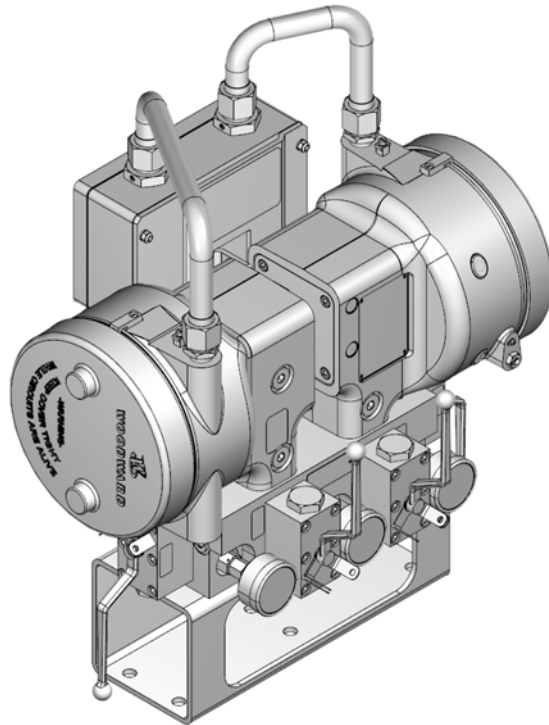




**Individual CPC-II Converter Replacement Procedure 26824
(Revision NEW)
Original Instructions**



**CPC-DX
Current to Pressure Converter
Dual Transfer Skid,
Individual CPC-II Converter Replacement Procedure**



General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.



Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

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The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.




Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.



Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with . Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

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Manual 26615

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Warnings and Notices

Important Definitions



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

WARNING

On-Line Modification,
Reconfiguration or
Start-Up

The configuration and dynamic settings for CPC-II converters must be precisely matched prior to engaging in concurrent “live” (on-line) operation or “live” transition between converters on an end application. Failure to precisely match and tune the configuration of converters to the proper control range prior to engaging in a “live” (on-line) replacement could result in turbine overspeed, loss of control, plant shutdown, property damage and severe bodily injury, including death.

Proper converter configuration and dynamic settings are unique to specific end applications. It is the responsibility of the end user to determine the specific configuration and dynamic settings necessary for each specific converter application. This CPC-II Unit Replacement Procedure is a guideline that is dependent upon user-supplied configuration and dynamic setting data. Because of the variability of end applications, Woodward makes no warranty, express or implied, as to the suitability of this procedure for any given “live” installation.

End users must develop site procedures suitable for specific end applications, and ensure that personnel are fully trained on such procedures prior to attempting to replace a converter on a “live” running turbine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start of an on-line replacement procedure. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts located in the area of control of the CPC-II.

! WARNING

Overspeed /
Overtemperature /
Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

! WARNING

Personal Protective
Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- Eye Protection
- Hearing Protection
- Hard Hat
- Gloves
- Safety Boots
- Respirator

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

! WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

! WARNING

Overspeed /
Overpressure

Never close the drain line when supply pressure is present on the CPC unit, otherwise the control output pressure can increase suddenly and cannot be controlled by the input setpoint. This could cause the turbine to overspeed. The supply pressure isolation valve and the control pressure isolation valve should always be closed prior to closing the drain line.

! WARNING

Never disconnect redundancy linkage between CPCs when both units are powered.

 **WARNING**

Only trained personnel are allowed to work on this device during operation.

NOTICE

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Battery Charging Device

IMPORTANT

It is recommended when performing the removal of a CPC-II converter from the CPC-DX skid that the isolation valves be secured with appropriate locks and tags, in accordance with the installation sites safety procedures.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).
- Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.
- Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual **82715**, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
 - Do not touch any part of the PCB except the edges.
 - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
 - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Special Conditions for Safe Use

Wiring must be in accordance with North American Class I, Division 1 or 2, or European Zone 1, Category 2 or Zone 2, Category 3 wiring methods as applicable, and in accordance with the authority having jurisdiction.

Field wiring must be suitable for at least 85 °C and 10 °C above the maximum fluid and ambient temperatures.

The CPC-DX must be used in an ambient temperature range from -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$).

The working fluid temperature must be in range $+15$ to $+70^{\circ}\text{C}$ ($+59$ to 158°F).

For proper operation and safety, ensure the safety ground is properly terminated to a proper earth ground.

Compliance with the Machinery Directive 2006/42/EC noise measurement and mitigation requirements is the responsibility of the manufacturer of the machinery into which this product is incorporated.

 **WARNING**

Explosion Hazard—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 2 applications.

 **AVERTISSEMENT**

Risque d'explosion—Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 1 ou 2 ou Zone 2.

Chapter 1.

General Information

Definitions and used abbreviations

CPC-DX – Current to Pressure Converter Dual Transfer Skid

CPC-II – Current to Pressure Converter

Master / Slave – The unit designated as the Master has yielded control to the other unit (Slave) by link between the two CPC-IIs. The Unit designated as the Master will take control during CPC-DX startup.

In Control – The unit actually controlling the position of the servo system

Not In Control – The unit acting as the backup to the In Control unit

DCS – Distributed Control System

CCW – Counter Clockwise

CW – Clockwise

List of Woodward Reference Literature

Manual 26455 –	Customer Publication Cross Reference and Revision Status & Distribution Restrictions
Product Manual 26615 –	CPC-II Current-to-Pressure Converter with Enhanced Dynamics
Reference Manual 26455 –	Woodward Energy Segment Customer Publications: Cross-Reference by Application Revision Status & Distribution Restrictions
Product Manual 26758 –	CPC-DX Current to Pressure Converter Dual Transfer Skid
CPC-II Unit replacement Procedure 26824 –	CPC-DX Current to Pressure Converter Dual Transfer Skid, CPC-II Unit replacement procedure
Manual 82715 –	Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, & Modules

Woodward software-download section website
(www.woodward.com/searchpublications).

List of Woodward Required Software

9927-1885 –	CPC-II PC Service Tool
--------------------	------------------------

Woodward software-download section website
www.woodward.com/software.

List of Required Hardware or Materials

Torque wrench(es)	Installation required torques ranges, wrench end type and size
	<ul style="list-style-type: none"> • 100.0 – 128.0 lbf-ft (136 – 174 Nm), Type: Open End; Size: 1 1/2 in • 56.0 – 64.0 lbf-ft (76 – 87 Nm), Type: Open End; Size: 1 3/8 in • 20.0 – 25.0 lbf-ft (27.0 – 34 Nm), Type Hex Head; Size 8 mm
Wrench(es)	<ul style="list-style-type: none"> • Type: Open End; Size: 1 1/2 in • Type: Open End; Size: 1 3/8 in • Type Hex Head; Size 8 mm
	Installation required torques ranges, screwdriver end type and size
Torque Screwdriver(s)	<ul style="list-style-type: none"> • 5.3 – 7.0 lbf-in (0.6 – 0.8 Nm), Type: Slotted; Tip Size: 0.6 x 3.5 mm • 35 – 39 lbf-in (3.9 - 4.4 Nm) Type: Slotted; Tip Size 6.5 X 1.2 mm • 22.0 – 26.5 lbf-in (30 – 36 Nm) Type: Phillips; Tip Size: PH 3
	<ul style="list-style-type: none"> • Type: Slotted; Tip Size 3.5 X 0.6 mm • Type: Slotted; Tip Size 6.5 X 1.2 mm • Type: Type: Phillips; Tip Size: PH 3
Screwdriver(s)	<ul style="list-style-type: none"> • Type: Slotted; Tip Size 3.5 X 0.6 mm • Type: Slotted; Tip Size 6.5 X 1.2 mm • Type: Type: Phillips; Tip Size: PH 3
	<ul style="list-style-type: none"> • RS-232 cable (male connector- both ends) • Multimeter • Insulation tape • Cable ties (approx. 8 inch (200 mm) long) • Oil absorbent pads / mats • Lifting strap (minimum capacity 100 lbs / 50 kg) • Cable Tie Removal Tool • PC computer with Woodward PC Service Tool installed • beam (approx. 40x100 mm, 1 meter long (2x4 inch; 3.3 ft. long))
Others	

Introduction

The CPC-DX is a complete packaged and tested assembly which consists of two Woodward current-to-pressure converters (CPC-II's) connected together to a single manifold with all interconnect piping, gauges and wiring included and factory tested.

The two CPC-II's are mounted to an anodized aluminum manifold containing the transfer valve, isolation valves and pressure test points. The manifold and CPC-II's are mounted to a steel support frame.

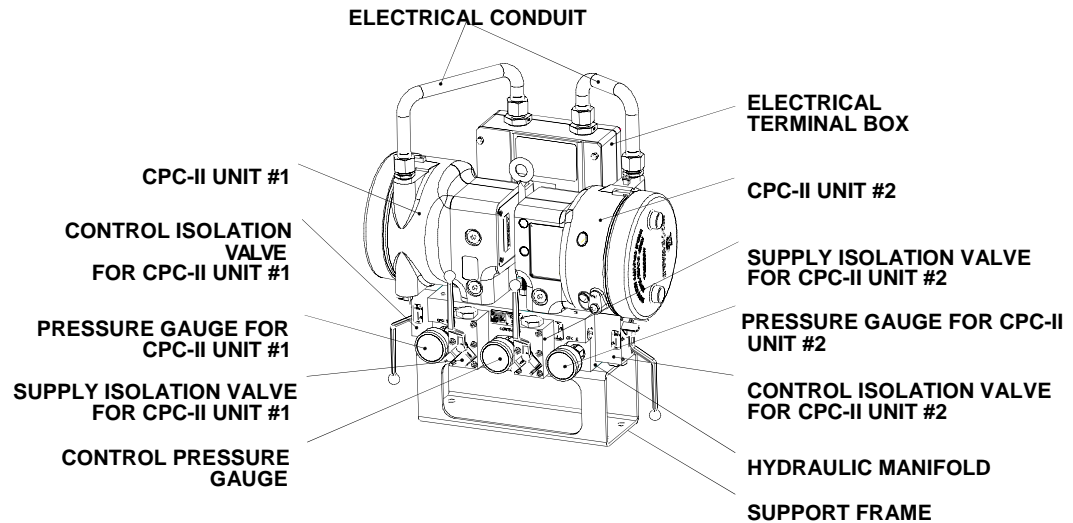


Figure 1-1. CPC-DX main components.

The complete assembly is designed for use in a hazardous environment, see Manual **26758** for more details.

Integrated oil pressure gauges allow users to visually verify which CPC-II is in control and check the CPC-DX output oil header pressure level. Discrete output relay contacts also can be connected to system indication (lights, lamps, plant DCS) to assist with system health monitoring.

The CPC-DX uses a specially designed fast-switching hydraulic valve to ensure minimal control switchover time and minimal system control pressure disturbance. This special valve allows the pressure converter with the highest pressure output to control the process, while blocking the output pressure of the converter with the lower pressure output.

The CPC-DX ports are represented as **SUPPLY** for the supply oil port, **DRAIN CPC 1** and **DRAIN CPC 2** for the drain (tank) lines, and **CONTROL** for the CPC-DX control oil connection to the control system.

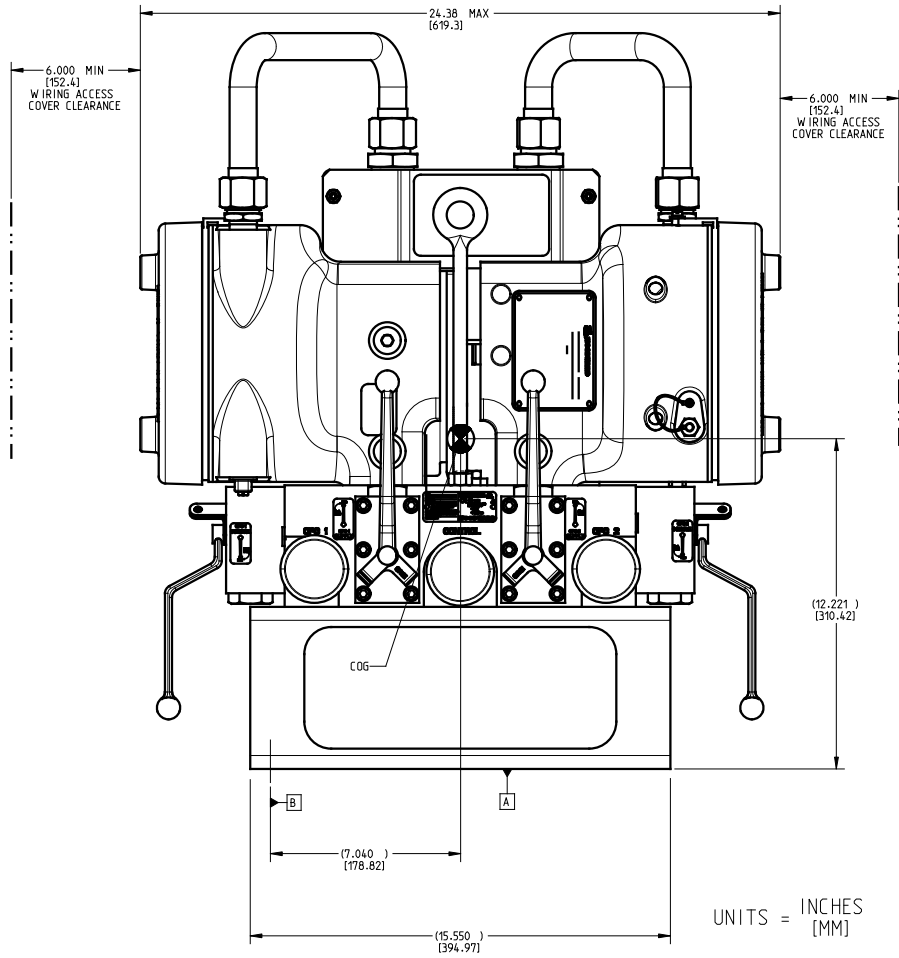


Figure 1-2. CPC-DX Installation Drawing, Front view.

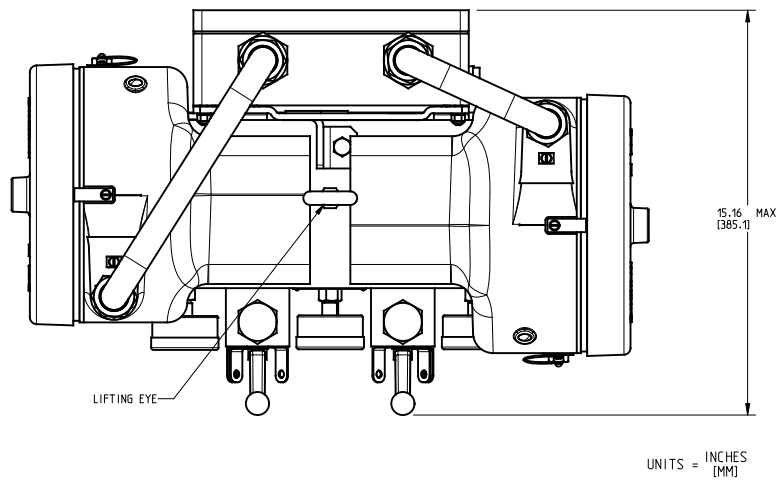


Figure 1-3. CPC-DX Installation Drawing, Top view.

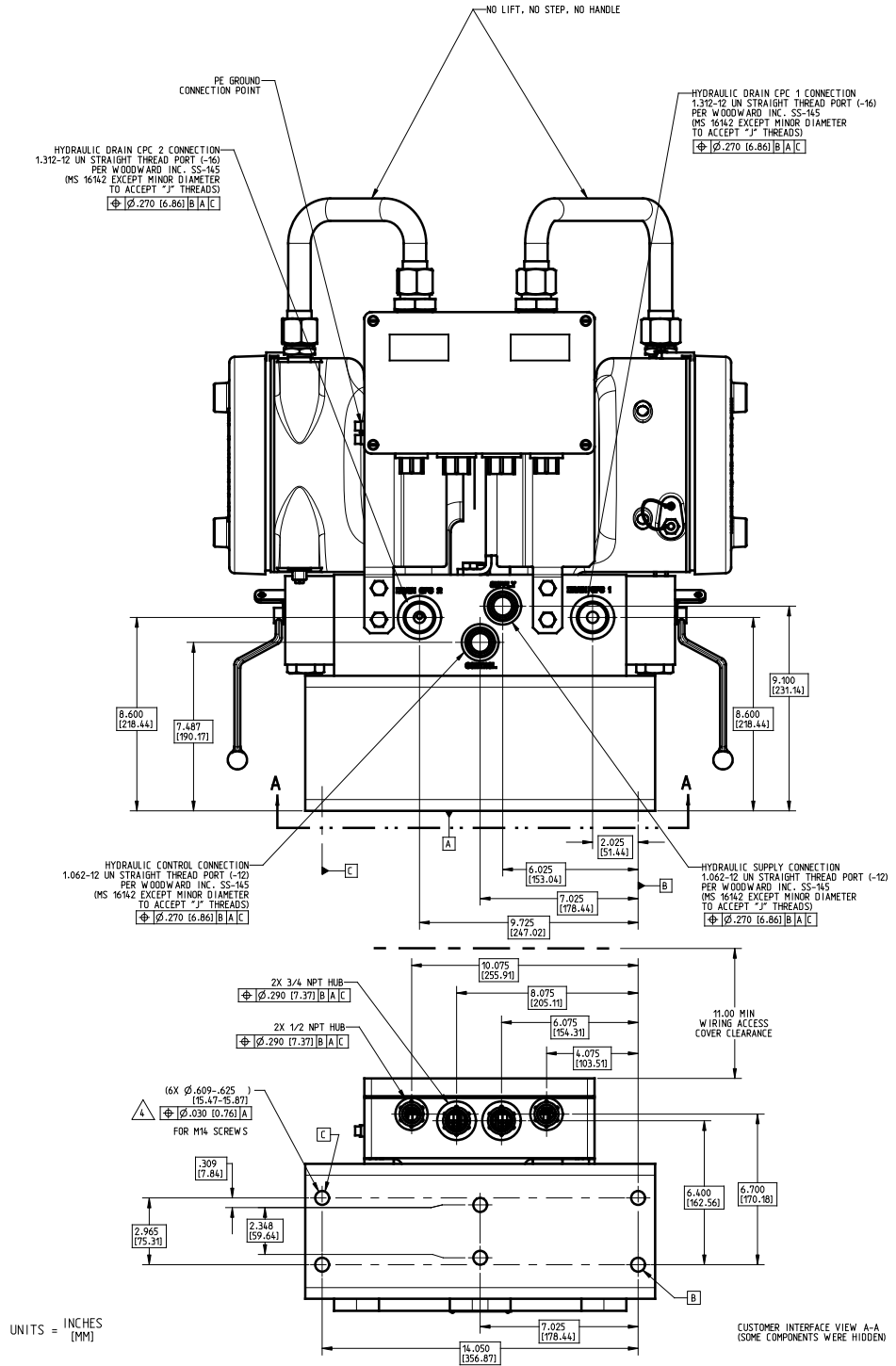
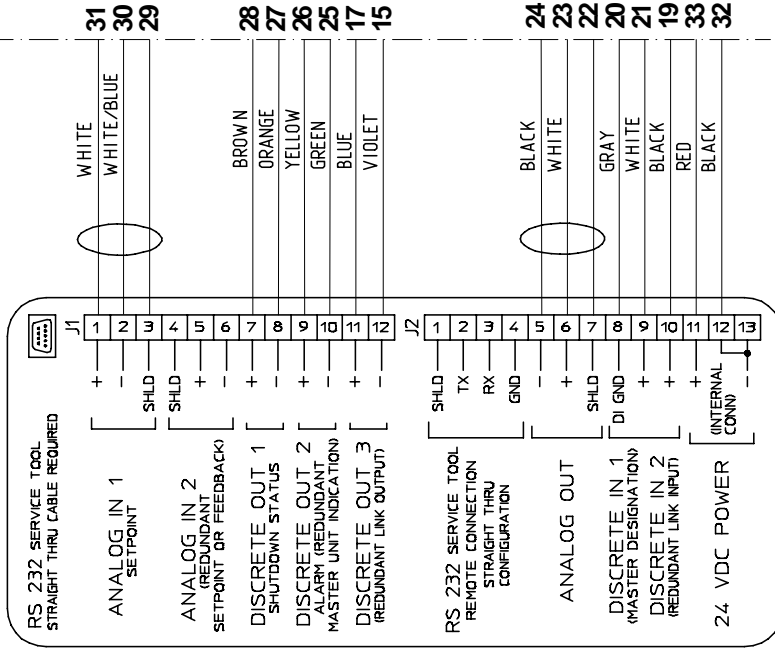


Figure 1-4. CPC-DX Installation Drawing, customer interface view.

CPC-II Unit#1 TERMINALS

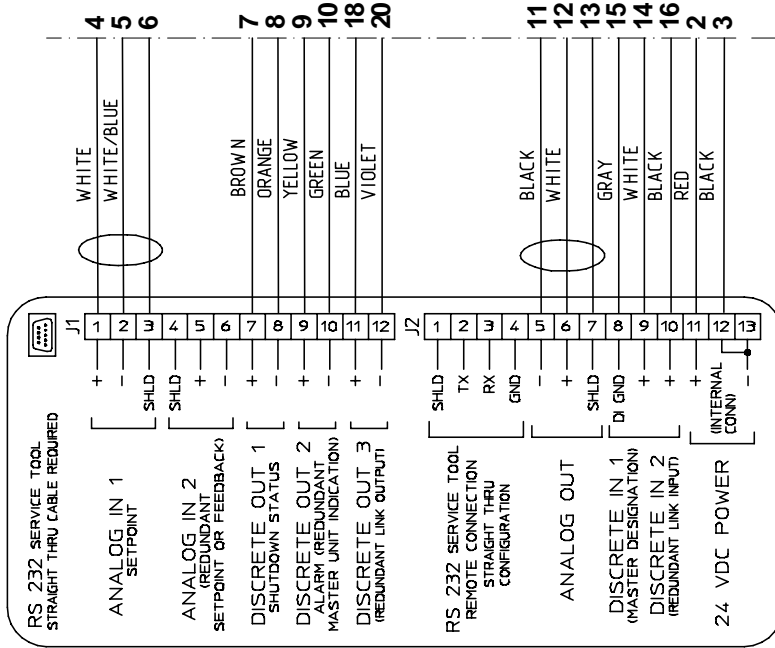
GND GREEN/YELLOW
SCREW



WIRES TO J-BOX

CPC-II Unit#2 TERMINALS

GND GREEN/YELLOW
SCREW



WIRES TO J-BOX

Figure 1-5. CPC's wiring diagram

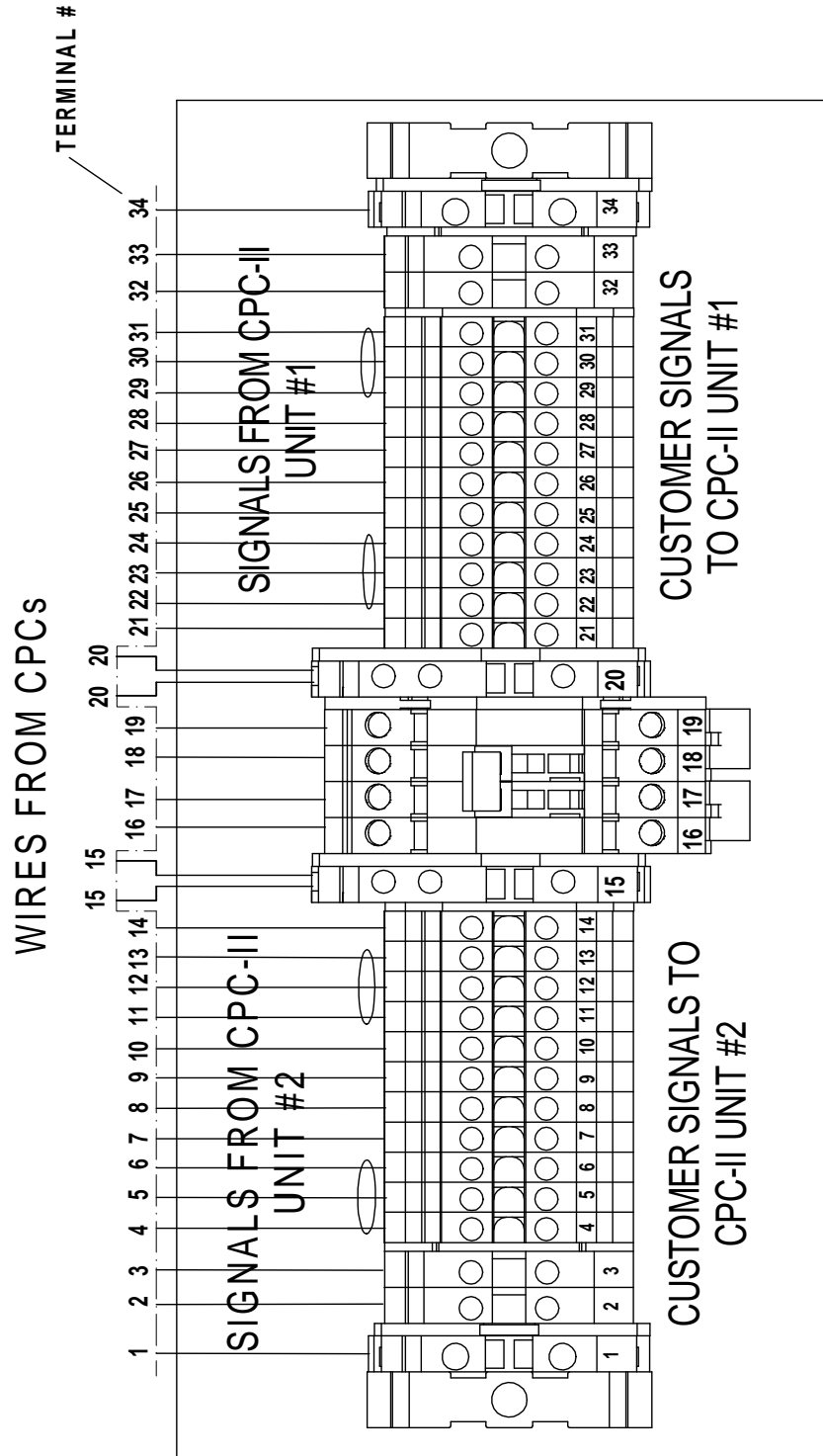


Figure 1-6. Electrical Terminal Box, wiring diagram

Chapter 2.

Online CPC-II unit replacement

WARNING

On-Line Modification,
Reconfiguration or
Start-Up

The configuration and dynamic settings for CPC-II converters must be precisely matched prior to engaging in concurrent “live” (on-line) operation or “live” transition between converters on an end application. Failure to precisely match and tune the configuration of converters to the proper control range prior to engaging in a “live” (on-line) replacement could result in turbine overspeed, loss of control, plant shutdown, property damage and severe bodily injury, including death.

Proper converter configuration and dynamic settings are unique to specific end applications. It is the responsibility of the end user to determine the specific configuration and dynamic settings necessary for each specific converter application. This CPC-II Unit Replacement Procedure is a guideline that is dependent upon user-supplied configuration and dynamic setting data. Because of the variability of end applications, Woodward makes no warranty, express or implied, as to the suitability of this procedure for any given “live” installation.

End users must develop site procedures suitable for specific end applications, and ensure that personnel are fully trained on such procedures prior to attempting to replace a converter on a “live” running turbine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start of an on-line replacement procedure. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts located in the area of control of the CPC-II.

WARNING

Overspeed /
Overtemperature /
Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

Before starting CPC-II unit replacement procedure make sure that following steps are fulfilled:

- All site safety procedures are observed. The environment surrounding the CPC-DX skid must be ventilated to a non-hazardous combustion level before removing the CPC-II cover or CPC-DX electrical terminal box cover or performing any other steps below.

**WARNING**

Explosion Hazard—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

- CPC-II Settings File back-up is created on fully functional configured and tuned previously unit.

To create a new settings file from CPC-II:

Using PC Service Tool go to the Settings tab, from pull down menu select “Save from Device to File” and save to an appropriate folder on your computer.

See Woodward manual **26615** for more details.

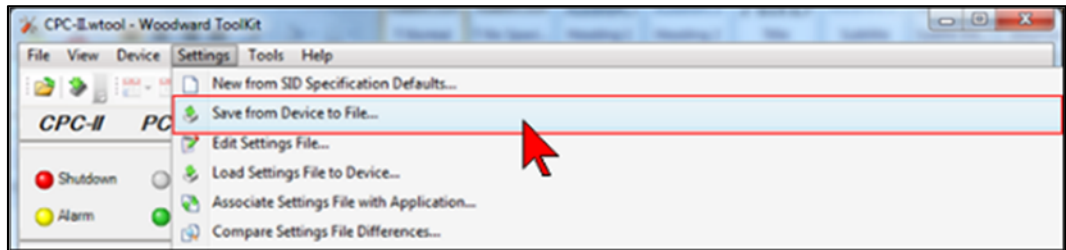



Figure 2-1. Saving CPC-II Settings File (creating back-up).

IMPORTANT

It is good practice to make a back-up file which can be used to restore the original settings should a problem occur with new settings or replacement for a new unit.

System preparation prior to CPC-II unit replacement.

2.1 VERIFY WHICH UNIT IS CURRENTLY CONTROLLING THE PROCESS / SERVO.

 WARNING	<p>“Master/Slave” indication shows only which unit is designated for primary operation from the control system. Because it is possible for the slave to be in control, it is necessary to confirm which unit is controlling the skid output via the external gages and the “In Control” discrete output status.</p>
--	--

It is possible to verify which unit currently is In Control in several ways (see below points A, B, C):

A. The system control pressure will be indicated on the center gage (marked on hydraulic manifold with “CONTROL”).

The CPC-II currently controlling process will have a matching pressure indicated on its gage (markings on hydraulic manifold: CPC-II Unit #1 pressure gauge marked with “CPC 1”, CPC-II Unit #2 pressure gauge marked with “CPC 2”). The unit Not In Control or Failed should indicate a lower or zero (0) pressure.

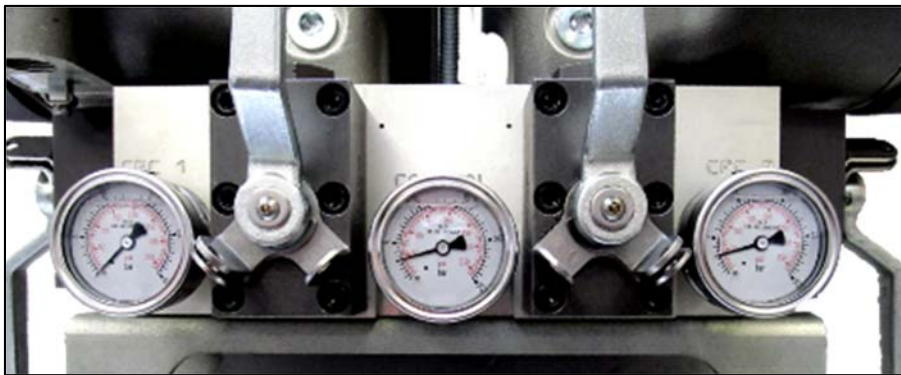


Figure 2-2. Unit In Control verification using CPC-DX pressure gauges.

As shown in figure 2-3 below, the unit on the right (CPC 2) is in control and the unit on the left (CPC 1) is not in control. In figure 2-4, the unit on the left (CPC 1) is in control and the unit on the right (CPC 2) is shut down.

UNIT IN CONTROL

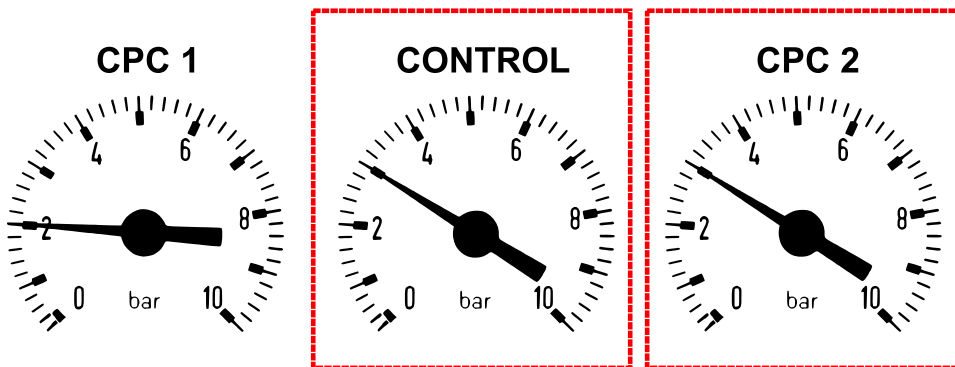


Figure 2-3. Unit In Control verification using CPC-DX pressure gauges (Case: CPC-II Unit #1 and Unit #2 operate).

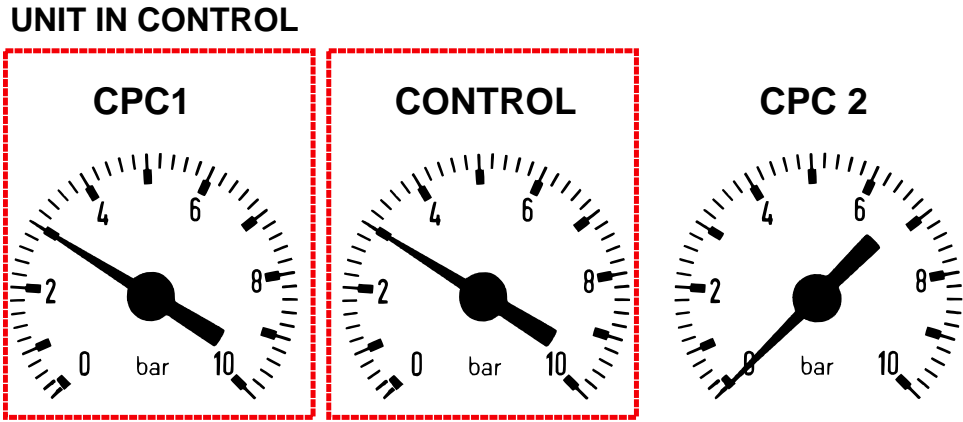


Figure 2-4. Unit In Control verification using CPC-DX pressure gauges
(Case: CPC-II Unit #1 operates and Unit #2 shut-down).

- B. Check indication in control room which unit is in control (discrete output 2 for CPC-II must be configured as in control / not in control status).
- C. Use a switching device (e.g. switch relay - not provided with the CPC-DX assembly) to designate master for the unit currently keeping control.

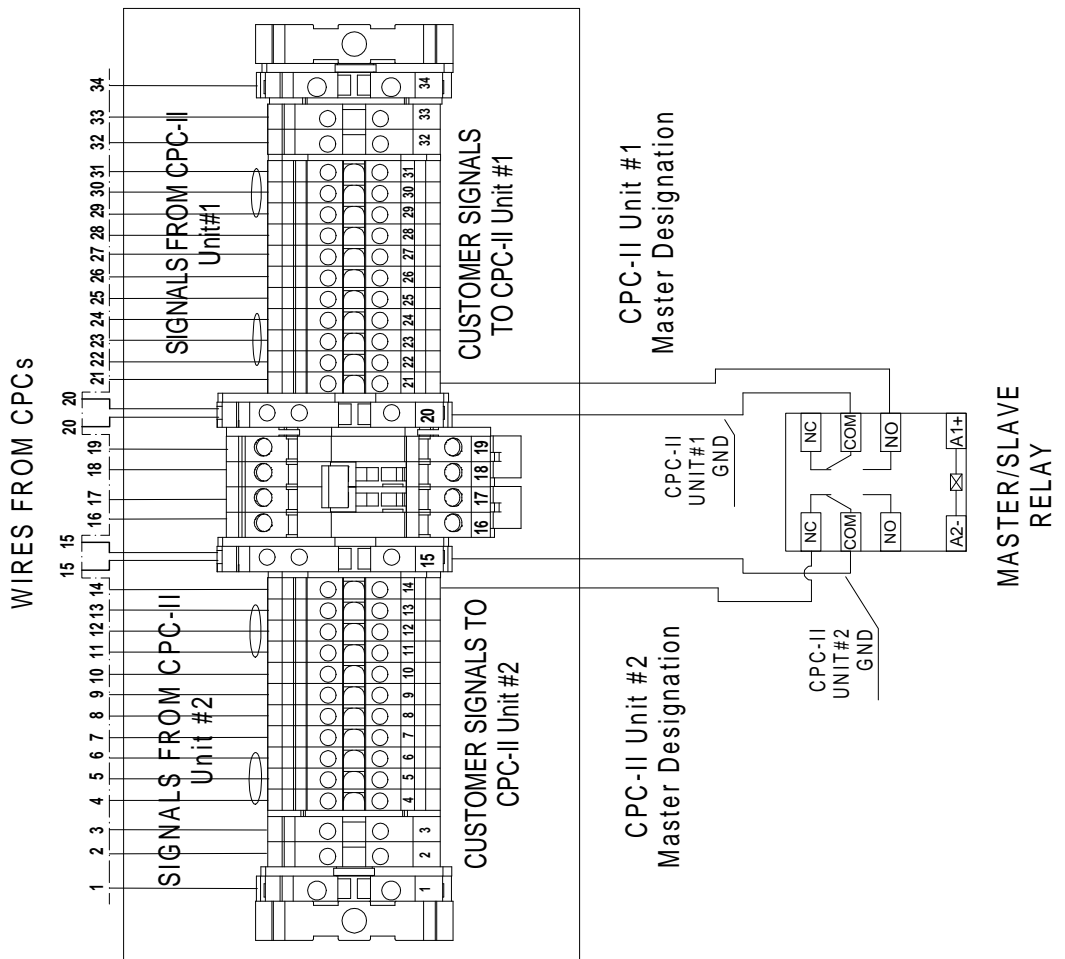


Figure 2-5. Wiring Connections for Master Designation

2.2 SHUT DOWN THE CONTROL SIGNAL FROM THE PROCESS CONTROLLER TO THE UNIT TO BE REPLACED.



For proper operation and safety, ensure which unit have to be shut down. Wrong action can cause turbine shut down and in some cases serious damage.

2.3 SHUT DOWN POWER TO THE UNIT TO BE REPLACED.

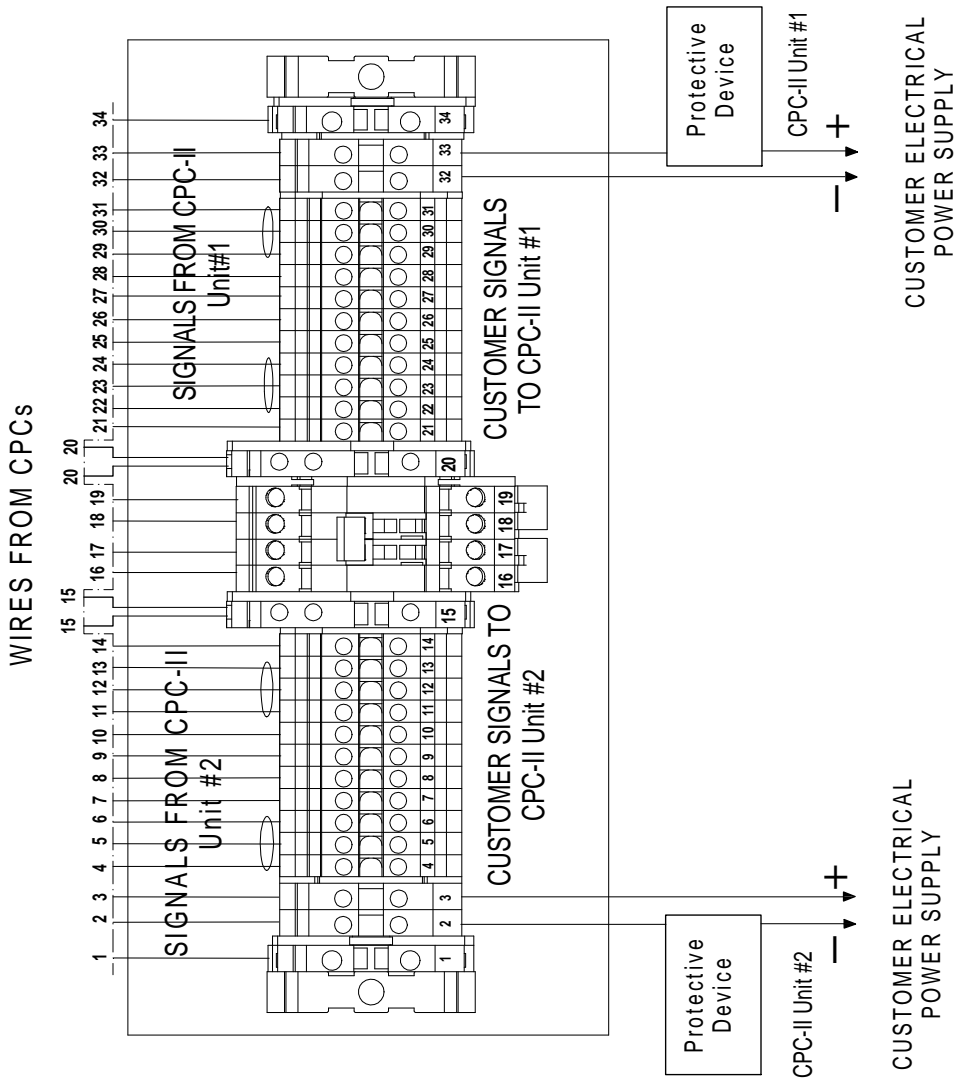


Figure 2-6. Power Supply Input Connections

2.4 CLOSE THE CONTROL ISOLATION VALVE FOR THE UNIT TO BE REPLACED AND LOCKOUT.

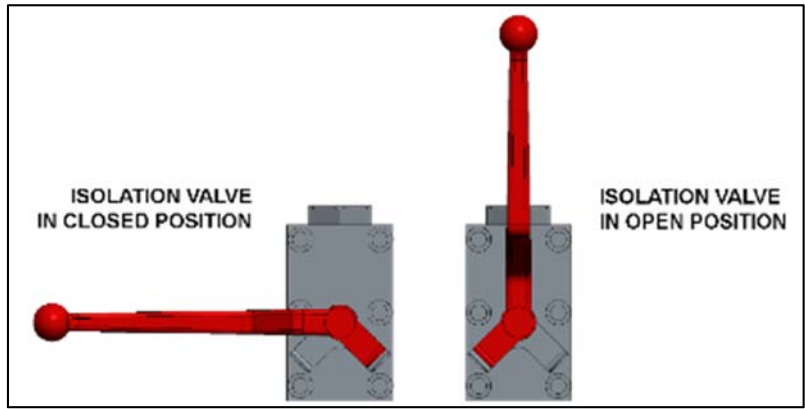


Figure 2-7. Isolation valve OPEN / CLOSED lever position

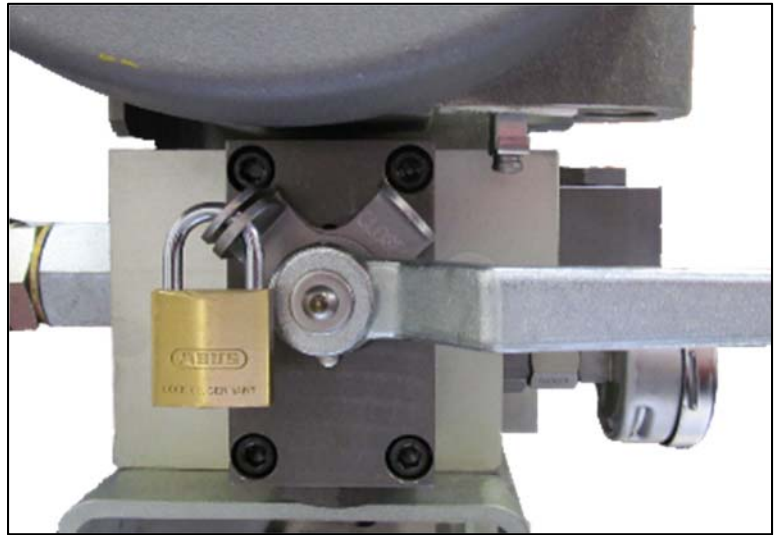


Figure 2-8. Control Isolation valve CLOSED and locked-out with padlock
(lock not provided with the CPC-DX unit)

Additionally valve position OPEN/CLOSED could be verified by markings on valve locking plate (see figure 2-9.).

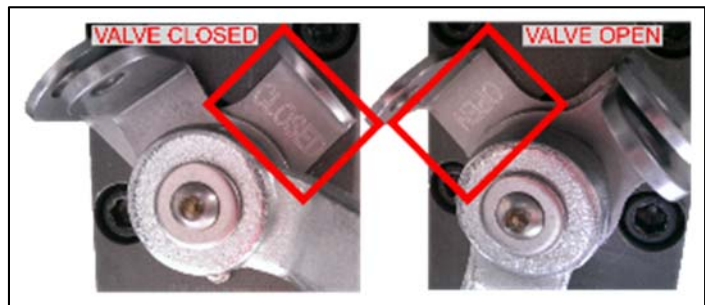


Figure 2-9. Open/ Close markings on isolation locking plate.

2.5 CLOSE THE SUPPLY ISOLATION VALVE FOR THE UNIT TO BE REPLACED AND LOCKOUT.

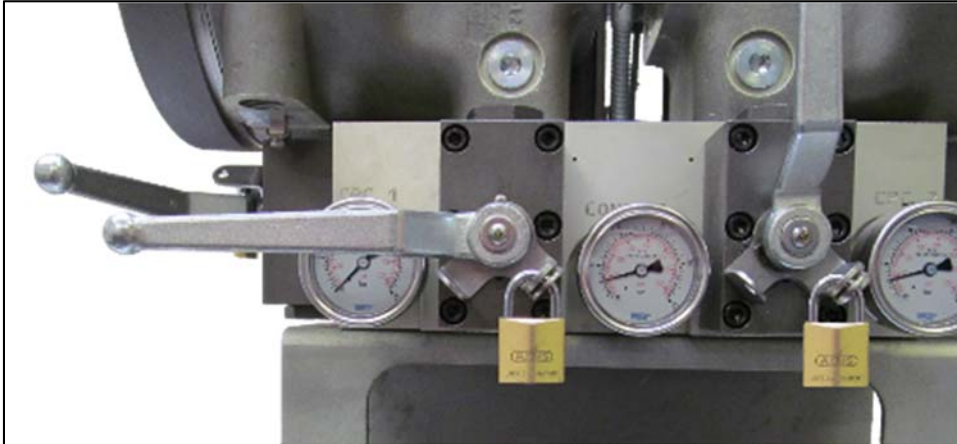


Figure 2-10. Supply Isolation valves CLOSED and locked-out with padlock
(not provided with CPC-DX unit)

2.6 CLOSE THE DRAIN ISOLATION VALVE FOR THE UNIT TO BE REPLACED (IF PRESENT) ON THE MANIFOLD DRAIN.

IMPORTANT

During replacement procedure close and lock – out the drain port in case of positive back pressure.

! WARNING

Overspeed /
Overpressure

Never close the drain line when supply pressure is present on the CPC unit, otherwise the control output pressure can increase suddenly and cannot be controlled by the input setpoint. This could cause the turbine to overspeed. The supply pressure isolation valve and the control pressure isolation valve should always be closed prior to closing the drain line.

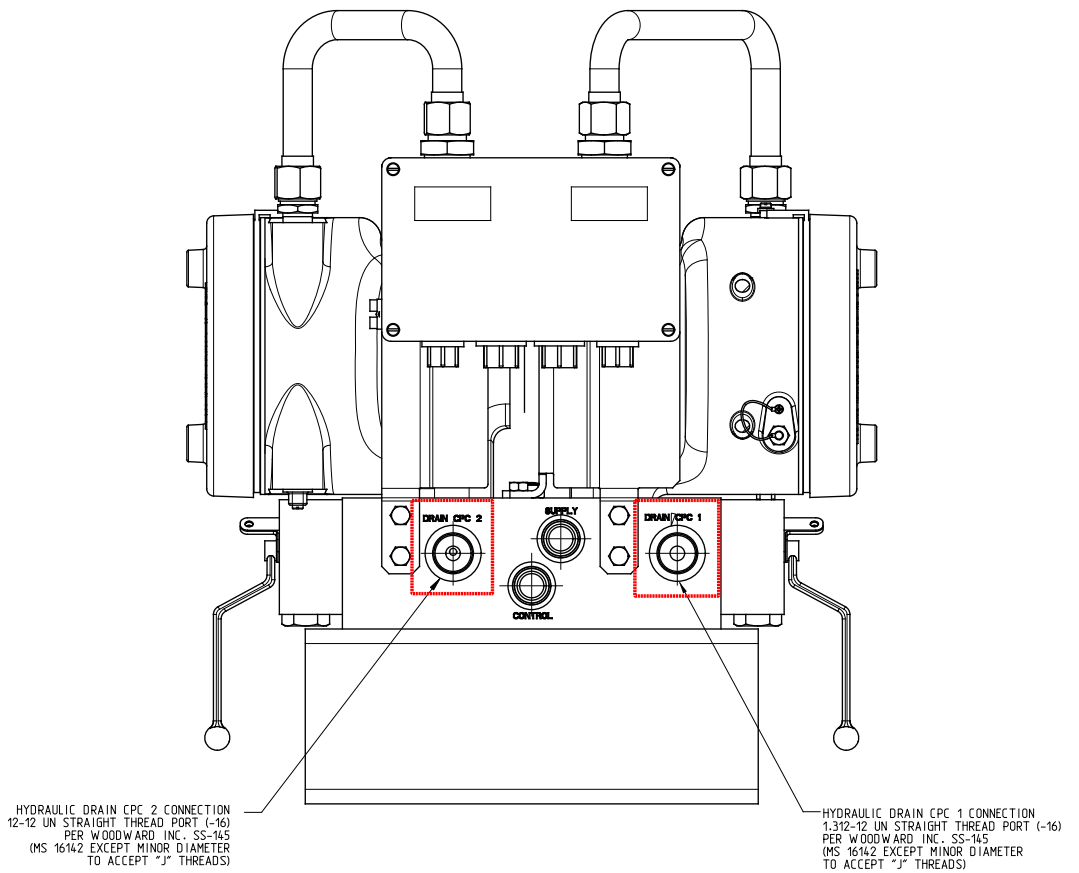


Figure 2-11. CPC-DX Installation Drawing, Drain ports location

CPC-II Unit disassembly from the CPC-DX Skid

WARNING

Never disconnect redundancy linkage between CPCs when both units are powered.

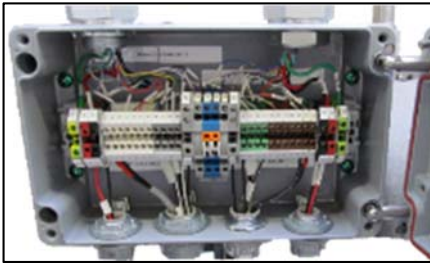
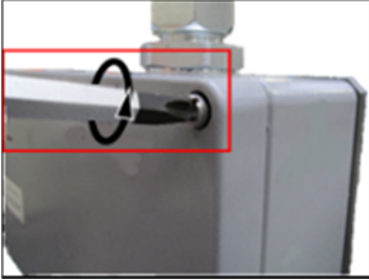
NOTICE

When you disconnect CPCs health link, the operating CPC will indicate Redundancy Fault alarm:

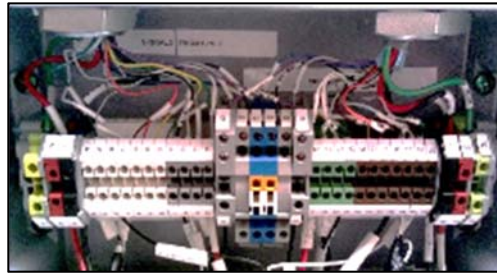
 Redundancy Fault

3.1 DISCONNECT HEALTH LINK (REDUNDANCY LINKAGE).

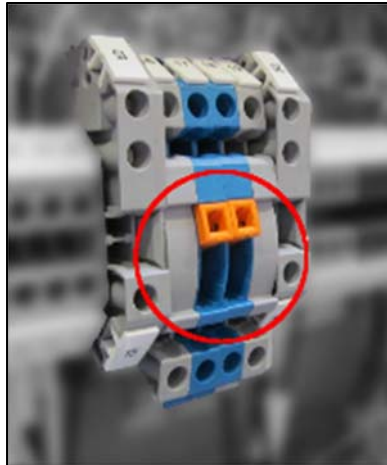
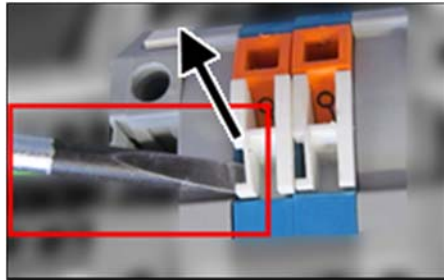
- A) Open the CPC-DX Electrical Terminal Box unscrewing 4 (four) screws using screwdriver (Type: Phillips; Tip Size: PH 3). CCW direction.



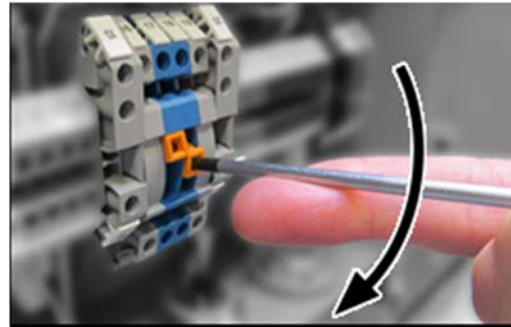
- B) Verify if all wire ends and terminals are properly marked, if not, complete it according to Figure 1-6. Electrical Terminal Box, wiring diagram.



C) Remove locking wedges using screwdriver (Type: Slotted; Tip Size 3.5 X 0.6 [mm])



D) Pull down the switches. This action will electrically disconnect both CPC-II units.



E) Lock the switch in down position installing the wedges.



3.2 VERIFY VOLTAGE VALUES BETWEEN TERMINALS.

The voltage values listed below indicate which unit is in control. Confirm that these readings are consistent with the indication of the gages.

	Measure voltage between terminal Number	Voltage [V]
When CPC 1 is shut down (unit to be replaced)		
Shutdown CPC-II Unit #1 Running CPC-II Unit # 2	15 and 16	>7
	20 and 19	<3
When CPC 2 is shut down (unit to be replaced)		
Running CPC-II Unit #1 Shutdown CPC-II Unit #2	15 and 16	< 3
	20 and 19	>7

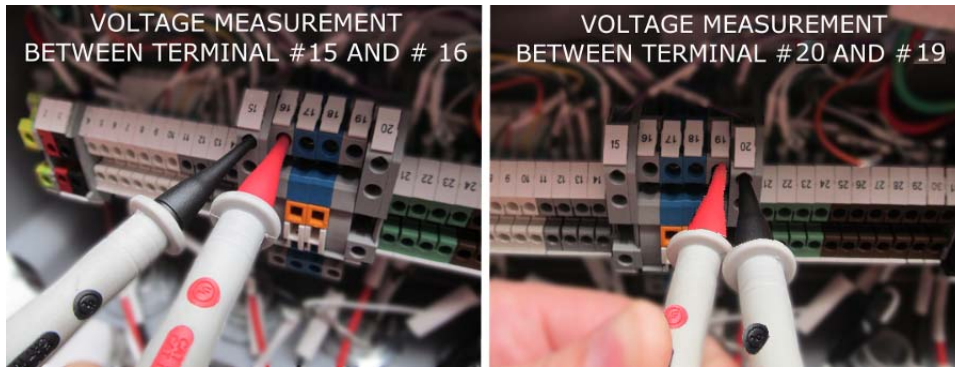


Figure 3-1 CPC-II voltage measurement and verification.

3.3 REMOVE ALL WIRES OF THE REPLACED CPC-II CONVERTER AT THE ELECTRICAL TERMINAL BOX TERMINALS.



WARNING

During this operation be careful and do not disconnect running CPC-II connections.



WARNING

Make sure power is off to the CPC-II converter which to be removed.

TWIN - Terminals system (terminals #15; and 20). Upper screw is used to hold foreground wire, lower screw is used to hold background wire, see Figure 3-2 below.

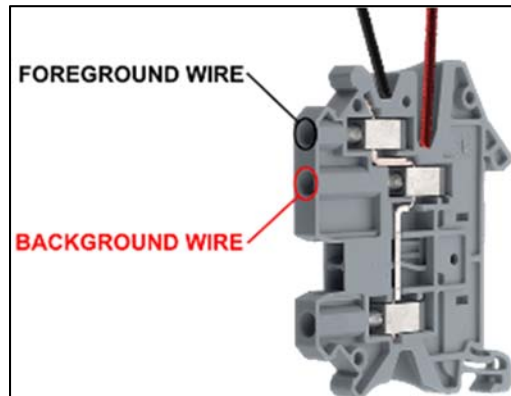


Figure 3-2 TWIN - Terminals system handling.

See electric diagram shown on Figure 1.5 and figure 1.6.

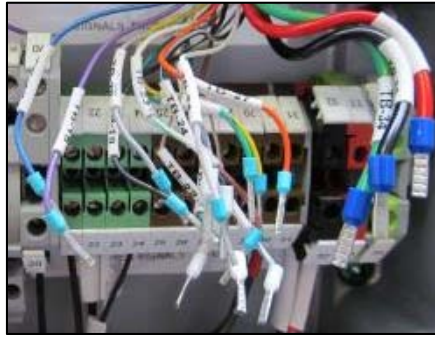


Figure 3-3 Wires from CPC-II to be replaced shown disconnected inside the Electrical Terminal box.

3.4 UNSCREW A CONDUIT NUT FROM ELECTRICAL TERMINAL BOX FITTING.

Loosen the nut from the CPC conduit - use open end style wrench, size 1 1/2 in.

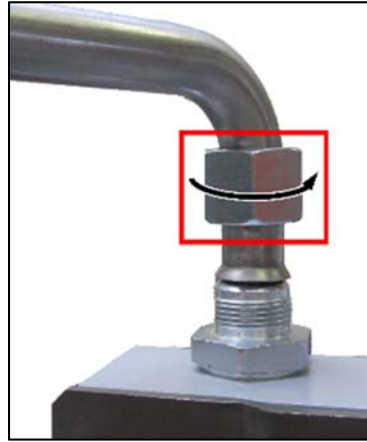


Figure 3-4. Unscrew a conduit nut from Electrical Terminal Box fitting (CCW direction)

3.5 PREPARE LIFTING SLUG TO LIFT CPC-II UNIT

Example how to attach lifting strap to lift CPC-II unit – see figures 3-5, -6, -7.

! WARNING

Heavy object - approximately 49 lbs (22 kg). To avoid injury use lifting aids and proper lifting techniques when removing and replacing

! WARNING

Do not lift or handle the CPC-II by any conduit.



Figure 3-5. Lifting strap installation.



Figure 3-6. Lifting strap properly installed.



Figure 3-7. Lifting strap properly installed (CPC-II unit on the CPC-DX hydraulic manifold).

3.6 UNBOLT THE CPC-II FROM CPC-DX HYDRAULIC MANIFOLD.

WARNING Watch for hydraulic leakage at the manifold/CPC interface during this operation.

Use a long socket wrench 2.5 – 2.7 inch (63 – 69 mm) to unscrew 4 bolts (CCW direction). Access to the bolt from the bottom of the CPC-DX hydraulic manifold. Hex socket size 8 mm. Typical wrench shape is shown on picture below.

Screw size - metric SOC HD Cap, M10 x 1.50, 3.15 inch (80 mm) long– 4 pieces.

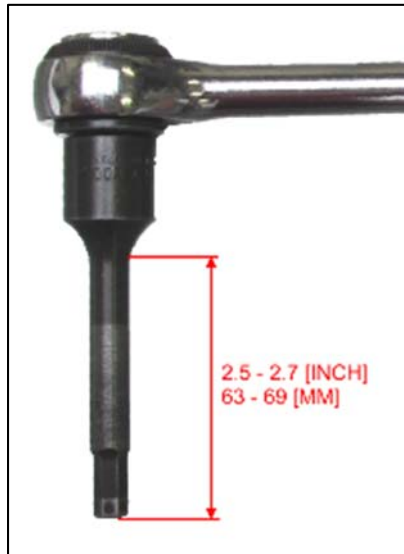


Figure 3-8. Long socket wrench

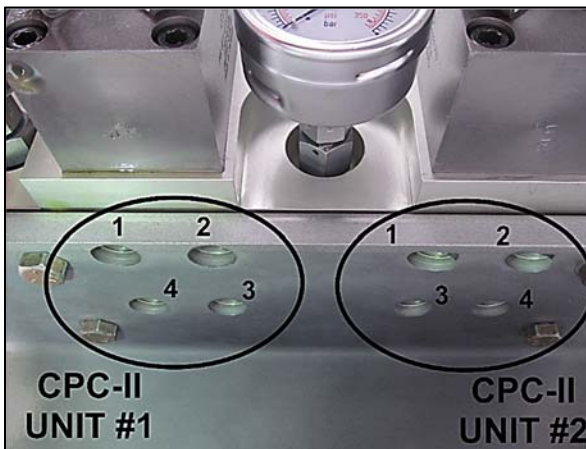


Figure 3-9. CPC-II mounting bolts view (bottom of the hydraulic manifold).

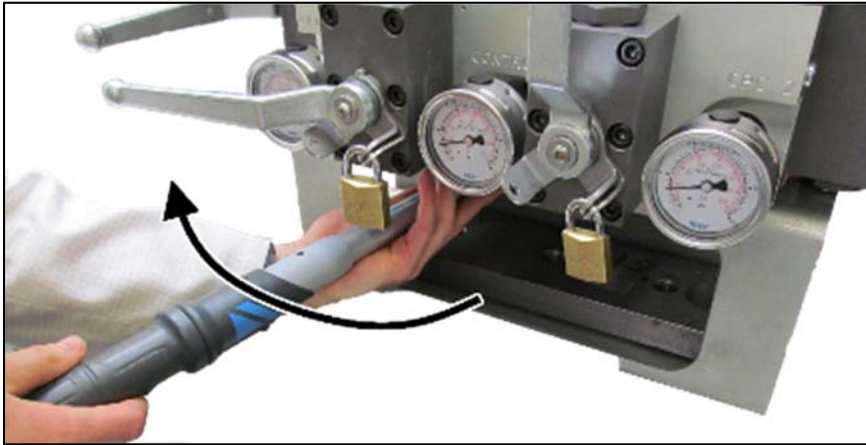


Figure 3-10. CPC-II mounting bolts unscrewing (CCW direction as viewed from the bottom.).

Some minor oil spilling is normal, a significant continuous leak is not normal. If significant leakage occurs, retighten the CPC-II mounting bolts, stop and wait until system can be taken off line.

NOTICE

Be prepared to use a clean lint free oil absorbent cloth to clean up the spilled oil.

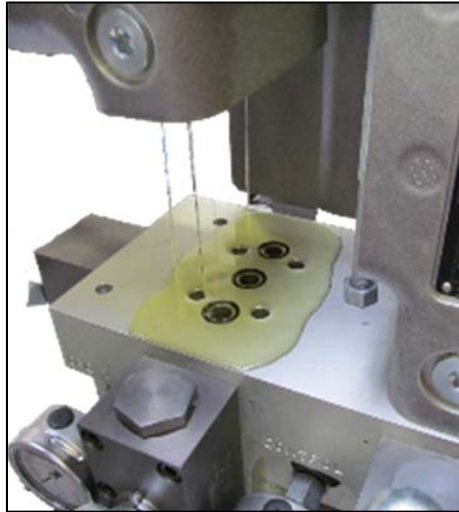


Figure 3-11. Oil spillage from removed CPC-II unit.

- 3.7** INSTALL A PLUG ON THE ELECTRICAL TERMINAL BOX FITTING TO PREVENT CONTAMINATION OR DIRT INGRESS INTO THE INTERIOR.



Figure 3-12. Fitting with installed plastic plug.

- 3.8** COVER THE HYDRAULIC INTERFACE TO THE MANIFOLD TO KEEP CONTAMINATION OUT AFTER CPC-II REMOVAL.



Figure 3-13. CPC-DX manifold with secured hydraulic passages after CPC-II unit removal (shown yellow plastic plugs not provided with the CPC-II unit)

- 3.9** REMOVE AND RE-LOCATE THE CPC-II TO SAFE AREA.



Figure 3-14. CPC-II unit removed from CPC-DX assembly.

Electrical wires disassembly from removed CPC-unit (failed)

4.1 UNSCREW AND ROTATE COVER RETAINING CLAMP

Loosen (CCW direction) CPC-II cover retaining clamp using slotted type screwdriver; Size: 6.5 X 1.2 mm.

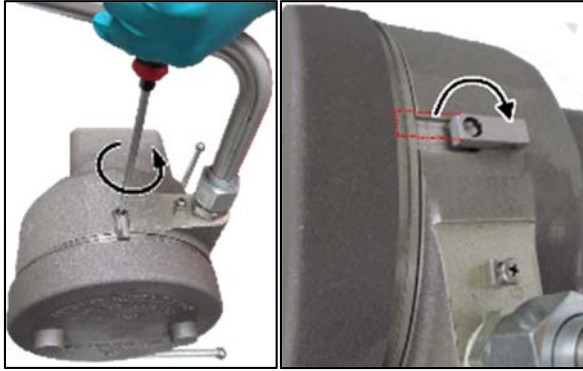


Figure 4-1. Loosening CPC-II cover retaining clamp (CCW direction).

4.2 REMOVE FRONT CPC-II COVER.

Unscrewing the cover, hold CPC-II unit in a vice with smooth protective brass or plastic protectors to prevent damage to the converter main housing.

To unscrew CPC-II cover (CCW direction) place a 1 m bar between the two cover lugs.



Figure 4-2. Loosening CPC-II cover with bar.

4.3 WIRING VERIFICATION

Verify if all wire ends and terminals are properly marked, if not, complete it according to Figure 1-5. CPCs, wiring diagram and figure 1-6. Electrical Terminal Box, wiring diagram.



Figure 4-3. CPC-II terminal blocks view (CPC-II cover removed).

4.4 DISCONNECT TWO (2) TERMINAL BLOCKS.

- A. Unscrew 4 (four) screws using slotted screwdriver; Tip Size 3.5 X 0.6 mm.

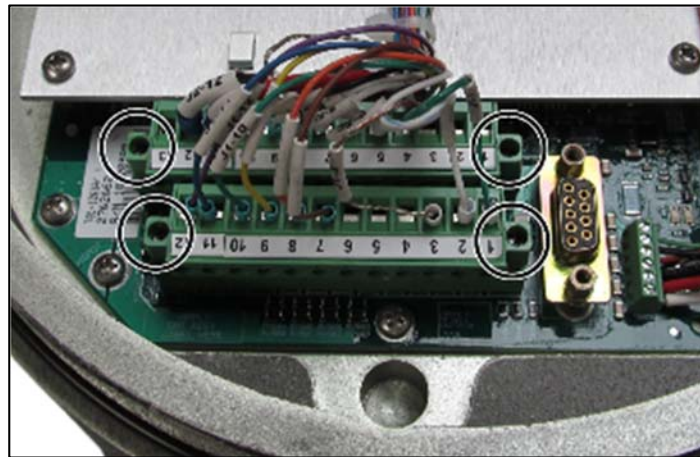


Figure 4-4. CPC-II terminal blocks 4 (four) mounting screws localization (CPC-II cover removed).

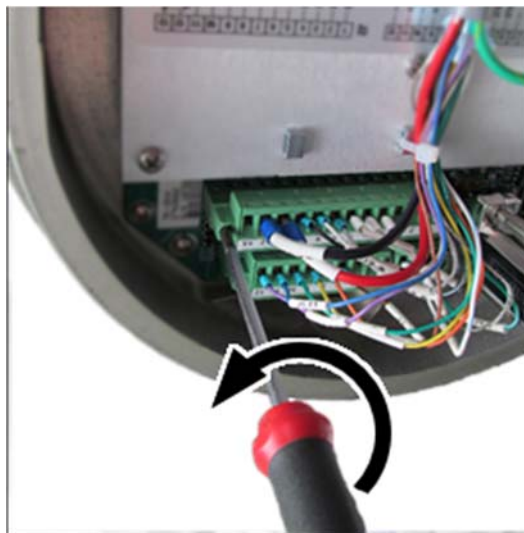


Figure 4-5. Unscrewing 2 (two) CPC-II terminal blocks (CCW direction).

- B. Remove wire block (gently pull out using screwdriver).

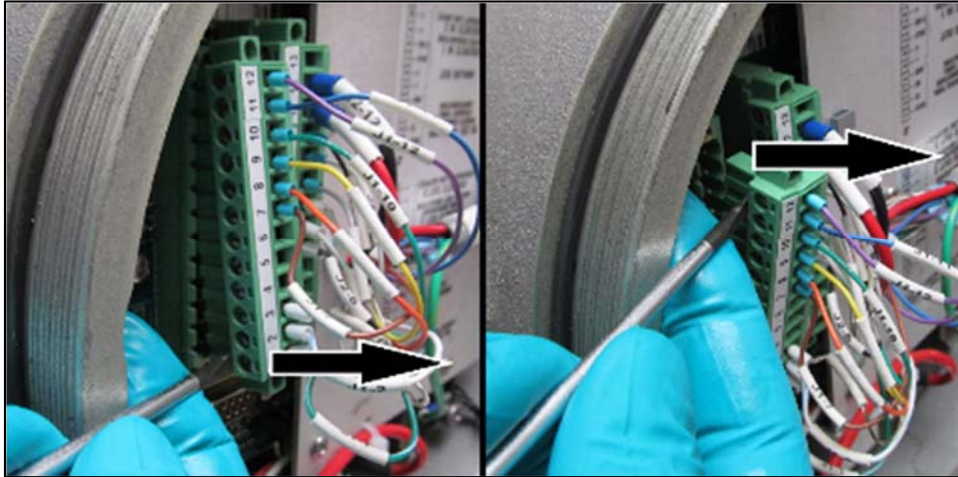


Figure 4-6. CPC-II wire blocks pulling out.

4.5 REMOVE THE CONDUIT TUBING FROM THE FAILED CPC WITH THE WIRES STILL INSIDE. DO NOT PULL THE WIRING THROUGH THE CONDUIT.

- A. Carefully cutout cable ties using Cable Tie Removal Tool.

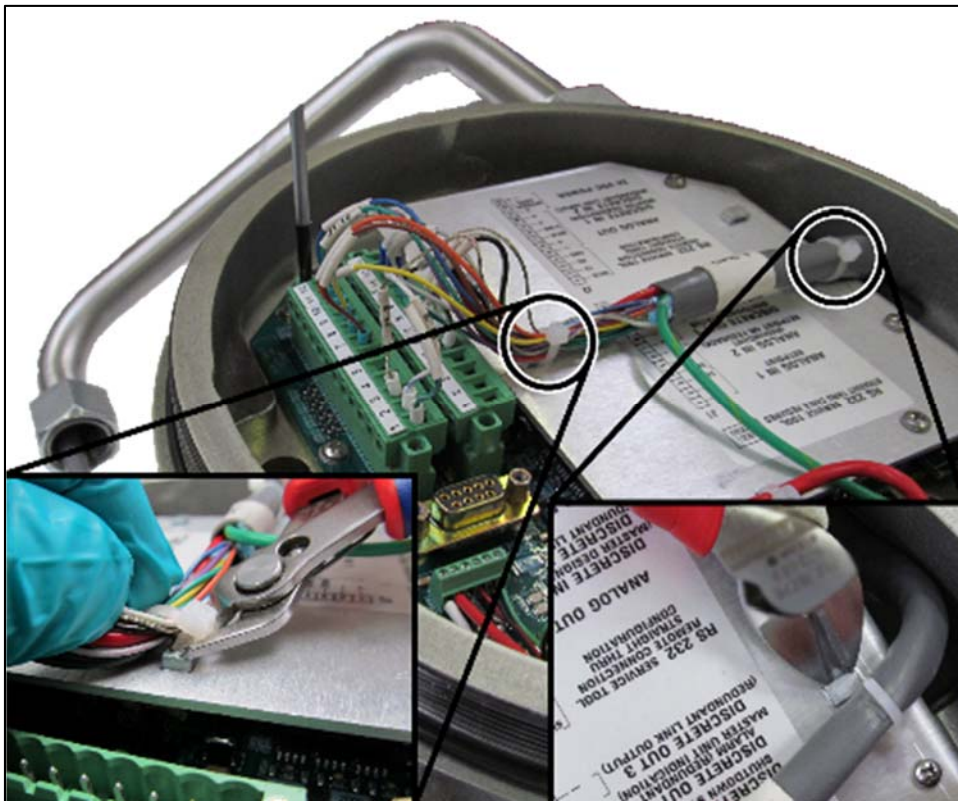


Figure 4-7. CPC-II cable ties cutout.

- B.** Unscrew grounding point crew using Philips type screwdriver, size PH3; (CCW direction).



Figure 4-8. CPC-II Ground wire unscrewing.

- C.** Remove wires from terminal blocks.
Use screwdriver Type Slotted; Tip Size 3.5 X 0.6 mm (CCW direction).

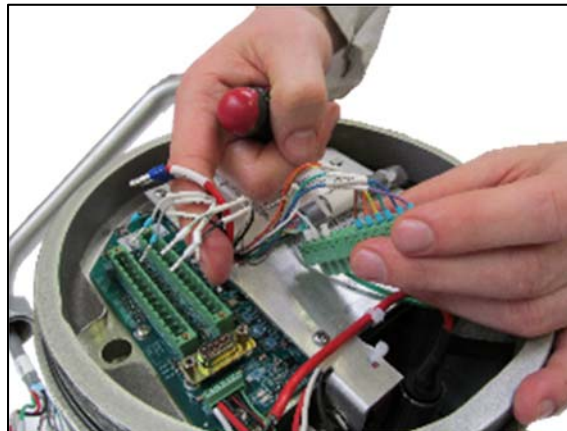


Figure 4-9. CPC-II wires removal from terminal block.

- D.** Unscrew a nut, wrench type: Open End; Size: 1.5 in (CCW direction).



Figure 4-10. CPC-II conduit nut unscrewing.

- E. Gently pull out cable from CPC-II housing. Do not pull out the wiring from the conduit!

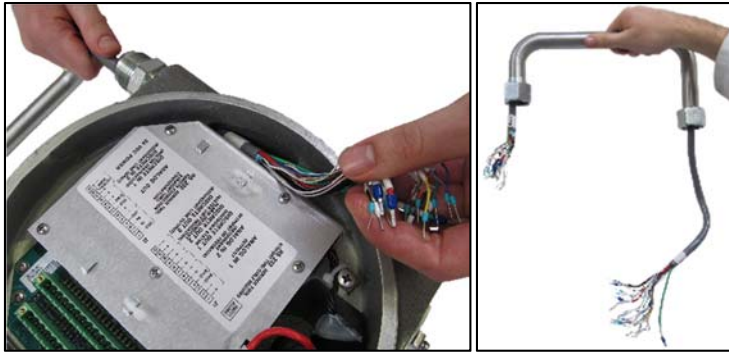


Figure 4-11. CPC-II cable and conduit removal.

New CPC-II Unit hardware Installation procedure

5.1 UNSCREW CPC-II COVER AND ROTATE COVER RETAINING CLAMP

Repeat steps from paragraph 3.1 to 3.2

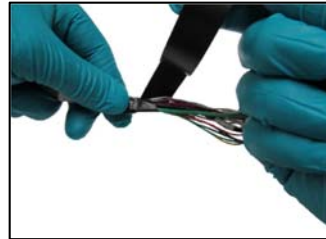
5.2 ELECTRICAL WIRES ASSEMBLY ON NEW CPC-II UNIT.

Use previously disassembled wires with conduit from replaced CPC-II unit.

- A. Use electrical tape and cable tie to pull cable through CPC conduit entry.



B. Isolation tape and cable tie



C. Wires tape wrapping



D. Cable tie fixing with isolation type to conduit



E. CPC cable ready to install

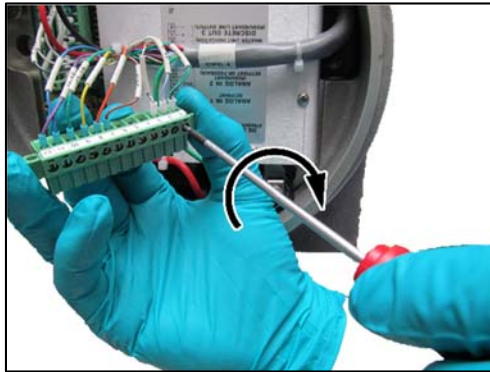


F. CPC cable installation

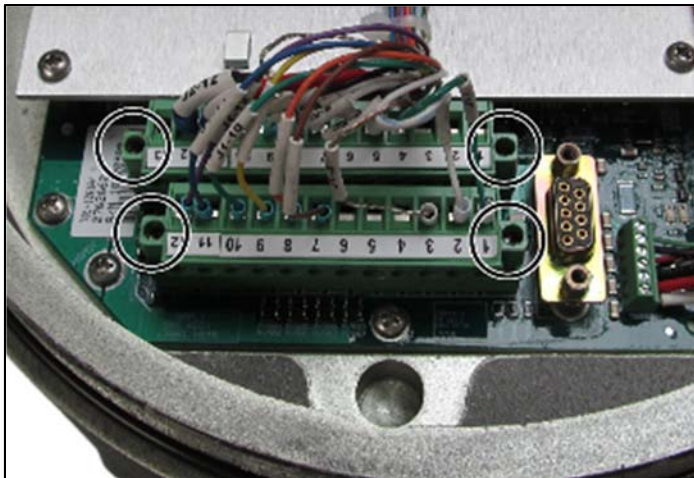
- G. Tighten a nut CW direction - hand tightening only (later during installation on some conduit reposition could be necessary).

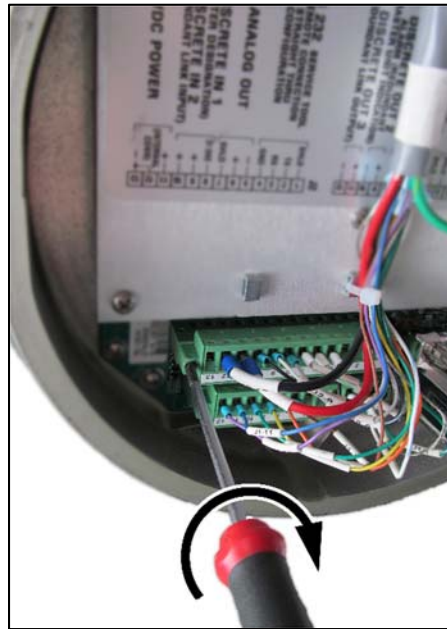


- H. Install wires on terminal blocks
(See Figure 1-5. CPCs, wiring diagram) Use screwdriver Type Slotted; Tip Size 3.5 X 0.6 mm. Torque wires clamp screw in terminals to 5.3-7 lbf-in (0.5-0.6 Nm), CW direction.



- I. Install two (2) terminal blocks.
Use screwdriver Type Slotted; Tip Size 3.5 X 0.6 mm. Torque 4 (four) screws to 5.3-7 lbf-in (0.5-0.6 Nm) CW direction.

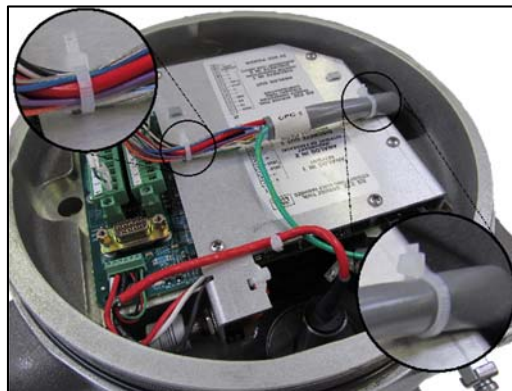




- J.** Install GND wire.
Use screwdriver Type: Phillips; Tip Size: PH 3. Torque to 3.7 lbf-ft (5.1 Nm) CW direction.



- K.** Secure wires with wire ties.



5.3 RETURN THE UNIT TO THE SKID LOCATION.

Clean the top surface of the hydraulic manifold and ensure no debris will fall into the hydraulic passages when removing the covers applied to the hydraulics passages.

! WARNING

Only trained personnel should be allowed to work on this device during operation.

Incorrect action could cause release of pressurized oil which could present a risk of burn or fire hazard.

Incorrect operation or improper tuning could cause erratic operation when the system is operated automatically by the turbine control system. Proper tuning is essential before transferring to automatic operation.

IMPORTANT

Make sure that supply and control isolation valves are closed during installation of the CPC-II unit.

! WARNING

Open and close all valves slowly. This will help prevent creating any hydraulic disturbances in the system.

5.4 CLEAN-UP SKID MANIFOLD MOUNTING SURFACE AND INSTALL SEALING O-RINGS.

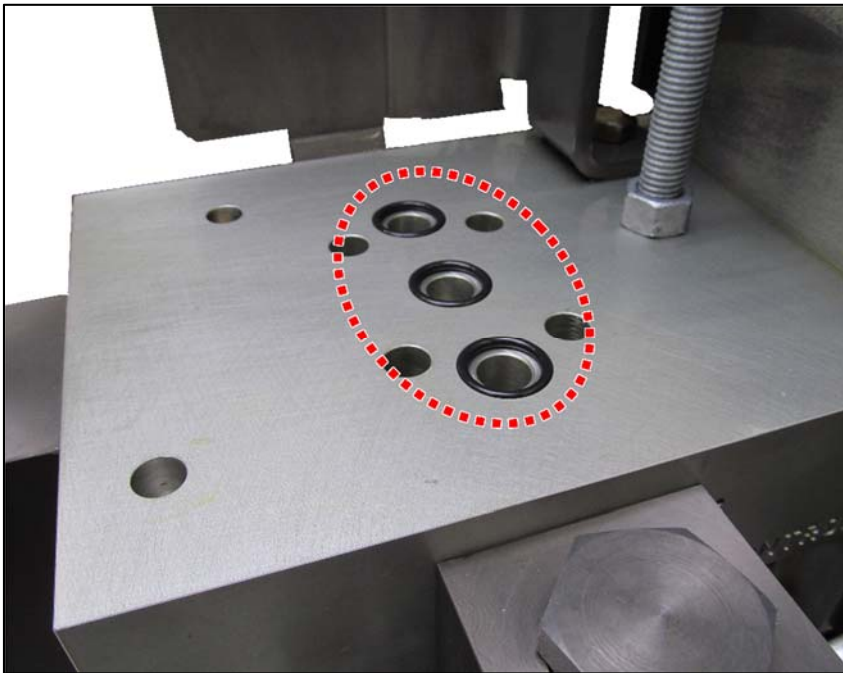


Figure 5-1. New sealing O-rings (3 pcs) installed on hydraulic manifold

5.5 PLACE CPC-II ON SKID MANIFOLD.

Place the CPC-II unit on CPC-DX manifold and simultaneously run wire bundle through Electrical Terminal Box entry fitting.

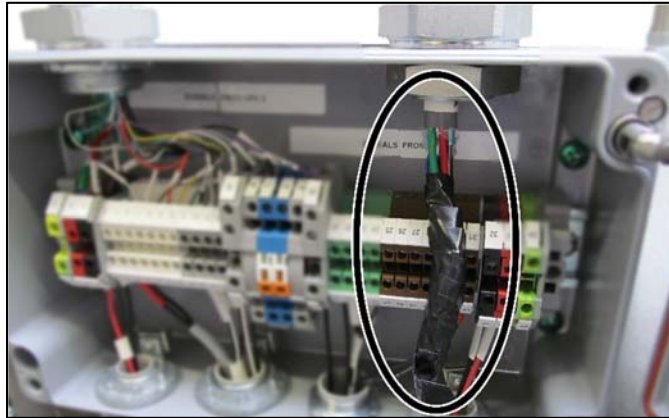


Figure 5-2. CPC-II wires inside Electrical Terminal Box

5.6 SCREW NEW CPC-II ON THE SKID MANIFOLD.

Use a long hex wrench 2.5 – 2.7 inch (63-69 mm) to tighten 4 (four) bolts (CW direction). Access to the bolt from the bottom of the CPC-DX manifold. Hex socket size 8 mm. Typical wrench shape is shown on picture below.



Figure 5-3. Long socket wrench

Screw size - metric SOC HD Cap, M10 x 1.50, 3.15 inch long (80 mm) – 4 pieces, torque to 20-25 lbf-ft (27 – 34 Nm).

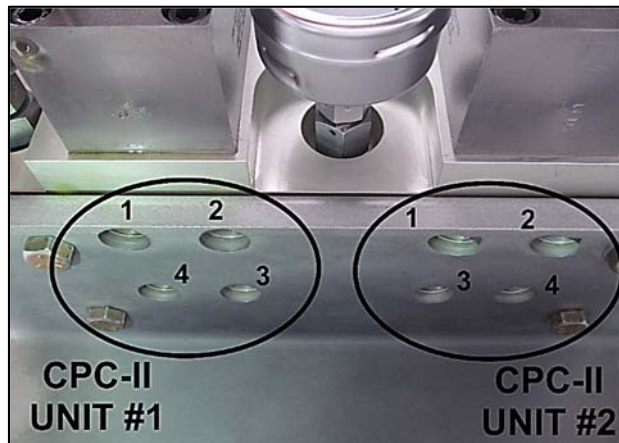


Figure 5-4. CPC-II mounting bolts view (bottom of the hydraulic manifold)

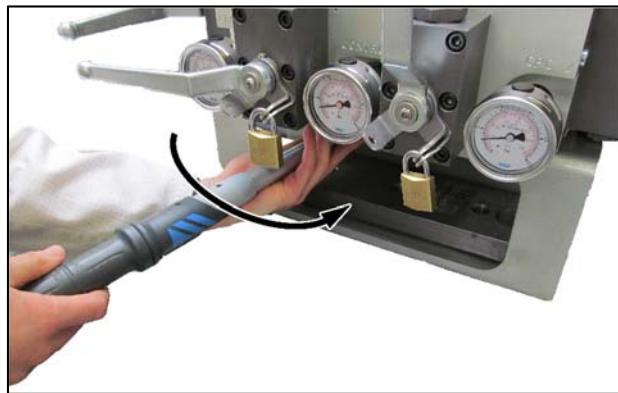


Figure 5-5. CPC-II mounting bolts tightening (CW direction as viewed from the bottom.).

5.7 TIGHTEN THE CONDUIT NUTS.

Tighten the conduit nuts to 100-128 lbf-ft (136 – 174 Nm). Use open end style wrench, size 1 1/2 in (CW direction).

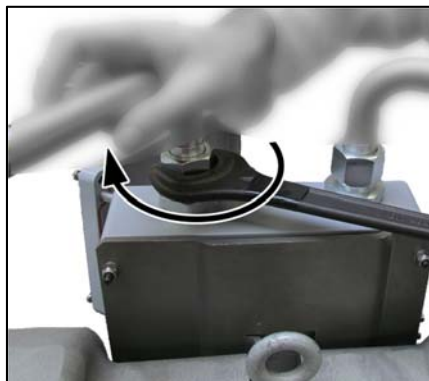


Figure 5-6. CPC-II conduit nut tightening (CW direction).

⚠ WARNING	Double check the wiring connections before applying power. Make sure that all wires are connected to the proper terminals and tightened correctly.
------------------	---

5.8 INSTALL WIRES OF THE REPLACED CPC-II CONVERTER AT THE ELECTRICAL TERMINAL BOX TERMINALS.

Before performing this step please review TWIN – Terminals wires handling system (#15 and # 16) - see Figure 3-2.



Do NOT turn on hydraulic lines before complete mechanical and electrical unit installation process.

Install all wires inside Electrical Terminal Box according to Figure 1-5. (CPC's wiring diagram) and Figure 1-6. (Electrical Terminal Box, wiring diagram).

Use torque screwdriver to install wires in terminals, Type: Slotted; Tip Size: 0.6 x 3.5 mm. Torque to 5.3 – 7.0 lbf-in (0.6 – 0.8 Nm) CW direction.

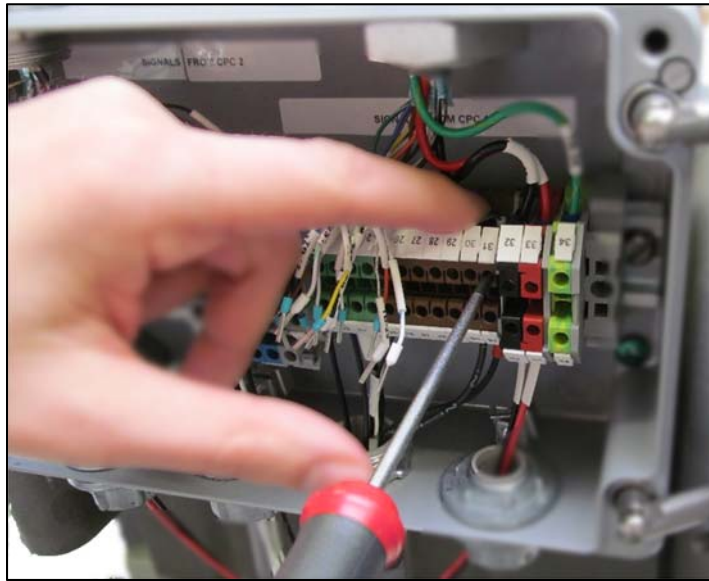


Figure 5-6. CPC-II wires installation.

New CPC-II unit software settings loading procedure

WARNING

Explosion Hazard—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 2 applications.

Make sure the area is non-hazardous. Connect CPC-II and PC Serial port using RS-232 cable (male connectors). Launch and connect the service tool. For newer PCs or laptops with USB ports rather than serial ports, a USB-to-serial converter is required. An approved converter can be obtained from Woodward P/N 8928-1151.

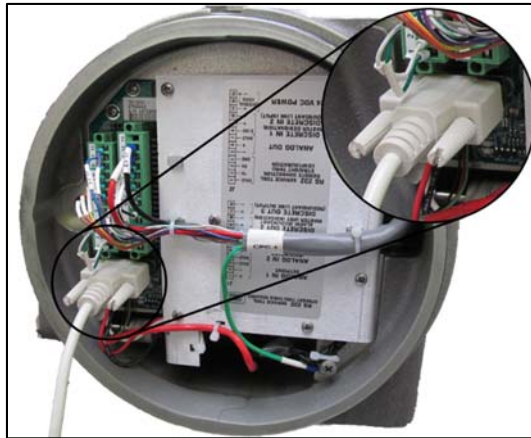


Figure 6-1. CPC-II with installed RS-232 connection cable.

- 6.1 ENSURE THAT THE TURBINE CONTROL WHICH IS OPERATING THE FAILED CPC IS SHUT DOWN AND/OR SENDING A SHUTDOWN SIGNAL TO THE REPLACED CPC.**
- 6.2 TOGGLE THE HEALTH LINK (REDUNDANCY LINKAGE) TO RUN POSITION.**

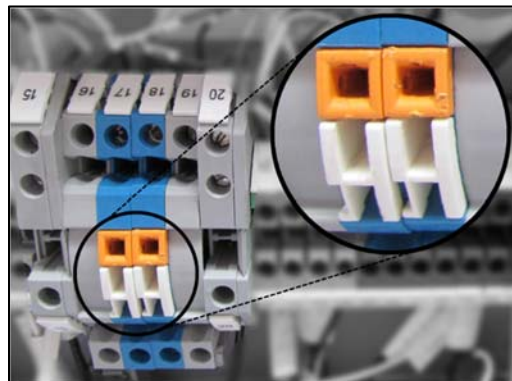


Figure 6-2. CPC-DX health link (orange switches) in run position and secured with switching locks (white piece).

6.3 APPLY ELECTRICAL POWER TO THE CPC-II.

The green LED illuminate when electrical power is applied. Start the PC Service Tool and download the appropriate settings file from step into new CPC-II unit.



Figure 6-3. CPC-DX with applied electrical power – green LED illuminate.

6.4 START THE PC SERVICE TOOL.

When CPC-II connection is established with Service Tool, download the appropriate settings file (previously created) into new CPC-II unit (please refer to User Manual **26615**).

6.5 UPLOAD A BACKUP FILE INTO CPC-II.

A back-up file can be uploaded into CPC-II unit from the following:

- a) Archived (back-up) settings file
- b) Copied from the failed unit (depending on failure type)

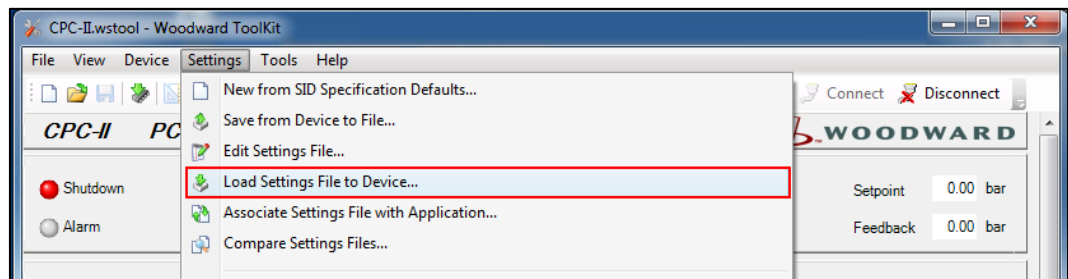


Figure 6-4. Loading the Settings File to the CPC-II device.

6.6 VERIFY BASIC SETTINGS USING SERVICE TOOL.

Verify if basic settings match desired system settings or are identical to “healthy” CPC-II unit values.

Parameters to verify:

- *Pressure Readback Scaling Parameters*

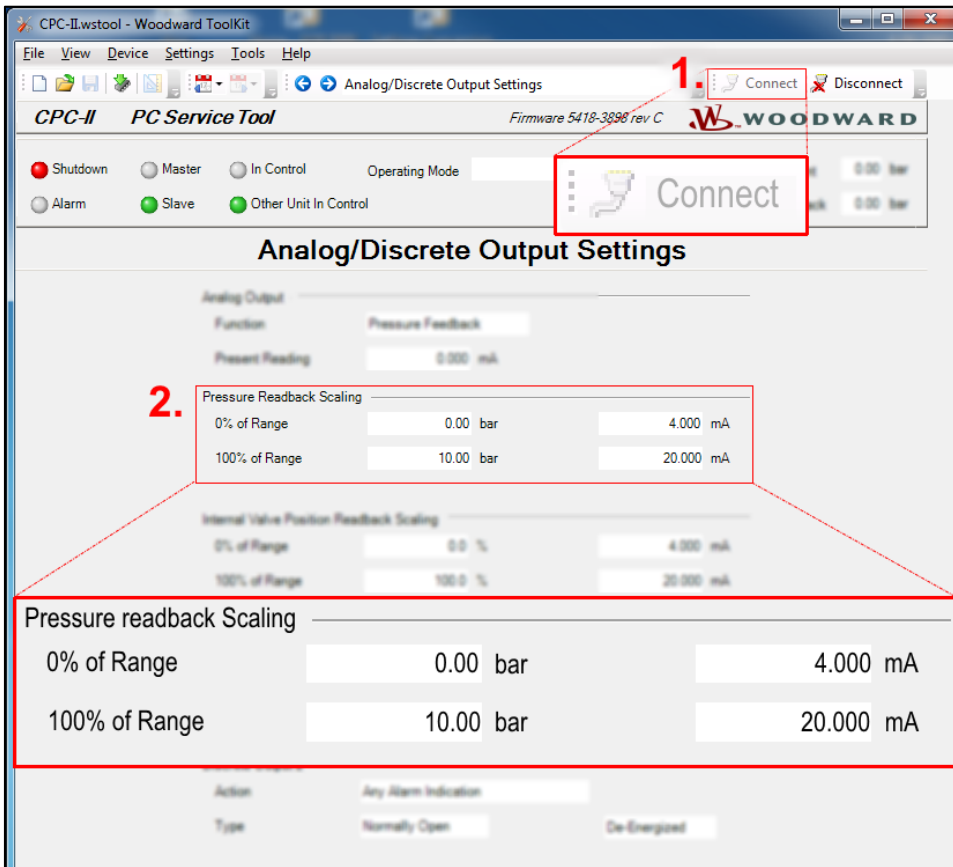


Figure 6-5. Pressure Readback Scaling parameters verification.

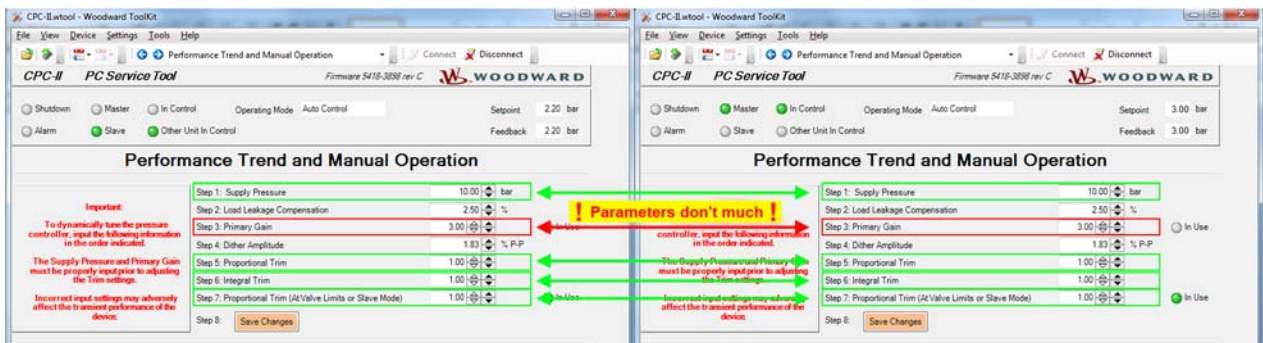
- *Dynamic Settings Parameters*

IMPORTANT

Make sure that Dynamic Performance Parameters match (comparing Unit Not In Control to Unit In control).

Only the Load Leakage Parameters could cud have different value – is specific for each unit.

(only the Load Leakage Parameters could not match)



6.7 VERIFY THAT THE UNIT IS IN SHUTDOWN DUE TO LOW SETPOINT SIGNAL. CONTROL ISOLATION VALVE IS STILL CLOSED.

Verify CPC-II unit shutdown condition based on (See PC Service Tool tab “Overview”):

Point 1. – Unit has established connection with Service Tool

Point 2. – Shutdown condition is annunciated by red LED indicator.

Point 3. – Setpoint is equal or below 4 mA

Point 4. – Setpoint Fault condition is annunciated by red LED indicator.

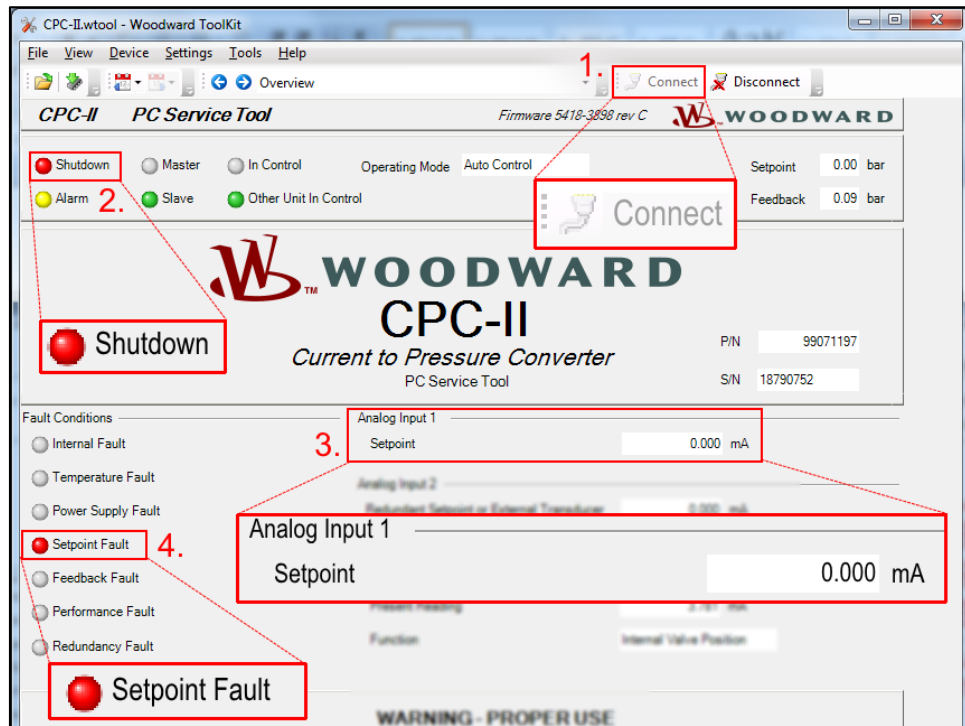


Figure 6-6. Basic parameters verification.

6.8 SWITCH CONTROL TO MANUAL MODE

Operate the CPC-II unit in Manual Mode by setting the setpoint to the minimum control pressure (See PC Service Tool tab “Performance Trend and Manual Operation”).

- Parameter: Manual Control Settings
 - o Mode: Enabled

Warning: Make sure unit is in safe mode prior to manual operation.
Note: Analog Setpoint(s) must be at 0 bar to enable manual operation.

Manual Control Settings

Mode **Enabled** ▼

Pressure Setpoint 0.00 bar

Manual Potentiometer Stroke Settings

Allow Potentiometer Use **Disabled** ▼

5% Enable Level Reached

2% Enable Level Reached

0 sec. Remaining Delay

Figure 6-7. Manual Control Mode Enabled.

6.9 SLOWLY OPEN DRAIN VALVE (IF PRESENT IN THE SYSTEM).**⚠ WARNING**

Make sure that drain isolation valves is open before opening supply isolation valve located on the CPC-DX unit.

⚠ WARNING

Overspeed /
Overpressure

Never open the supply line when drain line is closed on the CPC unit, otherwise the control output pressure can increase suddenly and cannot be controlled by the input setpoint. This could cause the turbine to overspeed.

The drain isolation valve should always be open prior to opening the supply line.

6.10 SLOWLY OPEN SUPPLY VALVE.

Unlock isolation valve (removing padlock) and turn to open position.

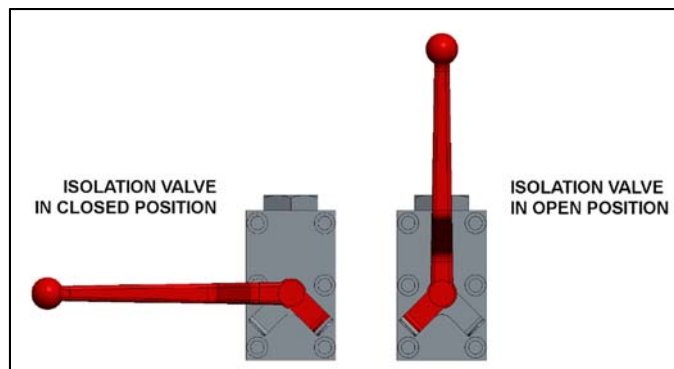


Figure 6-8. Isolation valve OPEN / CLOSED lever position

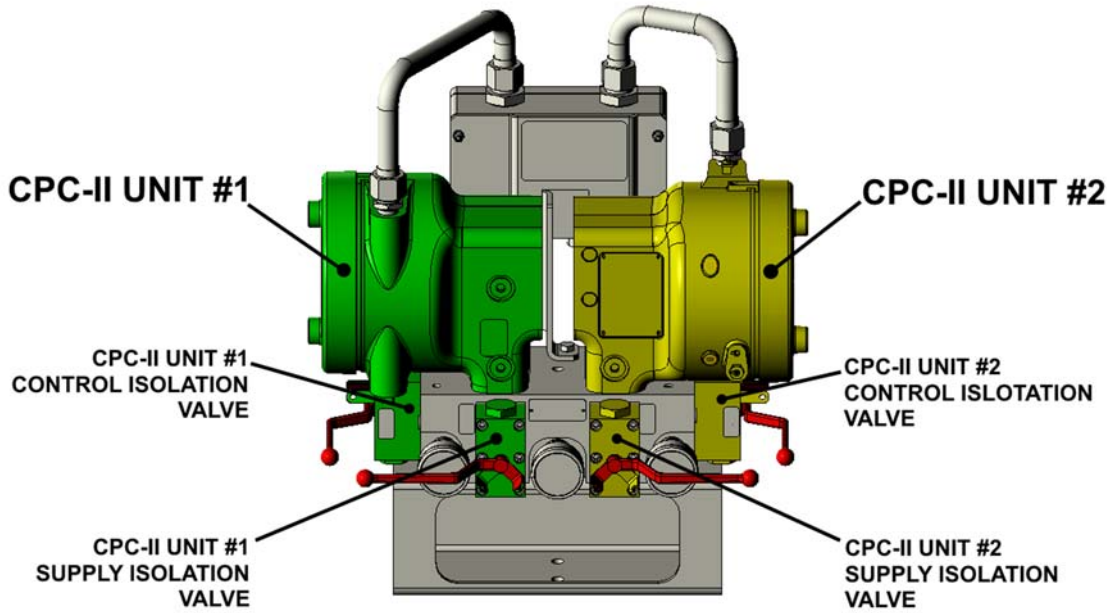


Figure 6-9. CPC-DX unit with all isolation valves in **CLOSED** position

6.11 ADJUST (IF NECESSARY) PRIMARY GAIN.

If necessary adjust Primary Gain of the replaced unit at the midpoint of the control range for rapid control response with minimal overshoot. Some overshoot is permissible as it is necessary for displacement of the servo.

See *Performance Trend and Manual Operation* screen (PC Service Tool)

- Step 3: Primary Gain

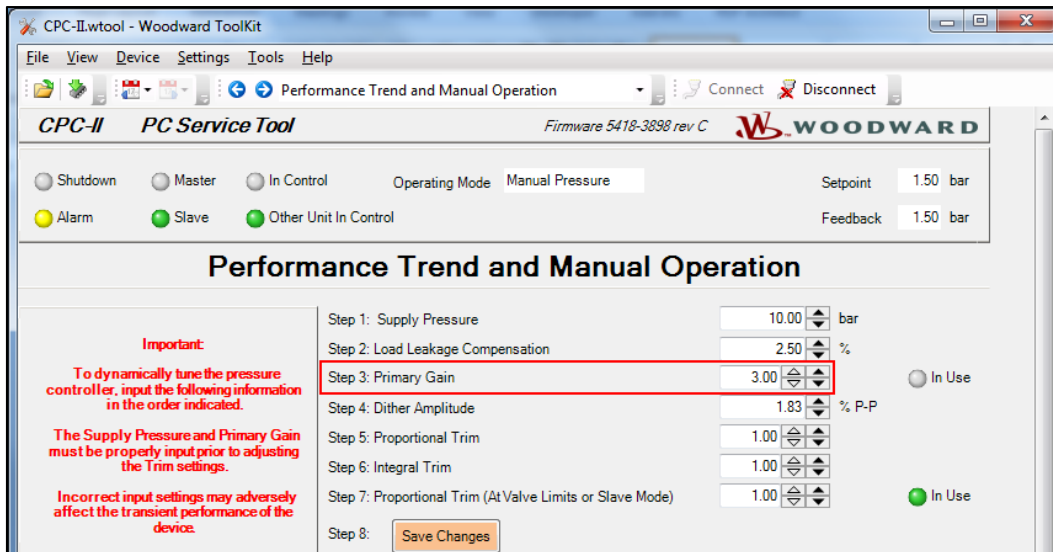


Figure 6-10. Primary Gain adjustment

6.12 VERIFY CPC-II UNIT PERFORMANCE

- A. Check performance by switching between the midpoint and the high point of the control range. If the performance is not sufficiently stable, reduce the primary gain for minimal overshoot, minimal ringing and stable control.

See *Performance Trend and Manual Mode* screen (PC Service Tool)

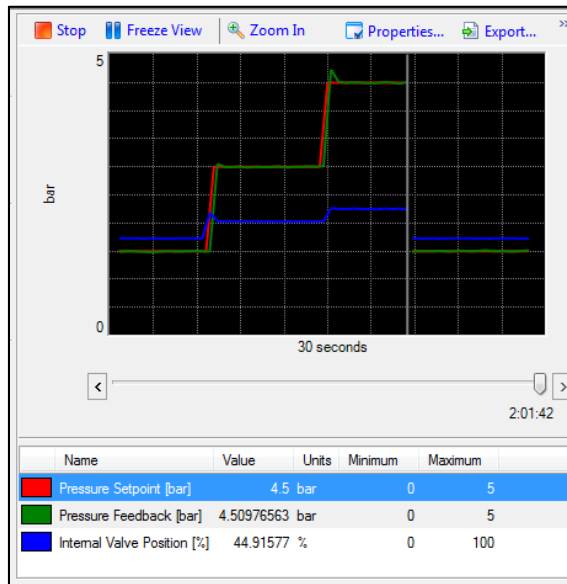


Figure 6-11. Performance verification on Performance Trend chart

- B. Check performance by switching between the midpoint and the low point of the control range. Typically the performance will be more stable at this operating point if tuned properly for high pressure and mid pressure performance.

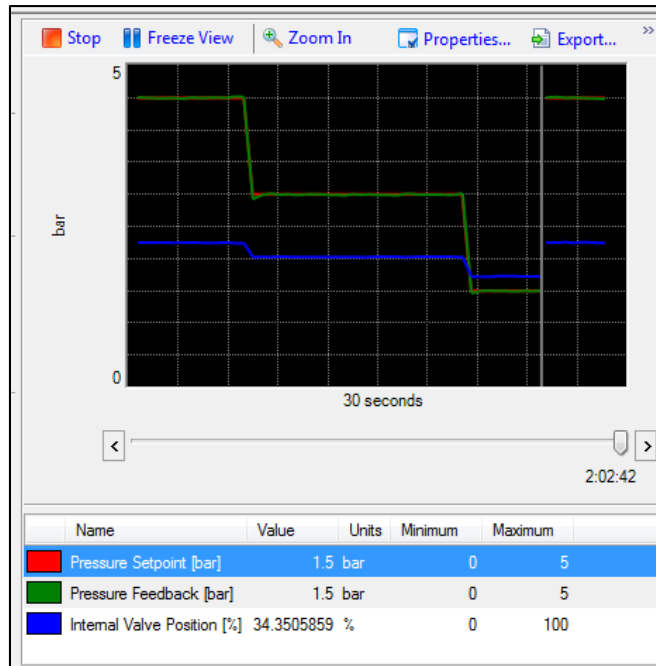


Figure 6-12. Performance verification on Performance Trend chart

6.13 DISABLE MANUAL CONTROL MODE

See *Performance Trend and Manual Operation* (PC Service Tool).

- *Manual Control Settings*
 - o *Mode: Disabled*

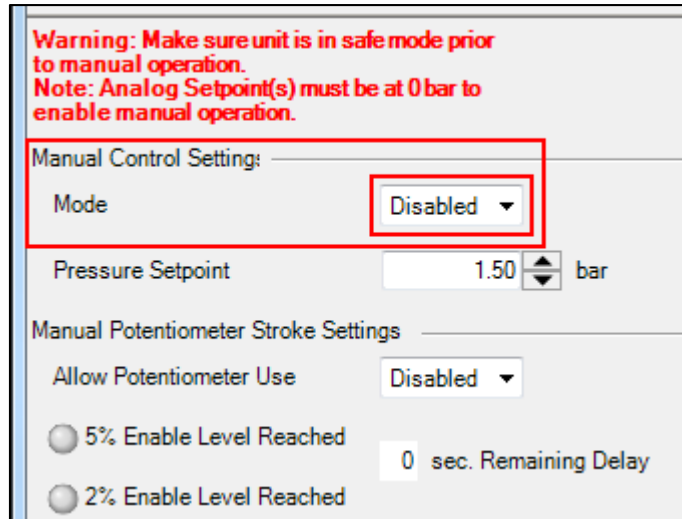


Figure 6-13. Manual Control Mode Disabled.

6.14 UNIT – UNIT PRESSURE OFFSET VERIFICATION

Verify if the replaced CPC-II unit has pressure offset at the same level as the unit in control (default is 0.8 bar).

See PC Service Tool tab *Redundancy Overview*

Parameter: In Slave Mode Setpoint is Decreased by:

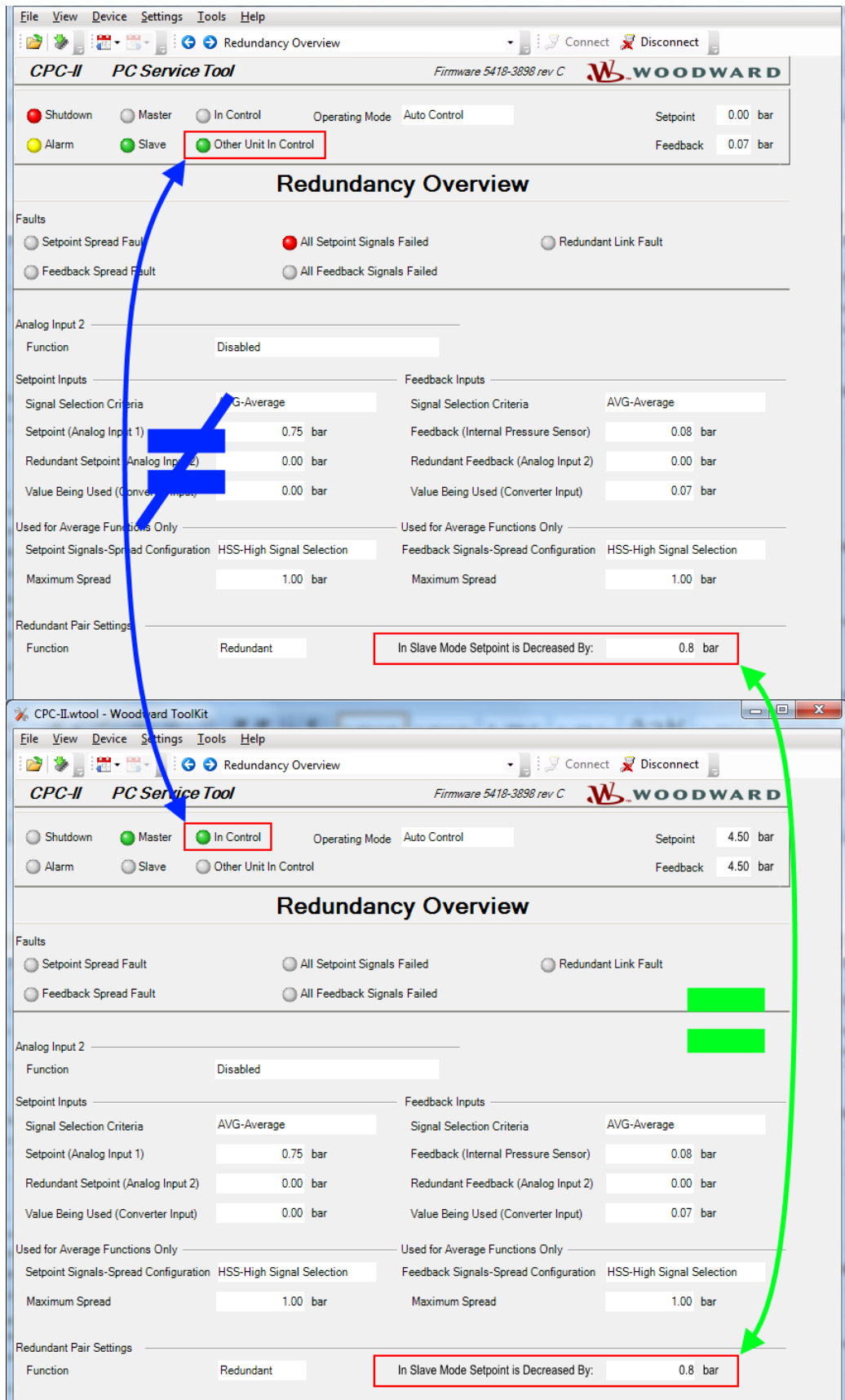


Figure 6-14. Pressure offset value verification between CPC-II units.

6.15 ENABLE THE CONTROL SIGNAL FROM PROCESS CONTROLLER.**6.16 VERIFY INSTALLED UNIT HYDRAULIC CONTROL OUTPUT SIGNAL.**

Verify hydraulic output parameters using the PC Service Tool readings and CPC-DX pressure gauges indicators.

6.17 PRESSURE FEEDBACK STABILITY VERIFICATION.

In PC Service Tool's screen *Performance Trend and Manual Operation* run trend chart tool to make sure Pressure feedback is stable and match pressure setpoint signal.

6.18 SLOWLY OPEN THE CONTROL VALVE ON THE CPC-DX HYDRAULIC MANIFOLD (REPLACED CPC-II UNIT HYDRAULIC PATH).**6.19 VERIFY UNIT-UNIT SWITCHING PERFORMANCE (IF POSSIBLE).**

If possible or when appropriate to bring the turbine or process to a safe level, verify the switching performance between CPC's.

6.20 DISCONNECT PC SERVICE TOOL

Close PC Service Tool connection clicking *Disconnect* (see Figure 6-16) and disconnect RS-232 interface cable from CPC-II communication port.

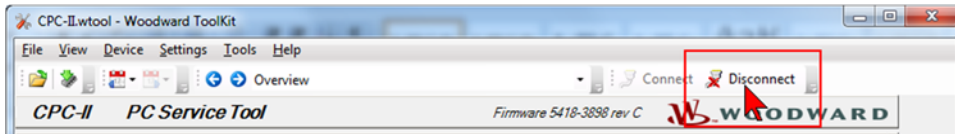


Figure 6-15. PC Service Tool communication disconnection with CPC-II.

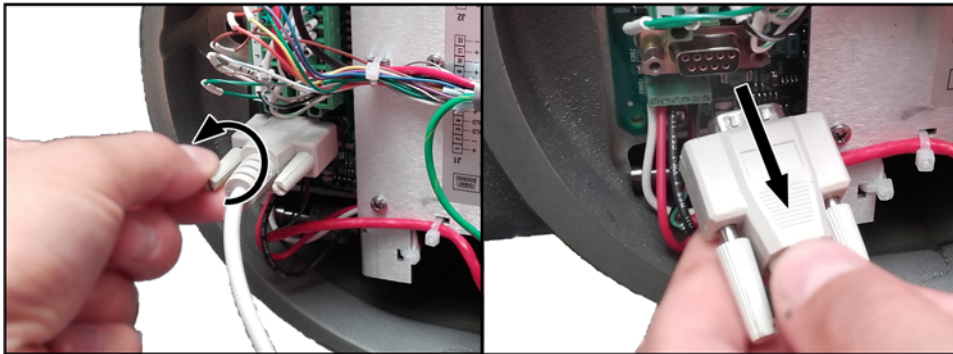


Figure 6-16. RS-232 cable disconnection from CPC-II communication port.

6.21 INSTALL CPC-II COVER

Apply Dry Film Lubricant to the threads of the valve housing cover. Install cover by rotating CW and hand tighten only to snug by placing a 1 meter bar between the two cover lugs.

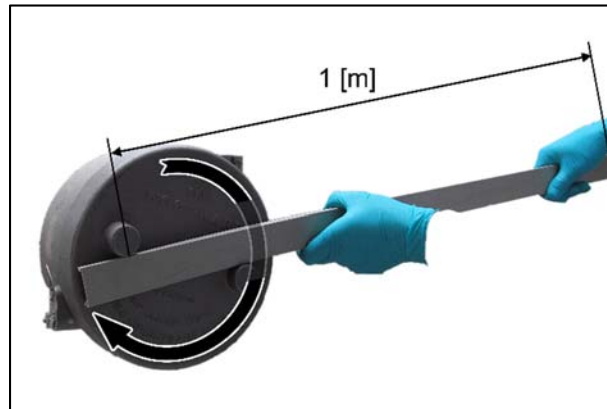


Figure 6-17. CPC-II cover tightening.

6.22 INSTALL THE LOCKING CLAMP.

- Install and torque the locking clamp screw to 35-39 lbf-in (3.9 - 4.4 Nm) in CW direction. Use flat torque screwdriver Type: Slotted; Tip Size 6.5 X 1.2 mm



Figure 6-18. CPC-II locking clamp tightening.

Chapter 3.

Product Service Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

Consult the troubleshooting guide in the manual.

Contact the manufacturer or packager of your system.

Contact the Woodward Full Service Distributor serving your area.

Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM and Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.

An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.

A **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.

A **Recognized Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

You can locate your nearest Woodward distributor, AISF, RER, or RTR on our website at:

www.woodward.com/directory

Replacement Parts

When ordering replacement parts for controls, include the following information:

- the part number(s) (XXXX-XXXX) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact us via telephone, email us, or use our website: www.woodward.com.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at www.woodward.com/directory, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems		Products Used in Engine Systems		Products Used in Industrial Turbomachinery Systems	
Facility	Phone Number	Facility	Phone Number	Facility	Phone Number
Brazil	+55 (19) 3708 4800	Brazil	+55 (19) 3708 4800	Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727	China	+86 (512) 6762 6727	China	+86 (512) 6762 6727
Germany:		Germany	+49 (711) 78954-510	India	+91 (129) 4097100
Kempen	+49 (0) 21 52 14 51	India	+91 (129) 4097100	Japan	+81 (43) 213-2191
Stuttgart	+49 (711) 78954-510	Japan	+81 (43) 213-2191	Korea	+82 (51) 636-7080
India	+91 (129) 4097100	Korea	+82 (51) 636-7080	The Netherlands	+31 (23) 5661111
Japan	+81 (43) 213-2191	The Netherlands	+31 (23) 5661111	Poland	+48 12 295 13 00
Korea	+82 (51) 636-7080	United States	+1 (970) 482-5811	United States	+1 (970) 482-5811
Poland	+48 12 295 13 00				
United States	+1 (970) 482-5811				

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____
Site Location _____
Phone Number _____
Fax Number _____

Prime Mover Information

Manufacturer _____
Turbine Model Number _____
Type of Fuel (gas, steam, etc.) _____
Power Output Rating _____
Application (power generation, marine, etc.) _____

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____
Control Description or Governor Type _____
Serial Number _____

Control/Governor #2

Woodward Part Number & Rev. Letter _____
Control Description or Governor Type _____
Serial Number _____

Control/Governor #3

Woodward Part Number & Rev. Letter _____
Control Description or Governor Type _____
Serial Number _____

Symptoms

Description _____

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Revision History

Changes in Revision NEW—

- Initial release

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **26824_NEW**.



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Woodward has company-owned plants, subsidiaries, and branches,
as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.