

SETTING UP THE THC SENSOR PWM MODULE

IF you already have a working PWM Module with your DTHCIV of either REV number and you are just upgrading to the DTHC IV for CommandCNC you can skip this section of the setup



**PWM MODULE
REV 21 and later**

This update is to cover the newer PWM rev 21, PWM Mod2 and the soon to be released PWM II

**UPDATED for PWM, newer PWM MOD2
and PWM II**

10/22/17

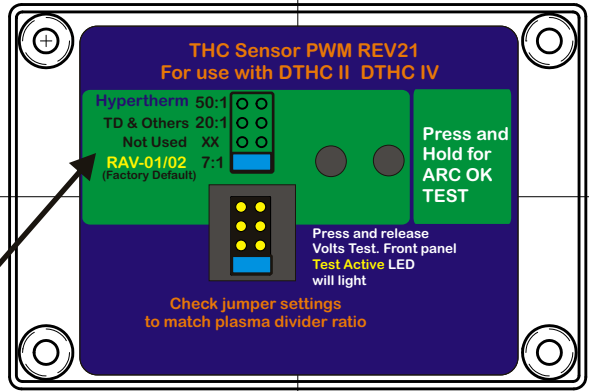
SETTING THE THC SENSOR PWM PRESCALE DIVIDER RATIO(REV21)

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THIS MUST BE DONE TO MATCH YOUR INSTALL UNITS ARE SHIPPED TO MATCH THE RAV-01 (7:1) RATIO. USE THE CHART BELOW IF YOU ARE USING THE MODULE WITH A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER. SEE THE SECTION ON CONNECTING A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER TO DETERMINE TE PROPER RATIO

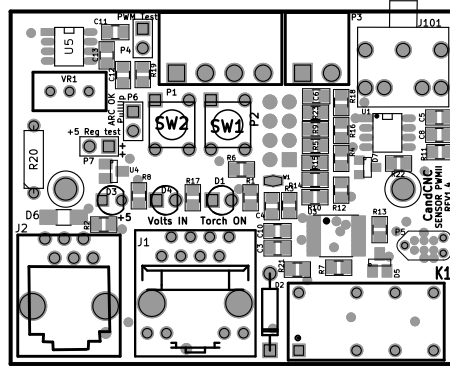
- To set PWM SENSOR ratio divider option:
1. Turn case over. There is a small access slot for the Prescale Jumpers
 2. Determine the proper setting for the type setup you have.
 3. Set the small option jumper to match.

Prior MODEL PWM Shown Rear



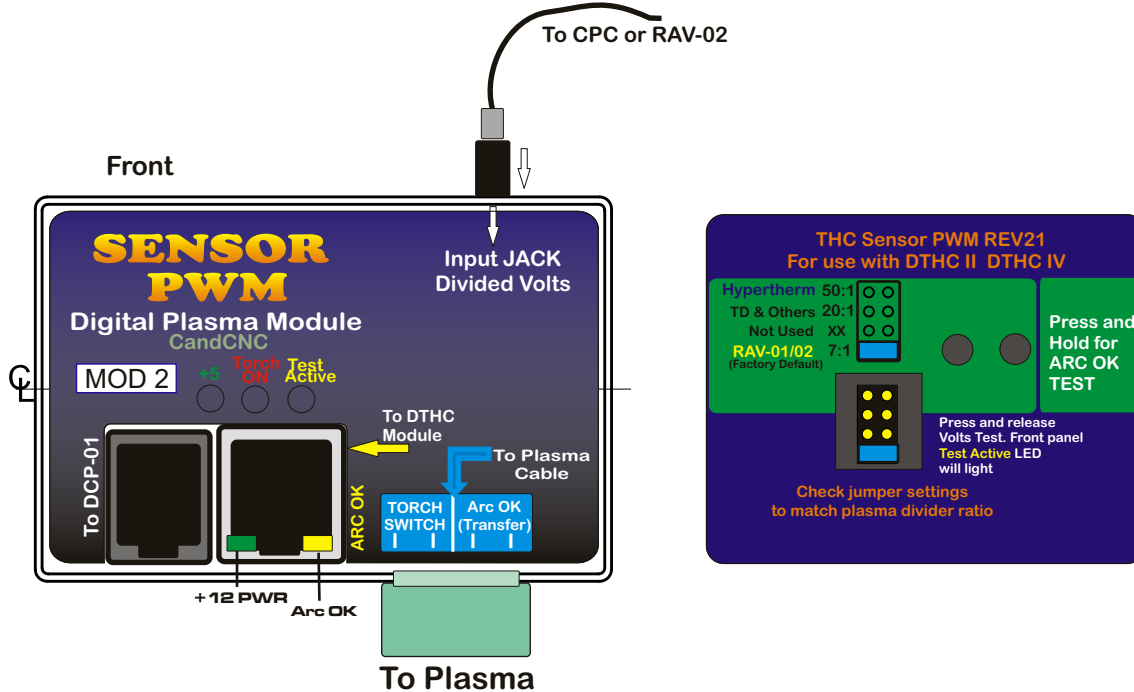
	50:1 Scale (Hypertherm and some others) Recommended for Hypertherm with CPC
	20:1 Standard on some Thermal Dynamics, others
	30:1 Divider (Not ON Sensor PWM)
	7:1 Divider (from CandCNC RAV-01 Card) DEFAULT

IMPORTANT:
The Hypertherm 45 has an internal voltage divider. It cannot be changed from the 50:1 ratio. Set your PWM Sensor jumper to the 50:1 position if you are using the MIC-01 Direct Connect Cable.



THC SENSOR PWM MODULE VOLTS TEST/CAL

THC SENSOR PWM MODULE TEST/CAL



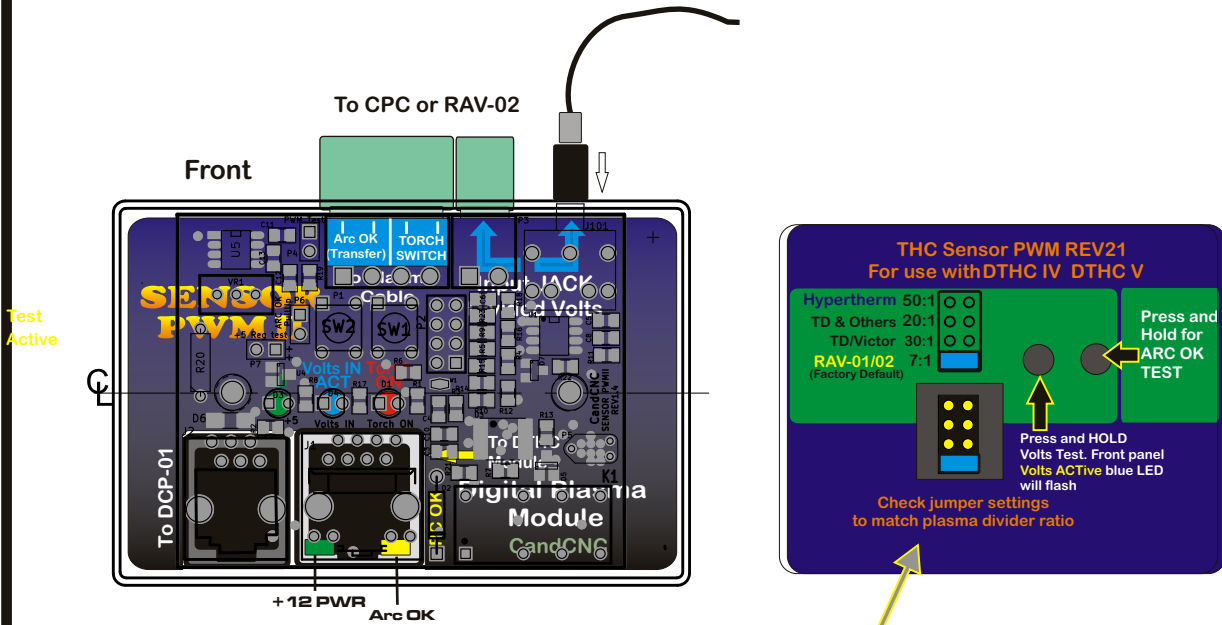
THC PWM Module (Plasma Pickup Module) can be put in TEST/CAL mode without removing the card from the case.

- ✂ Turn the case over and look on the back. There are two recessed test buttons find the button marked VOLTS.
- ✂ Unplug the Divided Volts (from the plasma) either the 2 pin plug or the stereo plug. **Leaving the Divided Volts plugged in will Skew the reading.**
- ✂ Push and release Volts Test, this puts the unit in test/cal mode. The yellow Test Active on the front will flash. You should see 126 to 128 volts displayed on the TORCH VOLTS in the CommandCNC screen
- ✂ Pushing the button again will take the unit out of test/cal mode and the LED will stop flashing and the TORCH VOLTS reading will return to Zero.
- ✂ In TEST mode the PWM signal to the DTHCIV is tested. If you unit passes the Volts Test then the Cat5 cable and DTHCIV module are operating properly. If the voltage is still wrong or zero when the torch fires then the cable to plasma is bad or the voltage divider in the plasma is bad.

The test is based on a simulated PWM from the circuit **so if the prescale divider setting is wrong the calibration will show correct but when the torch is fired the voltage will be wrong.**

THC SENSOR PWM MODULE VOLTS TEST/CAL

THC SENSOR PWM II MODULE TEST/CAL

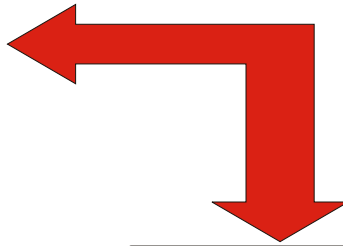


THC PWM II Module Rev 1.4 (Plasma Pickup Module) can be put in TEST/CAL mode without removing the card from the case.

- ✂ Turn the case over and look on the back. There are two recessed test buttons find the button marked VOLTS.
- ✂ Unplug the Divided Volts (from the plasma) either the 2 pin plug or the stereo plug. **Leaving the Divided Volts plugged in will Skew the reading.**
- ✂ Push and hold Volts Test puts the unit in test/cal mode. The blue Volts IN ACT LED on the front will flash. You should see 126 to 128 volts displayed on the TORCH VOLTS in the CommandCNC screen
- ✂ Releasing the button will take the unit out of test/cal mode and the LED will stop flashing and the TORCH VOLTS reading will return to Zero.
- ✂ In TEST mode the PWM is completely tested. If you unit passes the Volts Test but the voltage is still wrong or zero when the torch fires then the cable to plasma is bad or the voltage divider in the plasma is bad.

The test is based on a simulated PWM from the circuit **so if the prescale divider setting is wrong the calibration will show correct but when the torch is fired the voltage will be wrong.**

THC SENSOR PWM MODULE VOLTS TEST/CAL

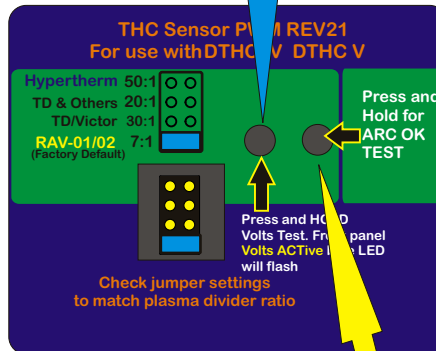


Depress and Hold TEST button to test PWM circuit back to DTHCIV. Volts ACT LED on front will flash and DTHC screen in CommanCNC should display a voltage. Calibrated units (see DTHC calibration section) should display 126 to 128 volts during test.

CandCNC THC SENSOR PWM and PWMII

SENSOR PWM

Case not shown for clarity



CHECKING ARC OK SIGNAL BACK TO DTHCIV CARD:

1. Turn case over.
2. With RJ45 (UTP cable) connected to DTHCIV and unit powered up, depress the ARC OK TEST BUTTON on the card. The ARC OK LED on the MACH screen should light. The ARC OK test LED on the front of the case will light.



Screen may be different

THC SENSOR PWM MODULE VOLTS TEST/CAL

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Before you make connections to the plasma unit you may want to do some testing to confirm proper operation of the THC SENSOR PWM with the DTHC II/ IV Module.

- Connect the THC SENSOR PWM (or Sensor PWM II MODULE) to the RJ45 (CAT5) connector on the DTHCIV Module. **Be careful! Do not connect the CAT5 from the DTHCIV module to ANY OTHER RJ45 jack. It has voltages that can damage other modules (like the USB to RS485 4 port hub or the Ethernet jack on the controller or your PC**
- Start CommandCNC using the Desktop Icon Plasma Profile and make sure you can come out of RESET and that the CP (Charge Pump) LED on the front of the MP3600/ BladeRunner is ON.
- On full controller products you have to have the Motor DC on to come out of RESET.
- Click on the TORCH icon on the screen. You should see the LED above the TORCH button on CommandCNC turn on and there will be a click in the THC Sensor PWM card and the small LED on the front labeled TORCH ON will light. That indicates the TORCH ON relay is working.
- The next check is to confirm the ARC OK circuit is working. **Follow the instructions for the THC SENSOR PWM section and open the back and use the ARC OK Test button.** The ARC OK LED on the MACH3 Screen should light. If it does you can proceed to the actual hookup of the THC SENSOR PWM Module to your plasma unit.
- If any of the tests fail make sure you have the cables firmly attached and that they are the correct type.

All cards are tested at least twice and most three times before they leave the factory. It's unusual for a THC SENSOR PWM to be bad or fail in no load testing. If you have checked all of the connections, cables and MACH setup and you still cannot get the THC SENSOR to work contact us at 903-364-2740 or via e-mail at Tom@CandCNC.com

NOTE: Some Larger (>100A) plasma units or older smaller models use various methods to start the initial ARC. Most common is HF (High Frequency) start. HF Start presents several challenges. It uses the concept that higher frequency waves travel through air (and arc) easier than DC voltage. The HF is normally combined with a higher voltage and it starts an ARC that the plasma uses to ignite the air. Once the arc fires, if a conductive part is close, the arc will transfer to the material. The HF start causes a lot of noise and current spikes. The other form of High Voltage start is the CD (Capacitor Discharge) method. It is basically a high current version of an Automotive ignition system. Up to 30,000 volts can be generated. If the THC Sensor is not protected, the high voltage and high frequency can cause component failure on the card or (worse) in the THC unit and even burn the board. The THC Sensor PWM (REV18 and up) is protected from HF and most High Voltage start circuits.

MAKING CONNECTIONS TO YOUR PLASMA CUTTER

1. You need the proper CandCNC Plasma Connection Kit to make the interface to your plasma cutter.

2. Different types of plasma cutters can be used. Some have everything needed terminated to one connector (e.g. Hypertherm 45/65/85/105/125) with rear CPC. Others may have the same or no external connectors. We can only cover a few specific types.

NOTE: Some plasma cutters use a manual contact start (TAP start) when the end of the torch has to touch the metal then be retracted to start the arc. These types of cutters WILL NOT WORK for plasma CNC cutting.

A note about HF start plasma cutters and the DTHCIV.

The DTHCIV is highly isolated from the plasma side and the noise from an HF start plasma will not enter the controls through the PWM module or the DTHCIV. **Most problems from HF start are from having a common connection to the control side (motor power supply, PC or monitor, etc)** The table and plasma chassis needs a good *local* earth ground (rod) close to the table. You need to separate the Plasma cutter and its cables as far as possible from the controls. You should NOT tie the control side to the same ground rod as the plasma or table is connected to. The AC safety grounds between the two systems need to connect at one common point (only) and as physically separated as possible. In severe cases you may need to provide a separate clean ground to the control side or even place the control equipment in a shielded metal enclosure NOT connected to the plasma ground. Even earth grounded wires with high currents running through them will induct some noise into anything tied to the same ground. Just a few volts of noise on a shared ground can disrupt the operation of some PC's. If you fire your torch and the PC locks up, CommandCNC stops responding, or the controller does weird things, you need to start separating the source of the noise (the plasma cutter and the torch leads) away from the PC control side and break any LOCAL common connections...even grounds.

MAKING CONNECTIONS TO YOUR PLASMA CUTTER

The smaller Hypertherm and other modern brand units use a low noise method called “blowback arc start”. The electrode is mounted against a spring that keeps it pushed against the inside of the nozzle as long as air is not flowing. When the unit is triggered the ARC starts a few milliseconds after the current starts to flow in the electrode circuit. As the air flows it pulls the electrode away from the nozzle and creates an ARC. That is used to ionize the air and start the plasma.

The DTHC IV can be used with all types of plasma units. The HF units tend to be very noisy and some even have large amounts of RFI. The total isolation of the DTHC IV circuit from any low level (PC logic) including any common ground, stops any conducted noise. The internal circuits are protected from RFI with proper layout and careful attention to bypass components on all active circuits.

Hooking Up Your Plasma Machine to the MP3600-DTHC IV/BladeRunnerAIO DTHC IV LINUX

NOTE: IF you have a Hypertherm with a rear “CPC (14 pin) round connector you can skip this section.

CAUTION: Portions of this install may include opening your plasma cutter machine and attaching wires. **MAKE SURE THE UNIT IS UNPLUGGED PRIOR TO REMOVING ANY COVER(S) OR MAKING ANY CONNECTIONS.** Plasma units have HIGH VOLTAGES present that can be dangerous or lethal. IF YOU ARE NOT EXPERIENCED WORKING WITH HIGH VOLTAGES, DO NOT ATTEMPT TO INSTALL THIS OR ANY OTHER DEVICE INSIDE YOUR PLASMA UNIT YOURSELF. SEEK PROFESSIONAL HELP.

In order to control your plasma unit, there are three main connections that need to be made to the plasma unit itself. All of the following operations are to be done with the power disconnected from your plasma unit.

You should determine which type install you will need for your plasma.

There are 3 questions that need to be answered:

- 1.) Does your plasma unit have an internal ARC OK (dry contact) signal or one on a standard CPC connector? If not then you will need to purchase and install the Digital Current Probe Option (DCP-01). It is available separately or as part of the Universal Connection Kit
- 2.) Does your plasma unit have an internal voltage divider (Automation Interface) with a ratio of 20:1 or 50:1 ? If not you will need to purchase and install the Raw Arc Volts divider card (RAV-01). It is available separately or as part of the Universal Connection Kit
- 3.) Are you using a hand torch or machine torch? If using a hand torch (even with a unit that is setup for automation, you will probably need to tap into the TORCH SWITCH wires from the hand torch to fire the torch remotely (from the computer). There is a page on how to do that from either the RAV-01 (if you already have it because of #2 above) or directly from the THC SENSOR PWM connector.

If you have a Plasma unit that needs the RAV-02 card you will need to install that card in your plasma unit or have it done. See the RAV-02 card section for instructions and warnings. If you are using the DCP-01 for ARC OK, there is an addendum at the end of this manual on installing and testing the DCP-01.

NOTE: IF you have a Hypertherm or Thermal Dynamics "A" series with a rear "CPC (14 pin) round connector you can skip this section.

1. Most plasma units have connection terminals where wires from the torch or panel connectors attach to the internal PC Boards. The terminals provide a convenient place to do your connections. Use crimp-on spade or round terminals to attach the wires to the terminal strips. Make sure the new wires you install do not touch adjacent metal objects. On some machines there may be more than one set of small wires and are used for sensing tip shorts and other conditions. **To identify the correct pair for the Torch Switch** use an ohmmeter or continuity checker across each pair while you manually push the torch head button. When you identify the pair make note of where they attach. Use #22 to #18 stranded wire (twisted pair) to connect between the two screw terminals on the THC Sensor PCB marked "Torch Switch" to the two switch terminals in the plasma unit.

There is no polarity. NOTE: IF your unit has noise filter chokes from the torch switch wires up to its internal logic card, it is recommended you place the two wires to the RAV-02 PCB on the other side of the chokes from their torch head connection (end closest to the internal logic card).

2. If your unit has a Raw Arc Voltage connection point (i.e. like the Hypertherm 1000 series), you will need to use their manual and suggestions as to how to connect to the two points and run those wires to the RAV-02 card. Just make sure you use wire that has insulation rated for at least 400 V. Small signal wire like telephone wire (UTP) is not rated that high and can arc to nearby components. **The RAV-02 card is designed to take the full tip voltage and divide and filter it. Open circuit full tip voltage can be as high as 300VDC in some machines.**

3. If your plasma unit does not have a designated tip voltage measurement point, you will need to locate a place inside the unit where you can get one wire onto the **WORK CLAMP** lead and another on the heavy lead(s) that connects to the torch tip (**ELECTRODE**).

a. Note: some machines like the Hypertherm 380 do not have a single heavy wire to the Torch tip and instead have a set of parallel smaller wires that all terminate into one connector. In the case of the 380 the **WHITE** wires are the tip volts negative.

b. You can identify both locations by visually tracing the two leads as they come into the box. You should find several locations/terminal strips that have connections to these two points and you can use those for your sense wire connections. Use unshielded stranded.

c. Make a connection between the locations you have identified that tie directly to the two leads (workclamp and torch tip) to the two "TIP Volts" terminals. Make sure that these wires are routed where they cannot come into contact with hot or moving components. The TIP VOLTS inputs on the RAV-02 card have a polarity. The + side is the Workclamp and the - side is the Electrode

5. If you are using the CandCNC Digital Current Probe (DCP) with a plasma that does not have an ARC OK signal , the DCP01 provides a current feedback to CommandCNC and the ARC OK trip point is set and provides a software based ARC OK

6. If you have a plasma unit that DOES have an Arc Good signal and you have the DCP module, either signal will trip the ARC OK.

Note: The term Arc Good is interchangeable with Arc Ok , Arc Xfer and OK to MOVE.

7. NOTE: IT IS ESSENTIAL that the chassis of the plasma table have a good earth ground. Refer to the suggested grounding section of the diagrams and provide for a good earth ground close to the table. A safety ground back to a breaker panel many feet away may be a good ground for AC frequencies (60hz) but poor for higher frequencies like plasma noise.

DISCLAIMER AND LEGAL NOTICE

The following section covers the installation of a Voltage Divider card inside the plasma unit. There are dangerous and possibly lethal voltages present in a plasma power supply/unit. **ALWAYS UNPLUG THE UNIT FROM THE AC POWER BEFORE REMOVING ANY COVERS. ALWAYS REPLACE ALL COVERS AND SAFETY BARRIERS BEFORE TURNING THE POWER BACK ON.**

You do any install of a card inside of your Plasma Power Unit AT YOUR OWN RISK. If you do not wish to do the procedure either find a person qualified to do so OR contact us for options.

CandCNC/Fourhills Designs (hereafter referred to as “CandCNC”) nor any of its resellers or agents will be responsible for any damage to any plasma unit or the loss of any income resulting from using any of our electronics or using our instructions written or verbal to connect to any electronics. While we take care to provide accurate and concise information, we will not be responsible for any damages to equipment, personnel, or surrounding equipment, structures or land resulting from the direct or indirect use of our products.

The entire liability of CandCNC or any of its agents or employees is to replace or repair products provided by CandCNC. Under no circumstances will we be liable for any damages or loss exceeding the value of the actual products provided by us regardless if the products are used as described and in the proper manner. All CandCNC products carry a warranty that covers repair or replacement **ONLY**. Any labor, travel expense or costs to replace a component or product outside the CandCNC factory is **NOT COVERED** by warranty.

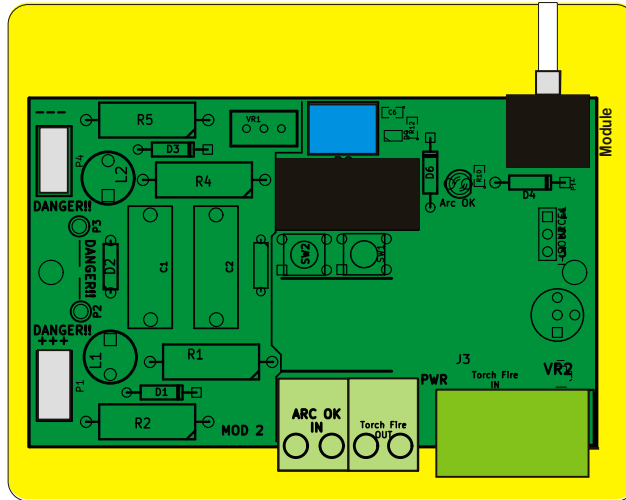
If you do not accept the terms of this notice **DO NOT OPEN OR INSTALL THE RAV-01 CARD**. Return the card for a full refund and seek an alternative way to sense the voltage.

CAUTION: Some plasma units use a very high voltage spark (Capacitor Discharge or CD) arc starting system. While the RAV-01 card is protected from high voltage inputs CD type systems can cause arcing in the connecting wires or to nearby components. If you have a CD start unit and do not have experience working with high voltage systems **SEEK PROFESSIONAL HELP** to do any install.

CONNECTING to YOUR PLASMA RAV-012 Raw Arc Voltage Divider Option

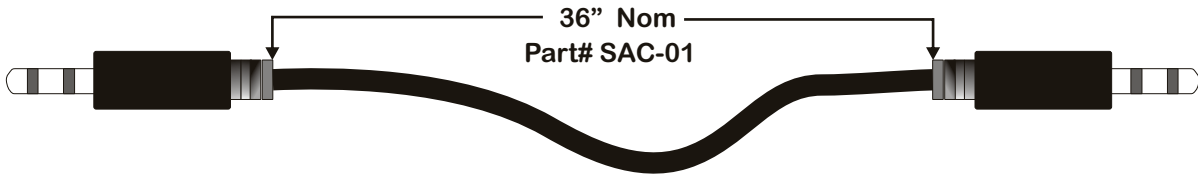
For Plasma Units **WITHOUT** Internal Voltage Divider
NOTE this card comes in most of the Connections Kits including
the UNIVERSAL CONNECTION KIT

RAV-02 Raw Arc Volts CARD

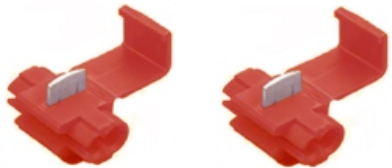


←
Plexglas
Insulator
Base
(safety shield)

SHIELDED ANALOG CABLE

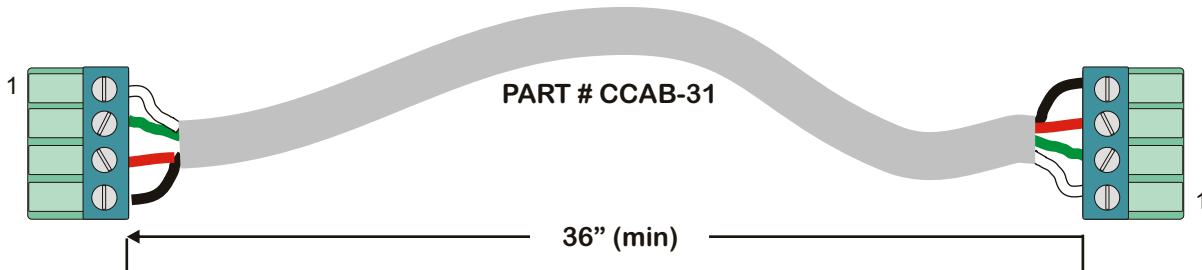


36" Nom
Part# SAC-01



ScotchLOC™
IDC Splices (RED)
2 pieces

RAV to THCSensorPWM Interconnect



PART # CCAB-31

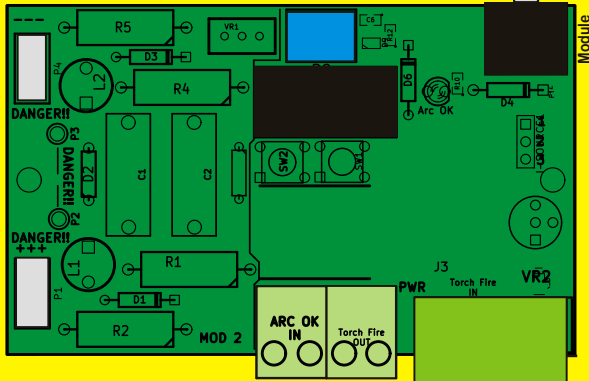
36" (min)

CONNECTING to YOUR PLASMA

RAV-02 Raw Arc Voltage Divider Option

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Later version RAV-02



RAV-02 Raw Arc Volts CARD

IMPORTANT: When making any connection inside the Plasma Unit, disconnect the unit from the AC Line (unplug it). Do not open the case with power on the AC line. **THERE ARE DANGEROUS VOLTAGES** present in the unit anytime it is connected to an AC source **EVEN IF IT IS TURNED OFF.**

IF YOU HAVE AN INTERNAL ARC OK SIGNAL:
Connect one wire to Terminal 4 and Terminal 3 above (left two terminals)

IF YOU **DO NOT** HAVE AN INTERNAL ARC OK SIGNAL: You will need to purchase a DCP-01 Digital Current Probe.

TORCH SWITCH Terminals.
If you have a plasma unit with a Machine Torch you will need to locate the two torch fire connection points. in some units it is called START. IT is a REMOTE Fire set of wires.

IF YOU HAVE A HAND TORCH you will need to identify the two Torch Switch wires that come from the Hand torch and

RAV-02 PREFACE: General Information

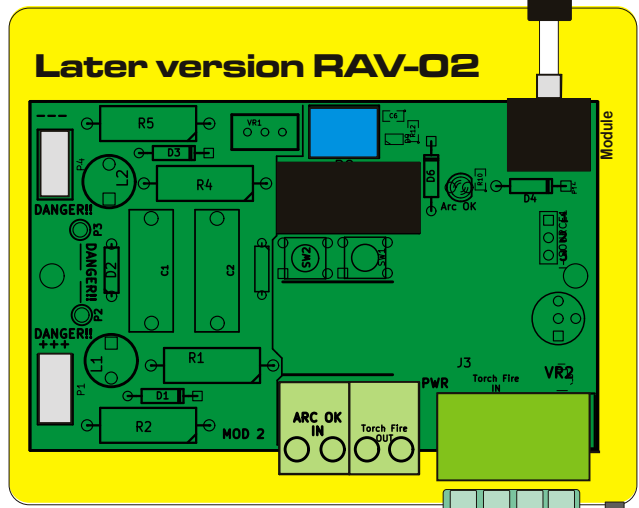
The RAV-02 can be used several ways so it can get confusing about making the connections. The primary use of the RAV-02 is to take Raw Arc Volts (undivided volts and divide it by a precise ratio so it can be used by the THC SENSOR PWM module to generate a digital signal to send volts data to the DTHCII Digital Torch Height Module. In some circumstances that is all that you will use the card for. Examples are on the Hypertherm 1000/1250/1650 series and the Older Thermal Dynamics "A" series. Both types have a rear CPC connector (14 pin) that has the Torch Fire and ARC OK signals available and are used with the CandCNC MIC-02 interface cable so **ONLY** the Shielded Analog Cable (SAC-01) is used between the RAV-01 and THC SENSOR PWM.

On other types of Plasma cutters that have no external connectors for ANY of the required signals the RAV-01 can become a connection board for accessing those signals internally and passing them to the THC SENSOR PWM Module via the CCAS-01 4 wire cable. The following pages will cover how to first use the RAV-02 as a voltage divider card in a unit that does not have an integrated voltage divider. If you have a plasma unit with no external connectors than the next section shows how to use the RAV-02 to fire the torch from the software. Finally if your plasma has an internal access to the Torch fire for a mechanical torch and an internal ARC OK (OK to MOVE). **REMEMBER:** the RAV-02 is just a pass-through (place to make connections) for ARC OK and TORCH FIRE. It does not sense or provide those signals.

There are added pages on some Plasma Cutters and how to connect them; sometimes there is more than one way. If there is a way to access the proper signals externally than that method with a cable is recommended. In each case the objective is to get the signals in and out of the THC SENSOR PWM Module.

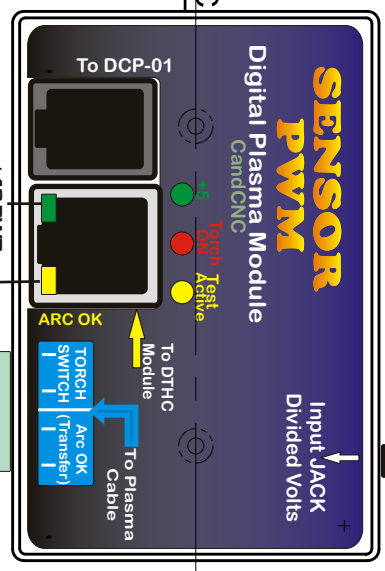
CONNECTING to YOUR PLASMA RAV-01 Raw Arc Voltage Divider Option

RAV-02 Mounted inside Plasma UNIT.
CandCNC RAW ARC VOLTS Voltage divider card



Plexiglas
Shield Safety

RJ45 (Cat5) cable to
DT-HCII Module



Note: Same wire colors are used on the PWM II

Divided volts from
CandCNC Raw Arc
Volts card

THC SENSOR PWM MODULE
Mounted outside plasma unit
Connections for PWM II MODULE are the SAME

CONNECTING to YOUR PLASMA RAV-02 Raw Arc Voltage Divider Option

For Plasma Units that have NO external connector for the required signals OR do not have an internal voltage divider.

Mounting the RAV-02 Card inside your Plasma Cutter: Do any mounting or modification with the Power cord DISCONNECTED to the plasma unit

The mounting location for the card will vary from one type/brand of plasma unit to another. Pick a location and mount the RAV-01 using the Plexiglass shield using small self tapping screws (not furnished) or adhesive Velcro strips. Mount the card at least 1 inch away on all sides from any internal cards, terminals or bare wires. The standoffs of the card are insulated and so the card can be mounted with the plexiglass shield against the chassis. There is high voltage present when the torch fires at the end of the card where the RAW ARC VOLTS (tip Volts) is connected. Keep that end of the card away from ANY conductive object closer than 2 inches.

Once you have the RAV-01 Card mounted in a safe location you will need to make provisions to connect the two low voltage cables (CCAB-31 and SAC-01). You need to provide holes on the rear or side of the unit (BE CAREFUL DRILLING METAL IN YOUR UNIT. TINY SHAVINGS CAN FALL ON PARTS THAT COULD SHORT.) Ream the holes smooth or drill them oversized and use a rubber grommet to protect the wires. Clean up with a magnet or blow the cabinet out with air. One hole needs to be able to pass the diameter of the SAC-01 Plug. The other needs to pass the diameter of the cable for the CCAB-31. NOTE: The 4 wide plug on the CCAB-31 cable is removable. You will need to remove the end that passes into the enclosure to fish the wire through for the RAV-01 Connection. BE SURE TO FOLLOW THE COLOR CODE TO REATTACH THE CONNECTOR. THE COLORS ON BOTH ENDS WILL GO ONTO THE SAME TERMINAL/PIN NUMBER. Connect the two cables where the diagram shows to the RAV-01 Card.

Making the connections

A WORD ABOUT ARC OK SIGNALS: “ARC OK” is our terminology of a signal coming back from the plasma unit that signals the unit has fired the torch and has a valid arc. Most plasma units made for manual cutting DO NOT HAVE an ARC OK (also known as ARC XFR; TRANSFER; OK to MOVE and other similar terms). It is a circuit that closes (relay contacts or sometimes called “dry contacts”) on a valid arc. Units that do have the signal will have it labeled, on a connector or covered in their manual. IF YOU HAVE DOUBTS, assume the unit does NOT have ARC OK and follow the guidelines below.

IF YOUR PLASMA HAS AN ARC OK CONNECTION POINT: There will be two connection points. Run a small gauge (18-24 ga) pair of wires from the internal ARC OK points to the two screw terminals on the edge of the RAV-01 Card. This wire carries no high voltage or current. Follow the diagram on Page _____. There is a board labeling program on some cards where the white printing is WRONG! USE THE PICTURES IN THIS MANUAL to make the connection. Make sure the connection is secure and that no stray wires are outside the opening of the screw terminals.

IF YOUR PLASMA DOES NOT HAVE AN ARC OK CONNECTION POINT: Turn to the section on the DCP-01 Digital Current Probe option. You will need to purchase and install this option to provide a reliable ARC OK signal to your DTHCII system.

Finding the correct connections.

The first signal you need to identify and locate is the Raw Arc Volts (Raw Tip Volts). This is the voltage between the Electrode and the Workclamp. The Hypertherm 1000 thru 1650 series have two spade terminals (J15 and J16) that are for easy connection of Raw Arc Volts. On later models (45/65/85/105/125) WITHOUT the internal voltage divider, the location of the Raw Arc Volts is not as obvious but they have Field Service Bulletins where they give detailed directions on finding the Raw Arc Volts. Our manual covers connection to the PowerMax 1000, 1250 and 1650 as well as the PowerMax 45 and PowerMax 65/85/105 with the optional CPC connector.

<https://www.hypertherm.com/Xnet/library.jsp/null> is a search page where you can enter your model number and then search the FSBs. The files are in PDF format.

For other brands of plasma units or a model not designed to be automated the search for connection points may be a little more difficult but not impossible. The key is the leads going to the torch cable. On most plasma units you can locate these signals by opening the unit (POWER DISCONNECTED!) and visually tracing the wires coming from the plasma torch. The Workclamp will be connected to a stud or terminal inside and is pretty easy to identify. It is the POSITIVE (+) side of the circuit. The Electrode side goes up the plasma cable to the torch head. It will be one heavy wire or a series of smaller gauge (12ga or larger) stranded wires of the same color and they will all connect to the same electrical spot (bus) inside the plasma. In a lot of units these wires are all solid WHITE in color but do not use color as your clue. Some plasma manufacturers provide block level schematics in their use or service manual that give wire colors (and in some cases terminal numbers and locations).

WHEN YOU HAVE LOCATED THE WORKCLAMP AND ELECTRODE WIRES IN THE UNIT:

Using a two conductor wire (18-22 ga) [not supplied] with insulation rated to 400V or more crimp on two ring or fork terminals. **USE WIRES OF TWO DIFFERENT COLORS** and long enough to reach the RAV-02 Card using an indirect route (give yourself extra wire). Run the first color wire (red or the brightest color) to where the WORKCLAMP attaches. Normally that will be a heavy bus bar with other smaller wires attached. If it is a single large stud you will need a ring terminal that will fit over the stud. That will be your positive (+) wire.

Use the other wire color and run a connection using a ring or fork terminal to where the ELECTRODE wires attach.

Carefully route both wires from their connection points over to where they will attach at spade inputs on the edge of the RAV-01 Card. Keep the wires away from other high voltage wires or components on the circuit board. Use nylon wire ties to secure the wires to other wire bundles or to the chassis. **DO NOT WIRE TIE THEM TO COMPONENTS ON THE PC BOARDS. DO NOT USE LOW VOLTAGE WIRES LIKE THOSE USED FOR WIRING PHONES OF NETWORKS.**

USING THE RAV-01 TO FIRE THE TORCH
(for plasam units with no external connector
to fire the torch or with a hand torch)

E

The next internal signal you need to locate is the TORCH SWITCH. If you are connecting to a unit with a Hand Torch you will need to find and tap into the two wires coming from the torch switch in the hand piece. How will you know? First the wires will be smaller and different colors than the ELECTRODE or PILOT ARC (more about that later) wires. In most cases there will be four smaller wires. Two will be the torch switch and two will be the PIP or CIP (Consummables-In-Place) wires. Once again the manufacturers documents can be of service here identifying colors and even connection points. If you do not have the manufacturers service information with schematics and cannot find them on-line you will need to do a little detective work to identify the torch switch wired.

The first thing your should do is get an Ohmmeter, and with it set to low ohms, short the leads together and make sure the meter shows the change and displays low (close to zero) ohms. If your meter has a “squaker” continuity tester position then use that as a tone indication. Clip across two of the four smaller wires. If you get no reading or tone (or an OV or OL indication) the circuit is open. Activate the torch switch on the hand piece and if the reading goes to a low value of ohms (<100) or the tone sounds, it is the switch contacts. Confirm the reading by pushing the torch switch several times. Keep testing wires until you find the pair that changes the meter. Note the colors. Use your meter to test the other wires. You may well find a pair that causes the meter to go to low ohms as soon as you touch them, but working the torch switch WILL NOT change the meter. Those are NOT the torch switch pair. Once you have identified the Torch Switch pair study the diagram on page ____ and using the two ScotchLOC connectors slide one over each of the two wires connect them to the Torch Switch pair.

That concludes the internal connections you will have to make for your unit. Make sure all leads are insulated and away from possible physical damage. Double check to make sure there are no loose connections and that you have attached/ re-attached any wires mentioned in the above guidelines.

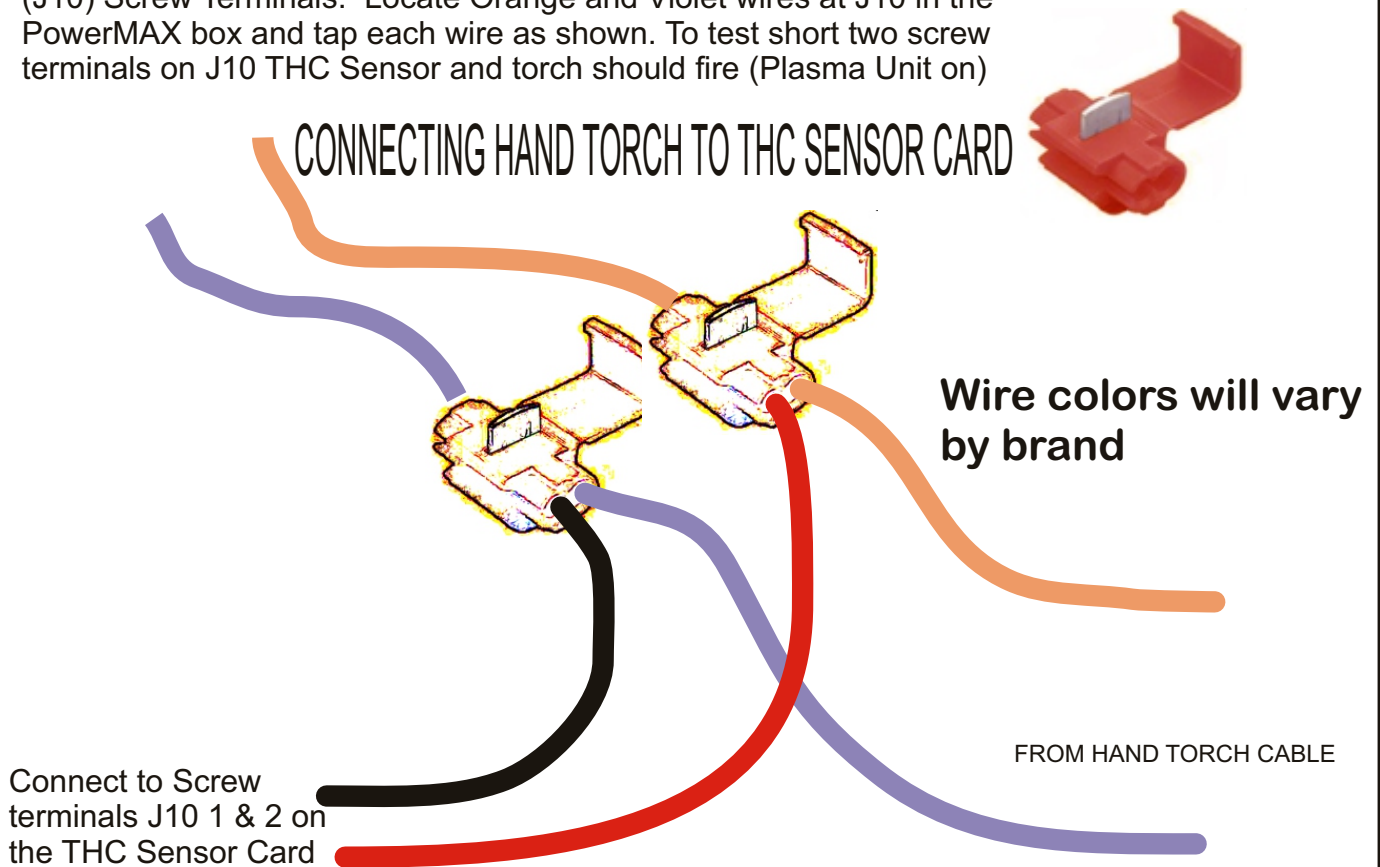
Replace all covers and safety devices on the plasma unit and plug the plasma unit into power with the unit switched off. Turn the unit on, and make sure the unit works correctly in manual mode. (i.e. cut a piece of metal by hand). If you have a machine torch manually fire the torch from the Torch On button in MACH3

USING THE RAV-01 TO FIRE THE TORCH
(for plasam units with no external connector
to fire the torch or with a hand torch)

NOTE : Some models of plasma cutters that have a CNC connector (CPC connector) have a safety lockout to prevent firing the hand torch remotely. The listed connection will fire the torch the same as pulling the trigger. Both the trigger and the software can fire the torch. There may be a way to bypass the lock-out and use the CPC connector to fire the torch. Contact us via e-mail for other possible solutions on plasma cutters that have a CPC connector.

Use ScotchLoc IDC Splices (RED) to tie Torch Switch output on THC Sensor (J10) Screw Terminals. Locate Orange and Violet wires at J10 in the PowerMAX box and tap each wire as shown. To test short two screw terminals on J10 THC Sensor and torch should fire (Plasma Unit on)

CONNECTING HAND TORCH TO THC SENSOR CARD

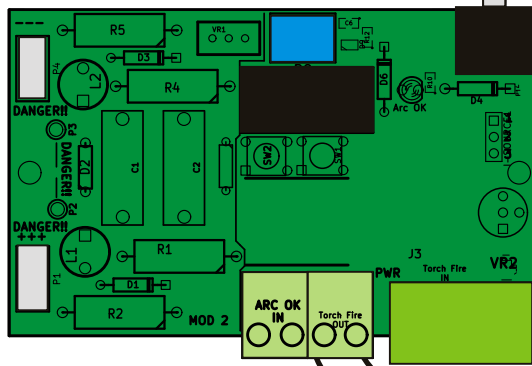


IMPORTANT: When making any connection inside the Plasma Unit, **disconnect the unit from the AC Line (unplug it). Do not open the case with power on the AC line.** THERE ARE DANGEROUS VOLTAGES present in the unit anytime it is connected to an AC source EVEN IF IT IS TURNED OFF.

USING THE RAV-01 TO FIRE THE TORCH
 (for plasam units with no external connector
 to fire the torch or with a hand torch)

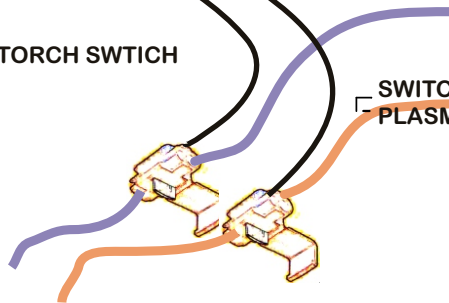
RAV-02 Raw Arc Volts CARD

Later version RAV-02

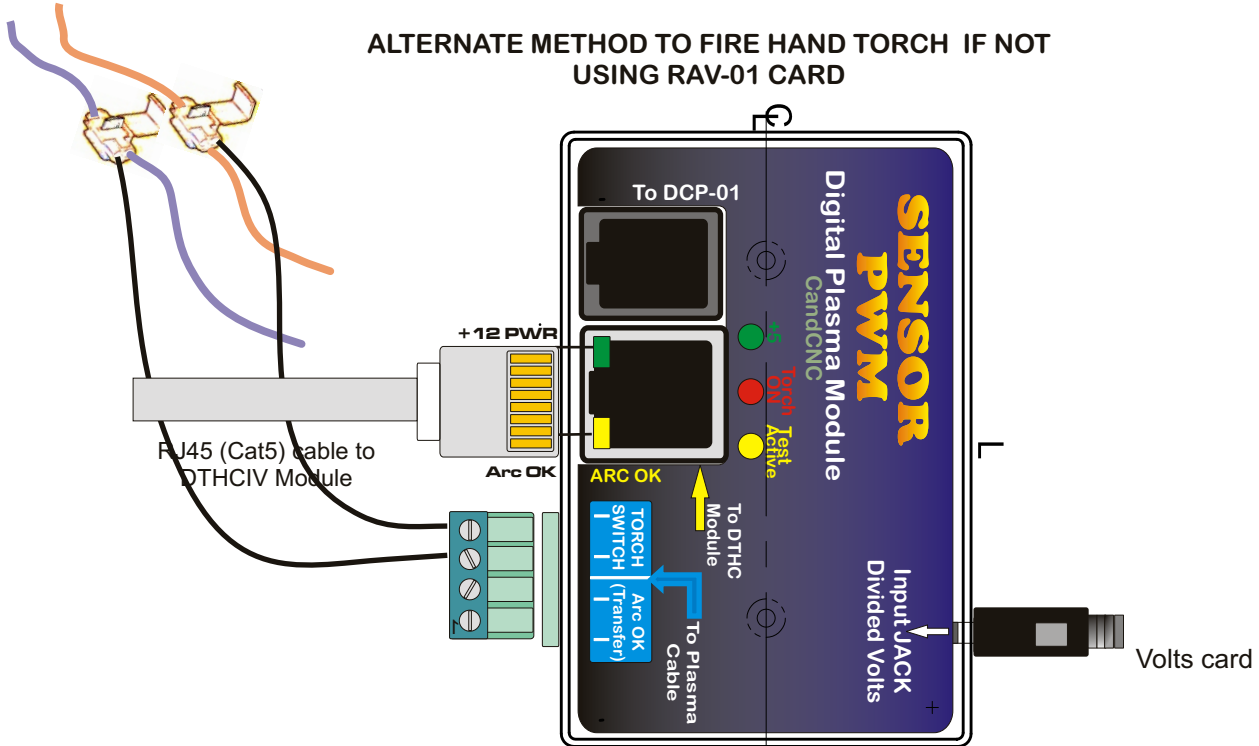


CONNECTING TO HAND TORCH SWITCH
 WIRES FROM RAV-01

SWITCH WIRES FROM
 PLASMA HAND PIECE



**ALTERNATE METHOD TO FIRE HAND TORCH IF NOT
 USING RAV-01 CARD**



**Use the same two wires on the 4 pin connector for
 the PWM Module REV 21**

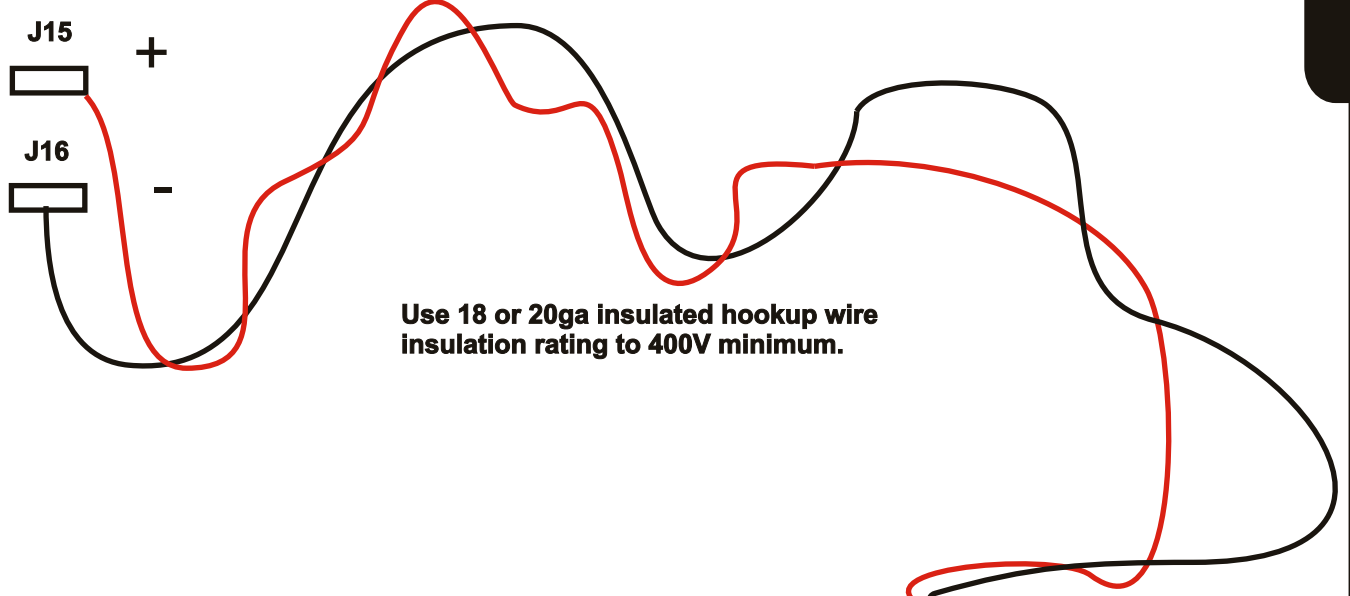
HYPERTHERM 1000/1250/1650 Connecting THC SENSOR PWM CARD

F

This is for units with a hand torch that do not have the rear CPC connector

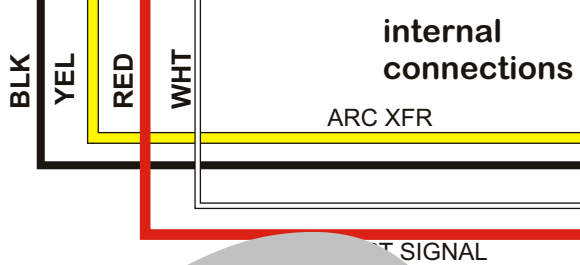
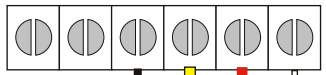
TIP VOLTS CONNECTION

J15 and J16 are Slide-on connectors located on the PCB

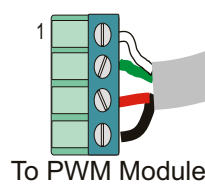
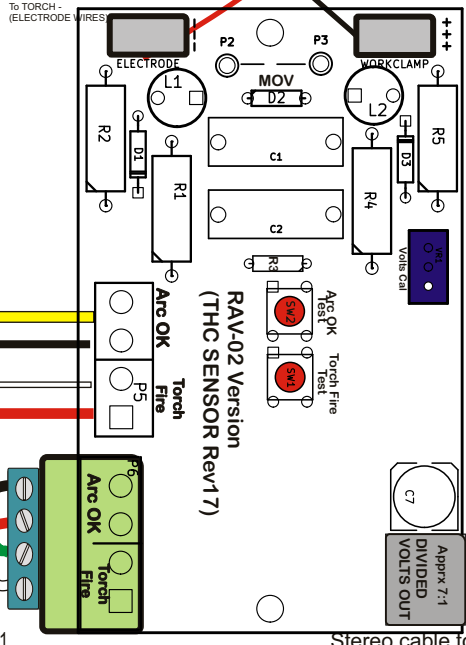


DANGER
HIGH VOLTAGE
WHEN TORCH
IS ON

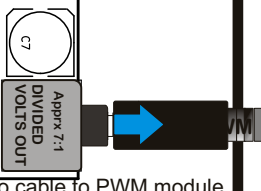
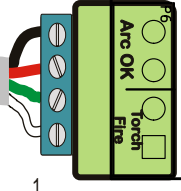
J19 Located inside Cabinet on PC Board



RAV-02



PART # CCAB-31

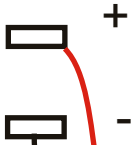


**Connect to THC SENSOR PWM VIA
CAB-31 Cable**

**HYPERTHERM 1000/1250/1650 and Thermal Dynamics units
with rear CPC connector and no Arc Voltage Divider**

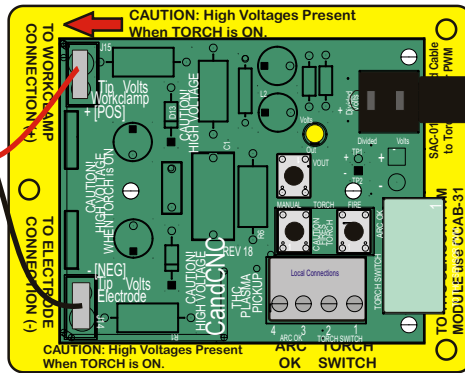
F

Raw arc volts connection points vary from one model to another. Refer to manufacturers manuals for locations.



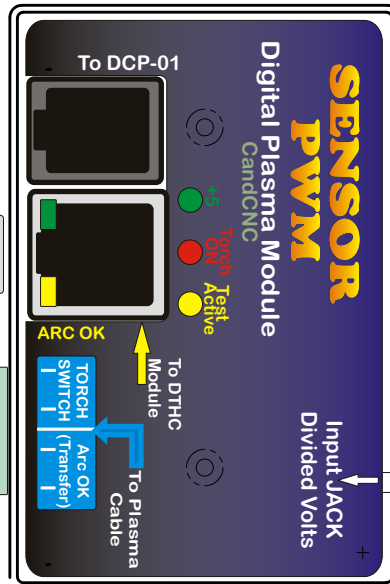
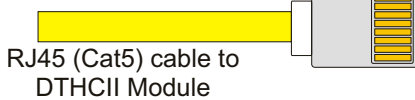
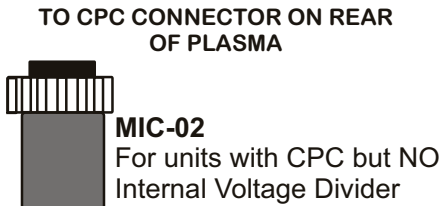
Use 18 or 20ga insulated hookup wire. Insulation rating to 400V minimum.

OPTIONAL RAV-02 MOUNTED INSIDE PLASMA



Route shielded cable through rear bulkhead

METHOD TO CONNECT TO UNIT WITH MACHINE TORCH USING REAR CPC CONNECTOR FOR TORCH FIRING AND ARC OK

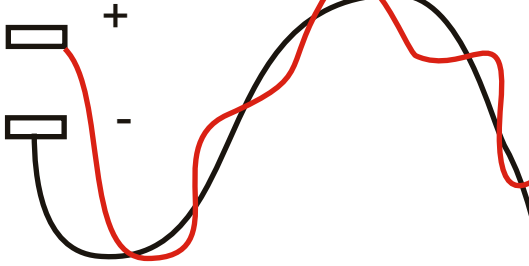


Divided volts from CandCNC Raw Arc Volts card

**HYPERTHERM 1000/1250/1650 and Thermal Dynamics units
with rear CPC connector and no Arc Voltage Divider**

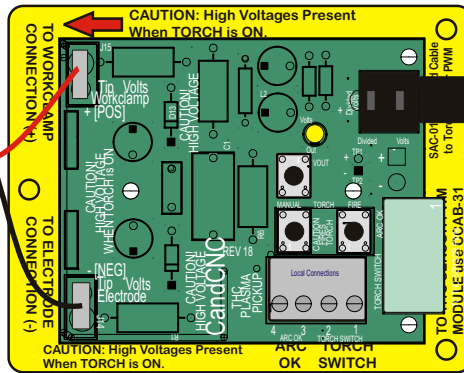
F

Raw arc volts connection points vary from one model to another. Refer to manufacturers manuals for locations.



Use 18 or 20ga insulated hookup wire. Insulation rating to 400V minimum.

**OPTIONAL RAV-02
MOUNTED INSIDE PLASMA**

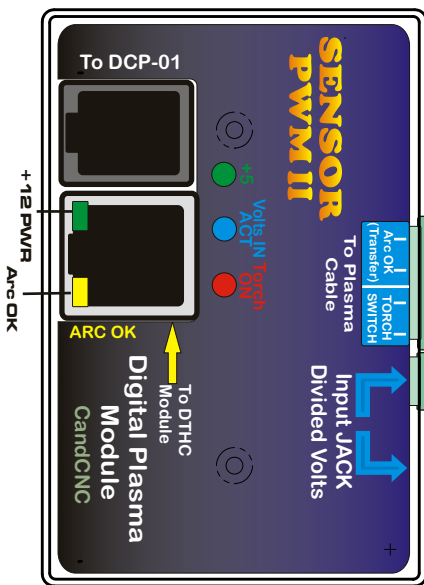


Route shielded cable through rear bulkhead

**METHOD TO CONNECT TO UNIT
WITH MACHINE TORCH USING
REAR CPC CONNECTOR FOR
TORCH FIRING AND ARC OK**

TO CPC CONNECTOR ON REAR OF PLASMA

MIC-02
For units with CPC but NO Internal Voltage Divider



Front

To CPC or RAV-02

Divided volts from CandCNC Raw Arc Volts card