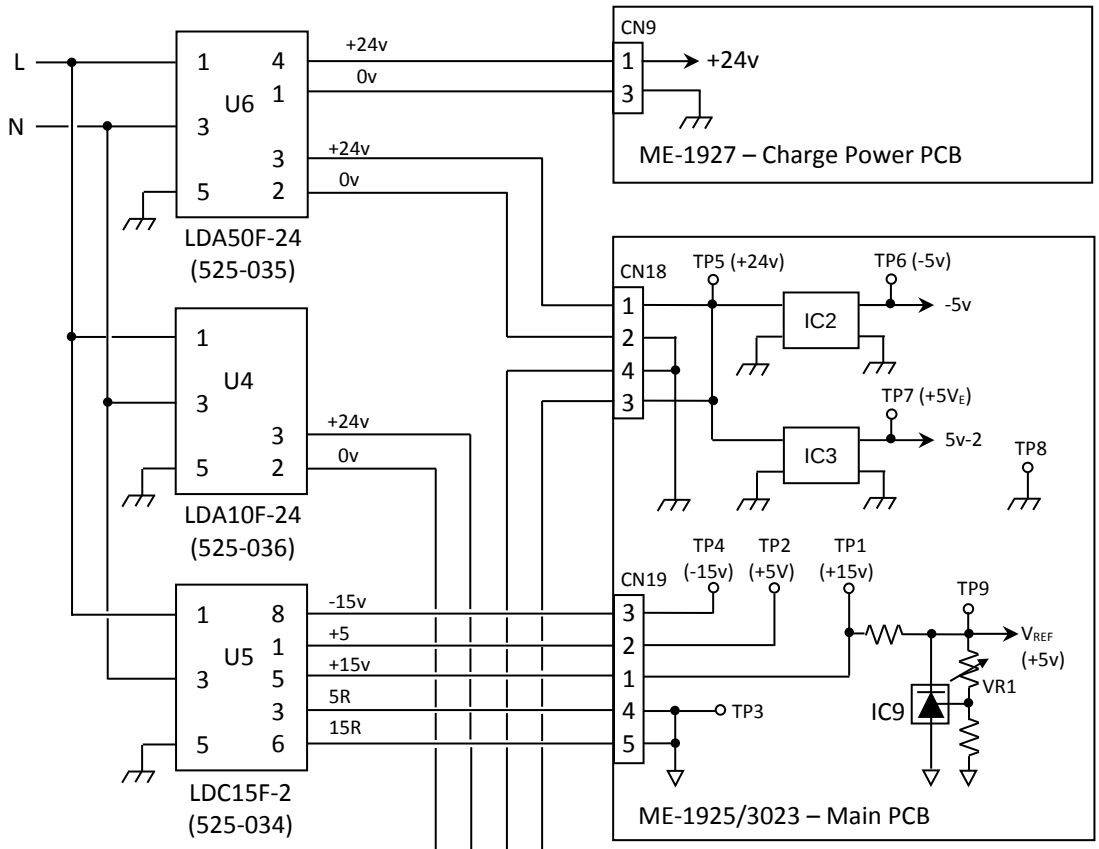


MLE-116A

8. Faulty Power Supply

An **E10** error can also be caused by faulty Power Supply voltage. Typically a power supply fault will also yield other error messages as well. Using a DMM, measure the power supply voltages on the **CPU** (Main PCB) at the appropriate test points (see tables below for a list of test points and expected voltages). If all voltages test OK, continue with the next step. If there is a problem with one or more of the power supply voltages, isolate the failure based on the schematics below. Refer to the AMYA Support site (www.amyasupport.com/lsd) under "Service" for more information on component / test point locations.

LW5A(M)/15A/25A/2AG/5AG Laser Welders (8-xxx-01-xx)
with ME-1925/ME-3023 Main PCB – Power Distribution for Single E-Stop/Interlock Lasers



ME-1925/3023 Test Points:

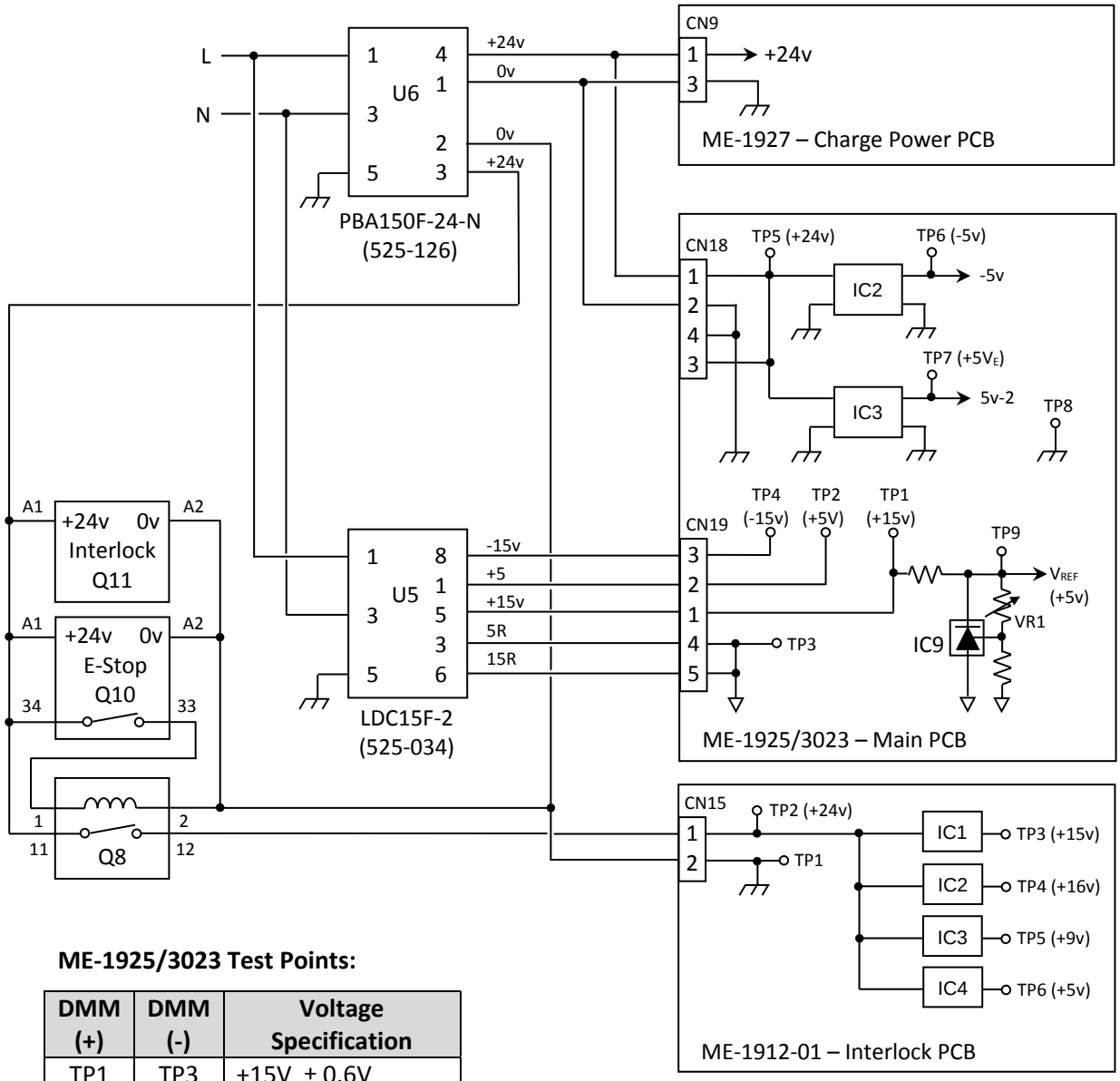
DMM (+)	DMM (-)	Voltage Specification
TP1	TP3	+15V ± 0.6V
TP2	TP3	+5V ± 0.2V
TP4	TP3	–15V ± 0.6V
TP9	TP3	+5V$_R$ ± 0.01V
TP5	TP8	+24V ± 0.5V
TP6	TP8	-5V ± 0.2V
TP7	TP8	+5V$_E$ ± 0.2V

Note: +5V$_R$ is adjusted by VR1 on Main PCB

Fuse F1: 218.002P (AMYA # 330-198)

U4, U5 and U6 are mounted to the inside chassis wall behind the Main PCB and Interlock PCB.

LW5A(M)/15A/25A/2AG/5AG Laser Welders (8-xxx-02-xx / 8-xxx-03-xx)
with ME-1925/ME-3023 Main PCB – Power Distribution for Dual E-Stop/Interlock Lasers



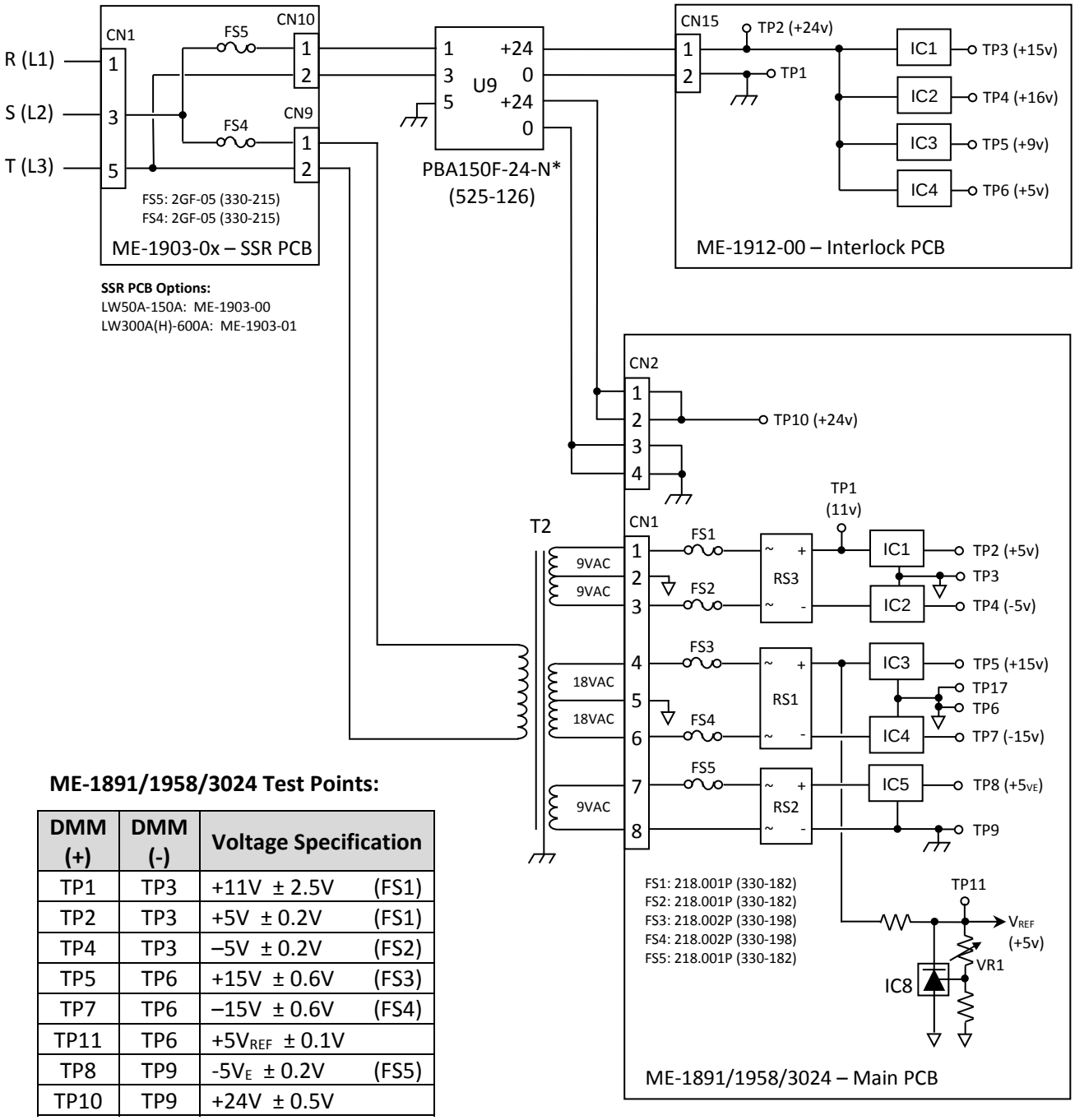
ME-1925/3023 Test Points:

DMM (+)	DMM (-)	Voltage Specification
TP1	TP3	+15V ± 0.6V
TP2	TP3	+5V ± 0.2V
TP4	TP3	–15V ± 0.6V
TP9	TP3	+5V$_R$ ± 0.01V
TP5	TP8	+24V ± 0.5V
TP6	TP8	-5V ± 0.2V
TP7	TP8	+5V$_E$ ± 0.2V

Note: +5V$_R$ is adjusted by VR1 on Main PCB

Power Supplies U5 & U6 are mounted to the inside chassis wall behind the Main PCB and Interlock PCB. Safety Relays Q10 / Q11 and relay Q8 are mounted on the chassis wall just below the Main PCB.

LW50A(C)/70A(C)/150A/300A(H)/400A/500A/600A Laser Welders (8-xxx-01-xx)
with ME-1891/ME-1958/ME-3024 Main PCB – Power Distribution for Single E-Stop/Interlock Lasers



ME-1891/1958/3024 Test Points:

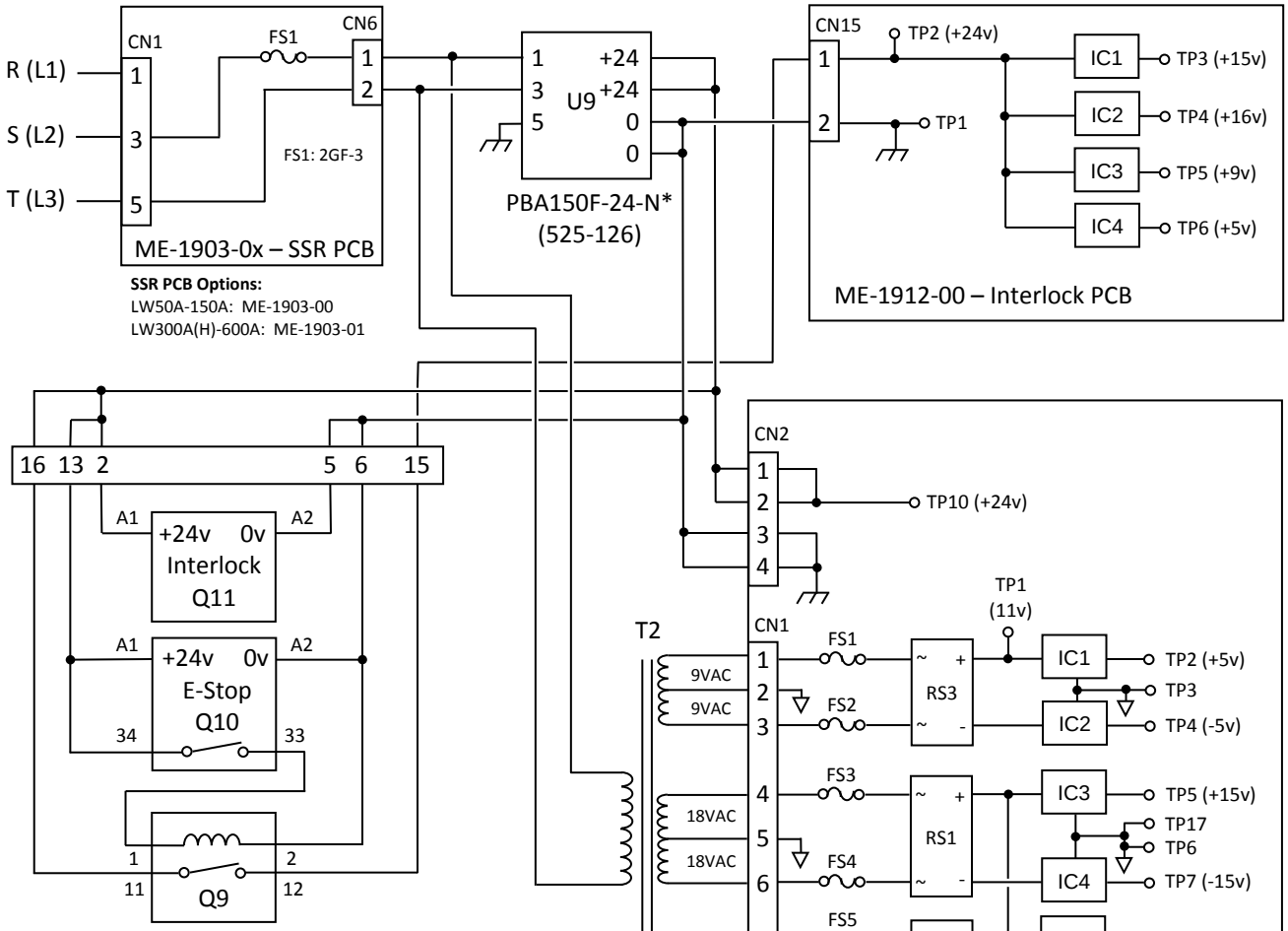
DMM (+)	DMM (-)	Voltage Specification	
TP1	TP3	+11V ± 2.5V	(FS1)
TP2	TP3	+5V ± 0.2V	(FS1)
TP4	TP3	–5V ± 0.2V	(FS2)
TP5	TP6	+15V ± 0.6V	(FS3)
TP7	TP6	–15V ± 0.6V	(FS4)
TP11	TP6	$+5V_{REF}$ ± 0.1V	
TP8	TP9	$-5V_E$ ± 0.2V	(FS5)
TP10	TP9	+24V ± 0.5V	

Note: $+5V_{REF}$ is adjusted by VR1 on Main PCB

The simplified schematic shown above highlights all important power supply connections and does not show all discrete components.

* At the time of this document's publish date, Power Supply U9 shown above is typical for 220VAC U.S. LW50A/70A/150A Laser Models. However, depending on the Laser Model, Date of Manufacture and destination country, Power Supply U9 may be different than shown. If a faulty power supply is found, read the model number of the power supply itself in order to determine the correct replacement.

LW50A(C)/70A(C)/150A/300A(H)/400A/500A/600A Laser Welders (8-xxx-02-xx)
with ME-1958/ME-3024 Main PCB – Power Distribution for Dual E-Stop/Interlock Lasers



ME-1958/3024 Test Points:

DMM (+)	DMM (-)	Voltage Specification	
TP1	TP3	+11V ± 2.5V	(FS1)
TP2	TP3	+5V ± 0.2V	(FS1)
TP4	TP3	–5V ± 0.2V	(FS2)
TP5	TP6	+15V ± 0.6V	(FS3)
TP7	TP6	–15V ± 0.6V	(FS4)
TP11	TP6	$+5V_{REF}$ ± 0.1V	
TP8	TP9	$-5V_E$ ± 0.2V	(FS5)
TP10	TP9	+24V ± 0.5V	

Note: $+5V_{REF}$ is adjusted by VR1 on Main PCB

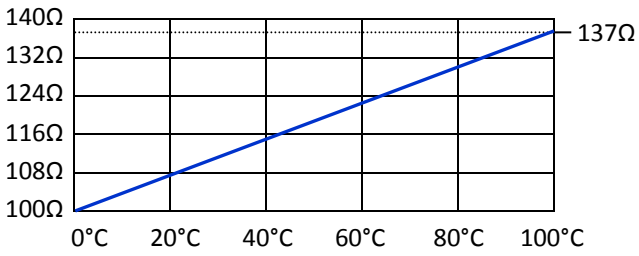
The simplified schematic shown above highlights all important power supply connections and does not show all discrete components.

* At the time of this document's publish date, Power Supply U9 shown above is typical for 220VAC U.S. LW50A/70A/150A Laser Models. However, depending on the Laser Model, Date of Manufacture and destination country, Power Supply U9 may be different than shown. If a faulty power supply is found, read the model number of the power supply itself in order to determine the correct replacement.

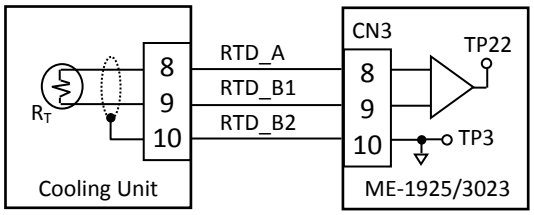
9. Faulty RTD Temperature Sensor

The first step in determining if the RTD sensor is bad is to use a thermometer to measure the cooling tank water temperature and compare this value to the reported temperature value on the Laser Controller. If the temperature is correct (within ± 1°C), continue with the next troubleshooting step. If the reported temperature is grossly incorrect, continue testing the RTD Sensor. If the reported temperature is close in magnitude but not accurate, then the temperature sensor circuit may need to be calibrated.

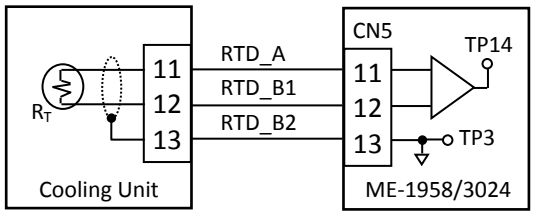
The temperature of the secondary cooling water is measured by an RTD (*Resistance Temperature Detector*) sensor located in the cooling water tank. The RTD sensor resistance is proportional to the temperature applied and its approximate response is shown on the right.



At 0°C the RTD resistance is ≈100 Ω and at 100°C the RTD resistance is ≈137 Ω. Depending on the CPU (Main PCB), disconnect the appropriate CN connector, then use a DMM to measure the RTD resistance.



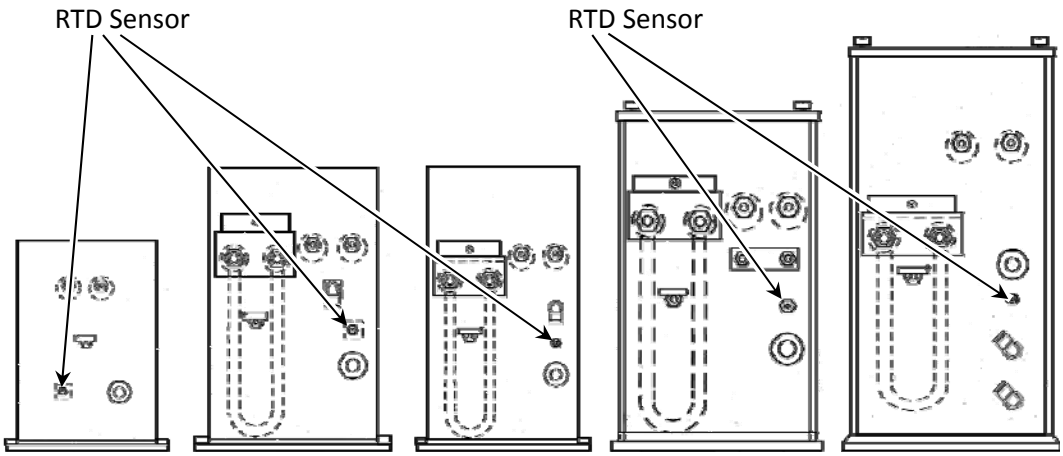
LW5A-25A/2AG/5AG



LW50A-600A

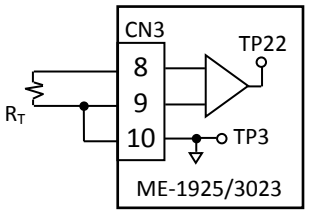
- ME-1925/3023 – Verify resistance (100 Ω ≤ R_T ≤ 137 Ω) between CN3-8 and CN3-9.
- ME-1958/3024 – Verify resistance (100 Ω ≤ R_T ≤ 137 Ω) between CN5-11 and CN5-12.

If the resistance is within the expected range, continue with the next troubleshooting step. If the resistance is either 0 Ω (short) or ∞ Ω (open), inspect the wiring harness, RTD sensor, or bulkhead connector. If it is determined that the RTD sensor is bad, replace the RTD sensor with **AMYA # 701-052**. The location of the RTD sensor varies among Laser models but is always fastened to the cooling water tank as shown below:

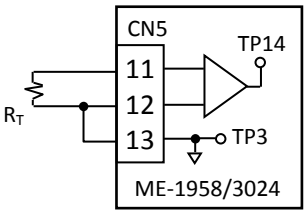


10. RTD Sensor Circuit Calibration

If the reported temperature is close in magnitude to the temperature measured by the thermometer, the temperature sensor circuit on the Main PCB may need adjustment. Before starting this calibration procedure, all power supply voltages should be verified. In order to properly adjust the sensor circuit a 100Ω ± 0.1% and 137Ω ± 0.1% resistor will be required. Disconnect the RTD sensor harness from the CPU (Main PCB) and replace the RTD sensor with the 100Ω ± 0.1%. Adjust the VR potentiometer as noted in the table below to achieve 5mV. Replace resistor with 137Ω ± 0.1% and adjust the VR potentiometer as noted in the table below to achieve 4.88V. Repeat procedure until no further adjustments are required.



LW5A-25A/2AG/5AG



LW50A-600A

Main PCB	R_T Resistance	Equivalent Temperature	DMM		Procedure
			(+)	(–)	
ME-1925 or ME-3023	100Ω	0°C	TP22	TP3	Adjust VR5 for 5mV (+15mV/-5mV)
	137Ω	100°C			Adjust VR6 for 4.88V (± 0.03V)
ME-1958 or ME-3024	100Ω	0°C	TP14	TP3	Adjust VR3 for 5mV (+15mV/-5mV)
	137Ω	100°C			Adjust VR2 for 4.88V (± 0.03V)

11. Faulty Cooling Fan(s) / PCB

If a cooling fan is faulty an E10 error can occur. Visually inspect all cooling fans and verify they are functioning properly. If a fan is not rotating, use a DMM to identify, isolate and repair the fault. Refer to the appropriate section below and replace the faulty component(s) as noted in each section.

LW5A(M)/15A/25A and LW2AG/5AG

The Fan power in the LW5A(M)/15A/25A and LW2AG/5AG is produced by the ME-1927 Charge Power PCB (located in the Charge Unit). The ME-1927 sits horizontal just below the ME-1926 Charge Control PCB and is located behind the right side panel. FAN 4 is always "ON". FANS 1-3 are pulse width modulated (at +24V) based on the ambient temperature.

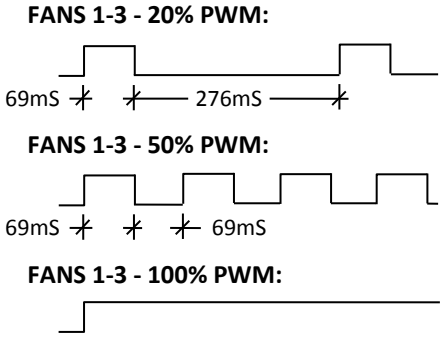
FAN 1-3 Operation:

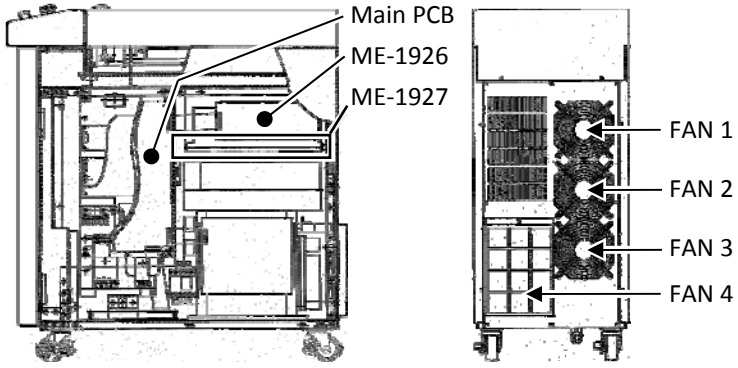
Fan	Temp	PWM[3]
Sanyo Fan	≤ 29°C	20%
	30 - 34°C	50%
	≥ 35°C	100%
Pelco Fan	≤ 34°C	50%
	≥ 35°C	100%

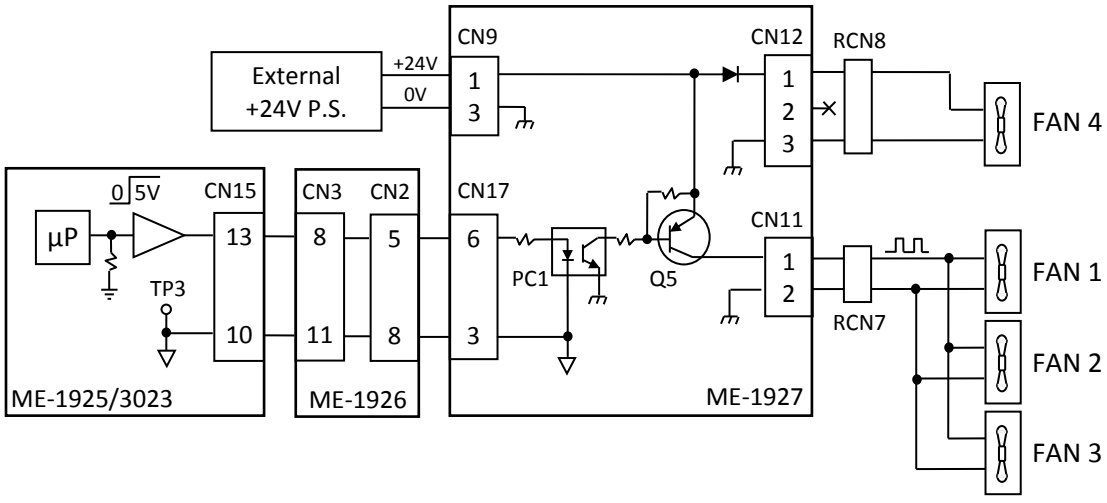
Fan Replacement:

Fan #	Design	Mfg P/N	AMYA #
1-3	Prior to 05-2010	Sanyo 109R1224H102[1]	305-047
4	Prior to 05-2010	Sanyo 109R1224H102	305-047
1-3	After 05-2010	Pelco R1225X24BPLB1[2]	305-066
4	After 05-2010	Pelco R1225X24BPLB1[2]	305-066

1. If a Sanyo fan is faulty, it should be replaced by a Sanyo Fan. If a 305-066 Pelco is used for replacement, all 3 fans (FANS 1-3) must be replaced and the CPU (Main PCB) firmware revision bumped up to V00-08R (or higher).
2. If Pelco R1238L24BPLB1 is currently installed, it may be replaced with a Pelco R1225X24BPLB1 fan (305-066).
3. The PWM waveforms are shown below for reference.







LW50AC/70AC – Air-Cooled Models

The Fan power in the LW50AC/70AC is produced by the ME-1903 SSR (Solid State Relay) PCB. There are two versions of the ME-1903 SSR PCB used, the ME-1903-00 and the ME-1903-02. The ME-1903-00 are used in the CDRH models (U.S. destination) and the ME-1903-02 are used in the CE Models. The ME-1903-xx is mounted horizontally just below the ME-1958/3024 (Main PCB) behind the left side panel. FAN 1 is always "ON". FANS 2-3 are pulse width modulated (at 200VAC) based on the ambient temperature.

Fan Replacement (LW50AC/70AC):

Fan #	Mfg P/N	AMYA #
1	Sanyo 109S025UL	305-044
2-3	Oriental Motor MRS18-DUL	305-067

Fuse Replacement (ME-1903-00) – CDRH Models:

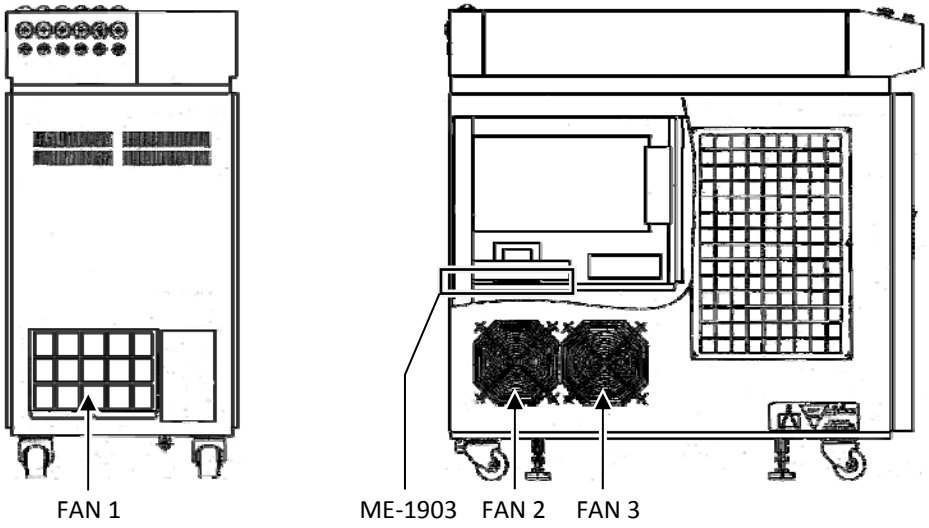
Fuse	Value	Mfg P/N	AMYA #
FS2	0.5A	FA-Ubon 2GF-05	330-215
FS7	5.0A	FA-Ubon 2GF-5	330-216

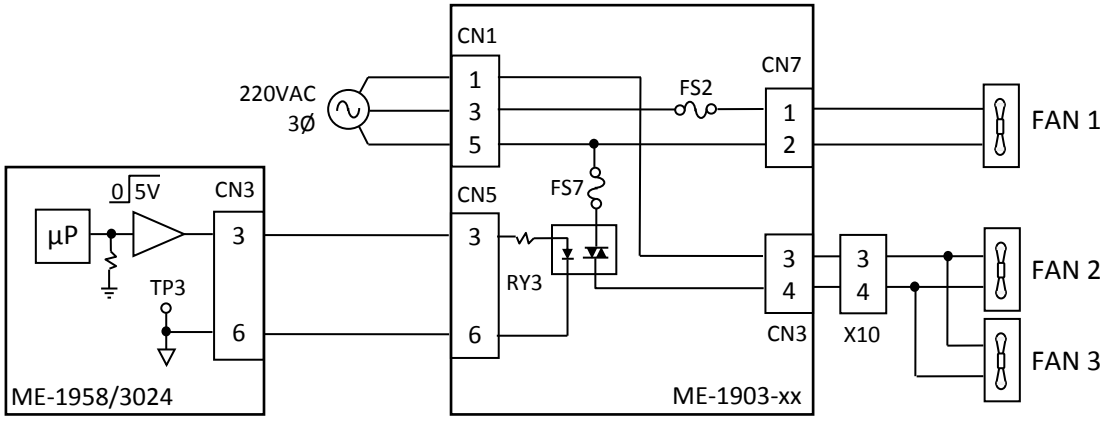
FAN 2-3 Operation (PWM operation):

Temp	PWM	Reference Notes
< 27°C	0%	< (Low + 2°C)
27°C - 29°C	20%	(Low + 2°C) - (Ref – 1°C)
30°C - 34°C	50%	(Ref) - (High – 6°C)
≥ 35°C	100%	≥ (High – 5°C)

Fuse Replacement (ME-1903-02) – CE Models:

Fuse	Value	Mfg P/N	AMYA #
FS2	0.5A	Littelfuse 313.500	330-049
FS7	5.0A	Littelfuse 313 005	330-016





LW50A/70A/150A – Water-cooled Models

The Fan power in the LW50A/70A/150A is produced by the ME-1903 SSR (Solid State Relay) PCB. There are two versions of the ME-1903 SSR PCB used, the ME-1903-00 and the ME-1903-02. The ME-1903-00 are used in the CDRH models (U.S. destination) and the ME-1903-02 are used in the CE Models. The ME-1903-xx sits horizontal just below the ME-1958/3024 (Main PCB) behind the left side panel. FAN 1 is always "ON".

Fuse Replacement (ME-1903-00) – CDRH Models:

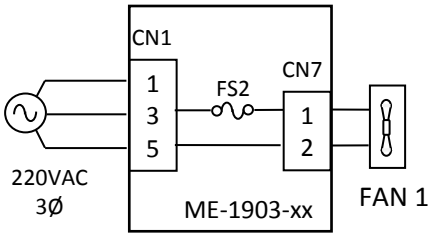
Fuse	Value	Mfg P/N	AMYA #
FS2	0.5A	FA-Ubon 2GF-05	330-215

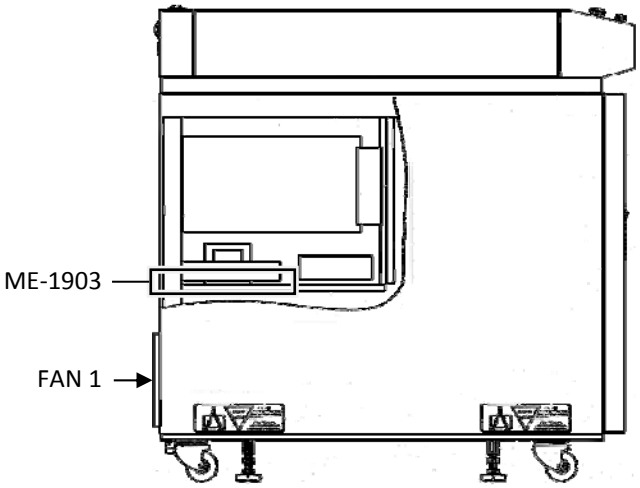
Fan Replacement (LW50A/70A/150A):

Fan #	Mfg P/N	AMYA #
1	Sanyo 109S025UL	305-044

Fuse Replacement (ME-1903-02) – CE Models:

Fuse	Value	Mfg P/N	AMYA #
FS2	0.5A	Littelfuse 313.500	330-049





LW300A(H)/400A

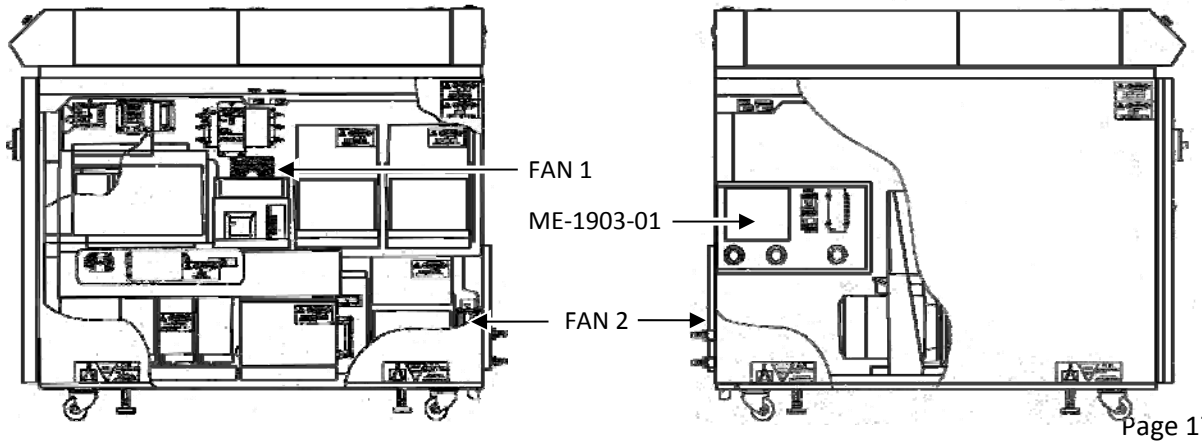
The Fan power in the LW300A(H)/400A is produced by the ME-1903-01 SSR (Solid State Relay) PCB. The ME-1903-01 mounts vertically on the center support behind the left side panel at the rear of the Laser. There are two main cooling fans used to keep the electronics cool, FAN 1 and FAN 2. Both fans are always "ON". FAN 1 is located in the center of the Laser (accessible from the right side) and FAN 2 mounted on the rear panel.

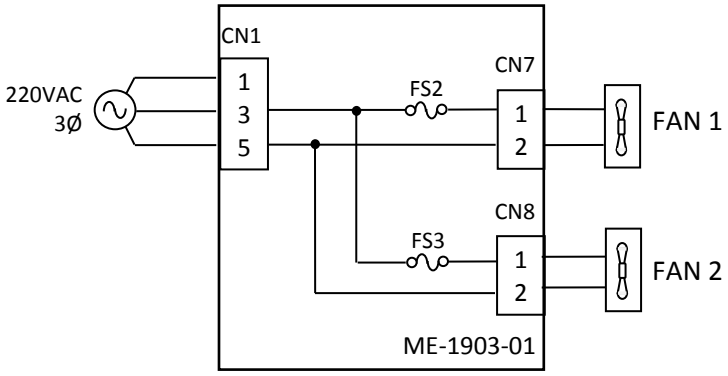
Fan Replacement (LW300A(H)/400A):

Fan #	Mfg P/N	AMYA #
1	Sanyo 109S025UL	305-044
2	Sanyo 109-603	305-029

Fuse Replacement (ME-1903-01):

Fuse	Value	Mfg P/N	AMYA #
FS2	1.0A	Littelfuse 313 001	330-017
FS3	0.5A	Littelfuse 313.500	330-049





LW500A/600A

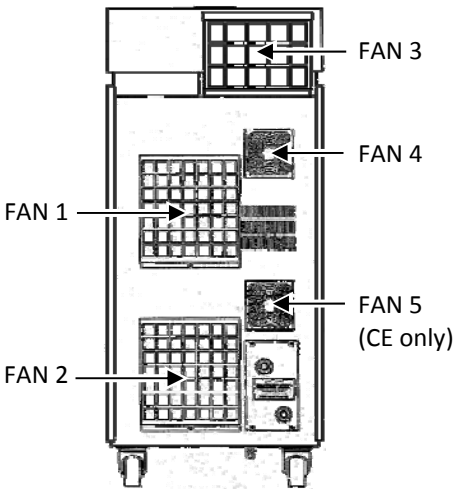
The Fan power in the LW500A/600A is produced by the ME-1903-01 SSR (Solid State Relay) PCB. The ME-1903 is mounted vertically on the top rear of the laser on the opposite side of the ME-1958/3024 Main PCB. There are four main cooling fans used to keep the electronics cool, FAN 1-4. All four fans are always "ON". In CE models there is an additional fan, FAN 5 which is connected directly to the EA33 auto-breaker.

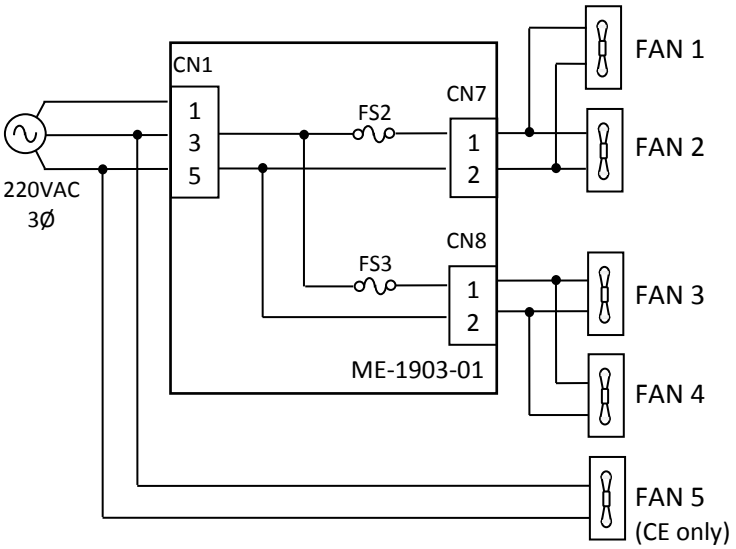
Fan Replacement (LW500A/600A):

Fan #	Mfg P/N	AMYA #
1-2	Sanyo 109-603	305-029
3-4	Sanyo 109S025UL	305-044
5	Sanyo 109S025UL	305-044

Fuse Replacement (ME-1903-01):

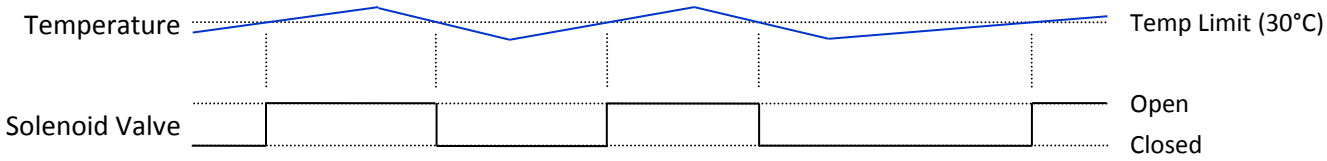
Fuse	Value	Mfg P/N	AMYA #
FS2	1.0A	Littelfuse 313 001	330-017
FS3	0.5A	Littelfuse 313.500	330-049





12. Faulty Solenoid Valve (LW50A-600A)

The water-cooled Lasers (LW50A-600A) regulate the operating temperature by allowing the (external) primary cooling water supply into the Laser through a solenoid valve. When the temperature of the secondary cooling water reaches 30°C, the solenoid valve opens allowing the Laser to cool. Likewise, when the temperature of the secondary cooling water falls below 30°C, the solenoid valve closes.

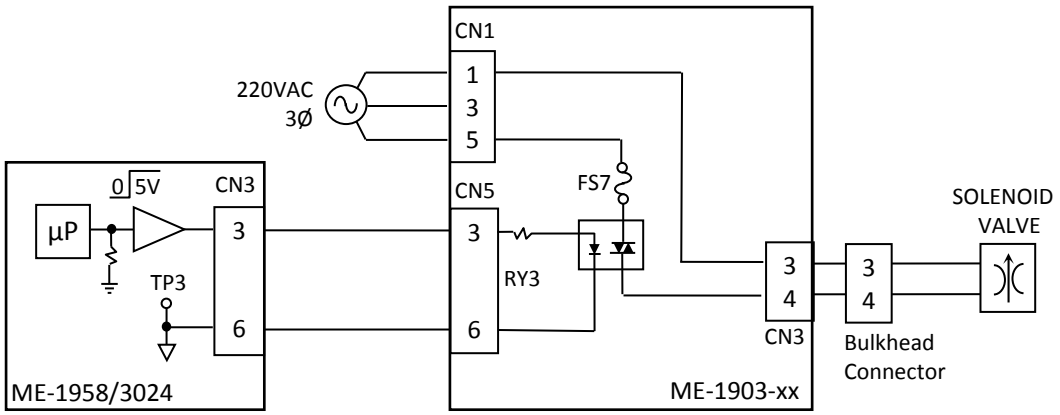


As noted previously in this troubleshooting procedure, the solenoid valve may not function properly if dirty or plugged. If the solenoid valve is clean, and the Laser cannot cool down enough to maintain normal operating temperature, the solenoid valve may be faulty. Using a DMM verify the operation of the solenoid valve. Using a thermometer in the cooling water tank may help determine when the solenoid valve should be energized. In addition the solenoid valve makes an audible "click" when opening and closing. If the solenoid valve is found to be defective, replace with the proper solenoid as noted in the table below. If the solenoid valve is operational, continue with the next troubleshooting step.

Laser Model	Solenoid Valve	
	Mfg P/N	AMYA #
LW50A/70A/150A	RSV-15A-210W-2G211-AC200V	720-133
LW300A(H)/400A		
LW500A/600A	RSV-25A-210W-2G211-AC200V	720-193

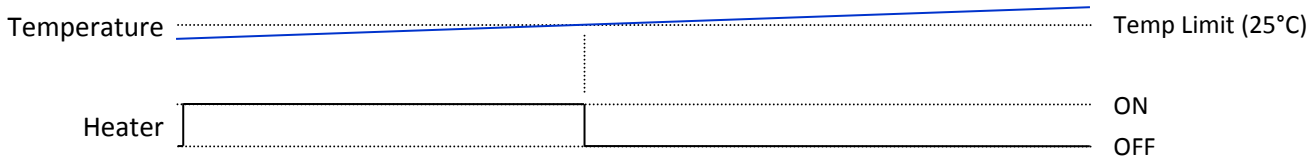
Fuse Replacement (FS7) – *common with Heater circuit*:

SSR PCB	Mfg P/N	AMYA #
ME-1903-00	FA-Ubon 2GF-5	330-216
ME-1903-01	Littelfuse 313 005	330-016
ME-1903-02	Littelfuse 313 005	330-016



13. Faulty Heater / Heater Control (LW50A-600A)

In the water-cooled Lasers, a heater is placed in the cooling water tank to help raise the temperature of the cooling water when operating in cooler ambient temperatures. When the temperature of the secondary cooling water is below 25°C, the heater turns ON allowing the secondary cooling water temperature to increase. Once the secondary cooling water reaches 25°C, the heater is turned OFF. If the heater is stuck ON, the primary cooling water may not be sufficient enough to keep the Laser cool which can cause an **E10** alarm condition.

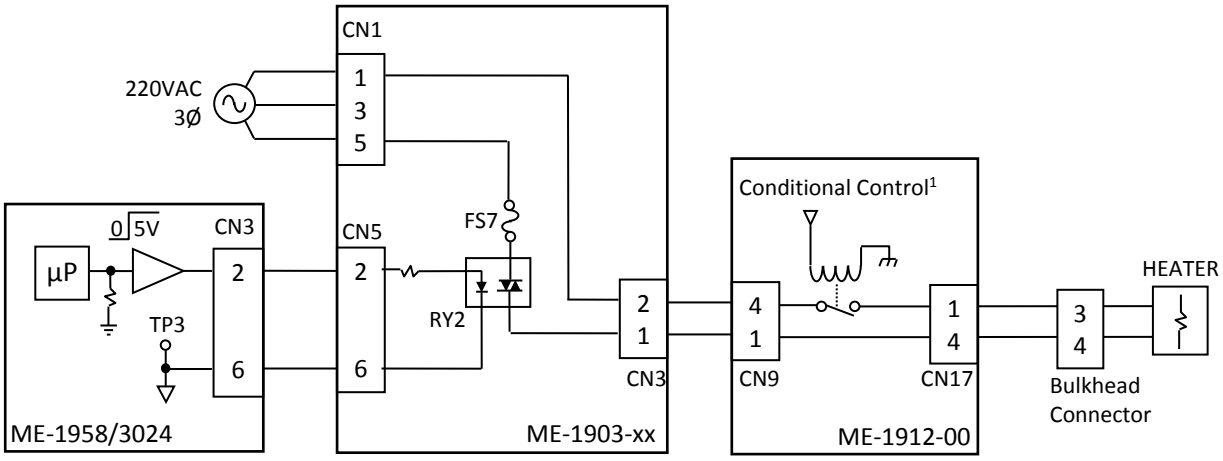


Using a DMM verify the operation of the heater circuit. Using a thermometer in the cooling water tank may help determine when the heater should be energized. If the heater or drive circuit is found to be defective, replace appropriate parts as noted in the tables below.

Laser Model	Heater		
	Mfg P/N	AMYA #	Capacity
LW50A/70A/150A	Nippon Heater LU-205	368-036	500W
LW300A(H)/400A			
LW500A/600A	Nippon Heater UU-1K 200VSUS304	*Special order*	1,000W

Fuse Replacement (FS7) – *common with Solenoid Valve circuit:*

SSR PCB	Mfg P/N	AMYA #
ME-1903-00	FA-Ubon 2GF-5	330-216
ME-1903-01	Littelfuse 313 005	330-016
ME-1903-02	Littelfuse 313 005	330-016

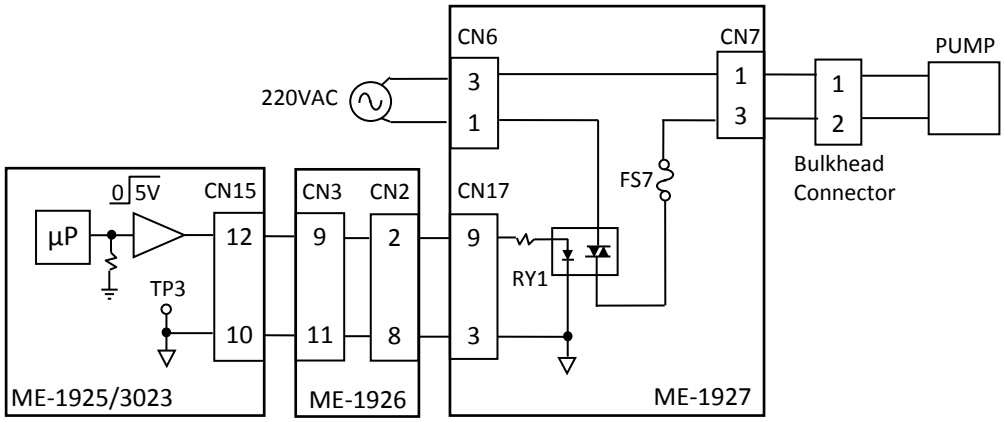


1. Conditional Control - Heater enabled when the following conditions are met:
   (Pump thermal switch OK + Shutter thermal switch OK + Coolant Thermal Switch OK + Coolant level OK + Head Cover Switch OK + Pump Cover switch OK.)

14. Faulty Water Pump / Water Pump Control (LW50A-600A)

If the water pump is faulty, it is possible that an **E12 Low Flow Rate of Coolant** alarm will also be present. A faulty water pump typically makes a lot of noise and if the water pump has failed, pieces of the water pump impeller may be present at the water filter. In the event of pump failure, also make sure that no debris is present in the Oscillator chamber which can minimize cooling and cause further damage.

LW5A(M)/15A/25A Laser Welders

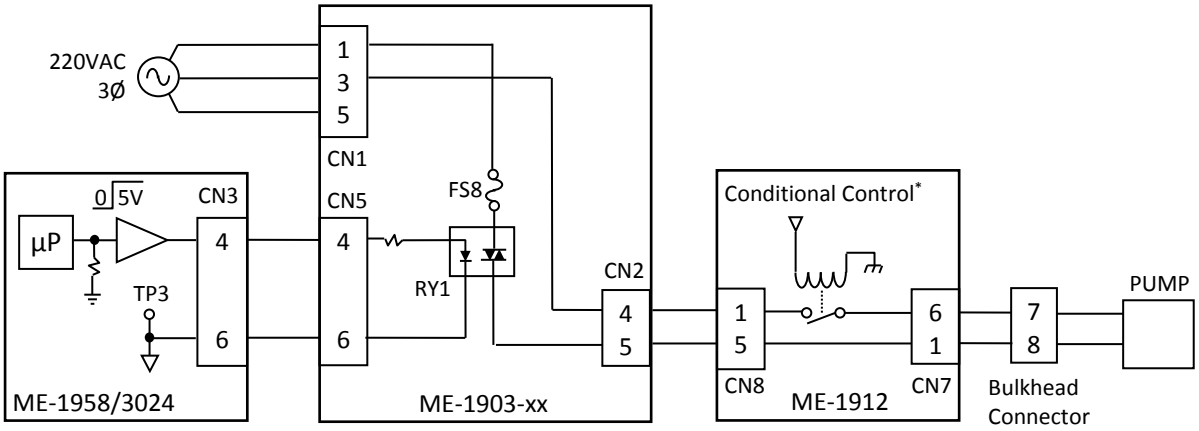


LW5A(M)/15A/25A Component Replacement:

Component	Mfg P/N	AMYA #
FS7 (on ME-1927)	Littelfuse 218.001P	330-182
Water Pump	Terada MC70DF	MC70DF
	Iwaki MD-30RZ-220N (*obsolete*)[1]	MD-30RZ-220N
LW5A-25A/2AG Complete Cooling System	MHC A-03595-003	A-03595-003
LW5AG Complete Cooling System	MHC AS1151227	*Special order*

1 The Iwaki Pump has been superseded to the Terada Pump.

LW50A/70A/150A Laser Welders



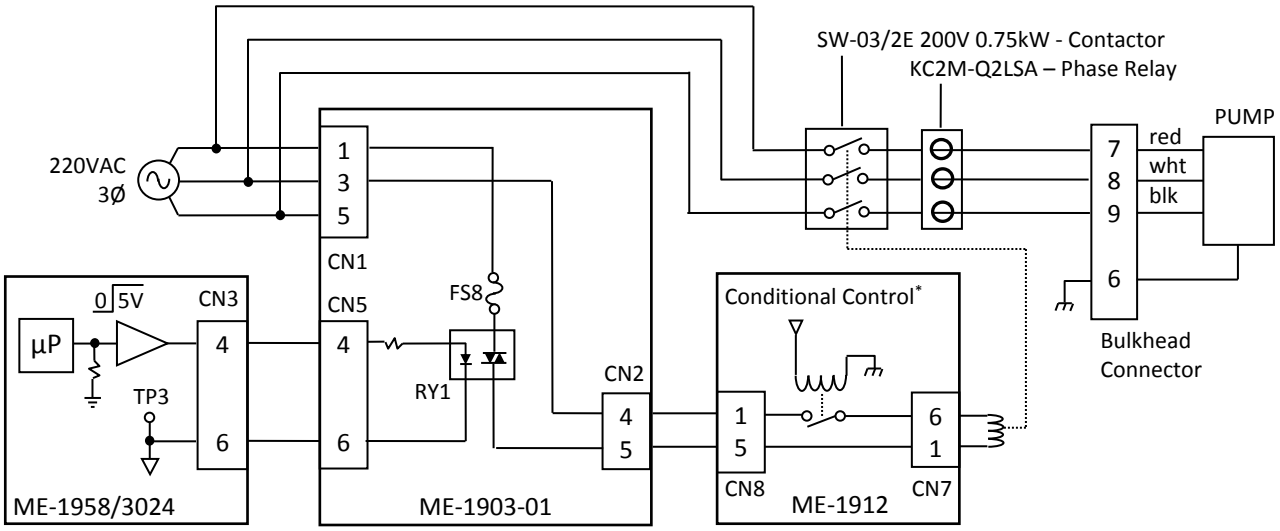
* Conditional Control – Water Pump enabled when the following conditions are met:

(Pump thermal switch OK + Shutter thermal switch OK + Coolant Thermal Switch OK + Coolant level OK + Head Cover Switch OK + Pump Cover switch OK.)

LW50A/70A/150A Component Replacement:

Component	Mfg P/N	AMYA #
FS8 (on ME-1903-00)	FA-Ubon 2GF-5	330-216
FS8 (on ME-1903-02)	Littelfuse 313 005	330-016
Water Pump	Iwaki MD-70RZ	MD-70RZ
LW50A/70A Complete Cooling System	MHC A-05143-004	A-05143-004
LW150A Complete Cooling System	MHC A-05143-002	A-05143-002

LW300A(H)/400A Laser Welders



* Conditional Control – Water Pump enabled when the following conditions are met:

Pump thermal switch OK + Shutter thermal switch OK + Coolant Thermal Switch OK + Coolant level OK + Head Cover Switch OK + Pump Cover switch OK.

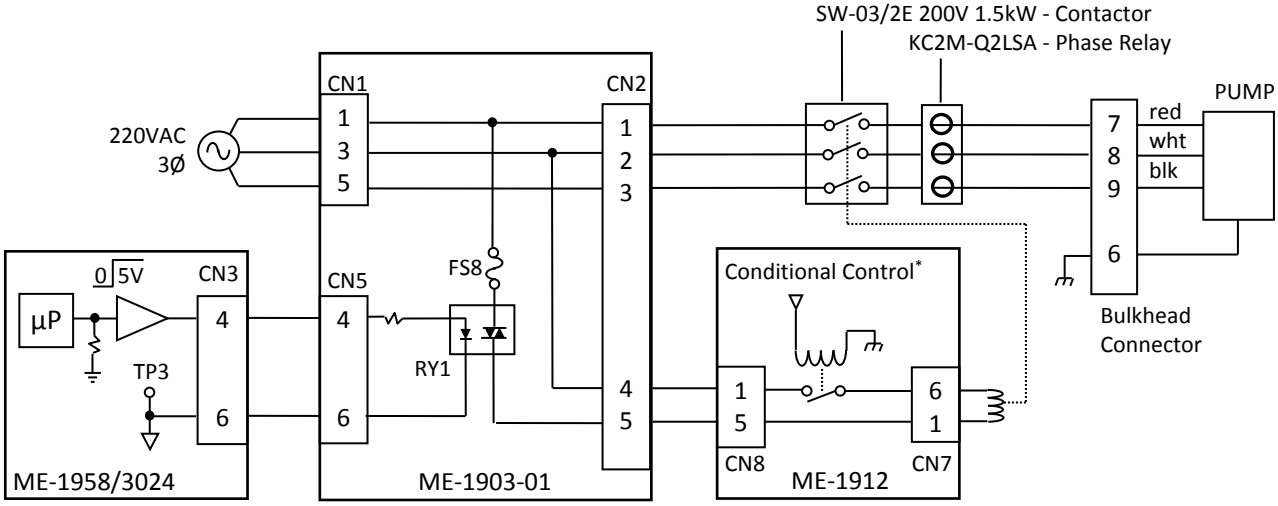
LW300A(H)/400A Component Replacement:

Component	Mfg P/N	AMYA #
FS8 (on ME-1903-01)	Littelfuse 313 005	330-016
Water Pump	Ebara 32X25EHML361.1	270-490
	Hayashi HDG-401PGxxx (*obsolete*)[1]	270-490
	Pan World NH-401PW-CV-TN5622 (*obsolete*)[1]	NH-401PW
SW-03 Contactor	Okinaya SW-03/2E 200V 0.75K	555-166
KC2M Phase Relay	Omron K2CM-Q2LSA	K2CM-Q2LSA
Complete Cooling System	MHC AS1159065	AS1159065

1 The following water pumps should be replaced by the 32X25EHML361.1**:**

Pan World # NH-401PW-CV-TN5622 (green pump)
Hayashi Kakohki # HDG-41PGCH
Hayashi Kakohki # HDG-41PGCH4
Hayashi Kakohki # HDG-401PG-CH4
Hayashi Kakohki # HDG-401PGAH4

LW500A/600A Laser Welders



* Conditional Control – Water Pump enabled when the following conditions are met:

Pump thermal switch OK + Shutter thermal switch OK + Coolant Thermal Switch OK + Coolant level OK + Head Cover Switch OK + Pump Cover switch OK.

LW500A/600A Component Replacement:

Component	Mfg P/N	AMYA #
FS8 (on ME-1903-01)	Littelfuse 313 005	330-016
Water Pump	Ebara 32x25EHML461.5	270-515
	Ebara 32X25P10121.5A (*obsolete*)[1]	32X25P10121.5A
SW-03 Contactor	Okinaya SW-03/2E 200V 1.5KW	555-164
KC2M Phase Relay	Omron K2CM-Q2LSA	K2CM-Q2LSA
Complete Cooling System	MHC A-04481-001	A-04481-001

1 The Ebara # 32X25P10121.5A is an obsolete water pump. Replace with AMYA # 270-515.

If AMYA # 270-515 is used to replace the 32X25P10121.5A, the AMYA # 1151659 Pump Spacer and AMYA # 1151759 Collar will also be required.

15. Faulty Heat Exchanger / Radiator

When all possible causes have been eliminated, the next step is to examine the Heat Exchanger / Radiator. A faulty Heat Exchanger / Radiator can either have an obstruction / blockage or there can be a leak.

Typically an obstruction / blockage may also be indicated by a **E12: Low Flow Rate** alarm. To test for an obstruction, drain the cooling tank, remove the hoses from the heat exchanger / radiator and then blow air through the heat exchanger / radiator. If there is little or no air flow coming out of the other end, the heat exchanger / radiator may be clogged. The same test can also be completed by cycling water through it. If it is determined that there is blockage, replace the heat exchanger / radiator.

If the Heat Exchanger / Radiator is leaking, the Laser will constantly need the secondary cooling water re-filled. A leak may also be indicated by an **E04: Coolant Low Level** alarm. To test for leaks, drain the cooling tank, remove the hoses from the heat exchanger / radiator and then fill the heat exchanger / radiator with water while plugging the opposite end. If it is determined that there is a leak, replace the heat exchanger / radiator.

LW5A(M)/15A/25A

Component	AMYA #
Radiator	Z-0211
Radiator (obsolete)	Z-00731-001
Radiator Plug	M-5P
Hose Clamps	SNP-14

LW50A/70A

Component	AMYA #
Heat Exchanger	BXC-024-NU-20
Heat Exchanger (obs)	BXN-005-P-14
Hose Clamps	SNP-24

LW150A

Component	AMYA #
Heat Exchanger	BXN-005-P-26
Hose Clamps	SNP-24

LW50AC/70AC

Component	AMYA #
Radiator	Z-01633-002
Heat Exchanger	BXC-024-NU-20
Hose Clamps	SNP-24

LW300A(H)/400A

Component	AMYA #
Heat Exchanger	BXN-005-P-40
Hose Clamps	SNP-24

LW500A/600A

Component	AMYA #
Heat Exchanger	BHE-015-P-26
Hose Clamps	SNP-24

End of Document