



Model 234

Power Supply/Cooler

**Operation
and
Maintenance Manual**

**Quantronix Corp.
41 Research Way
East Setauket, NY 11733**

**Phone: (631) 784-6100
Fax: (631) 246-9742**

Web: www.quantron.com

January 2000

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This section deals with the electrical safety aspects of the Model 234 Power Supply / Cooler. Additional safety instructions can be found in the appropriate laser section of this manual. Please read all safety sections and instructions prior to system operation

All warning and caution notices appearing in the manual are boxed. Warning notices indicate the potential for personal injury. Caution notices indicate the potential for equipment damage. Please read these notices carefully.

Warning

Lethal electrical voltages exist in the Model 234 Power Supply / Cooler. Follow manual instructions. Do not attempt any modifications to the electronic control system or electrical triggering system.

Warning Labels

MAIN INPUT
A/C POWER CABLE

PHASE A — RED
 PHASE B — BLK
 PHASE C — ORG
 GND — GRN

CAUTION

LINE VOLTAGE ALWAYS
PRESENT INSIDE ENCLOSURE

VOLTAGE _____
 AMP. PHASE _____
 FREQ. _____

CAUTION

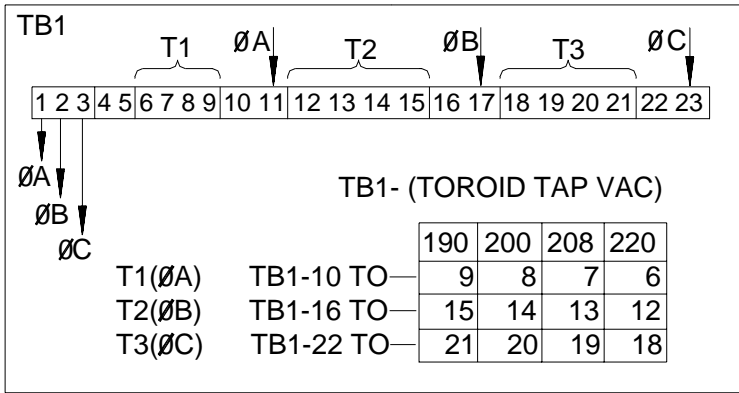
FAN MUST BE UNPLUGGED
BEFORE COVER CAN BE
FULLY REMOVED

CAUTION

DISCONNECT LINE VOLTAGE
SOURCE PRIOR TO REMOVING
REAR COVER

CAUTION

NO USER SERVICABLE PARTS
INSIDE. TO REDUCE THE RISK OF
ELECTRIC SHOCK, DO NOT REMOVE
COVER. REFER SERVICING TO
QUALIFIED SERVICE PERSONNEL



Remote Interlock

Federal law requires every laser system to have a remote interlock (see the Laser Safety section of your manual). For your laser system, this interlock is located on the rear panel of the Model 234 Power Supply / Cooler. The function of the remote interlock is to provide a means for electrically disabling the laser from a remote location (e.g., door interlock).

Information for the installation of this interlock is contained in the Installation Section of this manual.

General Rules for Electrical Safety

1. Disconnect main power lines before working on any electrical equipment if it is not necessary for the equipment to be operating.
2. The main system circuit breaker **MUST** be in the “OFF” position prior to changing the lamp. The laser power supply is not isolated from the power source. High voltage or current may be transmitted to the lamp leads if the circuit breaker is in the “ON” position.

For maximum protection, disconnect the main power line before changing the lamp.

3. After disconnecting the power, wait at least 5 minutes for the capacitors to discharge through the bleeder resistors before touching any electrical equipment.
4. Do not short or ground the power supply output. The power supply is **NOT** electrically isolated from the power line. Positive protection against possible hazards requires proper connection of the ground terminal on the power cable and an adequate ground. Check these connections at the time of installation and periodically thereafter.
5. Never work on electrical equipment unless there is another person present who is familiar with the operation and hazards of the equipment and who is competent to administer first aid.
6. When possible, keep one hand away from the equipment to reduce the danger of current flowing through the body.

7. Always use approved, insulated tools when working on high voltage circuits
8. Special measurement techniques are required for this system. A technician who has a complete understanding of the system's operation and associated electronics must select ground reference.

System Description

Model 234 Power Supply / Cooler is a modular system designed to operate all the Quantronix krypton arc lamp pumped Nd:YAG and Nd:YLF laser heads. The unit contains the following modules, which provide all the required functions for a fully integrated power supply and cooling system:

- Logic and Control Unit
- Krypton Arc Lamp Power Supply
- Water Cooling System
- Power Distribution Unit
- Options

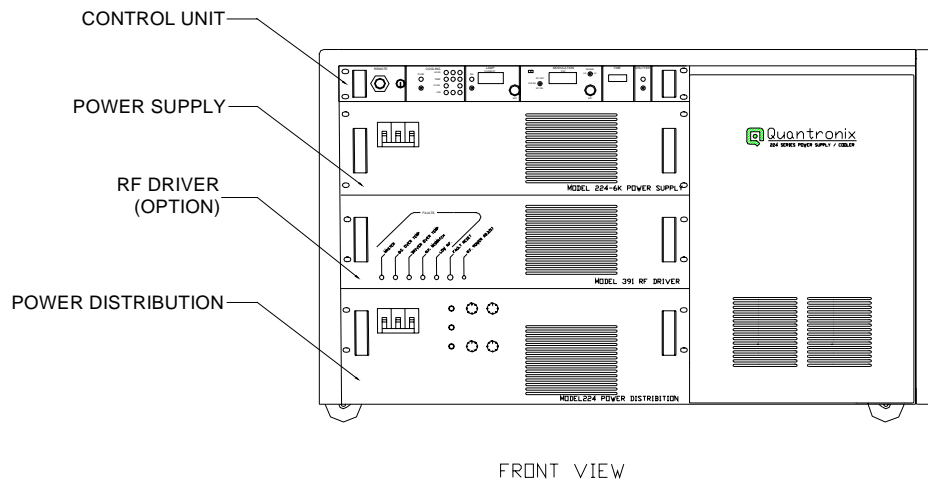
Control and monitoring of the laser operating parameters is provided by the control panel on the front of the Model 234 Power Supply / Cooler.

Control and operating parameters of the laser can also be controlled remotely via the RS-232 interface provided on the rear of the Model 234 Power Supply / Cooler.

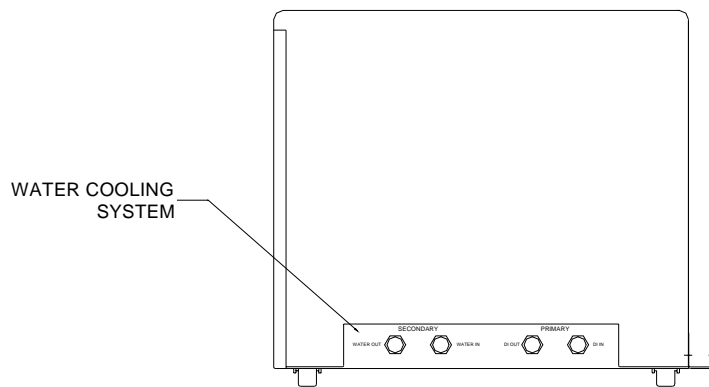
Control and operating parameters of the laser can also be controlled remotely using the optional Remote Control Unit. A special connector is provided on the front of the Control Unit of the Model 234 Power Supply / Cooler panel for this purpose.

Model 234 Power Supply / Cooler has a height of 53.5 cm (21 inches) and will fit under most optical benches or work tables.

Figure 2.1 Model 234 Power Supply / Cooler



FRONT VIEW



RIGHT SIDE

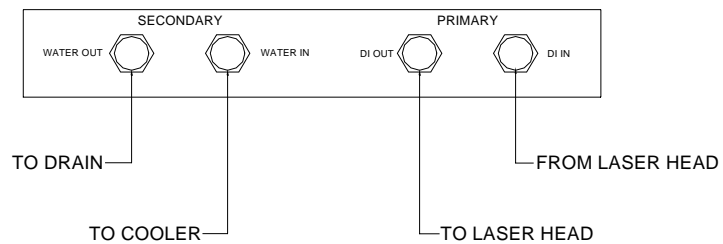
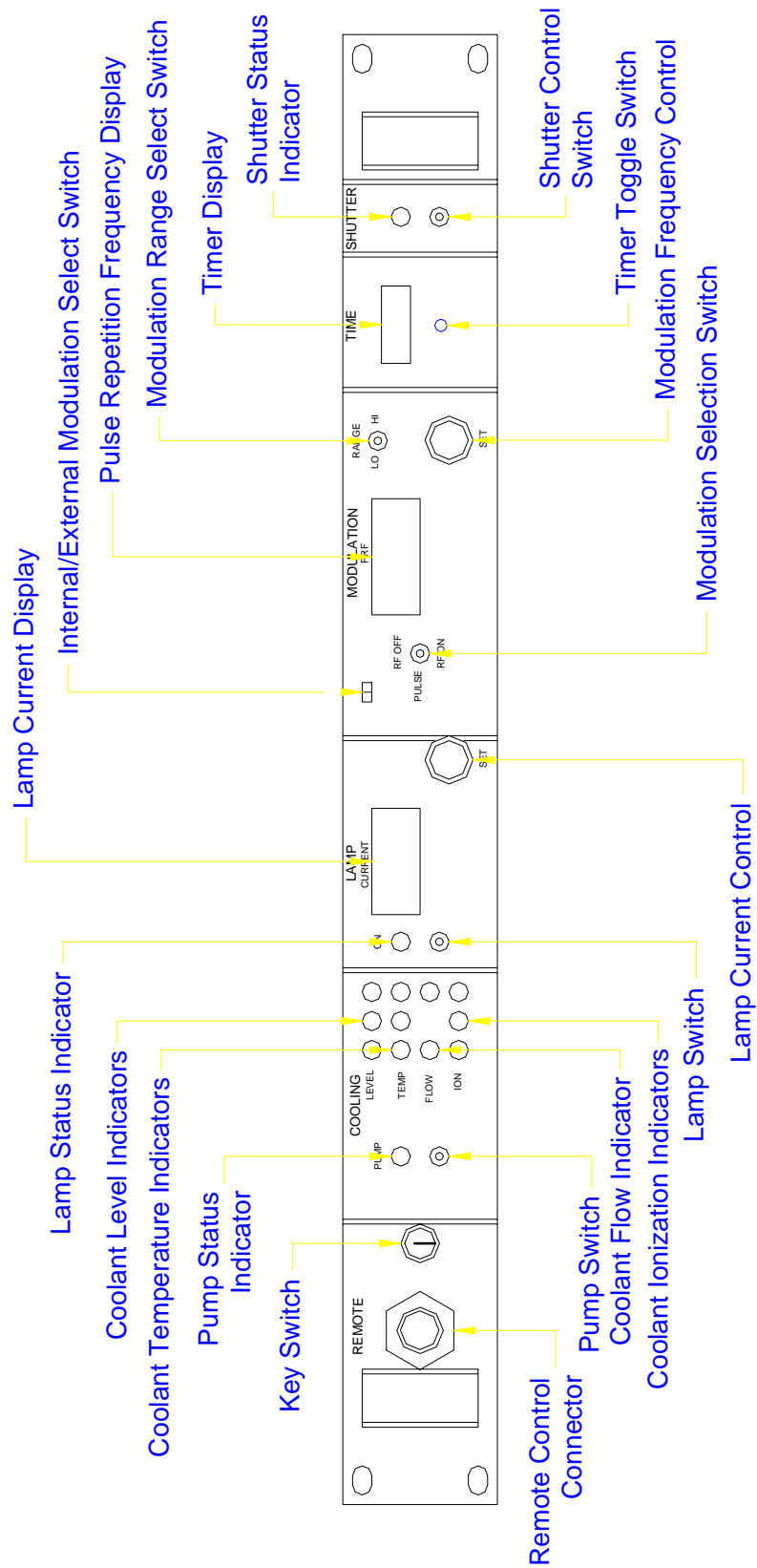


Figure 2.2 Control Unit



Control Unit

The control panel on the Model 234 Power Supply / Cooler is the main user interface for the control and monitoring of the laser operating parameters. The control and monitoring functions provided are listed below:

Keyed lockout switch

Cooling Status Indicators

- Pump Status. *Indication, on or off*
- Primary Coolant Level. *Indication, Safe, Warning and Fault*
- Primary Coolant Temperature. *Indication, Safe, Warning and Fault*. In the Warning Mode, the warning lamp blinks when the temperature is too cold. In the Fault Mode, in addition to the indication lamp, a beeper sounds
- Primary Coolant Flow. *Indication, Safe, Fault*. In the Fault Mode a beeper sounds and the system shuts down after a few seconds.
- Primary Coolant Ionization. *Indication Safe, Warning and Fault*.

Krypton Arc Lamp Control

- Lamp Switch, on or off
- Display of lamp current
- Lamp Current Adjust potentiometer. An internal trim pot limits the current to a preset maximum value

RF Modulation Control

- Three position switch to control RF ON, PULSE and RF OFF
- Range Switch, HI, MED and LOW to provide improved resolution over the adjustment range.
- PRF Display (Pulse Repetition Frequency)
- Internal/External switch to enable a external pulse source to be used.

Dual Timer

- Displays Total Time the laser has been in operation (Not Resettable) and a second timer that can be reset. The Total Time Display is used to log operating time and for preventive maintenance. The Resettable Timer is used to log lamp life.
- Timer toggle switch used to alternate between the Total Time Display and the Resettable Display. This switch is also used to reset the Resettable Display.

Windows Based Control Software and an optional handheld Remote Control Unit are also provided to control and monitor the functions listed.

- Laser status, select Ready, Standby or Idle

- Select Fire Mode, Single Shot, Continuous or Timed
- Adjust and display lamp current.
- Adjust and display the Q-switched Pulse Repetition Frequency
- Turn PRF on or off.

Power Supply

The power supply is a compact, lightweight, constant current regulated source of D.C. power for the krypton arc lamp/lamps in the laser head. The main power switch, located on the front panel, is a UL listed, 3 phase circuit breaker that combines primary circuit protection with on/off control. The current control, power supply enable, trigger ready, current read back, ignition and interlock functions are all remotely controlled via a 15 pin sub-D connector on the back of the unit.

The supply is built into a 19" rack-mountable chassis. All cabling and wiring connections are made at the rear of the power supply. The power supply chassis is mounted on slides in the Model 234 cabinet and can be easily pulled out for service or replacement.

Water Cooling System

The Water Cooling System is a closed-loop primary system that supplies filtered, deionized water to cool the laser and an open loop, secondary system for heat exchange. All materials in contact with the deionized primary cooling system are non-contaminating. The Water Cooling System is located in a separate section of the Model 234 cabinet. It is isolated from the electronics bay by a continuous bulkhead running the entire width of the cabinet. The water system itself is mounted to the cabinet with chassis slides that enable the cooler to be pulled out for routine maintenance and accessibility.

The primary and secondary water connections are located on the lower right side of the cabinet and are clearly marked. Connections to the primary water hook-ups are made with hose clamps, which firmly seal the braided hose to the barbed fitting. This will ensure a leak-free connection for DI water flow between the cooling section and the laser head. The secondary water fittings are standard 3/4" female garden hose connections.

Power Distribution Unit

The Power Distribution Unit of the Model 234 Power Supply/Cooler receives the 208 VAC 3-phase input power and distributes it as a variety of voltages (i.e., 208 VAC 3 Phase, 208 VAC 1 Phase, 120 VAC, 24 VAC, +/-15 VDC and +/-5 VDC) to all the other major assemblies. Two versions are offered, a 6 kW and a 10 kW unit. Both assemblies follow the same schematic and include the following components:

1. Main Circuit Breaker
2. Main Contactor
3. Low Voltage/Phase Monitor Relay
4. Transformers: 208 VAC to 120 VAC
208 VAC to 24 VAC
5. Pump Overload Relay
6. +15, -15 and 5 VDC Power Supply
7. +/- 5 VDC Power Supply
8. Cooling Fan
9. Key switch Relay

Options

Model 391 AO Q-Switch Driver

The Model 391 RF Driver provides up to 100 watts of RF power for an AO Q-Switch used to Q-Switch your laser. The RF Driver allows many different options to be set up using an on-board multi-configuration switch.

An adjustable first pulse suppression ramp generator is built in to prevent excessive laser peak power in the first pulse.

A fault diagnostics feature will indicate the particular fault on the front panel by an indicator light. Any fault will result in automatic RF power shutdown.

System Specifications

	234-1 6 kW	234-2 10 kW
Electrical	200-220 volts AC 50/60 Hz, 3 Phase, WYE or Delta	200-220 volts AC 50/60 Hz, 3 Phase, WYE or Delta
Current per Phase (amps)	35	50
Mechanical		
Height (in)	21	21
(cm)	53.5	53.5
Width (in)	33.5	33.5
(cm)	85	85
Depth (in)	22.8	22.8
(cm)	58	58
Weight (lbs)	290	350
(kg)	130	160
Water Cooling System		
Primary		
Water Flow (gpm)	3 to 6	3 to 7
(lpm)	11.3 to 22.7	11.3 to 26.5
Temperature (deg F)	84	84
(deg C)	29	29
Secondary		
Water Flow (gpm)	2 to 5	4 to 6
(lpm)	8 to 20	16 to 24
Temperature (deg F)	45 to 65	45 to 65
(deg C)	7 to 18	7 to 18
Pressure (psig)	15 to 100	15 to 100
(kg/cm ²)	1 to 7	1 to 7

Site Requirements

Electrical

The electrical service at your site must be compatible with the label affixed to the Model 234 Cooler unit rear panel with respect to voltage, frequency, and load current requirements.

Configuration

User site electrical configuration may be either 3 phase WYE with ground or 3 phase DELTA with ground.

Input Voltage: 200-220 VAC, 3 Phase

Maximum: 220 VAC Phase to Phase

Minimum: 200 VAC Phase to Phase

Voltage Imbalance, Phase to Phase: 1% Maximum

Circuit Breaker/Fused Current

Model 224-1, 6 kW: 40 Amperes per phase

Model 224-2, 10 kW: 50 Amperes per phase

Main Input AC Power Cable

Phase ARED

Phase B.....BLACK

Phase C.....ORANGE

GROUNDGREEN

All Connections on Rear Apron of Power Distribution Box

Main Input AC Power Cable, P/N (3502—00216)

(20 foot No. 8 AWG)

For safety considerations, a 3 Phase ground fault interrupter and a manually operated 3 Phase disconnect switch at user site is recommended. Because of the wide variation in outlet configurations, the plug or junction box is supplied by the user.

CAUTION

DO NOT TURN ON MAIN AC POWER TO THE MODEL 234 POWER SUPPLY/COOLER AT THIS TIME.

REFER TO INSTALLATION SECTION 4.

Secondary Water

Maximum Inlet Pressure: 100 psig. (7 kg/cm²)

Inlet Temperature

Minimum 45 deg F (7 deg C)

Maximum 65 deg F (18 deg C)

Flow

Model 234-1, 6 kW: 2-6 gpm (8-24 lpm)

Model 234-2, 10 kW: 3-6 gpm (12-24 lpm)

Minimum Inlet/Outlet Differential Pressure to obtain 6 gpm.
(24 lpm) secondary flow is 2 psig.

Plumbing

Two 20 foot long, standard garden hoses are supplied with the system.

User to supply a 3/4" MALE GARDEN HOSE FITTING at both supply and return line.

CAUTION

DO NOT USE 3/4" MALE THREAD PIPE FITTINGS

An ON/OFF gate valve should be located at supply side. If system is closed loop, a similar valve should be located on return side.

User supply and return lines must be capable of handling a 6 gpm (24 lpm) volume.

A user-supplied, in-line string filter placed before the secondary inlet water fitting is recommended.

CAUTION

DO NOT AT THIS TIME CONNECT SECONDARY INLET AND OUTLET COOLANT HOSES TO MODEL 224 POWER SUPPLY/COOLER. REFER TO INSTALLATION SECTION 4.

Environment

Ambient air temperature, Maximum 104 deg F (40 deg C) at 100% of Rated Input Power. Minimum 33 deg F (1 deg C)

Humidity: Below the dew point at ambient air temperature.

Installation

Unpacking

Visually examine the container for signs of shipping damage prior to unpacking. If damage is evident, or a container missing, notify the carrier and Quantronix Corporation.

If no damage is noted, carefully unpack the Model 234 Power Supply/Cooler and any accessories. Compare unpacked items with the packing list and report any discrepancies to Quantronix Corporation.

Due to the custom nature of the laser system packaging, you may want to retain some or all of the packing supplies for future use.

CAUTION

IF THE LASER SYSTEM RECEIVED REQUIRES INSTALLATION BY QUANTRONIX FIELD SERVICE OR A QUANTRONIX REPRESENTATIVE DO NOT PROCEED BEYOND STEP 4, UNPACKING.

REFER TO THE LASER SYSTEM PORTION OF THIS MANUAL FOR CLARIFICATION.

CONTACT QUANTRONIX OR THEIR AUTHORIZED REPRESENTATIVE TO SCHEDULE THE INSTALLATION AT USER SITE.

Site Location, 234 Power Supply/Cooler

The Model 234 Power Supply/Cooler should be located on a flat level surface, below the level of the laser head.

A minimum of one foot clearance from the wall to the rear panel of the Model 234 Power Supply/Cooler is required to allow for adequate forced—air circulation.

A three-foot clearance forward of the front panel is required to service subsystems mounted on chassis slides.

Verify that all the following switches are in the OFF position:

Power Distribution Box, 3 Phase Circuit Breaker
Power Supply; 3 Phase Circuit Breaker
Model 391 RF Driver
Other Accessories

Connect or verify that all appropriate electrical cables are correctly interconnected between Model 234 Power/Supply Cooler and the laser head portion of system; paying particular attention to:

KRYPTON ARC LAMP CABLE, BLACK AND RED BANANA PLUGS

TWO (2) BNC TERMINATED COAXIAL CABLES FROM MODEL 391 RF DRIVER TO Q-SWITCH. (OPTION)

RF OUTPUT (J5) TO Q-SWITCH

TEMPERATURE FAULT (J2) INTERLOCK

INTRACAVITY LASER SHUTTER, J102

OTHER ACCESSORIES OR ELECTRICAL OPTIONS

Refer to the laser section of your manual and your test data reports to determine your exact system configuration.

Key switch on the front panel of the 234 logic unit should be in the OFF Position.

Connect the Model 234 Remote Control Unit (this is an optional item) to the connector on the front panel of the 234 logic unit

Primary Hoses

Connect and secure each of the two hoses to the appropriate DI IN/DI OUT barbed fittings. The hose connected to DI OUT at the cooler should be connected to the input on the laser head. The hose that connects to DI OUT is marked with a red band.

Electrical

Review Site Requirements.

Verify Model of 234 Power Supply/Cooler to be installed, 234-1, 6 kW or 234-2, 10 kW. This information is imprinted on the system serial number tag and written on your order confirmation and Test Data Report.

Electrical service must conform to values specified in section entitled Site Requirements, Configuration. If electrical service does not conform, do not proceed with installation.

Model 234-1

Connect main input AC power cable to user electrical service as per description in section entitled Site Requirements, Configuration.

Verify correct phase rotation. (See “Phase Rotation Verification on next page.)

Model 234-2

CAUTION

THE MODEL 234-2 POWER SUPPLY/COOLER IS TESTED AND SHIPPED CONFIGURED FOR 3 Phase, 208 VAC +/-2.4%, INCOMING SUPPLY VOLTAGE.

This Model includes a 3 Phase, multi-tapped, toroidal step-up autotransformer located between the rear panel of the 234 Power Supply/Cooler and the Model 234-2 Power Supply.

The tapped toroidal autotransformer provides the required 3 Phase, 230 VAC input needed for the Krypton Arc Lamp supply over input voltage ranges of 190, 200, 208 and 220 VAC.

To correctly configure the transformer, first measure and record your site's phase-to-phase voltage:

Phase A to Phase B = _____ volts AC

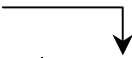
Phase A to Phase C = _____ volts AC

Phase B to Phase C = _____ volts AC

Next, check the values in Table 4.1. If necessary, move jumpers to appropriate tap(s) on TB-1 of the toroidal autotransformer. This will provide a measured phase-to-phase voltage match within 5 VAC of listed values in Table 4.1.

Connect main input AC power cable to your electrical service as per description section entitled Site Requirements, Configuration.

Table 4.1 Autotransformer Connection Chart

Factory Default Jumpers 

Measured Incoming Phase-to-Phase Voltage	190	200	208	220
Phase A, Connect Terminal 10 to	9	8	7	6
Phase B, Connect Terminal 10 to	15	14	13	12
Phase C, Connect Terminal 10 to	21	20	19	18

Phase Rotation Verification

WARNING

INCORRECT PHASE ROTATION WILL RESULT IN THE SYSTEM APPEARING TO BE “ELECTRICALLY-DEAD” AS IF DISCONNECTED FROM ELECTRICAL SERVICE.

EXERCISE EXTREME CAUTION.

LETHAL POTENTIALS DO EXIST WITHIN THE POWER DISTRIBUTION BOX.

Again, verify that all switches are in the OFF position.
Connect main AC plug into main receptacle.
Turn on main incoming 3 Phase AC voltage.

Turn on 3 Phase circuit breaker located on front panel of Model 234 Power Supply/Cooler Power Distribution Box.

Turn the key switch on 234 Control Unit from the OFF position, clockwise to ON position. If the phase rotation is correct the

LEVEL, TEMPERATURE, FLOW and IONIZATION Status Indicator LED's will illuminate, indicating the appropriate status. If illuminated, continue installation.

If the Status Indicator LED's did not illuminate, two phases (leads) at main incoming AC female receptacle, or junction box, must be interchanged to obtain correct phase rotation. Before proceeding, turn key switch on 234 Control Unit to OFF position. Turn 3 Phase circuit breaker on Power Distribution Box to OFF position. Disconnect main AC plug to Model 234 Power Supply/Cooler. Remove main incoming AC power and/or padlock in OFF position incoming AC before interchanging any two phase leads.

After changing leads, retest. If problems persist, contact the Quantronix Field Service group nearest you or Quantronix authorized representative for assistance.

Secondary Water Connections

Prior to connecting hoses, flush secondary water supply into a suitable drain until free of particulate matter such as solder globules and water flow appears clear.

At the Model 234 Power Supply/Cooler secondary inlet/outlet female fittings, verify that a rubber washer is present in each fitting before making hose connections. Connect opposite end of hoses to APPROPRIATE secondary supply and return, 3/4" MALE GARDEN HOSE fittings. Again, verify presence of the rubber washer at each fitting before making connection.

Open secondary supply gate valve (and return gate valve if applicable) and visually check for water leaks. If no leaks are

visible, proceed to initialize water pump/cooler operation.

Initializing Water Pump/Cooler Operation

Again, verify that all switches are in the OFF position.
Connect main AC plug into main receptacle.
Turn on main incoming 3 Phase AC voltage.

Turn on 3 Phase circuit breaker located on front panel of Model 234 Power Supply/Cooler Power Distribution Box.

Primary (Laser Head) Water

Seven gallons (26.5 liters) of steam distilled water is required for initially filling system.

CAUTION

DO NOT USE DEIONIZED WATER FOR INITIALLY FILLING SYSTEM. DO NOT USE DEIONIZED WATER TO MAINTAIN WATER LEVEL IN RESERVOIR. ADD ONLY STEAM-DISTILLED WATER.

Initial Fill

Remove right hand side panel of cooler by lifting directly upward at the underside of the panel.

Slide out water cooler subassembly on chassis slide by disengaging each one-quarter-turn, twist lock retainer located on each side.

Remove top cover of reservoir.

Fill reservoir to the water level line indicated on reservoir.

DO NOT OVERFILL

The hydraulic system is designed so that the water pump will be self-primed as water is introduced into the reservoir. Turn the 234 Control Unit key switch, from OFF position, clockwise to the ON position and push up on the Pump Switch. The water pump should turn on and after a couple of seconds shut off due to low level water sensor being actuated.

Again fill reservoir until low level fault indicator extinguishes. To restart the water pump, push up on the Pump Switch. The water pump will again turn on. It will be necessary to repeat this sequence several times until the laser head, primary water hoses and D.I. cartridge have been filled. With primary water flow established, adjust the water level to the line indicated on the reservoir.

While filling system, verify proper water flow direction through laser head (anode to cathode) by observing flow of air bubbles. Confirm that system has no water leaks when under pressure.

User-Site with Utilities Other Than 3 Phase. 208 +/- 10% VAC

Electrical service at user site must be made to provide and conform, via a three phase transformer if necessary, to site

requirements stated in section entitled Site Requirements, Configuration.

Prior to installation of Model 234 Power Supply/Cooler, a three phase transformer having a minimum of 13 KVA rating for the Model 234-2 and a 10 KVA for Model 234-1 rating for continuous commercial service must be installed by the user.

CAUTION

ATTEMPTING TO INSTALL AND OPEPATE A MODEL 234 POWER SUPPLY/COOLER WITH ELECTRICAL UTILITIES NOT CONFORMING TO REQUIREMENTS MAY RESULT IN DAMAGED COMPONENTS, AND VOID WARRANTY COVERAGE.

Installation of the Remote Interlock

As mentioned in the Safety section of this manual, your Model 234 Power Supply/Cooler is equipped with a remote interlock, per Federal Regulations. This feature allows the user to inhibit lasing via the intracavity shutter from a remote location.

Most commonly, this feature is used as a door interlock in the area where the laser is used.

At the rear of the Model 234 Power Supply/Cooler, there is a 15 pin male connector located below where the main power cable enters the cabinet (see Figure 4.2). The interlock is terminated to pins on this connector.

Shutter Remote Interlock

The Shutter Remote Interlock (pins 1 and 2) is designed to drive the intracavity shutter to the closed position (preventing lasing) when open. A remote interlock switch (SPST) wired into these pins will disrupt lasing when opened, but it will not shut down the electrical system of the cooler, logic, or power distribution assemblies.

Table 4.2 Model 234-2 Autotransformer Terminal Strip

TERMINAL	DESCRIPTION
1	PHASE A ARC TO LAMP POWER SUPPLY
2	PHASE B ARC TO LAMP POWER SUPPLY
3	PHASE C ARC TO LAMP POWER SUPPLY
4	NOT USED
5	NOT USED
6	PHASE A VOLTAGE CORRECTION FOR 220 VOLTS
7	PHASE A VOLTAGE CORRECTION FOR 208 VOLTS
8	PHASE A VOLTAGE CORRECTION FOR 200 VOLTS
9	PHASE A VOLTAGE CORRECTION FOR 190 VOLTS
10	PHASE A INCOMMING VOLTAGE
11	PHASE A INCOMMING VOLTAGE
12	PHASE B VOLTAGE CORRECTION FOR 220 VOLTS
13	PHASE B VOLTAGE CORRECTION FOR 208 VOLTS
14	PHASE B VOLTAGE CORRECTION FOR 200 VOLTS
15	PHASE B VOLTAGE CORRECTION FOR 190 VOLTS
16	PHASE B INCOMMING VOLTAGE
17	PHASE B INCOMMING VOLTAGE
18	PHASE C VOLTAGE CORRECTION FOR 220 VOLTS
19	PHASE C VOLTAGE CORRECTION FOR 208 VOLTS
20	PHASE C VOLTAGE CORRECTION FOR 200 VOLTS
21	PHASE C VOLTAGE CORRECTION FOR 190 VOLTS
22	PHASE C INCOMMING VOLTAGE
23	PHASE C INCOMMING VOLTAGE

Figure 4.2 Shutter Interlock

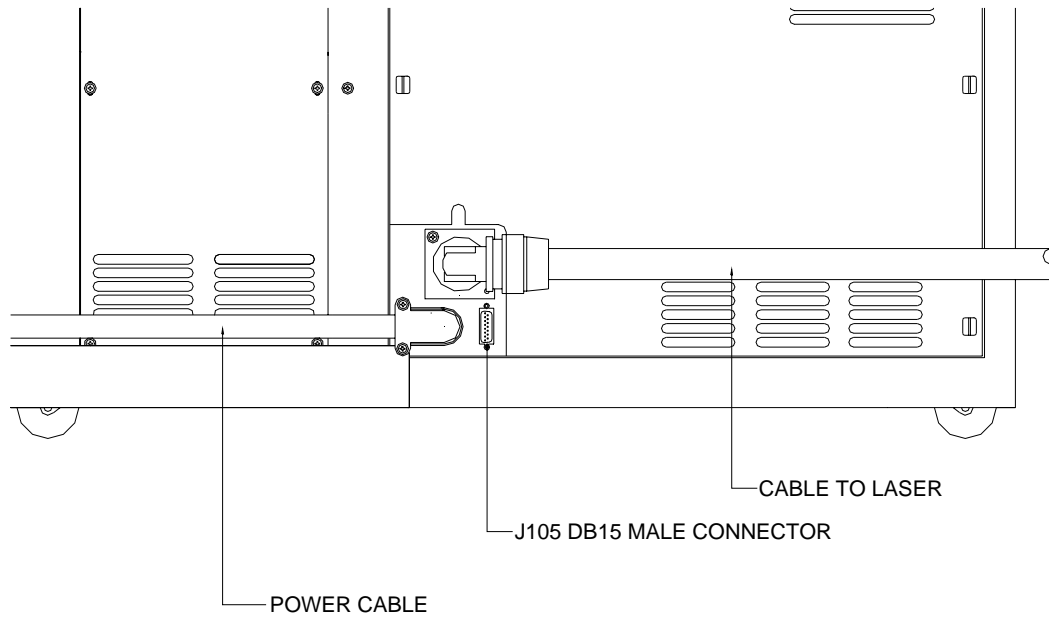


Table 4.3 J105 DB 15 Male Connector

Pin No.	Signal
1	Shutter Interlock
2	+5 Volts DC
3	Ext PRF Enable
4	Ext PRF Pulse
5	Ext PRF Gate
6	Ext PRF First Pulse Suppression
7	Ext PRF Return
8	Ext Current Enable
9	Ext Current Control
10	Ext Current Return
11	Current Readout
12	Shutter Open Command
13	Shutter Close Command
14	Shutter Open
15	Ground

Controls

WARNING

Read all *safety* sections of this manual prior to operation of any controls.

Control of the Model 234 Power Supply/Cooler is exercised via the Control Panel (Fig. 2.2). This control unit consists of a key switch, pump switch, pump status indicator, coolant status indicators, modulation select switch, modulation frequency control, range select switch, pulse repetition frequency display, lamp switch, lamp status indicator lamp current display, lamp current control, dual timers, timer select switch, shutter control switch and shutter status indicator

This section of the manual will introduce you to the various switches, indicators and displays. The actual use of these switches, indicators and displays to operate your laser system will be covered in the Operations Section of this manual.

Remote Control Connector

A connector provided to attach the optional remote control unit.

Key Switch

Turns the controller on and off A key switch is provided to prevent the laser from being operated by unauthorized personnel.

Pump Switch

Turns the primary cooling water pump on or off and initiates the laser cooler interlocks.

Pump Status Indicator

Indicates that the pump is on or off

Coolant Level Indicators

Provides a visual indication of primary water level. Green lamp on indicates the primary cooling water is at the correct level. Yellow lamp and audible beeper pulsing, indicates that the primary cooling water is not at the correct level Red lamp and audible beeper on indicates that the primary cooling water level is too low and shuts down the laser.

Coolant Temperature Indicators

Provides a visual indication of primary water temperature. Green lamp on indicates that the primary cooling water is in the correct temperature range. Yellow lamp pulsing, indicates that the primary cooling water has not reached correct operating range Red lamp and audible beeper pulsing indicates that the primary cooling water temperature is hot. Continuous red lamp and audible beeper

indicates that the primary cooling water temperature is too hot and shuts down the laser.

Coolant Flow Indicators

Provides a visual indication of primary water flow rate. Green lamp on indicates the primary cooling water is flowing at the correct flow rate. Red lamp and audible beeper on, indicates that the primary cooling water flow rate is too low. After 5 seconds, this condition will cause the laser to shut down.

Coolant Ionization Indicators

Provides a visual indication of the ionization level of the primary water. Green lamp on indicates that the deionized water in the primary cooling water loop is in the correct conductivity range. Yellow lamp on, indicates that the conductivity of the deionized water in the primary cooling water loop is too low and maintenance is required. Red lamp on indicates that the conductivity of the deionized water in the primary cooling water loop is too high and maintenance is required. The arc lamp will not operate when the high conductivity alarm is active

Lamp Switch

Turns the arc lamp on or off

Lamp Status Indicator

Green lamp on indicates that the arc lamp is on.

Lamp Current Display

Displays the current, in amperes, the arc lamp is using

Lamp Current Control

This potentiometer is used to adjust the arc lamp current. An internal trim pot is preset to limit the maximum current to a safe operating range. This control will not operate when under computer control.

Modulation Select Switch

This is a three-position switch. When set to RF ON it turns on the Q-switch and stops the laser from lasing. When set to PULSE, the laser pulses at the repetition frequency indicated on the display. When set to RF OFF, there is no RF power to the Q-switch and the laser operates in the CW mode.

Modulation Frequency Control

This potentiometer is used to adjust the pulse repetition frequency. The PRF can be adjusted between 10 Hz and 50 kHz.

Range Select Switch

Used to provide improved resolution of the Modulation Frequency Control adjustment range. In the low range, it will allow adjustment in the range of 10 Hz to 500 Hz. In the medium range, it will allow adjustment in the range of 10 Hz to 5000 Hz. In the high range, it will allow adjustment in the range of 10 kHz to 50

kHz.

Pulse Repetition Frequency Display

Displays the pulse repetition frequency that will be applied to the Q-switch.

Maintenance Timer Display

This is a dual function timer. As a total time display, indicates the total time the laser has been in operation. This function is used to indicate when scheduled maintenance is to be performed. As an elapsed timer, it is used to log arc lamp life.

Timer Toggle Switch

Used to alternate between the total time display and the elapsed time display. To reset the elapsed time press and hold for 15 seconds.

Shutter Control Switch

Used to open and close the shutter. Push switch up to open the shutter.

Shutter Status Indicator

Provides a visual indication of the position of the shutter. Green indicates the shutter is open.

Quantronix Model 234 Power Supply / Cooler RS-232 Serial Interface

The 234 Power Supply/Cooler can also be controlled through the RS-232 Serial Interface located on the rear panel of the controller board. The functions provided are:

RS-232 Enable, Disable and Status

Provides commands to enable, disable or request the status of the RS-232 Interface.

Cooler On, Off and Status

Provides commands to turn cooler pump on, off or to request the status of the pump.

Current Control

Used to set the arc lamp current and request the current setting.

RF Source External/Internal

Used to select the RF source. Default is internal source.

Laser On/Off and Status

Provides commands to turn laser on, off or to request the status of the laser.

PRF On/Off, Control Frequency and Request Status

Used to set and turn on and off the PRF and to request frequency setting.

Q-Switch RF On/Off

Command used to turn Q-Switch on and off

Shutter Open/Close and Status

Used to open and close the shutter and to request the shutter setting.

Warning Information

Used to request warning information on the water level, water temperature and DI water.

Laser Commander Control Software

The opening window of the Laser Commander creates a direct interface to the laser system. Using the controls in the Laser Commander Software the laser status can be monitored and operating parameters adjusted. Windows Based Control Software is also provided to control and monitor the functions listed.

Interlocks

Interlock faults result in laser shutdown and are reported to the system operator via the status indicators in the Laser Commander's window. Interlocks protect the user and laser system from possible damage or injury. Cooling water temperature, flow and level are continually monitored during laser operation.

Laser Status

The Laser Status selects the laser's operating mode. The laser can be set to operate at Idle, Stand-by or Ready.

Laser Power and Pulse Repetition Rate

Remote control of the laser power and pulse repetition rate is accomplished by adjusting the lamp current and frequency. To adjust the lamp current and frequency click on the Laser Set-up Button. This will launch the Laser Set-up dialog box. After setting the desired values, send the command to the laser by clicking the Update Button.

Fire Mode

Select the fire mode from the pull down menu.

Shutter Control

To fire the laser in the selected Fire Mode, click the Fire icon.

Shut Down

To shutdown the laser System, click in the exit button. The laser Commander will affect an orderly system shutdown.

Introduction

The following section outlines some of the most commonly used procedures required for normal operation of your Model 234 Power Supply / Cooler. These procedures assume that your system has been properly installed following the instructions in the section entitled Installation and is working according to the Specifications in the section entitled Introduction.

Please read and fully understand the safety section of this manual prior to operation.

If, during the operations of your Model 234 Power Supply / Cooler, an error indication is displayed, please refer to the troubleshooting guide outlined in the Customer Service Section. If, after following the recommended procedures your system is still not performing to specifications, please call Quantronix Customer Service.

Turning On the Model 234 Power Supply / Cooler

Assure proper secondary flow and drainage as specified in the installation section of the manual.

Turn the key switch on the Control Unit to the on position. Turn on the Pump Switch. Observe that the Coolant Level, Coolant Temperature, Coolant Flow, and Coolant Ionization indicators are lit GREEN, indicating all parameters are in the correct operating range. If an error indication is displayed, please refer to the troubleshooting guide outlined in the Customer Service Section.

Use the Modulation Select Switch to select the desired mode of operation. This is a three-position switch. When set to RF ON it turns on the Q-Switch and stops the laser from lasing. When set to PULSE, the laser pulses at the repetition frequency indicated on the display. When set to RF OFF, there is no RF power to the Q-Switch and the laser operates in the CW mode.

If the Modulation Select Switch has been set to PULSE, the Modulation Frequency Control potentiometer can be used to adjust the pulse repetition frequency. The PRF can be adjusted between 10 Hz and 50 kHz. The range select switch is used to provide improved resolution of the Modulation Frequency.

Initializing Lasing

Turn on the Lamp Switch and adjust the Lamp Current to the desired value using the Lamp Current Control Potentiometer. A

Green Indicator Light above the lamp control switch indicated the arc lamp is on.

Use the Shutter Control Switch to open the shutter. At this point the laser should be on.

Turning Off the Model 234 Power Supply / Cooler

Use the Shutter Control Switch to close the shutter.

Turn off the Lamp Switch. The Green Indicator Light above the lamp control switch should be off. Wait 2 minutes to allow the lamp to cool down.

Turn off the Pump Switch.

Turn the Key Switch to the off position. The laser is now shut down.

Turn off the secondary cooling water supply line and then the secondary cooling water return line.

WARNING

For servicing, it is necessary to shut off the wall circuit breaker and remove the wall plug from its receptacle.

Maintenance

Maintenance

The Model 234 Power Supply / Cooler was designed for ease of periodic maintenance and modular repair or replacement of assemblies in the case of failure. This section of the manual will deal with the periodic maintenance of the filters and removal of major sub assemblies should return or replacement become necessary.

Should a fault occur in your system, please refer to Troubleshooting section of the manual to isolate the problem.

Periodic Maintenance

The only periodic maintenance required for the Model 234 is to replace the Deionizing (DI) Cartridge and to clean or replace the particle filter. Replace the DI cartridge every 6 months.

WARNING

Disconnect the Model 234 Power Supply/Cooler from the wall prior to performing any maintenance tasks.

Accessing the Cooling System

To access the cooling unit, first remove the right side panel by lifting the panel and tilting it away from the cooler.

Slide out the water cooler subassembly on the chassis slides by disengaging each one-quarter-turn twist lock retainer located on each slide. The cooling unit is now free to be pulled from the cabinet on slides. Pull the cooling unit far enough from the cabinet so that the circular cover of the reservoir is exposed.

Replacing the De-ionizing Cartridge

It is not necessary to drain the unit to replace the DI cartridge. Turn Off the system Remove the hose from the top fitting of the used cartridge by pulling upward. There is a quick disconnect fitting on the lower end of the DI cartridge. Disconnect at the quick disconnect fitting and remove the assembly. Remove the hose with the fitting from the old DI assembly and reinstall it on the new DI cartridge. Please check that the flow markings on the cartridge match the system flow (are pointed upward).

Cleaning the Particle Filter

The Model 234 Power Supply / Cooler is fitted with a re-usable particle filter which can be cleaned many times before requiring

replacement. The filter is located in the bottom center of the primary water reservoir.

Turn Off the system. To clean the filter, reach into the reservoir and remove the filter assembly by turning counter clockwise. Reaching into the system with your hand will cause a DI error when the system is restarted. To eliminate this problem wear very clean latex gloves. Once the filter assembly is free of the threads, remove to a sink. Invert the filter assembly and run tap water through the inverted assembly. Use a soft brush and gently scrub the filter face. Once rinsed, place the particle filter back in the reservoir and fasten in place by turning clockwise.

NOTE

Please see the Spare Parts section of this manual for Part Numbering and ordering information. Quantronix strongly recommends using only original OEM replacement parts to ensure the continued operation of the Model 234 Power Supply / Cooler.

Draining the Reservoir

Remove the circular reservoir cover. Siphon the water from the reservoir as much as possible. Mop up any remaining water with a towel or sponge.

User Maintenance

Every effort has been made in the design and manufacture of your Model 234 Power Supply / Cooler, to ensure uninterrupted operation. In the unlikely event of a failure, please refer to the troubleshooting section of this manual. Once the cause of the problem has been isolated, please use the following guidelines for repair or replacement. This guide is not meant to be all-inclusive, but will cover those parts with a finite life cycle, and those which are considered user-serviceable.

Removing Sub-Assemblies for Repair or Replacement

LOGIC UNIT, POWER SUPPLY, RF DRIVER

Several of the major sub-assemblies in the Model 234 have been designed for ease of removal for repair or replacement. These include the Logic Unit, RF Driver, and Power Supply.

To remove these units, slide them out to the full extension of the chassis slides. Disconnect all wires and cables, making sure they are marked for ease of replacement. Depressing the slide latch buttons, pull the assembly off the cabinet slides. Remove the slide adapters from the sides of the units and carefully pack the unit for

shipment.

NOTE

In the case of any return, please follow the return procedure to expedite service. Obtaining a Return Materials Authorization (RMA) number and providing any pertinent failure information speeds response and helps us to continuously improve our product.

POWER DISTRIBUTION BOX

Although a modular unit, the Power Distribution box is hard wired to your electrical service via the umbilical cord. Therefore, removal for return is difficult and not recommended. However, the Power Distribution box has been designed so that access to any part is easily achieved through removal of the top cover.

Component Replacement

THERMOSTAT SWITCH

The Thermostat Switch is located in the bottom of the primary water reservoir. This small, metallic switch is removed after full draining of the reservoir. Unscrew the retaining bolt on the bottom of the reservoir and remove the switch head. Then disconnect the electrical wires for the switch from S3 on the cooler terminal block.

When replacing a sensor, please apply pipe tape or other sealing compound to the Thermostat Switch threads to assure leak-free cooler operation.

LEVEL SWITCH

The Level Switch is located at the top of the cooler, and is a float-type switch used to sense the proper water level in the reservoir. To remove, push the sensor body up through the cutout in the reservoir. Then remove the wires from S2 on the cooler terminal strip.

DEIONIZATION (DI) SENSOR/TEMPERATURE SENSOR

The DI sensor is located on the inner wall of the reservoir. To replace, pull the assembly out of the wall bracket. Loosen the hose clamp on the feeder hose and remove the unit from the hose. Then unscrew DI sensor from the “T” fitting. Disconnect the wires at S1, P1 on the cooler terminal block.

NOTE

Quantronix has a Field Engineering Department ready to assist you. Please call us should your cooler exhibit failure of any sort, or should you need operational assistance.

Shipping and Storage

Shipping

The Model 234 Power Supply / Cooler and associated laser will arrive in a specially designed shipping crate. If possible, retain this crate for future use in shipping or moving the system.

Should the original packing not be available, please take care in supporting the cooler in shipping. We recommend a wooden pallet to support the weight. Always completely drain the cooler prior to shipping.

Storage

Should you have to store the Model 234 Power Supply / Cooler for any length of time, please follow these simple guidelines:

1. Drain the cooler components completely. Any residual water can cause corrosion or damage via freezing should the temperature be below freezing.
2. Clearly label all connections for ease of assembly after storage.
3. Assure that the cooler is in a dirt/dust free environment, or package it to prevent dust and dirt from permeating the system.

Customer Service

The following information is supplied to the user as a helpful guide in evaluating possible problems during the operation of the Model 234 Power Supply / Cooler. If after following these guides, your system is still not performing to specification, please call Quantronix Customer Service.

Faults

When a fault is detected, a FAULT indicator will illuminate and the Model 234 system will shutdown. The indicator will stay illuminated until the user corrects the FAULT and resets the system.

To reset the system, return the Key Switch located on the Control Panel to the OFF position and follow the turn on procedure outlined in Operation Section of this manual.

Fault Indicators and their Causes

Pump Status Indicator

When this indicator is lit the primary cooling water pump is on. If this indicator does not turn on when the pump is turned on the pump is not operating.

Coolant Level Indicators

Provides a visual indication of primary water level. Green lamp on indicates that the primary cooling water is at the correct level. Yellow lamp and audible beeper pulsing, indicates that the primary cooling water is not at the correct level. Red lamp and audible beeper on indicates that the primary cooling water level is too low and shuts down the laser.

Coolant Temperature Indicators

Provides a visual indication of primary water temperature. Green lamp on indicates that the primary cooling water is in the correct temperature range. Yellow lamp pulsing, indicates that the primary cooling water has not reached correct operating range. Red lamp and audible beeper pulsing indicates that the primary cooling water temperature is hot. Continuous red lamp and audible beeper indicates that the primary cooling water temperature is too hot and shuts down the laser.

Coolant Flow Indicators

Provides a visual indication of primary water flow rate. Green lamp on indicates that the primary cooling water is flowing at the correct rate. Red lamp and audible beeper on, indicates that the primary cooling water flow rate is too low. After 5 seconds, this condition will cause the laser to shut down.

Coolant Ionization Indicators

Provides a visual indication of the ionization level of the primary water. Green lamp on indicates that the deionized water in the primary cooling water loop is in the correct conductivity range. Yellow lamp on, indicates that the conductivity of the deionized water in the primary cooling water loop is too low and maintenance is required. Red lamp on indicates that the conductivity of the deionized water in the primary cooling water loop is too high and maintenance is required. The arc lamp will not operate when the high conductivity alarm is active.

Lamp Status Indicator

Green lamp on indicates that the arc lamp is on.

Trouble Shooting

Coolant Level Indicators

Yellow lamp and audible beeper pulsing indicates that the primary cooling water is not at the correct level.

Probable Cause, *water level dropped due to evaporation or a leak in the system.*

Possible Remedy, add distilled water to fill line in reservoir. Always keep reservoir covered. Check for leaks.

Red lamp and audible beeper on indicates that the primary cooling water level is too low and shuts down the laser.

Probable Cause, *water level dropped due to evaporation.*

Possible Remedy, add distilled water to fill line in reservoir. Always keep reservoir covered.

Coolant Temperature Indicators

Yellow lamp pulsing, indicates that the primary cooling water is has not reached correct operating range.

Probable Cause, *arc lamp is not on. It has not been turned on, it is burned out or it has just been turned on, or the solenoid valve is stuck open due to dirt in the secondary water.*

Possible Remedy, turn on lamp, or replace. If the lamp is on, allow it to run for several minutes to stabilize the primary water temperature. Contact Quantronix Service.

Red lamp and audible beeper pulsing indicates that the primary cooling water temperature is hot.

Possible Cause, insufficient secondary cooling water.

Possible Remedy, increase the flow or decrease the temperature of the secondary water.

Continuous red lamp and audible beeper indicates that the primary cooling water temperature is too hot low and shuts down the laser.

Possible Cause, insufficient secondary cooling water.

Possible Remedy, increase the flow or decrease the temperature of the secondary water.

Coolant Flow Indicators

Red lamp and audible beeper on indicates that the primary cooling water flow rate is too low. After 5 seconds, this condition will cause the laser will shut down.

Possible Cause, Blockage in primary water flow or a bad Flow Switch.

Possible Remedy, Remove the blockage or replace the Flow Switch.

Coolant Ionization Indicators

Yellow lamp on, indicates that the conductivity of the deionized water in the primary cooling water loop is too low and maintenance is required.

Possible Cause, Use of high purity distilled water instead of steam-distilled water.

Possible Remedy, Allow system to run 30 minutes to see if the problem is eliminated. Replace the DI cartridge.

Red lamp on indicates that the conductivity of the deionized water in the primary cooling water loop is too high and maintenance is required. The arc lamp will not operate when the high conductivity alarm is active.

Possible Cause, System put into operation after a long period of disuse. Reaching into the water bucket with a bare hand.

Possible Remedy, drain and refill.

System will not Turn On

Possible Remedy, Check circuit breaker and fuses.

Possible Remedy, verify incoming phase to phase line voltage (208 VAC 10%).

Possible Remedy, verify upon turning key switch on that an audible click is produced by the phase rotation relay in the power distribution. Otherwise refer to Installation Section for details.

External Control

Quantronix Model 234 Power Supply / Cooler RS-232 Serial Interface

The 232 Serial Interface connector is a 9-pin D-Shell (DE9), labeled J6 located at the rear of the main logic board J6.

Connections

pin 2	224 Cooler Transmitted Data
pin 3	224 Cooler Received Data
pin 5	Signal Ground

Data Format

Baud rate	4800
Start bit	1 bit
Stop bit	1 bit
Data	8 bits
Parity	None

Communication Procedure

The 234 Cooler may be connected and controlled by a dumb terminal or computer via the RS-232 link. This interface is coexistent with the 234 control panel. After the 234 is turned on, the dumb terminal will display “\n\rQuantronix Corp. 234 Cooler, Version 1.04\n\r”

To enable RS-232 communications, the command “232 1” is given at which time the dumb terminal echoes “RS-232 control”. While RS-232 communications are enabled, then the keypad on the remote control panel remains functional. Only the key position Off is operational.

If manual control is desired, the command “232 0” must be entered and the dumb terminal echoes message “Panel control\n\r”.

While parameters can be changed via RS-232, all parameters can be accessed via the control panel.

Command line syntax

CCC V\r	
CCC	Command should be 3 characters, case not sensitive
CCC	is followed by a space character, but may also be excluded
V	Value 0 for off, 1 for on, or value setting for CUR (current) or PRF
\n	Carriage return
\r	Line feed

Commands

232	RS-232 enable/disable
232 1\r	RS-232 control enable
232 0\r	RS-232 control disable
232\r	Request RS-232 status on or off

COO	Cooler on/off
COO 1\r	Cooler on
COO 0\r	Cooler off (may be turned off when laser is on)
COO\r	Request Cooler status

CUR Current control

To set current parameter, laser must be on. To set Range is limited to within remote panel setting. Unit is 1/100 Amp.

CUR 3000\r	Current will be set at 30 Amp
CUR \$0BB8\r	Current will be set at 30 Amp
CUR\r	Request current setting, in 4 digits hexadecimal

DRS	RF source external/internal. NOTE default is external
DRS 0\r	Set RF source to external, min. is 100Hz with Model 392 RF driver
DRS 1\r	Set RF source to internal, min. is 20Hz with main control board

LAS Laser on/off
 LAS 1\r Turn on Laser, (224 Cooler must already be on)
 LAS 0\r Turn off Laser
 LAS\r request laser status

NOI Noise figure
 NOI\r request noise figure (1-99), in 4 digits, Hexadecimal

PRF PRF on/off and frequency control.
 The range is limited to within remote panel setting. Unit is 1/100kHz
 PRF 1\r PRF on
 PRF 0\r PRF off, single shot
 PRF 1000\r PRF frequency will be set at 10 kHz, ext. RF
 PRF \$03E8\r PRF frequency will be set at 10 kHz, ext. RF
 PRF 9\r Single shot, int. RF source
 PRF 8\r Single shot, int. RF source
 PRF 7\r PRF frequency will be set to 70Hz, int. RF source
 PRF 6\r PRF frequency will be set to 60Hz, int. RF source
 PRF 5\r PRF frequency will be set to 50Hz, int. RF source
 PRF 4\r PRF frequency will be set to 40Hz, int. RF source
 PRF 3\r PRF frequency will be set to 30Hz, int. RF source
 PRF 2\r PRF frequency will be set to 20Hz, int. RF source
 PRF\r request PRF frequency setting, in 4 digits hex

QRF Q-switch RF on/off
 QRF 1\r Q-switch RF on
 QRF 0\r Q-switch RF off. NOTE: sets laser to CW
 QRF\r Request Q-switch RF on/off

SHU Shutter open/close. Manual override switch must be in open position
 SHU 1\r Shutter open
 SHU 0\r Shutter closed
 SHU\r Request Shutter status

STB Stabilizer on/off
 STB 1\r Stabilizer on

STB 0\r Stabilizer off
STB\r Request Stabilizer status

KTP KTP shutter open/close
KTP 1\r KTP shutter open
KTP 0\r KTP shutter closed
KTP\r Request KTP shutter status

WAR Warning information
WAR\r request warning information, in 4 digits hexadecimal
bit 0 is water level
bit 1 is water temp
bit 2 is DI water

Example Laser Operation

```
Key switched to ON      \n\Quantronix Corp. 224 Cooler, Version 1.04\n\n232 1\r                RS-232 control\n\nCOO 1\r                Cooler on\n\nLAS 1\r                Laser is turned on\n\nQRF 1\r                Q-switch RF is turned on\n\n\nSHU 1\r                Shutter is open.\n\nCUR 2000\r            Current set to 20 Amps\n\nPRF 1\r                RF on. Laser is set to continuous fire\n\nPRF 0100\r            PRF set to 1kHz (external RF source)\n\nDRS 1\r                RF source set to internal\n\nPRF 2\r                PRF set to 20 Hz (internal RF source)\n\nPRF 8\r                Singe shot (laser is pulsed on/off)\n\nPRF 8\r                Another single shot\n\nDRS 0\r                RF source is set to external\n\nPRF 0100\r            RF set to 1kHz\n\nPRF 1\r                Laser is set to continuous fire (1kHz)\n\nQRF 0\r                Laser is set to CW\n\nQRF 1\r                Laser is returned to continuous fire\n\n\nSHU 0\r                Shutter is closed.\n\nLAS 0\r                Laser is turned off.\n\nQRF 0\r                Q-switch RF is turned off
```

COO 0\r

Cooler is turned off.

232 1\r

Panel control\n\r

Key switched to OFF

Schematics

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Power Distribution Box

J601 Cooler Connector	
Pin No	Signal
1	Pump Phase A
2	Pump Phase B
3	Pump phase C
4	Solenoid 24 Volts AC
5	Solenoid
6	Ground
7	
8	
9	
10	
11	
12	
13	Fan 24 Volts DC
14	Fan 24 Volts DC
15	

J602 To Controller	
Pin No	Signal
1	Water Solenoid
2	
3	-15 Volts DC P/S 1
4	+15 Volts DC P/S 1
5	+5 Volts DC P/S 1
6	24 Volts AC
7	-5 Volts DC P/S 2
8	5 Volts DC Com P/S 2
9	24 Volts AC
10	Contactator On
11	15 Volts DC Com P/S 1
12	+5 Volts DC Com P/S 1
13	Logic On
14	5 Volts DC Com P/S 2
15	+5 Volts DC P/S 2

J603 To RF Driver	
Pin No	Signal
1	Phase A
2	Phase B
3	Ground

J604 To Laser Head	
Pin No	Signal
1	120 Volts AC
2	120 Volts AC Return
3	
4	

Cooler

J301 To J103 on Controller	
Pin No	Signal
1	
2	
3	Digital Level Fault
4	Digital Level Warning
5	Digital Flow Fault
6	Digital Temperature Fault
7	Digital DI Sense
8	Analog Temperature Sense
9	
10	Digital Level 2 Return
11	Digital Level 1 Return
12	Digital Flow Return
13	Digital Temperature Return
14	Digital Sense Return
15	Analog Temperature Return

J302 To J601 on Power Distribution Box	
Pin No	Signal
1	Pump Phase A
2	Pump Phase B
3	Pump phase C
4	Solenoid 24 Volts AC
5	Solenoid
6	Ground
7	

Power Supply

J201 To J107 on Controller	
Pin No	Signal
1	Remote On/Off Positive
2	Read Back Negative
3	Clear Internal Lock Positive
4	Read Back Positive
5	
6	Program Voltage Positive
7	
8	
9	Remote On/Off Negative
10	Clear Internal Lock Negative
11	Program Voltage Negative
12	Trigger Ready Positive
13	Trigger Ready Negative
14	Remote Trigger Negative
15	Remote Trigger Positive

RF Driver

J13 To J108 on Controller	
Pin No	Signal
1	
2	Logic Ground
3	Logic Ground
4	CW/Q-Switch Ramp Select
5	
6	
7	External PRF
8	PRF Gate
9	Internal/External PRF Select
10	Q-Switch On/Off
11	Logic Ground
12	Logic Ground
13	Q-Switch Fault
14	
15	
16	
17	
18	RF Ground
19	RF On/Off
20	
21	
22	
23	
24	
25	Logic

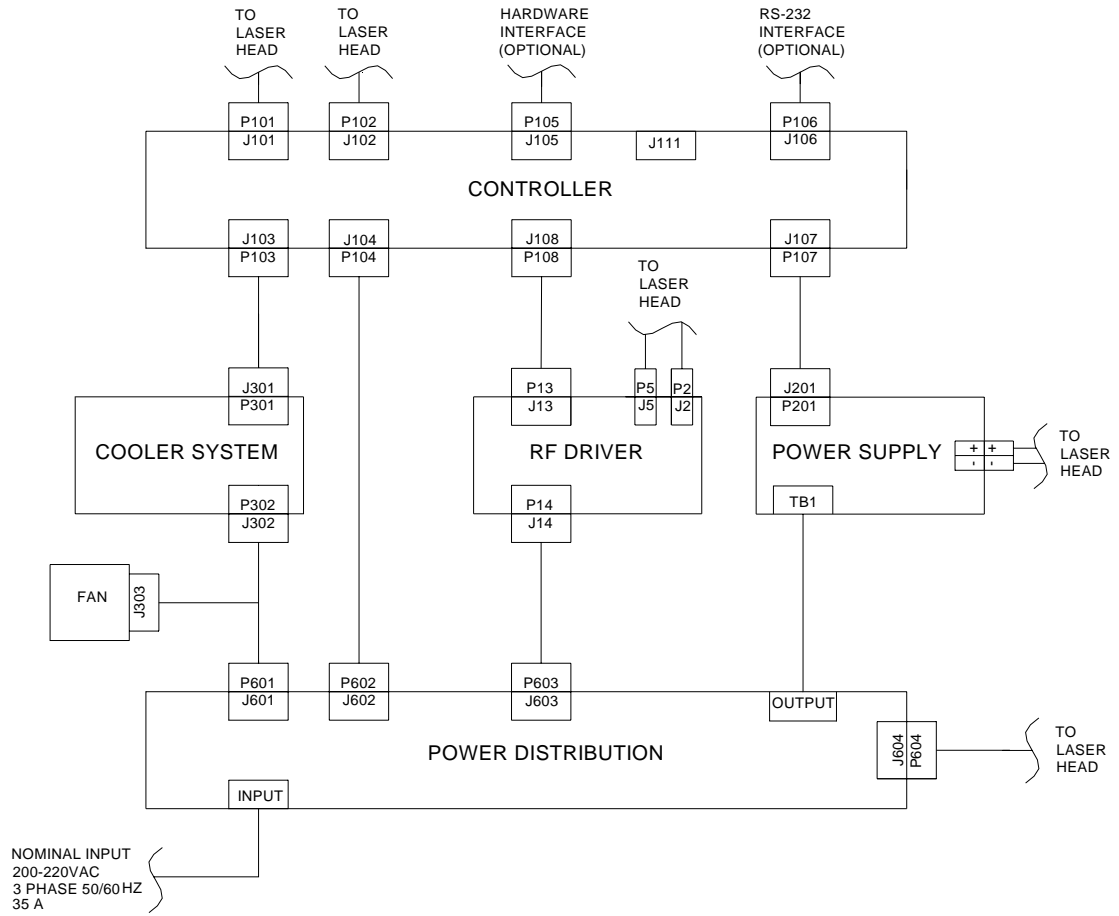
J101 To Laser Head	
Pin No	Signal
1	+12 Volts DC Unregulated
2	
3	-15 Volts DC
4	+15 Volts DC
5	Power Detect
6	
7	
8	Isolated Ground
9	Logic Ground

J102 To Laser Head	
Pin No	Signal
1	
2	Internal SHT Return
3	KTP SHT Return
4	Emis Lt
5	
6	Internal SHT
7	KTP SHT
8	24 Volts AC
9	

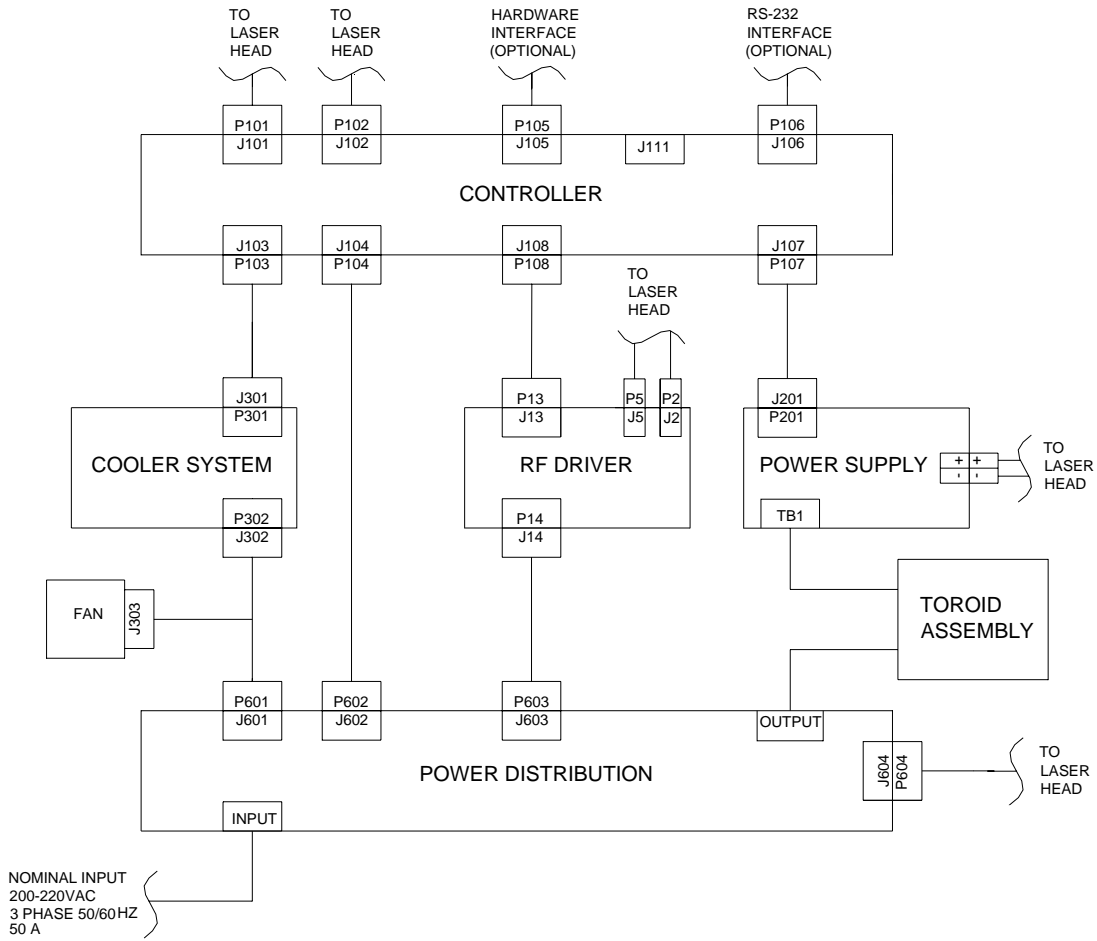
J105 To Hardware Interface (Optional)	
Pin No	Signal
1	Shutter Interlock
2	+5 Volts DC
3	External PRF Enable
4	External PRF Pulse
5	External PRF Gate
6	External PRF First Pulse Suppression
7	External PRF Return
8	External Current Enable
9	External Current Control
10	External Current Return
11	Current Readout
12	Shutter Open Command
13	Shutter Close Command
14	Shutter Open
15	Ground

J106 To RS-232 Interface	
Pin No	Signal
1	DTR
2	TXD
3	RXD
4	DCD
5	Ground
6	NU
7	CTS
8	RTS
9	UN

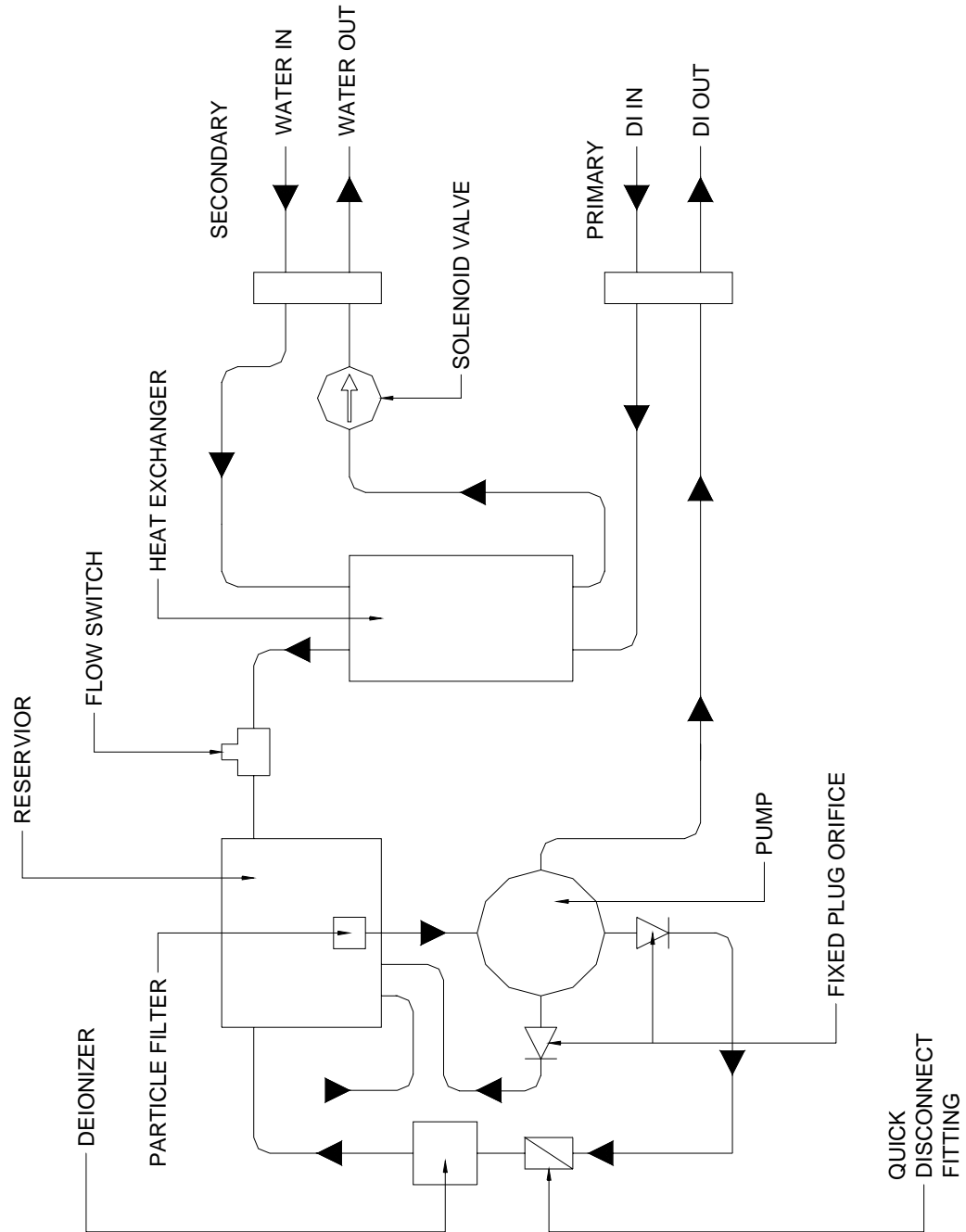
Model 234-1 Power Supply/Cooler



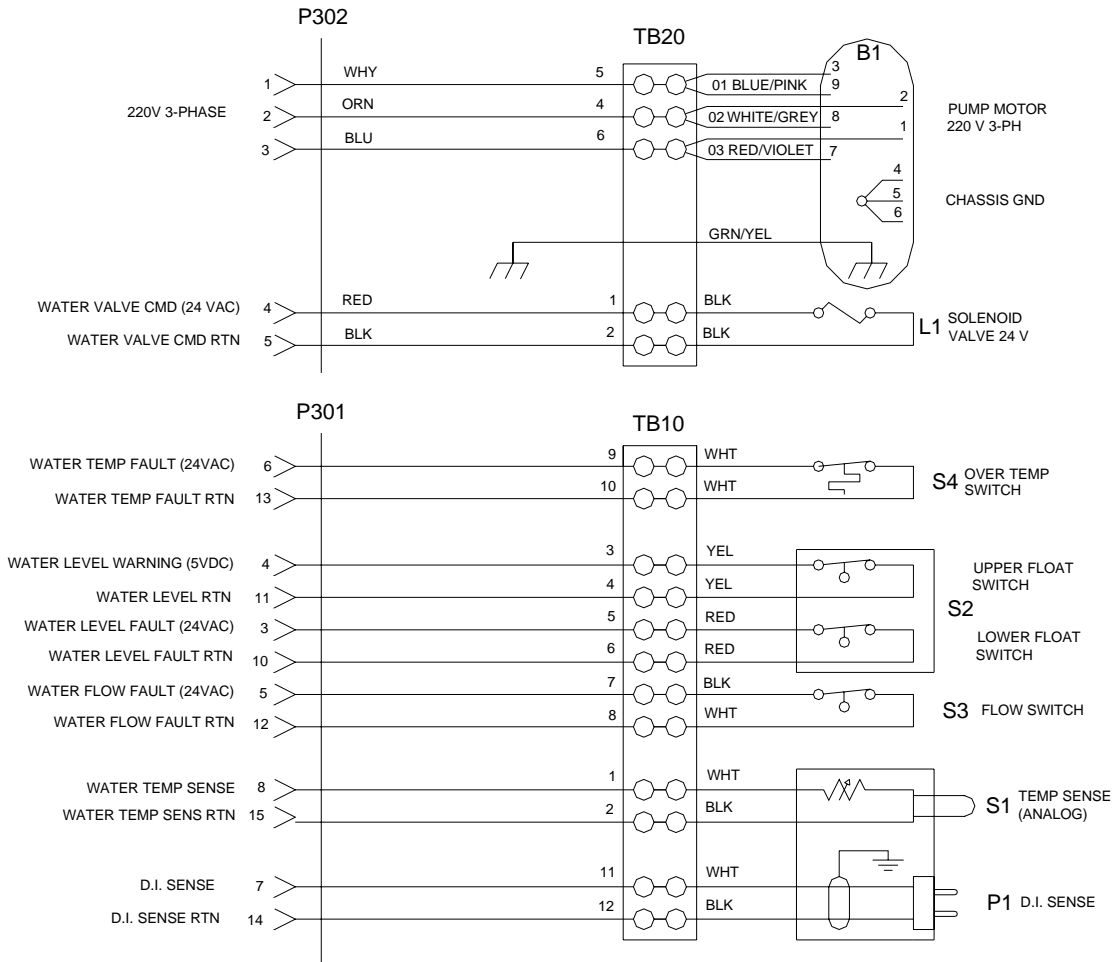
Model 234-2 Power Supply/Cooler



Water Flow Through Model 234 Cooler



Model 234 Cooler Schematic

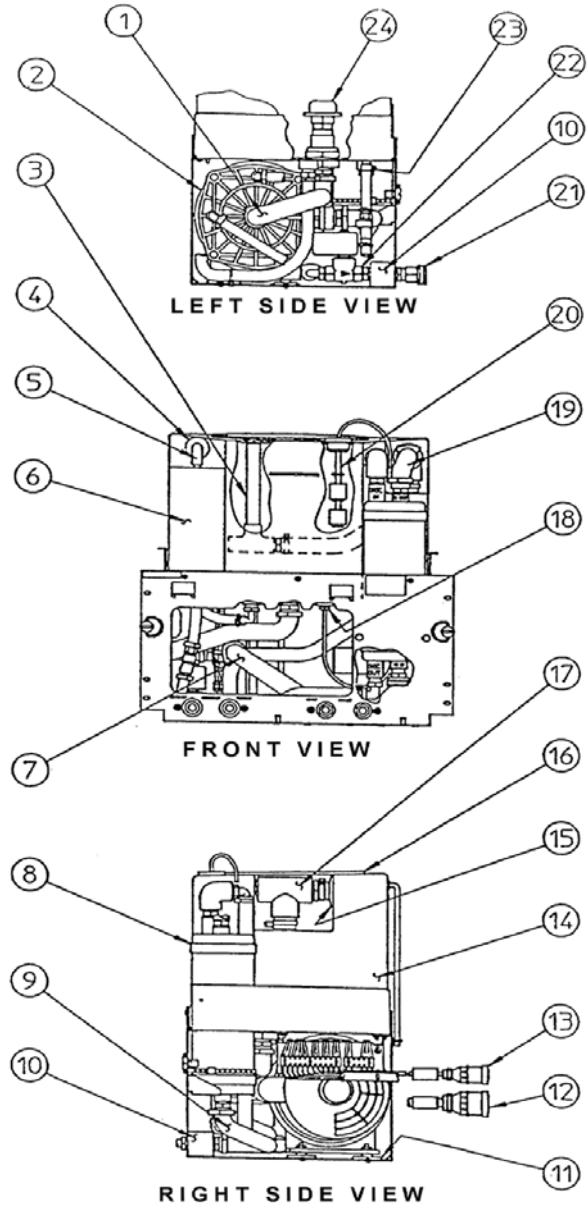


Spare Parts List

1 HP Cooler

Description	Part Number
1 HP Cooler water system.....	0202-05888
1. Hose, preformed 'J' reservoir to pump.....	3002-01895
2. Pump water 1HP	2801-00749
a. Volute Assembly	
* Volute case.....	2802-00408
* Fitting 3/4 NPT(2).....	3001-51015
* Fitting Elbow(2).....	3001-50973
* Plug Orifice(2)	1402-02448
* Adhesive(4oz)	1008-00189
b. Volute Case.....	2802-00408
c. Impeller	2802-00424
d. Seal, with seat	093740
e. Gasket, end bell.....	093724
3. DI Water Sensor Assembly	0202-05667
4. Reservoir Tank Seal (small)	3002-01968
5. Hose Elbow, DI cartridge to reservoir	3002-01887
6. Cartridge, DI Water.....	072835
7. Hose, preformed '5' pump to DI out	3002-01909
8. Heat Exchanger	2802-00459
9. Hose, preformed 'U' DI in to heat exchanger.	3002-01925
10. Manifold, coolant fitting	1402-02626
11. Pump isolation mount(4)	2703-05368
12. Cable assembly, cooler to logic	0202-05608
13. Cable assembly, Pump/solenoid to clr	0202-05624
14. Reservoir	3002-01933
15. Reservoir tank seal (large)	3002-01976
16. Reservoir Cover	3002-01941
17. Water flow switch.....	2802-00483
18. Thermostat Switch	2205-00944
19. Hose Elbow, heat exchanger/flow switch.....	3002-01984
20. Water level switch.....	2802-00475
21. Garden hose connector (Secondary water)	2703-02571
22. Solenoid valve	3002-01917
23. Hose clamp, (DI cartridge)	2305-1395
24. Filter, particle	2802-00467

Figure 12.1 Cooler



1.5 HP Cooler

Description	Part Number
1.5 HP Cooler water system	0202—05896
1. Hose, preformed ‘J’ reservoir to pump	3002-01895
2. Pump water 1.5HP2801-00757	
a. Volute Assembly	
* Volute case.....	2802-00408
* Fitting 3/4 NPT(2).....	3001-51015
* Fitting Elbow(2).....	3001-50973
* Plug orifice(2)	1402-02448
* Adhesive(4 oz)	1008-00189
b. Volute case	2802—00408
c. Impeller	2802—00416
d. Seal with seat	093740
e. Gasket, end bell.....	093724
3. DI Water Sensor Assembly.....	0202—05667
4. Reservoir Tank Seal (small).....	3002—01968
5. Hose Elbow, DI Cartridge to reservoir	3002—01887
6. Cartridge, DI water	072835
7. Hose, Preformed ‘S’ pump to DI out	3002—01909
8. Heat Exchanger	2802—00505
9. Hose, Preformed ‘U’ DI in to heat exchanger	3002—01925
10. Manifold, coolant fitting	1402—02626
11. Pump Isolation mount..(4)	2703—05368
12. Cable Assembly, cooler to logic	0202—05608
13. Cable Assembly, Pump/solenoid to clr.....	0202—05624
14. Reservoir	3002—01933
15. Reservoir Tank Seal (large)	3002—01976
16. Reservoir Cover	3002—01941
17. Water Flow Switch	2802—00483
18. Thermostat Switch	2205—00944
19. Hose Elbow, heat exchanger/flow switch.....	3002-01984
20. Water Level Switch.....	2802—00475
21. Garden Hose Connector (Secondary water)	2703—02571
22. Solenoid Valve	3002—01917
23. Hose Clamp, (DI cartridge).....	2305—01395
24. Filter, Particle	2802—00467

Figure 12.2 Water Pump

