CAPACITIVE DISCHARGE UNIT

MODEL: MK1024M-PCS

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Introduction MK10 CD UNIT

This instruction manual is for use with the MK10 Series Capacitor Discharge Magnetizer units (CD Units). The MK10 CD Unit is supplied with the following configuration:

MK1024M-PCS (Standard Unit)

10kA unit with 24 capacitors of 144,000 uF each, for total of 3.456 F of capacitance. Charging voltages of 65 VDC (high) and 45 VDC (low)

This unit uses a single button trigger cable to initiate the shot. Digital LCD Current and Voltage indicators are sealed under a Lexan plastic window on top of the CD Unit housing.

General Description MK1024M-PCS

The Capacitive Discharge Magnetizing units are designed for portable pipe magnetizing service. Units are powered from 120 Volts AC 60 Hz. (240 Volts AC 50/60Hz units are also available).

The MK10 unit in proper operating conditions is capable of a 10,000 ampere (10kA) pulse into 3 – 100ft parallel connected 4/0 welding cables in series with a 40 ft central conductor rod (1-3/4" aluminum)

All units are built into a heavy duty, weather-proofed aluminum cabinet complete with carrying handles. A sealed bolted on cover keeps mag powder and other debris out of the unit. Digital LCD voltage and current indicators are sealed under a Lexan plastic window on the lid of the unit.

All CD units come with a 12' control (trigger) cable and a 6' AC power cable.

CAUTION

The current generated as the unit is triggered is directly related to the voltage charge in the capacitors when the unit is triggered and the total resistance of the combination of cables and/or central conductor.

The less the resistance the more current that is discharged (Shorter cables equals less resistance).

The MK10 CD Units are designed and limited to a maximum current of 17,000 amperes. Current greater than this may damage the SCR internal to the unit and require the unit to be repaired.

The shortest cable lengths or combinations that should ever be used are as follow:

1 – A single 4/0 cable NO SHORTER than 40' long

2 – 2ea 4/0 cabled in parallel, NO SHORTER than 80' long

3 – Standard central conductor setup is 3ea 30' 4/0 cables and 3ea 70' 4/0 cables and a 1-1/2" aluminum rod of 35'-48' long.

Sequence of Operation – MK1024M-PCS

With the power switch on, the regulated power supply energizes the CD control PC board. The transformer TR-1 supplies 120Vac to the rectifier bridge BR-1 thru the relay CR and the solid-state controller

As DC power is supplied to the CD control PC board, relay CR is energized. The solid-state controller limits the amount of current available to charge the capacitor bank. Current feedback is sensed though the current transducer in the primary lead of TR-1 and used to drive the solid-state controller via a reference amplifier within the CD control PC board.

As the unit charges, the voltage is compared to a preset reference voltage, when the capacitor bank reaches the predetermined setting the solid-state relay is switched off and the green ready light on the meter panel turns on. The capacitor voltage is shown on the LCD indicator on the front panel of the CD unit.

The HI/LO Switch is used to reset the charging reference setting in and thus lowering the shooting current. Units are shipped with the HI setting of 65VDC and a LO setting of 45VDC.

Should the capacitor bank reach 85 volts at any time during the charging cycle, an over voltage (OV) sensing circuit turns off the CR relay and disconnects the AC power to the bridge rectifier, at the same time CR relay shunts the voltage stored in the capacitor bank thru R1 in order to bleed down the stored energy safely and quickly.

The RED OV light comes on and the unit must be reset by switching off the AC power switch for a minimum of 30 seconds. This same sequence of events occurs when the unit is turned off or un-plugged.

With the ready light on, the unit is ready to shoot (trigger). As the unit is triggered, the SCR conducts and discharges the energy through the shooting cables and/or central conductor. A sensing coil placed on the negative buss bar

monitors the peak current of the shot and the value is stored and displayed on the LCD meter within the front panel. This reading lasts until the unit is recharged and the ready light comes on again.

When the shot is fired, a 20 second timer is initiated and a sensing circuit monitoring the voltage across the SCR comes into play. These circuits determine when to start the recharge cycle, the voltage across the SCR must be below a predetermined set value or the time delay must time out before the unit will recycle.

Clipping diode D1 and resistor R2 are used to shunt any back emf caused by inductance in the cable and the central conductor loop.

Resistor R1 is used to remove the charge from the capacitor bank if the unit is switched off. (safety precaution). It is also used to help discharge the capacitor bank voltage (after a shot) to the point at which the SCR will switch off (.6 volts across the SCR)

Preventative Maintenance

The following items should be checked each month under normal operating conditions. Severe field conditions require these to be checked more frequently.

WARNING:

Voltages inside the unit are enough to cause serious injury or death. Disconnect AC power before attempting to complete the following checks.

1 – Check cable connectors on each end of the unit, remove all corrosion or substances that may add to the contact resistance and thus reduce the maximum current flowing through the shooting cables and central conductor.

2 – Inspect the spade lug connectors on the shooting cables for damage or corrosion. Clean and/or replace as necessary.

3- Check the trigger and AC power cables for mashes, cuts and/or abrasions. Repair or replace as needed.

4 – Remove the top of the unit by removing the 4 cross tip head screws, be careful when lifting the top of the unit, the cable connecting the front panel is not long enough to allow you to place the lid aside. It must first be unplugged from the control PC board.

MAKE SURE THE AC POWER IS DISCONNECTED BEFORE REMOVING COVER

- After the cover is removed, inspect all electrical connections for proper tightness.
- Check for missing or loose hardware/parts within the case and repair/replace as needed.
- Be sure to remove all loose metallic objects from inside the unit, these parts could short out the capacitor buss bar and damage the unit internally.

5 – Check the capacitor terminal nuts for proper tightness. These nuts should be torqued to 60 in/lbs. (5 ft/lbs.)

- Before replacing the top of the CD unit, make certain the cover gasket is in good shape, replace as needed.
- Remember to reconnect the meter cable to the control PC board before replacing the cover and the hold down screws.

Control PC board adjustments

TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY!!

Required tools: (All meters must be calibrated for proper CD unit settings)

- AC current clamp meter
- DC Voltmeter (Multimeter)
- SHOTCHECK any model

Perform check/adjustments in the following order with the cover off EXCEPT for the current meter adjustment. Cover must be securely in place when shooting the CD unit.

Charging Current check/adjustment (T8): Sets the maximum AC current limit when charging the CD unit not to exceed 12 amps.

- With an AC amp meter on the secondary of the isolation transformer, verify that the current draw when charging the DC buss is between 8-11 amps. No greater than 12 amps as this will cause the circuit breaker on the unit to continually trip while unit charges.
- Adjust T8 charging current potentiometer in ¼ turn increments if needed, clockwise to increase and counterclockwise to decrease, until you get the CD unit within the above specifications.
- You will need to allow the unit to charge several times to verify the setting.

Please note that the lower the charging current the slower the unit will charge. The unit should charge 100% to any setting within 30-45 seconds, if it's not able to do this no matter the potentiometer setting the unit requires repair.

Voltage Meter check/adjustment (T7): Sets the voltage readout of the DC buss capacitors within +/- 0.2 volts DC.

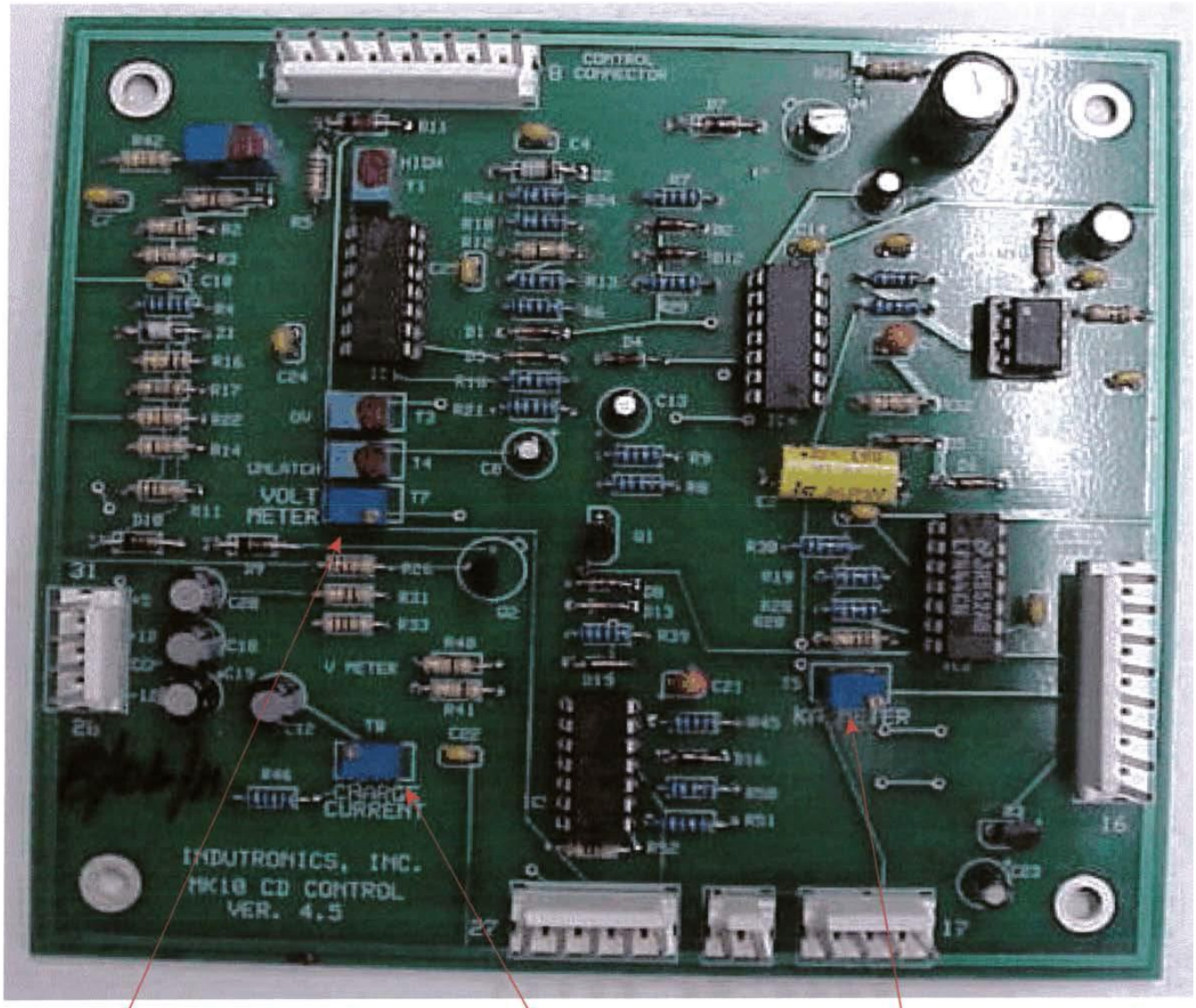
- Turn the power on, set on the HI setting and allow the unit to charge until the ready light indicator comes on. Then measure the voltage across one of the DC buss capacitors, make sure that the voltage is 65 VDC +/- 0.2 volts.
- Adjust T7 Voltmeter potentiometer in ¼ increments if needed until you get the voltage readings within the above specifications.

Current Meter check/adjustment (T5): Sets the shooting current readout on the digital meter indicator within +/- 0.5 Kiloamps on the HI setting only. Please note that the LO setting accuracy can be off by approx. 1.0 kiloamps at times due to the feedback circuit design.

- To calibrate, you must have a calibrated SHOTCHECK to monitor the output of the CD unit.
- Charge the CD unit on HI to 65 VDC, then shoot the CD unit. Now monitor the current meter readout to make sure it matches the SHOTCHEK readout within +/- 0.5 kiloamps.
- Adjust T5 KA Adjust potentiometer if needed until you get the desired reading. Make sure to adjust if needed within 5 seconds of shooting the CD unit and adjust in ¼ turn increments until you get the desired reading.
- This will require that the unit is charged and shot multiple times.

ALL OTHER POTENTIOMETERS SHOULD NEVER BE ADJUSTED IN THE FIELD AS THIS MAY CAUSE DAMAGE TO THE CD UNIT IF NOT DONE CORRECTLY.

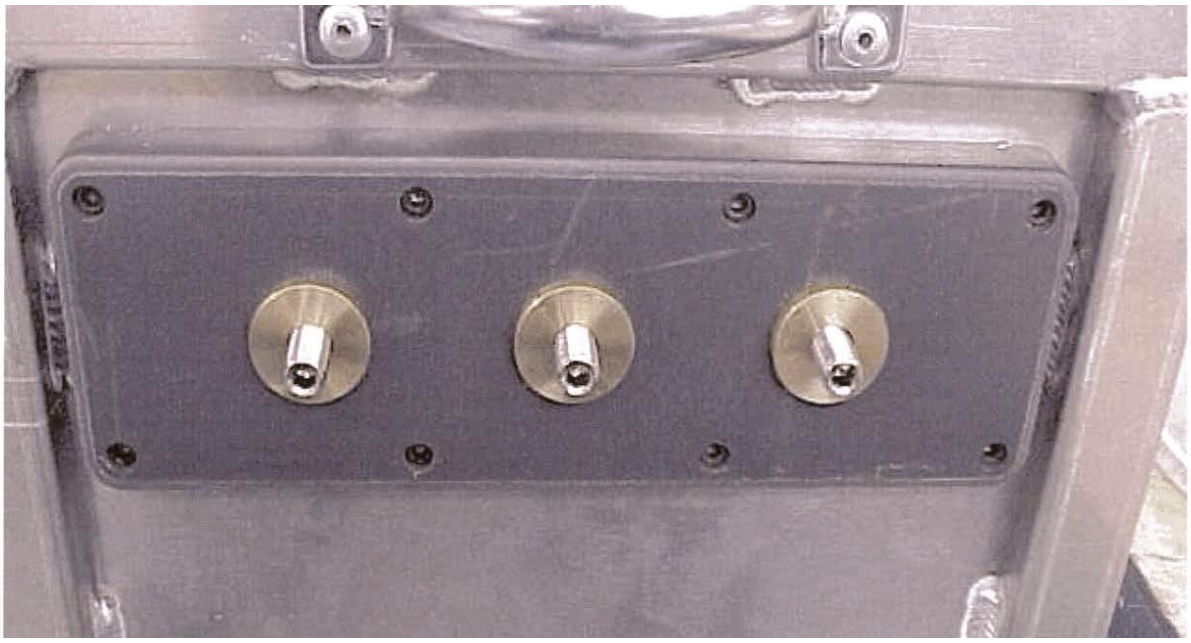
MK1024M-PCS - CD Unit Control board potentiometer locations



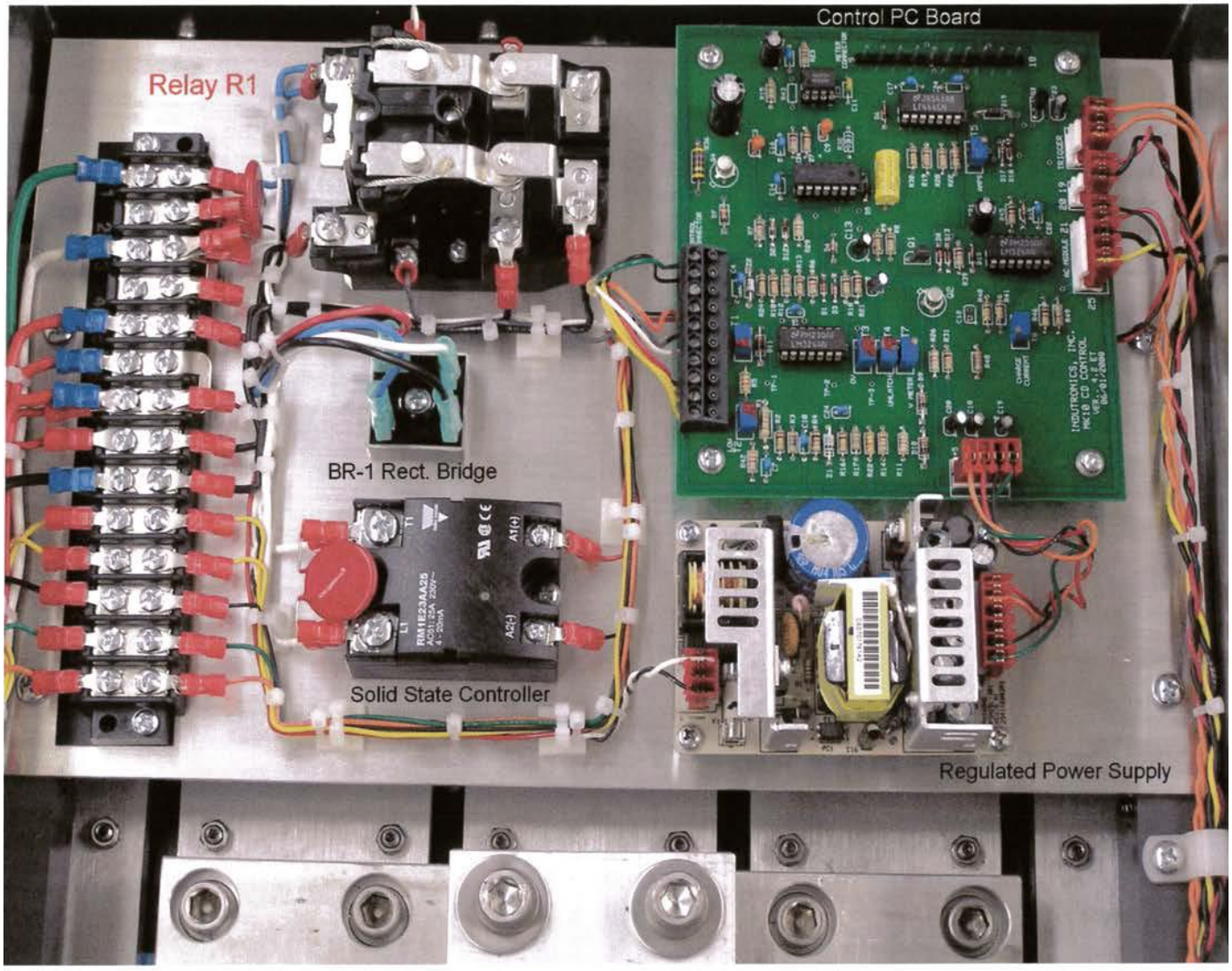
MK1024M-PCS - PARTS IDENTIFICATION PICTURES

EXTERNAL - CONTROL/CONNECTOR PANEL

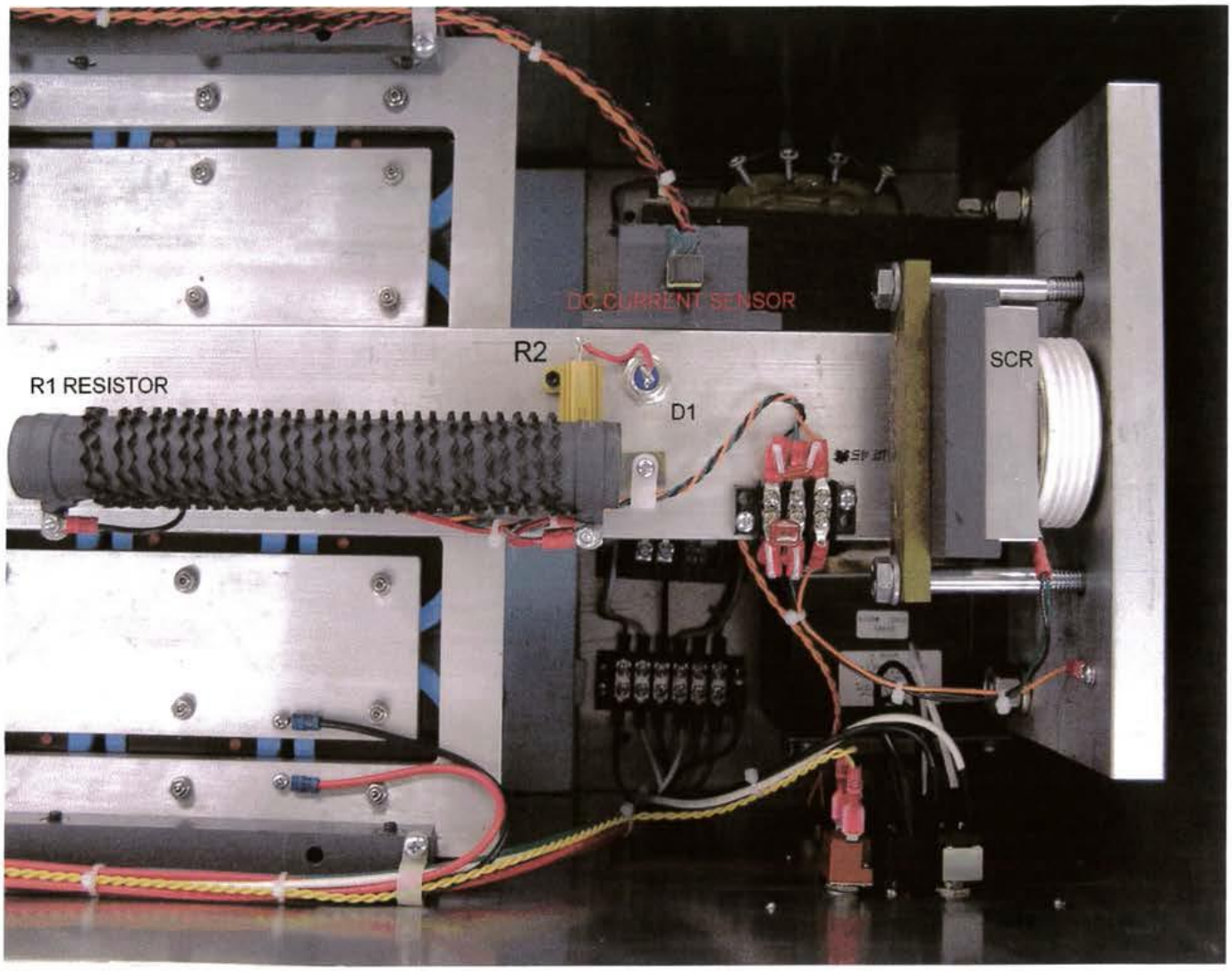
EXTERNAL - SHOOTING CABLE CONNECTIONS



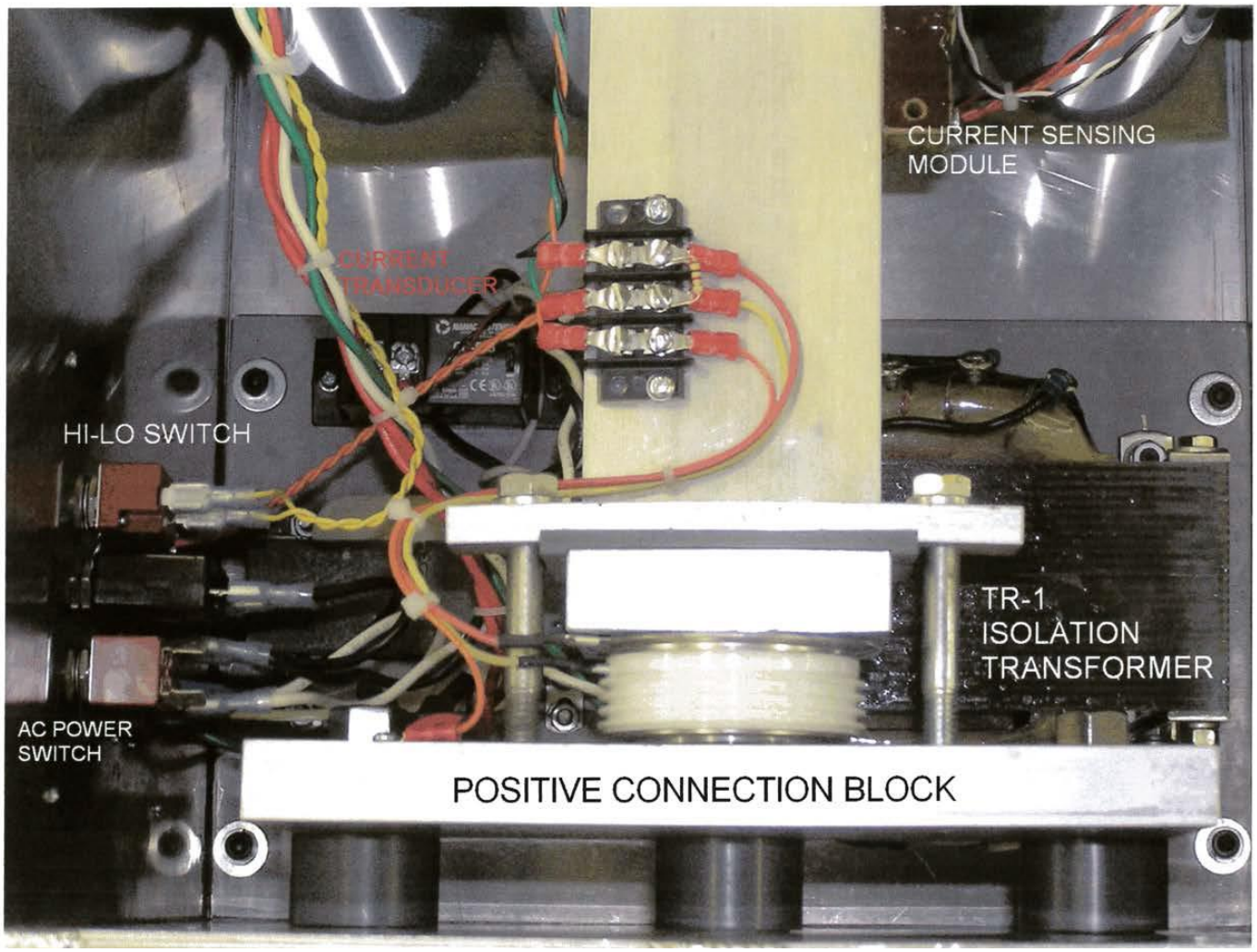
INTERNAL - LOW CURRENT SIDE OF CD UNIT



INTERNAL - HIGH CURRENT SIDE OF CD UNIT UPPER SECTION



INTERNAL - HIGH CURRENT SIDE OF CD UNIT LOWER SECTION



WARRANTY

Power Control Services, Inc. warrants that its MK1024M-PCS CD Units will be free from defects in materials and workmanship under normal use and service for 12 months from the date of delivery to the customer. Power Control Services, Inc. will replace or repair, at its option, any equipment or accessories that may be found defective under this warranty. This warranty specifically excludes any damage caused by negligence, abuse, tampering, improper use or setup or extreme weather/acts of god. Opening of the cabinet or other disassembly and/or modification of any part(s) of the unit without the express written consent of Power Control Services, Inc. will void this warranty.

To obtain service under this warranty, all products to be repaired must be returned to Power Control Services, Inc. or an authorized agent.

This express warranty is in lieu of all other warranties, expressed or implied. Power Control Services, Inc. liability shall be limited to the replacement cost of its own product in question. In no event, and under no circumstance, shall Power Control Services, Inc. be liable for any indirect, incidental, or consequential loss or damage arising from the use or failure of its equipment or breach of this warranty. No representation or other affirmation of fact, including but not limited to statement regarding suitability for use, or performance of the equipment, shall be or be deemed to be warranty by Power Control Services, Inc. for any purpose, nor give rise to any liability or obligation of Power Control Services, Inc. No agent, distributor, salesman, wholesale or retailer has the authority of Power Control Services, Inc. to any other affirmation, or warranty concerning these goods.

The terms of this warranty constitute the buyer's sole and exclusive remedy.

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