

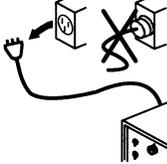
Field Service Tool Kit
HyPerformance Plasma (HPR)
Field Service Bulletin

804970 – Revision 2 – April, 2006

Hypertherm®

*The world leader in
plasma cutting technology*

Hypertherm, Inc.
Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
603-643-3441 Tel 603-643-5352 Fax
www.hypertherm.com

		<p>WARNING ELECTRIC SHOCK CAN KILL</p>
	<p>Disconnect electrical power before performing any maintenance. See the <i>Safety Section</i> of the system Manual for more safety precautions.</p>	

Introduction

The HPR Field Service Tool Kit (128921) allows a qualified technician to troubleshoot Hypertherm HPR systems.

The tool kit can be used to identify problems with, or verify the proper function of, wire harnesses, sensors, relay outputs, and printed circuit boards (PCBs). It can be used to verify the functionality of key HPR system interfaces such as the CNC input and output signals, RS-422 serial communications between the power supply and the CNC, and CAN communications among HPR modules. It also allows the technician to see the machine status, error codes and sensor data from HPR modules.

The primary tool in this kit is a Windows XP-equipped laptop (not included) running the Hypertherm power supply tools software. This kit also contains a coolant flow meter, an HPR test torch, a pressure test gauge kit, a CAN loop-back tester and a CNC Interface Tester. Individual components are available as well as the complete kit.

System requirements

- Pentium 4 or Celeron at 1.2 GHz or higher PC
- PC running Microsoft Windows XP Professional, or Windows XP Home Edition operating systems
- 128 MB of system RAM
- 100 MB of available hard-disk space
- CD-ROM drive
- VGA or higher-resolution monitor
- Mouse, trackball, touch-pad, or compatible Windows XP pointing device
- PC with an available USB slot, to support the USB/RS-422 converter (128932)

Recommended

- The latest Windows XP Service Pack updates should be installed on the PC.

Software

The software requires an RS-422 serial port on the PC and a cable connection to the HPR CNC interface.

The Equipment Tester: CNC RS-422-USB (128932), includes an isolated USB/RS-422 converter, cables and the software driver for connecting a Windows XP-equipped PC to an HPR power supply's CNC interface. The software can only be used with Windows XP.

The USB/RS-422 converter obtains its power from the computer's USB port. The isolated RS-422 port on the HPR control board and the isolated USB/RS-422 converter provide double isolation to help protect the PC from electrical noise generated by the plasma power supply.

Please note the serial COM port assignment. It will be required for step 6 in the software configuration instructions.

Installation

Install two software components: Hypertherm's Power Supply Tools (PST) software and the Windows XP drivers for the USB/RS-422 converter software.

1. The PST software is located on the software CD (081105), in the folder named "\Software\Hypertherm Power Supply Tools." Open the setup.exe file to install.
2. Copies of the software drivers for the USB/RS-422 converter are located on the software CD in the folder "\Software\Drivers," and also on the floppy disk (or CD) supplied with the converter. Install the software by following the instructions provided by the manufacturer. The instructions will ask you to plug the converter into an available USB port on the computer, and then locate the drivers on the CD drive or floppy disk drive.

Note: Ignore the message warning that the "hardware has not passed Windows Logo testing to verify its compatibility with Windows XP". This message only indicates that the software has not gone through the official Windows XP testing at Microsoft. It will work with Windows XP. Click on the Continue Anyway button to complete the installation.

Configuration

Open the Windows control panel after installation. Double-click the System icon to display System Properties. In the Hardware tab, click on the Device Manager button. Expand Ports (COM & LPT) by clicking on the (+) symbol or double-clicking on Ports (COM & LPT). Verify that there is an entry for "Isolated RS-485 Port." Make note of the COM port number that has been assigned. The assigned COM port may be different every time the converter is plugged in.

1. Launch Hypertherm Power Supply Tools.
2. Click the Done button on the Control Information screen. This will bring you to the Cutting screen.
3. Click on the Password button. Enter **4170** at the pop-up menu and click ENTER.
4. For Station 1, enter the following:
Lifter: **None**
Plasma 1: **HPR130 (or HPR)**
Plasma 2: **None**
Marker 1: **HPR130 (or HPR)**
Marker 2: **None**
Laser: **None**
Set all other stations to **None**.
Click Done. This will bring you back to the Cutting screen.
5. Click on the password button. Enter **1396** at the pop-up menu and click ENTER.

- Click on the Ports button. Set Link to HD4070/HPR130 (or HD4070/HPR), and select the appropriate serial COM port (from above) for the RS-422 connection, e.g. for COM4 select Serial 4. Leave Time Out at 5 sec. Click Done.
- Click Watch. Verify that the bottom right side of the window displays the time and PS Link Failed. Turn ON the HPR power supply. The PS Link Failed message should disappear. This indicates that the Hypertherm Power Supply Tools software has successfully established a communications link with the power supply. The TD and RD lights on the converter will blink intermittently, and almost at the same time, at a rate of 1-3 blinks every second.

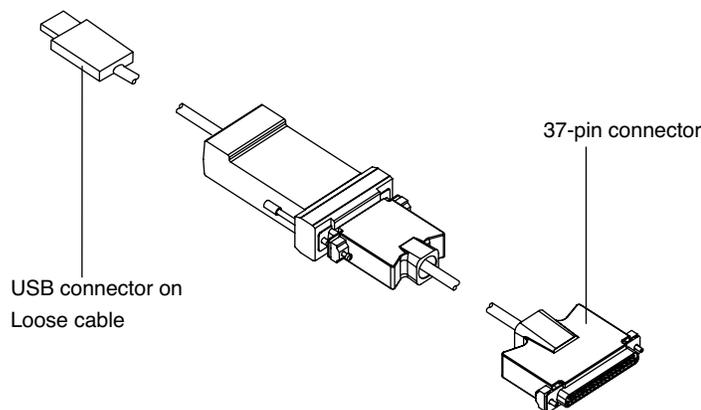
Hardware installation

USB/RS-422 converter – 128932

The converter is designed to plug directly into the CNC interface port of an HPR power supply. It has an attached cable with a 37-pin, D-subminiature (DB37) connector.

Plug the DB37 connector into the HPR control board. You may use either of the connectors on the control board. If one of them is already used, and the remaining connector does not mate with the 128932, a male-to-male adapter may be used. Two adapters (108547) are included in this kit.

The converter is configured to operate in RS-422 mode, 4-Wire configuration with RD always enabled. A loose USB cable (type A to type B) is supplied with the converter. Plug the cable (series B end) into the converter. Plug the USB end (series A) into the computer. The converter can be plugged or unplugged while the power is on, but it is recommended that you only plug or unplug it when the HPR power is off.



Operation

When the hardware and software have been successfully configured, follow these steps to establish a connection between the software and the HPR power supply:

1. Make sure the computer is on and running Windows XP, and the RS-422 port is configured properly. Follow the instructions in the software *Configuration* section of this document.
2. Close the Hypertherm PST Software if it is already running on the computer. Use the system hotkey ALT-F4.
3. Turn OFF the HPR power supply.
4. Launch the Hypertherm Power Supply Tools Software on the computer.
5. Turn ON the HPR power supply.
6. Click the Done button at the default Control Information screen on the computer.
7. Click on the Diagnostics button at the Cutting screen. You will return to the Control Information screen. A new Plasma System button will appear. Communications will be confirmed by an intermittent blinking of the TD and RD lights on the converter.
8. Click on the Plasma System button. This will bring you to the Power Supply Status screen. You can click on buttons to view live status of the power supply and gas console I/O. Live power supply sensor readings are displayed at the default HPR130 Information screen:

Line voltage is calibrated to nominal, 120VAC. The lower limit (102VAC) and the upper limit (138VAC) are displayed for reference. The upper and lower limits are 120VAC +/-15% respectively.

Coolant Flow is measured by the analog flow meter. The minimum required flow of 2.65 lpm (0.7 gpm) and the power-on minimum flow of 3.41 lpm (0.9 gpm) are shown for reference.

PS State Code displays the power supply state. This code corresponds to the code displayed on the manual gas console when the Set Amps toggle switch (8) is set to the Status position.

Last Error Code shows the last error incurred by the HPR system. This code corresponds to the code displayed on the manual gas console when the Set Amps toggle switch (8) is set to the Error position.

Temperatures displays actual chopper, coolant, and transformer temperatures. The lower temperature limit of 60°C and maximum temperature (varies for each sensor) are displayed for reference. All sensors must cool down below the lower temperature limit before operation of the HPR power supply can continue.

Gas Pressures displays live plasma cutflow, plasma preflow, shield cutflow, and shield preflow pressures. The minimum gas pressures (varies for each gas line) and maximum gas pressure of 99 PSI are displayed for reference.

9. Click on the Power Supply Inputs button to show the live status of the power supply inputs. CNC and internal power supply sensors are shown.

Serial Program – Selects between HPR130 and HPR260 applications

Plasma Start – CNC Plasma Start

Hold Ignition – CNC Hold Ignition

Phase OK – Phase-loss detection circuit

Arc Detect – Arc detection circuit

Pierce Complete – CNC Pierce Complete

Corner Current – Reduce plasma current for slower cutting speeds around corners

Redundant Start – Redundant Plasma Start optocoupler input to avoid single-fault failures

Serial ID0, Serial ID1, Serial ID2 – Sets the unique ID for multi-system installations.

10. Click on the Power Supply Outputs button. Enter **1396** at the pop-up password menu, followed by ENTER. A password is required because turning on some outputs may present electric shock hazards. A selection of outputs is presented to allow the manual override of optocoupler outputs and relay drives.

Pilot Arc Relay – Pilot arc relay drive for switching the pilot arc lead in and out of the plasma arc circuit

Marking Surge Relay – Relay drive for switching between the marking surge resistor and the cutting surge resistor

Pilot Arc Enable – Turns on the start circuit optocoupler to allow the start circuit (129791) to support a pilot arc current and control the voltage drop across H8 and H9 to help transfer the arc from the pilot arc lead to the workpiece.

Coolant Pump Motor – Turns on the relay to supply 240VAC to the coolant pump's motor

Soft Start Enable – Reserved for future use

CNC Error – Turns on the CNC Error optocoupler output

CNC Rampdown Error – Turns on the CNC Rampdown Error optocoupler output

Igniter – Turns on the relay to supply 120VAC to the 078172 High-Frequency Ignition console

Contactors – Turns on the relay to supply 120VAC to the contactor actuator coil

CNC Machine Motion – Turns on the CNC Machine Motion optocoupler output

CNC Not Ready For Start – Turns on the CNC Not Ready For Start optocoupler output

Spare Output – Reserved for future use

Note: Use the mouse to click on the toggle switches to turn on specific outputs. You may also use the TAB key to move among the selections, and the SPACE key to toggle each output between On and Off.

11. Click on the gas console inputs button to show the live status of the gas console inputs, of a gas console is connected.

Error select – The SET AMPS toggle switch (8) is in the ERROR position

Status select – The SET AMPS toggle switch (8) is in the STATUS position

Test preflow – The RUN toggle switch (7) is in the SET PREFLOW (3-4) position

Test cutflow – The RUN toggle switch (7) is in the SET CUTFLOW (5-6) position

Serial ID0, serial ID1, serial ID2 – Reserved for future use

12. Click on the Gas Console Outputs button. If asked for a password, enter **1396** at the pop-up password menu, followed by ENTER. You may not be asked for a password if you have already entered one for the Power Supply Outputs screen earlier in the session. All outputs available are relay drives to turn on 120VAC gas solenoid valves SV1 through SV20.

Note: Use the mouse to click on the toggle switches to turn on specific outputs. You may also use the TAB key to move among the selections, and the SPACE key to toggle each output between On and Off.

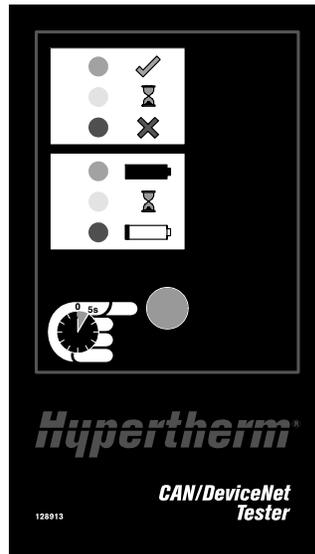
Troubleshooting

1. If PS Link Failed is still displayed, you may need to perform a hardware reset on the computer's serial port or converter. The quickest way to do this is to turn OFF the HPR power supply, unplug the USB cable from the converter to the computer (either end of the USB cable will work), plug the USB cable back in, and turn ON the HPR power supply.
2. If the computer goes into Standby or Hibernate mode automatically, the serial port may require a hardware reset after resuming operation from one of these modes. Especially on laptop computers, turn off or disable any automatic Standby, Hibernate, or Power off modes to avoid losing the PS Link. This is usually done with Power Options in Windows XP Control Panel. In Power Options, select the Power Schemes tab, and set System standby and System hibernates to Never. Alternatively, set Power Schemes to Always On.
3. If PS Link Failed cannot be resolved using the methods described above, try to force both the USB converter and Power Supply Tools software to COM3.

- 3.1 Exit the Power Supply Tools software by pushing ALT-F4, if it is running, but leave the HPR power supply with the power ON.
- 3.2 Go to Device Manager under the Hardware tab in the Windows XP Control Panel. Expand the Ports (COM & LPT) entry. Right-click on Isolated RS-485 Port (COMx), then click on properties. Change the port assignment using the Advanced button under the Port Settings tab. Click on the drop-down list for the COM Port Number to select COM3. If it is already set to COM3, change it to a different COM port, then change it back to COM3. If COM3 (in use) is displayed, you may have another serial port plugged in to COM3 or COM3 has not been released by another Windows application (HyperTerminal may still be using COM3 or the PC was previously shut down, or entered power-saving mode, when Power Supply Tools was still running). If COM3 is still in use after repeated attempts to change to it, select the next available COM port in place of COM3. Click OK as needed and close Control Panel when finished. To be sure the USB converter uses the new COM port assignment, unplug the USB converter from the PC and then plug it back into the same USB port.
- 3.3 Launch the Power Supply Tools software. Click on the Password button. Enter 1396 in the pop-up menu and click ENTER.
- 3.4 Click on the Ports button. Set Link to HD4070/HPR130 (or HD4070/HPR) and select COM3. Click Done.
- 3.5 Close the Power Supplies Tools software by using the ALT-F4 keys. Reopen the Power Supplies Tools software.
- 3.6 Click Watch. If the bottom right side of the window displays PS Link Failed again, close the Power Supplies Tools software by using the ALT-F4 keys, unplug the USB cable from the PC, wait 5 seconds, plug the USB cable back into the PC and reopen the Power Supplies Tools software.

You may need to repeat the series of steps shown above one or more times to get the Power Supplies Tools software to synchronize the COM port selection with the USB converter. If the procedure still does not work after 3 consecutive attempts, then the Power Supplies Tools software may have a corrupted configuration file and you will need to contact Hypertherm for the latest version of the software.

HPR CAN loop-back tester – 128913



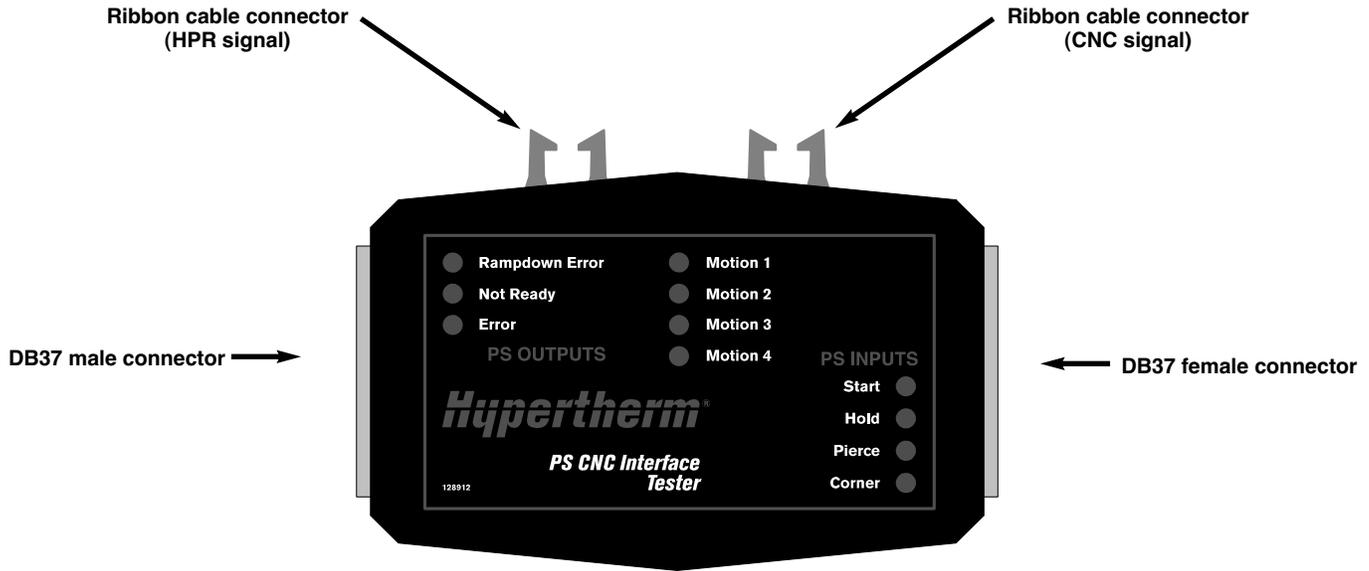
The loop-back Tester uses an internal 9V alkaline battery (not included) as the power source. It contains LEDs to indicate test status and the loop-back tester’s battery level. The battery powers the on-board DSP controller for communications, and eliminates the need to obtain power from the CAN port at the HPR Power Supply Control Board.

A momentary pushbutton is used to perform the CAN test and battery level functions. When the pushbutton is released, the CAN tester will be disconnected from the batteries, and use zero power. The independent Battery Level test and the CAN loop-back test are performed at the same time. Any test is valid as long as any of the battery LEDs are on. A 9V alkaline battery should be able to run for 5 hours continuously with the button held in the active position. A new battery should perform over 1000 test cycles, assuming that the button is held down for 10-15 seconds for each test cycle. Alkaline batteries are recommended. A carbon-zinc or a NiMH rechargeable battery can also be used, but may result in shorter battery life.

LED indicators

LED color	CAN test status	Battery level
No lights	Off	Empty/Missing/incorrect
Red	Fail	Low/replace soon
Yellow	Testing	Testing
Green	Pass	Good

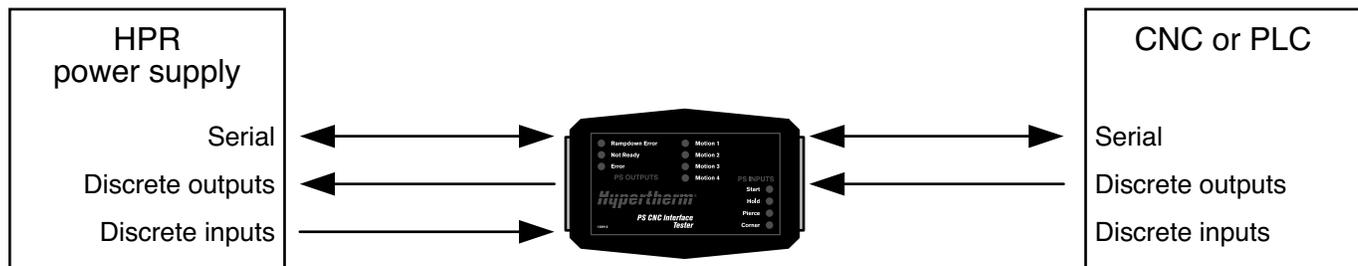
HPR CNC interface tester – 128912



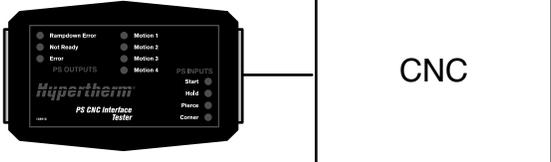
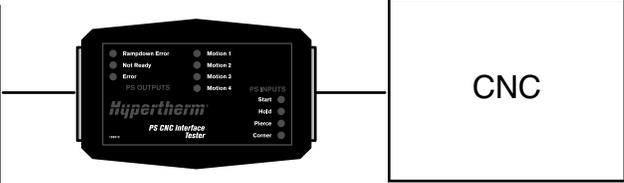
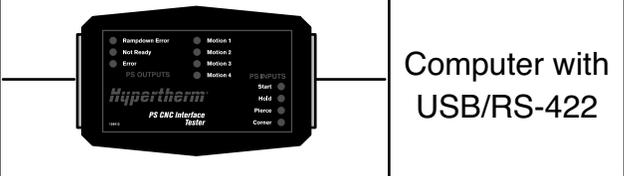
The HPR CNC Interface Tester indicates which discrete CNC inputs and outputs have been turned on by the HPR Power Supply control board or CNC. It has a DB37 male connector on the left side, a DB37 female connector on the right side and two ribbon cable connectors on the top edge.

The ribbon cable connectors can be used individually to monitor the RS-422 signals from the HPR or the CNC. They can also be used together to allow a computer to monitor the RS-422 signals in both directions at the same time. Two RS-422 serial ports and Microsoft’s “Hyperterminal” software (included in Windows XP) are required to use this optional feature.

The CNC Interface Tester is a unidirectional tester. The male connector should be connected to the HPR Control board, and the female connector should be connected to the CNC. The power supply outputs are not passed through to the CNC. The RS-422 and power supply inputs are both pass-through configurations.



The table below shows the tests that can be performed for different configurations.

Configuration		Test coverage
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">HPR power supply</div> 		HPR discrete outputs (limited)
		CNC discrete outputs
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">HPR power supply</div> 		HPR discrete outputs HPR discrete inputs CNC discrete outputs RS-422 serial
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">HPR power supply</div> 		HPR discrete outputs RS-422 serial

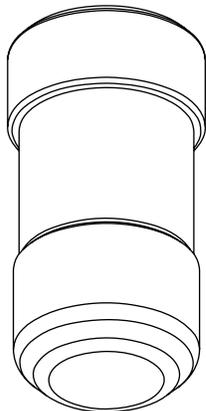
Gas pressure test gauge kit – 128812

The kit contains 2 pressure gauges and a field service bulletin. See field service bulletin (804540) for instructions.



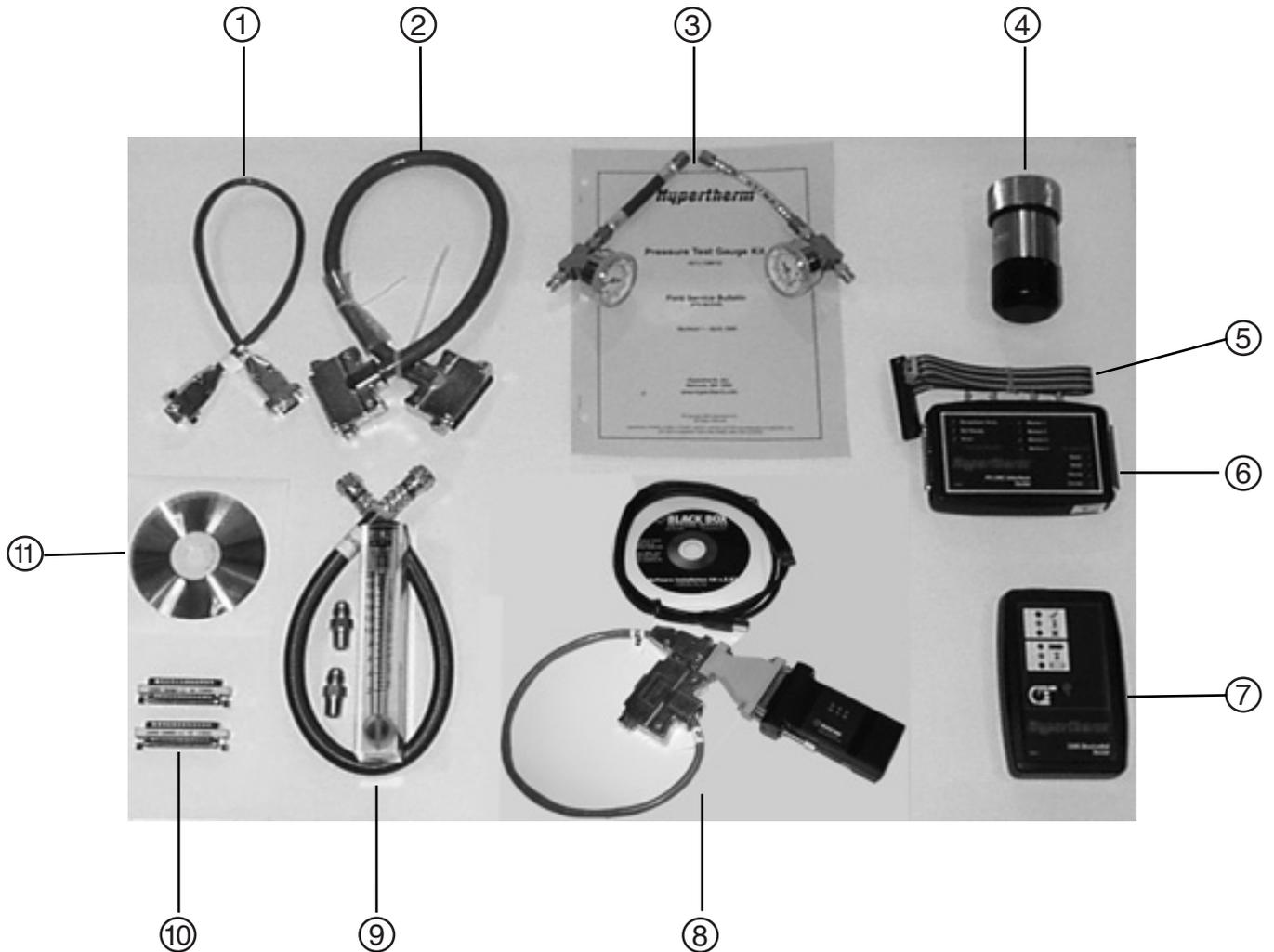
Test torch – 129982

1. Install the test torch.
2. Set the system to preflow or cutflow.
3. Turn OFF the supply gases.
4. The pressure displayed on the gas console or CNC will remain constant if there are no leaks in the system.



Parts list

Item	Part Number	Description	Qty
1	123759	Cable: 9-position CAN DSUB - 0.5M (1.5')	1
2	123760	Cable: 37-position male/female DSUB - 0.6m (2')	1
3	128812	Kit: pressure test gauges FSB: pressure test gauge kit Gauge assembly: pressure test	1 1 1
4	129982	Test torch	1
5	123782	Cable: CNC interface tester	1
6	128912	Equipment tester: CNC interface tester	1
7	128913	Equipment tester: CAN/DEVICENET tester	1
8	128932	Equipment tester: CNC RS-422, USB	1
9	128933	Flow meter assembly: coolant	1
10	108547	Adapter: 37-position male/male DSUB	2
11	081105	Software: HPR field service tool kit	1



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