iCNC XT™
CNC CONTROLLER

Operating Manual

Revision: AA  Issue Date: January 16, 2014  Manual No.: 0-5299
WE APPRECIATE YOUR BUSINESS!
Congratulations on your new Victor Thermal Dynamics product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 1-800-426-1888, or visit us on the web at www.thermal-dynamics.com.

This Operating Manual has been designed to instruct you on the correct use and operation of your Victor Thermal Dynamics product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

YOU ARE IN GOOD COMPANY!
The Brand of Choice for Contractors and Fabricators Worldwide.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to developing technologically advanced products to achieve a safer working environment within the welding industry.
WARNINGS

Read and understand this entire Manual and your employer’s safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer’s best judgement, the Manufacturer assumes no liability for its use.

XT™ CNC Controller
Operating Manual No. 0-5299

Published by:
Victor Technologies
82 Benning Street
West Lebanon, New Hampshire, USA  03784
(603) 298-5711

www.thermal-dynamics.com

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Original Publication Date:  January 16, 2014
Revision Date:

Record the following information for Warranty purposes:

Where Purchased: ___________________________________

Purchase Date:______________________________________

Power Supply Serial #:________________________________

Torch Serial #:_______________________________________
# TABLE OF CONTENTS

## SECTION 1: SAFETY INFORMATION
- 1.1 Notes, Cautions and Warnings ........................................................................ 1-1
- 1.2 Important Safety Precautions ....................................................................... 1-1
- 1.3 Publications .................................................................................................... 1-2
- 1.4 Note, Attention et Avertissement .................................................................. 1-3
- 1.5 Precautions De Securite Importantes ............................................................... 1-3
- 1.6 Documents De Reference .............................................................................. 1-4
- 1.7 Declaration of Conformity North America ....................................................... 1-6
- 1.8 Declaration of Conformity Europe/CE .............................................................. 1-7
- 1.9 Declaration of Conformity China .................................................................... 1-8
- 1.10 Statement of Warranty .................................................................................. 1-10

## SECTION 2: SPECIFICATIONS
- 2.1 Mechanical dimensions XT CNC ..................................................................... 2-2
- 2.2 Power Requirements ..................................................................................... 2-3
- 2.3 Mechanical dimensions Yaskawa Motors ....................................................... 2-3
- 2.4 Mechanical dimensions Neugart Gearboxes .................................................. 2-4

## SECTION 3: INSTALLATION
- 3.1 Common Devices Installation ........................................................................ 3-1
- 3.2 Main Power .................................................................................................... 3-3
- 3.3 Limit Switches Wiring .................................................................................... 3-3
- 3.4 E-stop Wiring .................................................................................................. 3-3
- 3.5 Yaskawa Motor and Servo Installation ............................................................. 3-5
- 3.6 Down Draft and Laser Pointer Wiring (XT 211 & 231 ONLY) OPTIONAL .......... 3-8
- 3.7 Plasma Communication, Plasma I/O ............................................................... 3-9
- 3.8 Height Control, Communication and I/O Cables ............................................. 3-10
- 3.9 Voltage Divider for iHC Torch Height Control ................................................ 3-11
- 3.10 Oxy Fuel Installation .................................................................................... 3-12
- 3.11 Oxy Fuel Lifter Wiring AC ............................................................................ 3-16
- 3.12 Oxy Fuel Lifter Wiring DC ............................................................................ 3-16
- 3.13 Oxy Fuel Capacitive Sensor Wiring ............................................................... 3-17
- 3.14 Setting up the Motion ................................................................................... 3-18
- 3.15 Unlocking the Hard Drive ............................................................................. 3-19
- 3.16 Drive Configuration ...................................................................................... 3-20
- 3.17 Motor and Encoder Polarities ....................................................................... 3-21
- 3.18 Encoder Values ............................................................................................ 3-22
- 3.19 Drift Adjustment .......................................................................................... 3-23
- 3.20 Maximum Speed Adjust .............................................................................. 3-26
- 3.21 Maximum Speed Test .................................................................................. 3-28
- 3.22 Minimum Speed Test ................................................................................... 3-29
- 3.23 Setting Motion Parameters .......................................................................... 3-30
- 3.24 Setting Correct Inertia Ratio ....................................................................... 3-31
- 3.25 Locking the Hard Drive ............................................................................... 3-33
# TABLE OF CONTENTS

## SECTION 4: QUICK START AND OPERATION ................................................................. 4-1

4.1 Quick Guide for Part Cutting ................................................................................. 4-1

## SECTION 5: OPERATION ......................................................................................... 5-1

5.1 Cut Process Screen ......................................................................................... 5-1
5.2 Overview Main Screen ..................................................................................... 5-3
5.3 iCNC XT Operating Control Panel ...................................................................... 5-6
5.4 Switch Descriptions and Functions .................................................................. 5-10
5.5 XT2 Switch Description and Function ................................................................. 5-12
5.6 XT242 Switch Description and Function ............................................................. 5-13
5.7 XT211/231 Switch Description and Functions .................................................... 5-19
5.8 Starting Procedure ............................................................................................. 5-27
5.9 Homing Procedure ............................................................................................. 5-28
5.10 Jog ....................................................................................................................... 5-29
5.11 Parameter Quick View ...................................................................................... 5-30
5.12 How To Proceed When Something Happens .................................................. 5-31
5.13 Advanced Setup ................................................................................................ 5-34

## APPENDIX: ............................................................................................................. A-1

A.1 Plasma and Height Controller Installation .......................................................... A-1
A.2 Mechanical dimensions iHC ............................................................................... A-1
A.3 iHC Lifter Installation ....................................................................................... A-2
A.4 iHC User Interface ............................................................................................. A-3
A.5 Main Settings ...................................................................................................... A-5
A.6 System Setup & Diagnostic Menus ..................................................................... A-6
A.7 I/O Bits Tab ......................................................................................................... A-7
A.8 Service Tab ......................................................................................................... A-8
A.9 Installation Tab .................................................................................................... A-9
A.10 Parameter Limits ................................................................................................ A-10
SECTION 1:
SAFETY INFORMATION

1.1 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

**NOTE**
An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

**CAUTION**
A procedure which, if not properly followed, may cause damage to the equipment.

**WARNING**
A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.2 Important Safety Precautions

**WARNINGS**

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.

**GASES AND FUMES**

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:
  - Antimony
  - Chromium
  - Mercury
  - Arsenic
  - Cobalt
  - Nickel
  - Barium
  - Copper
  - Selenium
  - Beryllium
  - Lead
  - Silver
  - Cadmium
  - Manganese
  - Vanadium
- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Sec. 25249.5 et seq.)

**ELECTRIC SHOCK**

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.
FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.

NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.

PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as suggested in the following per ANSI/ASC Z49.1:

<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>Less Than 300°</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>300 - 400°</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>400 - 800°</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

**WARNING:** Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

1.3 Publications

Refer to the following standards or their latest revisions for more information:


2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126


4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATIONAL AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

5. ANSI Standard Z41.1, STANDARD FOR MEN’S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018

6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

WARNING: This product contains chemicals, including lead, known to the State of California to cause birth defects and other reproductive harm. **Wash hands after handling.**
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.4 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

**NOTE**

Toute opération, procédure ou renseignement général sur lequel il importe d’insister davantage ou qui contribue à l’efficacité de fonctionnement du système.

**ATTENTION**

Toute procédure pouvant réserver l’endommagement du matériel en cas de non-respect de la procédure en question.

**AVERTISSEMENT**

Toute procédure pouvant provoquer des blessures de l’opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.5 Precautions De Securite Importantes

**AVERTISSEMENTS**

L’OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L’ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Coupant à l’arc au jet de plasma produit de l’énergie électrique haute tension et des émissions magnétique qui peuvent interférer la fonction propre d’un “pace-maker” cardiaque, les appareils auditif, ou autre matériel de santé électronique. Ceux qui travail près d’une application à l’arc au jet de plasma devrait consulter leur membre professionnel de médication et le manufacturier de matériel de santé pour déterminer s’il existe des risques de santé.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d’éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d’utiliser le matériel. Composez le + 603-298-5711 ou votre distributeur local si vous avez des questions.

**FUMÉE et GAZ**

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.
- Utilisez un appareil respiratoire à alimentation en air si l’aération fournie ne permet pas d’éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l’arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:
  - antimoine
  - cadmium mercure
  - argent
  - chrome
  - arsenic
  - cobalt
  - plomb
  - baryum
  - cuivre
  - sélénium
  - béryllium
  - manganesé
  - vanadium
- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain “MSDS”); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l’article 1 et les documents cités à la page 5.
- Utilisez un équipement spécial tel que des tables de coupe à débit d’eau ou à courant descendant pour capter la fumée et les gaz.
- N’utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Eliminez toute source de telle fumée.
- Ce produit, dans le procédé de soudage et de coupe, produit de la fumée ou des gaz pouvant contenir des éléments reconnus dans l’État de la Californie, qui peuvent causer des défauts de naissance et le cancer. (La sécurité de santé en Californie et la code sécurité Sec. 25249.5 et seq.)
• Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.

CHOC ELECTRIQUE

• Ne touchez jamais une pièce “sous tension” ou “vive”; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.

• Réparez ou replacez toute pièce usée ou endommagée.

• Prenez des soins particuliers lorsque la zone de travail est humide ou moite.

• Montez et maintenez le matériel conformément au Code électrique national des États-Unis. (Voir la page 5, article 9.)

• Débranchez l’alimentation électrique avant tout travail d’entretien ou de réparation.

• Lisez et respectez toutes les consignes du Manuel de consignes.

INCENDIE ET EXPLOSION
Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l’arc de plasma. Le procédé à l’arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l’explosion de fumées inflammables.

• Soyez certain qu’aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu’il est impossible de retirer de la zone de travail.

• Procurez une bonne aération de toutes les fumées inflammables ou explosives.

• Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.

• Prévoyez une veille d’incendie lors de tout travail dans une zone présentant des dangers d’incendie.

• Le gaz hydrogène peut se former ou s’accumuler sous les pièces de travail en aluminium lorsqu’elles sont coupées sous l’eau ou sur une table d’eau. NE PAS couper les alliages en aluminium sous l’eau ou sur une table d’eau à moins que le gaz hydrogène peut s’échapper ou se dissiper. Le gaz hydrogène accumulé explosera si enflammé.

RAYONS D’ARC DE PLASMA
Les rayons provenant de l’arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l’arc de plasma produit une lumière infra-rouge et des rayons ultra-violets très forts. Ces rayons d’arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

• Portez des gants de soudure et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l’arc.

• Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.

• Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l’arc en fournissant des cabines ou des écrans de protection.

• Utilisez la nuance de lentille qui est suggérée dans le recommandation qui suivent ANSI/ASC Z49.1:

<table>
<thead>
<tr>
<th>Courant Arc</th>
<th>Nuance Minimum</th>
<th>Nuance Suggérée</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moins de 300*</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>300 - 400*</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>400 - 800*</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

* Ces valeurs s’appliquent ou l’arc actuel est observé clairement. L’expérience a démontrer que les filtres moins foncés peuvent être utilisés quand l’arc est caché par moicieux de travail.

BRUIT

• Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.

• Il faut mesurer les niveaux sonores afin d’assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.

• Pour des renseignements sur la manière de tester le bruit, consultez l’article 1, page 5.

AVERTISSEMENT
AVERTISSEMENT : Ce produit contient des produits chimiques, notamment du plomb, reconnus par l’État de Californie comme pouvant causer des malformations congénitales et d’autres troubles de la reproduction. Se laver les mains après toute manipulation.

Documents De Reference
Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :


5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l’American National Standards Institute, 1430 Broadway, New York, NY 10018


8. Norme 51 de l’Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269


13. Livret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l’Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103


1.7 Declaration of Conformity North America

Declaration of Conformity

Manufacturer: Victor Technologies International Inc.
Address: 16052 Swingley Ridge Road
        Suite 300
        Chesterfield, MO 63033 U.S.A.

Type of Equipment: Plasma Cutting Controller
Model /Number: iCNC XT
Serial Number: Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.
Market Release Date: August 6, 2013

Classification: The equipment described in this manual is Class A and intended for industrial use.

WARNING

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CAN/CSA C22.2 number 61010-1
- UL 61010-1
- CB Scheme - EN61010-1/IEC 61010-1.
- CENELEC - EN61010-1.

Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Victor Technologies has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturer’s Authorized Representative

Joe Mueller S.V.P. Americas and General Manager
Address: Victor Technologies International Inc.
        16052 Swingley Ridge Road
        Suite 300
        Chesterfield, MO 63033 U.S.A

Date: January 16, 2014

(Signature)

Joe Mueller
Full Name

S.V.P. Americas and General Manager
(Position)
1.8 Declaration of Conformity Europe/CE

Declaration of Conformity

Manufacturer: Victor Technologies International Inc.
Address: 16052 Swingley Ridge Road
Suite 300
Chesterfield, MO 63033 U.S.A.

Type of Equipment: Plasma Cutting Controller
Model/Number: iCNC XT

Serial Number: Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

Market Release Date: August 6, 2013

Classification: The equipment described in this manual is Class A and intended for industrial use.

![WARNING]

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.


The equipment described in this manual conforms to all applicable aspects and regulations of the “EMC Directive” (European Council Directive 2004/108/EC) and to the National legislation for the enforcement of this Directive.

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CAN/CSA C22.2 number 61010-1
- UL 61010-1
- CB Scheme - EN61010-1/IEC 61010-1.
- CENELEC - EN61010-1.

Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Victor Technologies has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturer’s Authorized Representative

Steve Ward V.P. Europe and General Manager
Address: Victor Technologies International Inc.
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX
Date: January 16, 2014

Steve Ward
Full Name
V.P. Europe and General Manager
(Signature)
Declaration of Conformity

Manufacturer: Victor Technologies International Inc.
Address: 16052 Swingley Ridge Road
         Suite 300
         Chesterfield, MO 63033 U.S.A.

Type of Equipment: Plasma Cutting Controller
Model/Number: iCNC XT
Serial Number: Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.
Market Release Date: August 6, 2013

Classification: The equipment described in this manual is Class A and intended for industrial use.

WARNING

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.


The equipment described in this manual conforms to all applicable aspects and regulations of the “EMC Directive” (European Council Directive 2004/108/EC) and to the National legislation for the enforcement of this Directive.

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CAN/CSA C22.2 number 61010-1
- UL 61010-1
- CB Scheme - EN61010-1/IEC 61010-1.
- CENELEC - EN61010-1.

Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Victor Technologies has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturer’s Authorized Representative
Julian Chow  V.P. Asia Pacific General Manager
Address: Victor (Ningbo) Cutting & Welding Equipment Manufacturing Co. Ltd.,
         No. 58 West Jin Gu Middle Rd.,
         Xia Ying Sub District,
         Yinzhou District,
         Ningbo, 315104
Date: January 16, 2014
Classification: The equipment described in this manual is **Class A** and intended for industrial use.

---

**WARNING**

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.
LIMITED WARRANTY: Victor Thermal Dynamics® Corporation (hereinafter “Thermal”) warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal products as stated below, Thermal shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal’s specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal’s sole option, of any components or parts of the product determined by Thermal to be defective.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal shall not under any circumstances be liable for special or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, or claims of customers of distributor (hereinafter “Purchaser”) for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

The limited warranty periods for this product shall be: A maximum of three (3) years from date of sale to an authorized distributor and a maximum of two (2) years from date of sale by such distributor to the Purchaser, and with further limitations on such two (2) year period (see chart below).

<table>
<thead>
<tr>
<th>Parts</th>
<th>Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>iCNC XT™ Controller</td>
<td>2 Years</td>
</tr>
<tr>
<td>Repair/Replacement Parts</td>
<td>90 Days</td>
</tr>
</tbody>
</table>

Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized Thermal Dynamics® repair facility within thirty (30) days of the repair. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the customer. All returned goods shall be at the customer’s risk and expense. This warranty supersedes all previous Thermal warranties.

Effective October 23, 2012
SECTION 2: SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>XT2</th>
<th>XT211</th>
<th>XT231</th>
<th>XT242</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>2, Intel (secondary processor for motion &amp; I/O)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating system</td>
<td>XPE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ram</td>
<td>2GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet ports</td>
<td>1 RJ-45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB ports</td>
<td>3, 2 On backwall (USB2.0) + 1 On door (USB2.0)</td>
<td>2 RS-422/485 ports on d-sub 9 pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial ports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard drive</td>
<td>80GB SATA SSD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating console</td>
<td>Total of 5 switches (does not have laser pointer switch)</td>
<td>Total of 17 switches (includes laser pointer switch)</td>
<td>Total of 23 switches (includes laser pointer switch)</td>
<td>Total of 22 switches (does not have laser pointer switch)</td>
</tr>
<tr>
<td>Display</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration</td>
<td>1 Plasma</td>
<td>1 Plasma, 1 oxy, 1 powder marker</td>
<td>1 Plasma, 3 oxy, 1 powder marker</td>
<td>2 Plasma, 4 oxy, 1 marker</td>
</tr>
<tr>
<td>Number of I/O</td>
<td>7 Relay outputs, 6 inputs</td>
<td>27 Relay outputs, 8 inputs</td>
<td>51 Relay outputs, 8 inputs</td>
<td>52 Relay outputs, 2x5 inputs</td>
</tr>
<tr>
<td>I/O type</td>
<td>Line voltage / potential free outputs</td>
<td>Line voltage or user voltage / potential free outputs</td>
<td>Line voltage / potential free outputs</td>
<td></td>
</tr>
<tr>
<td>Axes available</td>
<td>2-3 Y, 1 X, optional 1 iHC Z</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default drives interface</td>
<td>Analog +9V speed signal, incremental encoder inputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated drives</td>
<td>Optional 400W / 750W integrated Yaskawa drives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated plasma height control</td>
<td>Optional IHC height control (for up 2 torches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNC AC input power volts (amps)</td>
<td>115VAC/230VAC (10A) (without drives 115VAC 3A, 230VAC 1.5A. With drives 115VAC 3A, 230V 10A.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive AC input power volts (amps)</td>
<td>230 VAC (10A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cnc protection device</td>
<td></td>
<td></td>
<td></td>
<td>10A slow blow fuse</td>
</tr>
</tbody>
</table>

Optional IO Expander Card with 16 relay outputs available for all iCNC XT models (down draft control)

On XT2 and XT242 all voltage outputs share the same inlet voltage level. There is no inlet for external voltage supply. If internal inlet cable is removed, external voltage for relay outputs can be connected to line & neutral pins. However, even then all voltage output relays share the same voltage level (outputs for gas solenoids, lifters etc.

On XT231 and XT211 as a default gas solenoid outputs are configured for inlet voltage output. On output connectors there are pins for user voltage that can be used instead if couple of relays are moved on relay card. It is also possible to use different voltage levels for gas solenoids and gas torch lifter outputs. XT211 and XT231 directly support both ac and dc lifters and common capacitive height controls.
WARNINGS

DO NOT CONNECT the controller directly to a computer through the RJ45 or RS232 port! Connections must be made with fiber optic devices, wireless LAN, short haul modems or other approved devices which provide galvanic isolation, due to ground loops, electrical noise, or high frequency which can destroy electrical components in the controller or host computer. Failure to follow these rules will VOID THE WARRANTY!

This device is an enclosed type AC Servo Driver with single-phase input and three-phase output. This device is provided with an integrated PLC and a Windows based user interface.

1. Use minimum 75 °C copper wire only
2. Use Copper Conductors Only
3. Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical Amperes, 230 Volts maximum.

### 2.1 Mechanical dimensions XT CNC

Cnc dimensions:
- Height: 17.7 in. (450mm)
- Width: 15.7 in. (400mm)
- Depth: 16.9 in. (430mm)

Mounting Plate:
- Width: 15.35 in. (390mm)
- Depth: 14.3 in. (363mm)*
- Mounting holes: 13.7 in. X 12.6 in. x 4xM6 (349mm x 320mm, 4 x M6)

* Max plate thickness 20mm with the provided mounting screws.

* Some users might want to expand the bottom plate from the front side. Usually you would create a space for a keyboard, mouse, or just some work space for papers etc.
2.2 Power Requirements

The power connector is located at the backside of the CNC unit. The connector is a standard IEC C14 power connector. Use a IEC C13 plug to connect the main power to iCNC XT. The power requirement is shown in the product label at the lower left corner in the backside of the CNC.

Use national wiring standards for wire and fuse sizes.

2.3 Mechanical dimensions Yaskawa Motors

SGDV Sigma 5

400W LL = 3.9 in. (98.5mm)
400W LC = 2.36 in. (60mm)
750W LL = 4.5 in. (115mm)
750W LC = 3.15 in. (80mm)
400W S = 0.551 in. (14mm)
750W S = 0.748 in. (19mm)
2.4 Mechanical dimensions Neugart Gearboxes

PLE60 (400W)

PLE80 (750W)
**3.1 Common Devices Installation**

**WARNINGS**

*DO NOT CONNECT the main power before all wiring is done and all cables are connected at both ends.*

*Always follow national wiring standard for wire sizes.*

This section provides a basic wiring guide for limit switches, E-stops, Yaskawa drives, Down draft control and laser pointer. If you have a different type of setup and are unsure how to wire your machine please contact Victor Technologies for further support.

---

**Grounding Requirements**

**Creating an Earth Ground**

1. To create a solid, low resistance, earth ground, drive a 12 mm (1/2 in) or greater diameter copper clad ground rod at least 1.8 - 2.4m (6 - 8 ft) into the earth so that the rod contacts moist soil over most of its length. Depending on location, a greater depth may be required to obtain a low resistance ground. Ground rods, typically 3m (10 ft) long, may be welded end to end for greater lengths. Locate the rod as close as possible to the work table. Install a ground wire, 50mm² (1/0 AWG) or greater, between the ground rod and the star ground point on the cutting table.

---

**Star Ground on Cutting Table**

---

---
Cable routing suggestion

The idea is to put the plasma torch, work, electrode, ohmic grounds etc cables to the opposite side from the I/O, encoder and motor cables (empty space shown in the picture). Use the gas hoses as a separator between the 2 cable sets.
3.2 Main Power

Use a IEC C13 plug to connect the main power to iCNC XT. The main power connector is shown in Section 2.5 Power requirements.

3.3 Limit Switches Wiring

Connect your normally closed limit switches in series as shown in the picture to connector J16 Limits. Y2 alignment switch is used to align the bridge when homing (optional feature). Mount your Y2 limit so that the bridge is straight when tripping both Y and Y2 limit switches.

3.4 E-stop Wiring

Wire your normally closed E-stop buttons in series to the input. On the power card you have options to enable/disable and change polarity of the e-stop signals. See next page for jumper descriptions.
### E-STOP POLARITY

<table>
<thead>
<tr>
<th>Name</th>
<th>Default</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>NC</td>
<td>External E-STOP (remotely located) switch polarity, jumper vertically</td>
</tr>
<tr>
<td>NO</td>
<td></td>
<td>External E-STOP (remotely located) switch polarity, jumper vertically</td>
</tr>
</tbody>
</table>

*NC = Normally Closed switch  
*NO = Normally Open switch.

### EXT E-STOP

<table>
<thead>
<tr>
<th>Name</th>
<th>Default</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td></td>
<td>External E-STOP (remotely located) Circuit Bypass. (No external E-Stop push button installed)</td>
</tr>
<tr>
<td>2-3</td>
<td>2-3</td>
<td>External E-STOP (remotely located) Circuit enabled</td>
</tr>
</tbody>
</table>

### JP SAFETY

<table>
<thead>
<tr>
<th>Name</th>
<th>Default</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td></td>
<td>Wrong Input Voltage Selection Safety Disabled</td>
</tr>
<tr>
<td>2-3</td>
<td>2-3</td>
<td>Wrong Input Voltage Selection Safety Enabled</td>
</tr>
</tbody>
</table>
3.5 Yaskawa Motor and Servo Installation

The CNC may have a different combination of servo amplifiers. The Yaskawa amplifiers come either as 400W, 750W or a combination of both. Wiring them is almost the same, the only difference is that the 750W drives has a bigger diameter motor cable so please ensure that the bigger wattage amplifiers get the thicker cable.

The amplifiers are mounted inside the CNC so that starting from left they go X, Y, Y2 (X is horizontal and Y’s are longitudinal).

"Y" is determined by the side with the "Y" limit switches. "Y2" is the side without the switches.
Routing the cables in the cable track

Start by routing and connecting the cables to the motors, both encoder and motor cable. Try to route the motor and encoder cables on the opposite side from the possible plasma torch, work and electrode cables in the cable track. Mark the cable ends that go to the cnc so you know into what servo amplifier you connect them inside the XT cnc.

Routing the cables into the XT CNC

Sort out your motor and encoder cable pairs so that it is easy to route them through the cable glands. The cable glands will house 2 cables each so that every axis will go through their separate cable gland.

1. Remove the cable gland by holding the plastic nut in place while you unscrew the cable gland body.

2. Split the cable gland in half. Use a small flat head screw driver and gently pry the clips holding the 2 halves together.

3. Route your cable inside the XT CNC. Take a length of approximately 40cm [16in] of the cable inside the XT CNC.

4. Put the cables, encoder cable first, through the seal and nut (motor and encoder).

5. Twist both of the cables through their separate ferrite beads. Make sure the cable seal and the cable gland nut are left on the wall side of the ferrite bead.

6. Remove the grounding clip using a screw driver.

7. Use the small plastic key to connect the motor cable wires to the amplifier. Make note that the wires go to the appropriate pins on the connector (U,V,W).
8. Put the grounding clip around the cable shield and screw it back to the amplifier. Add the motor cable ground wire (green/yellow) to the screw terminal next to the grounding clip.

9. Connect the encoder cable

10. Pull excess cable from the inside of the XT CNC and compile the cable gland. Put the cable gland seal to the cable gland.

11. Press the cable gland through the hole and tighten the nut.

12. Repeat the steps for all axes.

Connecting external voltage supply to the Yaskawa servo amplifiers, 110VAC and 220VAC systems

1. Make sure power is disconnected.

2. Route your power cable through the strain relief.

3. Locate the Yaskawa power filter on the right hand wall inside the XT CNC.

4. Crimp the provided abico connectors to the power cable wires.

5. Push the wires in place to the filter
3.6 Down Draft and Laser Pointer Wiring (XT 211 & 231 ONLY) OPTIONAL

You can control the fume extraction manually or by automatic. The switch marked Table controls the output on J30 pins #26 & #27. Connect your fume extraction motor ON/OFF relay to these pins, max contact current is 1A.

Connect your laser pointer +voltage to J30 pin #36. From an external power source connect the ground straight to the pointer and the +voltage to J30 pin #37. The laser pointer output is activated by the switch marked Pointer.
3.7 Plasma Communication, Plasma I/O

1. Connect the CNC end of the 9pin D connector to the serial port marked COM1 at the back of the XT CNC.

2. Connect the 37 pin male amp connector at the back of the XT CNC as follows: For XT211/XT231, J30 to the J30 plasma connector. For XT2/242, J25 to the J25 plasma connector.

3. Connect the ground wire to the ground stud at the back of the XT CNC.

4. Route the cables in the cable track. Try to place the cables with the other I/O cables on the opposite side from the plasma work, electrode, ohmic and other high noise cables.
3.8 Height Control, Communication and I/O Cables

1. Connect the plasma end of the communication cable to the plasma power supply connector J54 TCS /COMM
2. Connect the plasma end of the Plasma I/O Cable to the plasma power supply connector J15 CNC
3. Connect the plasma end of the Voltage Divider I/O Cable to the plasma power supply connector Height Control
4. Connect the 37 pin male amp connector marked J102 to the J102 connector at the back of the XT CNC.
### 3.9 Voltage Divider for iHC Torch Height Control

There is a space for mounting the V-D Board located on the upper portion of an internal vertical panel near the rear of the power supply. Pre-drilled holes for mounting the iHC V-D board as well as another popular height control are provided.

#### Install the Voltage Divider Board.

1. Locate the V-D Board which should be with the XT CNC.
2. Inside the Power Supply, locate and remove the mounting panel’s 2 screws and panel.
3. Install the V-D board standoffs and the V-D Board from the XT iCNC then reattach the panel with the 2 screws, securing the voltage divider board in place.
4. Connect the wire harness 9-78XX to the green 6pin connector on the voltage divider board and screw on the CPC connector to the rear panel hole marked “height control”.
5. The XT plasma supplies provide a terminal strip, TB4, on the right side ahead of the CCM module for connections to Arc V- (Torch); Tip V (Pilot); Arc V+ (Work). Connect wires to the voltage divider board marked Work and Electrode. Run the wires to TB4 twisting them around each other and then connect the Work to Work and Electrode to Arc V- (Torch).

#### Ohmic Sense cable.

The iHC finds the plate using an electrical or resistance measurement, thus “ohmic”, contact between the conductive end of the torch and the metal or “plate” being cut. A wire, usually a single highly flexible wire that withstands the reflective heat from the arc, is connected between the V-D board and the torch shield cup. The XT torch includes a metal spring clip which slips into a groove in the shield cup allowing easy removal for parts change. The Ohmic wire can be connected to this clip with a ¼” female push-on terminal.

Significant amounts of high frequency (HF) energy causing electromagnetic interference (EMI) can be conducted along this wire due to it’s close coupling to the torch. This is the reason for mounting the V-D board away from the CCM and close to the rear panel where the Ohmic wire does not need to pass near other sensitive electronics. It is especially recommended that the Ohmic wire not be routed near the CCM module or along the torch leads.

#### Ferrite cores.

It is recommended that the Ohmic Sensing wire be wrapped through a ferrite core with several turns, at least 3 but more is better, to reduce the energy conducted to the V-D board and into the plasma supply. The ferrite core should be located on the wire where it enters the plasma supply. A second ferrite core added several feet (couple of meters) from the torch will further reduce the conducted EMI that may couple to other cable/wires and cause interference.
This section provides a basic wiring guide for oxy fuel lifter, solenoids and capacitive sensor.

**Oxy fuel solenoid wiring**

By default the output connector will provide inlet voltage outputs. By moving jumpers on the relay board you have an option to select any dc or ac voltage. If you choose to use other than inlet voltage you need to provide an external power supply connected to J31/33/34 pins #28 (User VCC input) and #22 (User GND input).

Ancillary circuit wiring diagrams are simplified for illustrative purposes. Other connections may be required to meet the intended application. Voltage selection jumpers explained on following pages.
Main gas connector XT231 ONLY

With the XT231 you can have separate outputs for each torch station and then select your active station with the Sel 1, Sel 2, Sel 3 switches on the switch panel. You also have a main gas connector, the station select switches are ignored in these outputs.

By default the output connector will provide inlet voltage outputs.

Voltage selection jumpers explained on next page.
### J3

<table>
<thead>
<tr>
<th>Position</th>
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<th>Remarks</th>
</tr>
</thead>
<tbody>
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<td>1-2</td>
<td>1-2</td>
<td>Inlet line voltage</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>User VCC</td>
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</tbody>
</table>

### J4

<table>
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</thead>
<tbody>
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<td>1-2</td>
<td>1-2</td>
<td>Inlet neutral voltage</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>User GND</td>
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</tbody>
</table>
### JP10

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<td>1-2</td>
<td>Inlet line voltage</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>User VCC</td>
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</tbody>
</table>

### JP11

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<tbody>
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<td>1-2</td>
<td>Inlet neutral voltage</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>User GND</td>
</tr>
</tbody>
</table>

### JP12/JP13/JP14

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<tbody>
<tr>
<td>1-2</td>
<td>1-2</td>
<td>Inlet voltage lifter</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>User AC voltage lifter</td>
</tr>
</tbody>
</table>
3.11 Oxy Fuel Lifter Wiring AC

By default the output connector will provide inlet voltage outputs. See previous page for voltage selection jumpers.

3.12 Oxy Fuel Lifter Wiring DC

You can provide your own DC voltage to pins #2 and #8. The relay logic will then swap the polarity of the voltage going into the lifter motor. If the lifter moves up when you press down from the switch and vice versa, just swap the wires in pins #4 and #6. Max output rating 48VDC/4A.
3.13 Oxy Fuel Capacitive Sensor Wiring

The above picture describes a common wiring for a capacitive sensor with a motor controller. Depending on the polarity to enable automatic height sensing use either pin #35 normally closed or pin #36 normally open. The example is for 24VDC inputs.
3.14 Setting up the Motion

**CAUTION**

Disengage all motors from rails before doing the motion test. Disregarding this may result in mechanical damage.

**NOTE**

Important - Please complete all motion set up, in sequence, before operating the controller. Supply voltages must be present for the system to work.

1. Start with the following switches in the position listed.
   - Plasma Enable - OFF
   - EStop - Pushed IN.
   - Drive Enable - OFF
   - Drive - OFF
2. Apply servo drive power.
3. Apply 115 VAC to CNC.
4. Turn on CNC via momentary input power toggle switch located lower right corner of system.
5. Wait for all screens to appear then pull (release) the EStop button.
6. Wait for the optional Lift Enable screen to fade. (See Lifter instructions) Select NO to the Home Question
7. From the ICNC screen click on the following:
   - Info
   - File
   - ICNC Setup
8. Click Enter Administrator Mode and enter the password (pmcs1).
9. Check the box “Disable servo failure detect”.

3.15 Unlocking the Hard Drive

NOTE

The system will reboot during the locking and unlocking of the Hard Drive.

1. Select Option 8. NOTE - the button will indicate the current Hard Drive status.
2. Select option 8.1 “Change Status”.
3. Select “Unlock”
4. Select “Close”.
3.16 Drive Configuration

Select 1. Motion --> 1.1. Drive Configuration: choose 2 or 3 axis depending on your machine.

NOTE

You must go through each of the 8 steps in the right column, 1.1, 1.2, 1.3 etc. through 1.8.

1. Changing the drive configuration to a 3-axis system, demands doing a Total Restart to make the change valid. Follow the on-screen prompts and wait for the system to shut down and to restart again.

NOTE

Total Restart is located in System Status --> File --> Restart System Software.

2. When the controller reboots, you will be prompted to transfer the newly modified ROBOPRM1.DAT file to the background CPU. You may need to look behind other open windows for this. Select YES and give the password (default from factory is "pmcs1") to complete this action. When completed, restart iCNC Setup as explained above.
3.17 Motor and Encoder Polarities

**NOTE**

Make sure the Drive Enable Switch on the front of the controller is “OFF”

Make sure that the controller is in basic status (no lights-on in any of the 10 push buttons in front panel.)

**CAUTION**

Disengage all motors from rails before doing the motion test. Disregarding this may result in mechanical damage.

Select 1.2. Drive and Encoder Polarities from iCNC Setup.

1. Put the Drive Enable Switch on the front of the controller to “ON”
2. Opening this dialog box opens the positioning loop. Press Y+, Y-, X+, X- buttons to send out speed signals to the drives and check the actual rotation of the drive pinion wheels. If rotation is incorrect, change the corresponding polarity in the dialog box and check again.
3. After all polarities are correct, click the Drive Polarity OK check box.
4. Next, set the encoder polarity by pressing the Y+ direction for about 2 seconds. If the polarity is incorrect, the software will automatically detect it and change the setting automatically. Repeat for the +X direction. Click OK when completed.
5. Put the Drive Enable Switch on the front of the controller to “OFF”
3.18 Encoder Values

Select 1.3. Encoder Values from iCNC Setup.

Normal encoder values are in the 100 000 – 5 000 000 range.

You can calculate the encoder value like follows:

Metric: \((1005.3088\text{mm} \times \text{encoder pulses per revolution} \times 4 \times \text{gear ratio}) / (\text{module} \times \pi \times \text{number of teeth in pinion}) = \text{Encoder value}\)

Imperial: \((39.57909 \times \text{encoder pulses per revolution} \times 4 \times \text{gear ratio}) / (\text{Effective Diameter} \times \pi) = \text{Encoder value}\)

1. Type in your encoder values and click recalculate.
2. Click Apply

Check that you are moving the correct distance by doing the following:

1. Have just one motor connected to the rail at a time.
2. Put drive switch to ON
3. Move the machine to the front of the rail or reference mark. Reset the encoder counters by pressing the Reset counters button. Press the “Jog On/off” button to enter manual mode (note: the manual mode button will flash on-off). Using the directional keys or corresponding drive direction button, move the machine as long of a distance as is possible. Measure the machine position from the end of the rail or reference mark, using a metric tape measure and write down the distance.
4. Check from the coordinate display for the distance the CNC measured and write it down.
5. Zero the position.
6. If your measured distance and the distance the CNC measured are different, calculate the correct encoder value by: Dividing the displayed distance with the actual travel distance and then multiply the encoder value with the result. Example:
   - Encoder value in screen = 1143818.000
   - Actual moved distance = 3000mm
   - CNC displayed distance = 1500mm
   - \(3000 / 1500 = 2\)
   - \(2 \times 1143818.000 = 2287636.000\)
   - Correct encoder value = 2287636.000
7. If needed redo the steps above to set the correct encoder value.
8. Put the Drive Enable Switch on the front of the controller to “OFF”
3.19 Drift Adjustment

Select 1.4. Drift Adjustment from iCNC Setup.

1. Open the Yaskawa SigmaWin+ software from:

   Windows Start menu --> All Programs --> YE_Aplications --> SigmaWin+

2. Connect the USB cable located inside the controller at the right hand wall to the X amplifier:
3. Make sure your amplifiers are powered up and that the display in the amplifier shows bb. Select search and click search again.

4. After the search has finished select the new found drive and click connect.
5. In SigmaWin software Navigate to Setup --> Adjust Offset --> Adjust the Speed and Torque Reference Offset.


7. Put your Drive Enable switch to ON. Adjust the Speed Reference value to zero by clicking either the +1 or -1. When you have reached speed 0 (min-1) fine tune the drift by checking the drifting speed from iCNC setup 1.4. (first page of this section) Drift Adjustment. After you are done put the Drive Enable switch to OFF, disconnect from the drive and repeat for all axes.
3.20 Maximum Speed Adjust

The next step is 1.5. Max Speed Adjustment. This test will run the machine with maximum speed so you can fine tune the desired maximum speed.

**CAUTION**

Disengage all motors from rails before doing the motion test. Disregarding this may result in mechanical damage.

Make sure the speed potentiometer is set to 100% for this test.

1. Put Drive Enable Switch to ON.
2. Press X+ on the Max speed adjustment window.
3. Check your maximum speed. If the speed is good and you don’t need to drop the speed:
   - Check the Y speeds are roughly the same as X
   - Put the Drive Enable Switch on the front of the controller to “OFF”
   - Continue to the next step (Max speed test)

**Changing the maximum speed from the servo amplifier:**

1. Open SigmaWin software and connect the USB cable to drive X (see section 6.5 about connecting to the drive).
2. Select parameters, Edit parameters.
3. Select Speed(Pn3xx-) tab.
4. Double click Speed reference input gain.
5. Increase the gain value so you get a wanted maximum speed and click OK. Please note a higher value will give a lower speed.
6. Click Write.

7. Check your new maximum speed from the iCNC setup Max speed adjustment page.
8. Repeat procedure to further fine tune your maximum speed. Repeat steps to all axes so each one has the same max speed.
9. When finished, put the Drive Enable Switch on the front of the controller to “OFF” and remove the USB cable from the drives.
The next step is 1.6. Max Speed Test. This test is elementary for proper operation of the controller.

**CAUTION**

Disengage all motors from rails before doing the motion test. Disregarding this may result in mechanical damage.

Make sure the speed potentiometer is set to 100% for this test.

1. Select 1.6. Max Speed Test from iCNC Setup.
2. Put the Drive Enable Switch on the front of the controller to “ON”.
3. Select Start test when you are ready. When all four directions and speeds are set, press the ZERO push button on the controller and set the Max settable speed for the machine to a slightly slower speed than found in the test.
4. Put the Drive Enable Switch on the front of the controller to “OFF”.
5. Click Ok.
3.22 Minimum Speed Test

Select 1.7. Min Speed Test from iCNC Setup.

**CAUTION**

Disengage all motors from rails before doing the motion test. Disregarding this may result in mechanical damage.

1. Put the Drive Enable Switch on the front of the controller to “ON”
2. Select Start test and follow the instructions on the screen. This may take several minutes. Since the speed value is small, it may be difficult to see anything happening unless watching the motor pinions, or viewing X-Y positional data in the Machine Info screen.
3. After the measured speeds appear, select Calculate low speed corrections. With optimum drives and perfect adjustment, all the correction values will come in at 1. Press the ZERO push button on the controller, then select OK when ready.
4. Put the Drive Enable Switch on the front of the controller to “OFF”
5. Close iCNC setup.
6. From Info System status window, select File, Restart system software.
7. Follow instructions on the screen to restart the system software.
8. When the software restarts, you will be prompted to save files. Click yes and use password pmcs1.
3.23 Setting Motion Parameters

The next step is 1.8. set motion parameters.

Leave all parameters at default settings with the exception of the following:

- **Min settable speed.**
  Set to 1.5 times the parking speed.
- **Parking Speed**
  Must be higher than maximum drift mm/min.
- **Acceleration**
- **Deceleration**
- **Cenrifugal Acceleration**
  Must be set lower than either Acceleration or Deceleration parameters

![Drive parameters](image)
3.24 Setting Correct Inertia Ratio

Put the USB cable to the Y-Drive and connect to the drive (follow instructions on section 6.5).

Select Tuning and click Tuning.

1. Click Execute.

2. Use the following formula to determine your inertia ratio Note this only applies with SGMJV 04/08 motors and Neugart PLE60/80 gearboxes.

   **400W**
   - [Metric] $0.00035 \times \text{gantry weight per motor} \times \text{effective diameter of pinion}^2 = \text{Inertia ratio}$
   - [Imperial] $0.1 \times \text{gantry weight per motor} \times \text{effective diameter of pinion}^2 = \text{Inertia ratio}$

   **750W**
   - [Metric] $0.0001 \times \text{gantry weight per motor} \times \text{effective diameter of pinion}^2 = \text{Inertia ratio}$
   - [Imperial] $0.03 \times \text{gantry weight per motor} \times \text{effective diameter of pinion}^2 = \text{Inertia ratio}$

Example:

Dual drive system so the gantry weight is divided to 2 motors.

Gantry weight = 400kg (882 lb.).

Gantry weight per motor = **200kg (441 lb.)**.

Motors = **400W**

Effective pinion diameter = 30 teeth, module 1.5 = **45mm**

$0.00035 \times 200kg \times 45^2 = 141.75$

Inertia ratio = **142%**

Round up the calculated value to the next even one.

**NOTE**

*If you are unsure about your inertia ratio, please contact Victor Technologies technical support for assistance.*
3. Click Edit.

4. Type in your inertia ratio value and click Ok. Example a result of 65 = 65%, 125 = 125%.

5. Disconnect from the drive and repeat steps for Y2 axis.

6. After you are done put the Drive Enable Switch on the front of the controller to “OFF” and remove the USB cable from the drives.

7. Verify all changes have been completed at this point before going to the next step of locking the hard drive.
3.25 Locking the Hard Drive

**CAUTION**

After the CNC installation is completed, the Hard Drive should be locked to protect the system against unintentional changes, viruses and corruption of files. It is highly recommended to run the system with the Hard Drive locked.

**NOTE**

The system will reboot during the locking and unlocking of the Hard Drive.

1. Select Option 8. NOTE - the button will indicate the current Hard Drive status.
2. Select option 8.1 “Change Status”.
3. Select “Lock”
4. Select “Close”.

![Image of the locking interface](Image of the locking interface)
SECTION 4: QUICK START AND OPERATION

WARNINGS

DO NOT CONNECT the controller directly to a computer through the RJ45 or RS232 port! Connections must be made with fiber optic devices, wireless LAN, short haul modems or other approved devices which provide galvanic isolation, due to ground loops, electrical noise, or high frequency which can destroy electrical components in the controller or host computer. Failure to follow these rules will VOID THE WARRANTY!

This device is an enclosed type AC Servo Driver with single-phase input and three-phase output. This device is provided with an integrated PLC and a Windows based user interface.

1. Use minimum 75 °C copper wire only
2. Use Copper Conductors Only
3. Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical Amperes, 230 Volts maximum.
4. Solid state motor overload protection is provided in each model at 110% of rated FLA.
5. Integral solid-state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided by any R/C supplemental fuse (JDYX2), rated 250 Vac, 10 A.

4.1 Quick Guide for Part Cutting

This section will give a quick demonstration on cutting a part.

1. Verify that the machine is in cutting condition and you have correct consumables installed in the torch.
2. Select the thermal screen from the bottom tool bar.
3. Select the desired Cut Process based on the Process, Thickness, Gasses and Consumables in use. Click the desired process so it highlights in green.

4. Click Apply.

5. Click Close

6. Click Shapes

7. Select your macro, set the dimensions and click Ok.
8. Click Send to cutting

9. Verify your process is correct and click Ok.

10. Drive your machine to the reference 0.0 position and zero your position. See 4.3.2 for Jog and Zero.

11. Click iHC
12. Click find plate and when done click minimize.

13. Click program start. See section 4.3

Note:

See Promotion Nest and Plasma software manuals for more details.
5.1 Cut Process Screen

Definition of areas under the Cut Process Tab shown on the XT CNC Thermal Screen

1. Use the drop down boxes to select the material and thickness to be cut.

2. The available cut processes for the selected material and thickness will be displayed along with information indicating which process is “B” for Best cut quality, “F” for Fastest cut speed, “R” using the robotic consumables for beveling, “M” indicating maximum piercing thickness. Select the desired process by clicking on the Cut Process number and clicking the “Apply” button. When “Current process” equals “Selected process” the plasma is ready to cut. If red “Plasma not ready” is on check that the plasma is enabled via a switch located on the CNC panel.

3. This area shows the consumable to be used for the selected process. Click on “Show Picture” to see a picture of the consumables.

4. This area shows the cutting current and gas pressures that will be used for the selected cutting process.
1. CNC & THC tab shows the recommended default parameters the CNC will use for cutting as well as the recommended default parameters the Torch Height Control will use during cutting for the process selected.

2. SETUP tab is used to set the length of the hoses from the DMC to the DPC. The default length may be longer than those used in your particular installation. Press “Refresh” to update the screen with information from the CCM. Setting the correct length will shorten purge time. DO NOT set the length shorter than the actual hoses used or consumable life will be greatly reduced. This tab also shows the Cut Chart revision, the selected language and optional dip switch settings at the CCM.

3. CCM / Power Supply tab shows any active or latched power supply faults as well as the CCM firmware revision.

4. DMC tab shows any active or latched DMC faults as well as the DMC firmware.

5. DPC / Live Values tab shows any active or latched DPC faults, the DPC firmware, and the pressures measured at the DPC outlet hoses.
5.2 Overview Main Screen

The main screen is divided into three parts.

- Info (Systems Status)
- Promotion Cut – Next Job Preview
- Current Job

5.2.1 Info (System Status)

This is located on top of the screen. The info screen shows system information and is used for diagnostics and troubleshooting.

- Speed IPM (or metric) indicates machine speed.
- X & Y readouts indicate absolute position of the cutting tool.
- Speed Bar in %. This is interfaced directly with the Speed Potentiometer and will reflect the speed pot setting.
- Jogging direction indicator. Monitors and shows which direction/jogging key is pressed.
- Operational Panel – Interfaced with the 8-10 push buttons. Monitors which button is pressed or activated.
- System Running – Indicates that the second CPU is activated and functionally properly.
Located on the left hand side of the screen, the Promotion Cut Screen is the starting point to navigate throughout the different screens.

Opens the process selection window.

Selecting the Shapes button will automatically open the Macro Shape Library in ProMotion Nest.

The Download button opens the Windows Open File to select a stored program from an internal or external storage device.

Zoom button opens the zoom window. This lets you take a closer look at the parts.

The Setup button opens the Parameter Quick View Screen to allow you to change values for Kerf, Speed etc.

Opens to the jog screen dialog box. Functions like Drive machine to and Rip cut are located under this jog dialog box.

Selecting on the Act button will allow you to do a trial run of the program, select on board manual, and the options to open the menu bar on Promotion Cut - Next Job Screen.

**HINT:** To perform a trial run properly the manual mode button must not be activated.
5.2.3 Current Job

Located on the right hand side of the screen, the Current Job window displays the current job being cut with real time tracking.

- **CANCEL PROGRAM**
  Normally grayed out. Activated when a cutting program is stopped by pressing the Torch On/Off or the Stop–Backup button located on the front panel of the controller. Selecting Cancel Program will terminate the current job being cut or trial run.

- **MOVE PROGRAM**
  Normally grayed out, it becomes activated when a cutting program is stopped and the Manual Mode button is selected. When confirming if a part program fits on a plate, i.e. in Trial Run mode, it will re-position the program the same distance as the torch movement.

- **CUT PATH RECOVERY**
  Normally grayed out. Activated when a current program is stopped and the Manual Mode button is selected. Selecting Cut Path Recovery will re-start the pierce cycle at the point the torch is located and will allow travel back to the original program path.

- **READJUST CUT PARAMETERS**
  Selecting the Readjust Cut Parameters button will allow the operator to change certain parameters i.e. cutting speeds, creep speed/time, and delays, to the cutting program on the fly. This will eliminate the need for stopping the machine to make these changes.

- **Refresh**
  Refresh the current job screen.

- **Next Job Preview**
  Selecting the Next job preview will transfer the next program from the Next Job Preview screen without activating the cutting sequence. This is grayed out during cutting.

- **View track**
  Selecting the view track during cutting will zoom in on the cutting path.
The Cut again box allows the opportunity to suspend and save a current job and restart a saved job.

- **Cancel** – Cancel any selected functions under the Cut again box
  
  Show new start point – Selecting this function allows the mouse pointer to automatically change to a cross hair when a pierce point is identified on a part

- **Restart** – After locating a new pierce point, select Restart to start cutting cycle

- **Zoom** – Allows easier pierce point location on a nest by zooming-in on a part

- **Save job** – Will store existing suspended program to a temporary file

- **Reload saved job** – Brings back the suspended saved program from the temporary file

### 5.3 iCNC XT Operating Control Panel

The iCNC® XT’s operating control panel is located below the LCD graphics screen. Most machine motion and cutting functions are initiated using this operating control panel.

#### 5.3.1 Speed Potentiometer

![Speed Potentiometer Image]

Turning the potentiometer counter clockwise decreases the actual speed in comparison with the programmed speed. This potentiometer is only used in special cases, such as temporarily slowing down the cutting speed. Turning the dial down below 100% causes the Torch Hold / Corner signal to be activated, which freezes the automatic torch height control at that height. In most cases the speed potentiometer is set at 100% clockwise.

#### 5.3.2 Direction Jog Keys

![Direction Jog Keys Image]

MANUAL MODE must be activated before using the jog function. Press and hold a directional button and the machine will move in that direction. Releasing the button will cause the machine to stop. Pressing and holding two adjoining directional buttons will move both axis simultaneously in a 45 degree direction.
5.3.3 Manual Mode Button

Pressing the MANUAL MODE button activates the capability to jog and reposition the machine.

**CAUTION**

Pressing the MANUAL MODE button again will turn off the manual mode and will return the machine to the last known parked position.

5.3.4 Zero Button

Resets the X & Y counters to ZERO after locating a new starting point on the table using the jog function keys.

**HINT:** Pressing the zero button will automatically turn off the manual mode button, if it was activated on.

5.3.5 Start Button

Sends the cutting program from the “next job preview” screen to the “current job” screen to be executed, and starts the cutting cycle sequence. The START button illuminates and is on during the entire execution of the program. No programs can be transferred to the current job screen if the START button is on.

**HINT:** If this button is pressed during a programmed delay, the delay is terminated at once without memorizing the interrupted time of the delay in cutting parameters.
5.3.6 Torch ON/OFF Button

Pressing the TORCH ON / OFF button when manual mode is activated, will either manually start or turn off the cutting process.

Note:
When the start button is activated, and the cutting sequence is initiated, the TORCH ON/OFF button will automatically illuminate indicating the torch is on and the cutting sequence has started. When the program ends, the light will go out automatically indicating end of cut. If TORCH ON/OFF is pressed and released during the cutting process, machine motion and cutting stops. Pressing this button again starts machine motion and the cutting sequence with any programmed delays.

HINT: You can’t use TORCH ON/OFF for manual cutting, e.g. scrap lines. Manual button on push the TORCH ON and the pierce sequence will begin. Immediately after pushing TORCH you can start pushing a directional button, the machine won’t start to move before the pierce sequence has ended.

5.3.7 Record Time & Extend Time

RECORD TIME
During any start or end delay of the cutting process you will see this button light up. At the same time a counter on the screen counts down remaining seconds for current delay.

If this button is pressed during a programmed delay, the delay is terminated at once. The system memorizes the interrupted time of the delay and uses this new delay time when run again.

EXTEND TIME
If this button is pressed during a programmed delay, the system stops counting down the delay timer and begins to extend the timer. The counter on the screen will display this time extension. The delay will stay on until manually terminated by pressing either the START or RECORD TIME button. The light of the EXTEND TIME button is lit during manual delay extension.

Note:
These are not available in XT2 controller.

5.3.8 Speed Up & Speed Down Buttons

Short pushes increase or decrease the actual and set speed in small steps. Long lasting pushes change the speeds at a faster rate. The pushbuttons will illuminate during automatic corner acceleration and deceleration respectively.
5.3.9 Move Ahead Button

The MOVE AHEAD button is illuminated whenever a program is running. Pressing the Torch On/Off button will stop the machine and the Move Ahead button will turn off. At this point, pressing the MOVE AHEAD button will cause the machine to move forward on programmed path without cutting. Pressing the MOVE AHEAD button again will stop machine motion.

HINT: Turn speed potentiometer counter clockwise when using the Move Ahead feature for more precise control.

5.3.10 Stop / Backup Button

Press and release the STOP BACKUP button once during the cutting process to stop the cutting sequence and halt machine motion. Press and release the STOP BACKUP button again to move the machine in reverse, or backup on path. Pressing STOP BACKUP button again will stop motion.

HINT: Both the Stop-Backup and Torch on/off buttons work identically when running a cutting program. Pressing either button will allow cutting to stop.
5.4 Switch Descriptions and Functions

5.4.1 Emergency Stop - Button

The Emergency Stop – Off button is used to remove power from the entire system in case of an emergency. It supplies power to the servos and cutting controls. The power to the CNC is not removed. Motion and cutting will stop immediately when the Emergency stop is pushed in.

Turn the E-stop button clockwise and release, to apply power to the servos and cutting controls. Hold in the Emergency Stop for at least 10 seconds to allow the capacitors to discharge before releasing.

NOTE:

Before powering up we recommend that you move the Drive Switch to the off position.
5.4.2 Input Power Switch

The Input Power Switch is a momentary switch. Toggling the switch up and holding for two seconds will turn on power to the CNC and the system. The proper way to switch power off is using Windows shutdown. This will switch off all power in the controller. In case Windows shutdown is not available, it is possible to force power-off by pressing and holding down this switch for 20 seconds. This method is not recommended, unless there is no other way to shutdown the system.

Note:

After switching off the controller it is advisable to wait at least 20 seconds to allow the capacitors to discharge before switching on again.

5.4.3 Drive Switch

DRIVE ENABLE

This is a two position switch - ON or OFF. In the OFF position the servo drives are disabled. In the ON position the servo drives are enabled allowing the machine to move when commanded to do so.
5.5 XT2 Switch Description and Function

5.5.1 XT2 Switches and Descriptions

Floating Head Switch
- ON position will activate the Floating Head Output.
- AUTO position allows the plasma cutting signal from a program to run the plasma.
- OFF position will prevent activating the Floating Head.

Plasma Switch
- ON position will activate the Plasma Output.
- AUTO position allows the plasma cutting signal from a program to run the plasma.
- OFF position will prevent activating the plasma.

IHS Switch
- ON position will activate the IHS Output.
- AUTO position allows the IHS signal from a program to run the plasma.
- OFF position will prevent activating the IHS.

Up / Down switch
- Move torch Up/Down
5.6.1 Station Select Switches

Station Select Switches 1 – 4, Plasma 1 and Plasma 2
With the STATION SELECT switches the operator can select which torches are in use.

- The first 4 are Oxy-Fuel torches
- The last two are Plasma 1 and Plasma 2

The switches have 3 positions: Up/On, Middle/Off, Down/Auto

OFF for Oxy-Fuel stations 1 – 4 means:

- A station is not selected
- Preheat gases, cutting oxygen, water spray and ignition are disabled for this torch
- Torch Up and Down switches for this torch are disabled
- All Up / Down switch does not effect this torch

ON for Plasma stations 1 and 2 means that:

- Torch Up and Down switches for this torch are enabled
- All Up / Down switch will drive this torch
- In plasma cutting this torch will be used for cutting with normal plasma cut ON signals

AUTO for Oxy-Fuel and Plasma stations means that:

- All stations are OFF as default
- Stations are put ON with cnc control

Programmed cutting with 2 plasmas:

- In a case like this it is possible to create a cutting program where some of the programmed cuts (typically small holes) will be cut with the second plasma while others are cut with plasma 1.
- In a case like this the operator has to select plasma 1 AUTO and plasma 2 AUTO. The controller will automatically disable plasma 1 and enable plasma 2 according to the programmed selection of plasma 2. This needs to be added to the cutting program separately.

Cutting simultaneously with 2 plasma's:

- In a case where there are two similar plasma's on the machine, you can cut with both of them simultaneously by selecting both plasma 1 and plasma 2 ON.
5.6.2 Up / Down Switches

All Up / Down switch (See upper box on the picture above)
All Up / Down switch drives all the selected stations up and down.

Individual Up / Down switches (See lower box on the picture above)
Individual Up / Down switches will drive the corresponding station up or down, if the station is selected.

5.6.3 Cutting Oxygen On/Off/Auto Switch

- ON position will open the cutting oxygen solenoid
- AUTO position will allow the cutting program to open the cutting oxygen solenoid when necessary
- OFF position will prevent the cutting program from opening the cutting oxygen solenoid valve.
5.6.4 High Preheat On/Off/Auto Switch

This switch handles the Oxy Fuel High Preheat gases.

- ON position will open the Hi Preheat solenoid valve.
- Switch the gases OFF by moving this switch to the OFF position.
- AUTO position will allow the cutting program to open the High Preheat solenoid when necessary.
- OFF position will prevent a cutting program from opening the High Preheat solenoid valve.

5.6.5 Preheat On/Off/Auto Switch

This switch handles the Oxy Fuel Low Preheat gases.

- ON position will open the low preheat solenoid valve.
- Switch the gases OFF by moving this switch to the OFF position.
- AUTO position will allow the cutting program to open the High Preheat solenoid when necessary.
- OFF position will prevent a cutting program from opening the Preheat solenoid valve.
5.6.6 Marker On/Off/Auto Switch

- ON position will activate the marker. This is used for testing.
- AUTO position will be used when a cutting program includes marking.
- OFF position will prevent activating the marker from a cutting program.

Please note also the marker down switch usage.

5.6.7 Plasma On/Off/Auto Switch

- ON position will activate the plasma. This is used for testing.
- AUTO position allows the plasma cutting signal from a program to run the plasma.
- OFF position will prevent activating the plasma.

**NOTE:**

Some height controllers start the plasma by themselves. See IHS switch usage.

IMPORTANT: Please note the Marker Down (M.DOWN) switch usage.
5.6.8 Ignition Switch

Pressing the ignition switch will activate the igniters (if installed).

5.6.9 Marker Down On/Auto Switch

- **ON** position will activate the marker down signal. This is only used for testing. Important note: This switch in the **ON** position will cause the plasma start command to start the Marker instead of the plasma. If the Marker switch is in the **OFF** position even the marker will not be activated.

- **AUTO** position is where you normally keep this switch.
This is a 3 position switch controlling either the IHS or the Floating head, depending on machine options.

**INITIAL HEIGHT SENSING SYSTEM**

- In Manual position the system activates the IHS output relay.
- In Auto position the iCNC® XT activates the IHS output relay automatically
- In the middle position the IHS output relay is disabled.

**FLOATING HEAD SYSTEM**

- In Manual position the floating head will lower onto the material surface.
- In Auto position the floating head will lower automatically as commanded by the controller.
- In the middle (OFF) position the floating head will be disabled and stays in the UP position.

*NOTE:*

Some height controllers use the IHS signal to also activate the plasma. Control flow in this case: Height controller senses the plate, torch rises to ignition height and the height controller ignites the plasma.
5.7 XT211/231 Switch Description and Functions

5.7.1 Station Select Switches

NOTE:

Switches Not available in XT211 (See blue box on the picture above)

Station Select Switches 1 – 3.

With the STATION SELECT switches the operator can select which Oxy Fuel torches are in use.

The switches have 2 positions: Up/On, Down/Off

OFF for Oxy-Fuel stations 1 – 3:

- A station is not selected
- Preheat gases, cutting oxygen, water spray, ignition and pierce signals are disabled for this torch
- Torch Up and Down switches for this torch are disabled
- All Up / Down switch does not effect this torch

ON for Oxy Fuel stations 1-3 means that:

- Torch Up and Down switches for this torch are enabled
  - Preheat gases, cutting oxygen, water spray and ignition are disabled for this torch
- All Up / Down switch will drive this torch

Main gas signal will always activate even when all station select switches are Off.
5.7.2 Up / Down Switches

All Up / Down switch, (See bottom right most box “OXYFUEL” on the picture above)

The All Up / Down switch, drives all the selected stations up and down.

**NOTE:**

Switches Not available in XT211 (See yellow box on the picture above)

Individual Up / Down switches (See “PLASMA” bottom right and “1,2,3” upper right on the picture above)

The Individual Up / Down switches will drive the corresponding station up or down, if the station is selected.

5.7.3 Cutting Oxygen On/Off/Auto Switch

- ON position will open the cutting oxygen solenoid
- AUTO position will allow the cutting program to open the cutting oxygen solenoid when necessary
- OFF position will prevent the cutting program from opening the cutting oxygen solenoid valve.
5.7.4 High Preheat On/Off/Auto Switch

This switch handles the Oxy Fuel High Preheat gases.

- **ON** position will open the Hi Preheat solenoid valve.
- Switch the gases OFF by moving this switch to the **OFF** position.
- **AUTO** position will allow the cutting program to open the High Preheat solenoid when necessary.
- **OFF** position will prevent a cutting program from opening the High Preheat solenoid valve.

5.7.5 Preheat On/Off/Auto Switch

This switch handles the Oxy Fuel Low Preheat gases.

- **ON** position will open the low preheat solenoid valve.
- Switch the gases OFF by moving this switch to the **OFF** position.
- **AUTO** position will allow the cutting program to open the Preheat solenoid when necessary.
- **OFF** position will prevent a cutting program from opening the Preheat solenoid valve.
5.7.6 Pointer On/Off Switch

- ON position will activate the pointer device.
- OFF position will turn off the pointer device

5.7.7 Power On/Off Switch

- ON position will turn on the plasma power supply.
- OFF position will turn off the plasma power supply.
5.7.8 Table On/Off/Auto Switch

- ON position will activate the table down draft
- AUTO position will activate the table down draft when a cutting program is active
- OFF position will turn off the table down draft.

5.7.9 Plasma On/Off/Auto Switch

- ON position will activate the plasma. This is used for testing.
- AUTO position will allow the cutting program to command the plasma
- OFF position will prevent activating the plasma.

**NOTE:**

*Some height controllers start the plasma by themselves.*
5.7.10 Marker On/Off/Auto Switch

- ON position will activate the marker. This is used for testing.
- AUTO position will be used when a cutting program includes marking.
- OFF position will prevent activating the marker from a cutting program.

**NOTE**

Note the marker down switch usage.

5.7.11 Marker Down On/Off/Auto Switch

- ON position will activate the marker down signal.
- AUTO position is where you normally keep this switch.
- OFF position will prevent activating the marker down from a cutting program.
5.7.12 Water Switch

- ON position will activate the water spray signal.
- AUTO position will allow the cutting program to command the water spray signal.
- OFF position will prevent activating the water spray from a cutting program.

5.7.13 Ignition Switch

- ON position will activate the ignition signal.
- AUTO position will allow the cutting program to command the ignition signal.
- OFF position will prevent activating the ignition from a cutting program.
5.7.14 Aux1 Switch

- ON position will activate the aux1 signal.
- AUTO position will allow the cutting program to command the aux1 signal.
- OFF position will prevent activating the aux1 from a cutting program.

5.7.15 Aux2 Switch

- ON position will activate the aux2 signal.
- AUTO position will allow the cutting program to command the aux2 signal.
- OFF position will prevent activating the aux2 from a cutting program.
5.7.16 Auto Switch

- ON position will activate the auto signal, normally used for capacitive height sensing.
- AUTO position will allow the cutting program to command the auto signal.
- OFF position will prevent activating the auto from a cutting program.

5.8 Starting Procedure

Make sure that the red Emergency Stop button is pressed in and the drive enable switch is in the off position.

Switch on the system by toggling up the power switch located on the far right hand side of the unit. When power is applied, the iCNC® XT will take approximately 2-3 minutes to go through its internal diagnostics and fully boot up. After full power up, the Promotion Work Screen displaying Promotion Cut, Next Job Preview and Current Job along with Info (System Status) will be displayed. In addition, you will see the yellow Zero button flashing. This will stop automatically.

HINT: The flashing Zero button indicates that the second CPU (used for machine motion) has booted up correctly. The Zero button flashes 41 times.

Release the red E-Stop button by turning it clockwise. The “External Stop” dialog warning box will disappear from the screen. Switch the drive enable switch to the ON position to enable the drives. A dialog box may appear START HOMING PROCEDURE. See section 2.2 for detailed information.

5.8.1. Shutting Off / Removing Power

After locating a safe parked position, disable the drives by turning the drive enable switch to off. Turn off the controller using the normal Windows shutdown method. Click on Start (bottom left hand corner) on Window’s task bar, then click Turn Off Computer and Turn Off.

After the controller goes through a proper cycle down procedure the controller will turn off. Press the Emergency Stop button in.

HINT: If applicable, parking the machine near the homing switches will make Machine Homing quick and easy when the iCNC® XT is powered up again.
5.9 Homing Procedure

During initial power up, the iCNC® XT may display a Start homing procedure dialog box. If you select Yes, the machine will automatically locate the absolute zero home location. As a default, this is normally set at the bottom left corner of the cutting table, however this is selectable in the set-up parameters. If you select No, the dialog box disappears and no movement is executed.

5.9.1. Plate Alignment

Activating Plate Alignment allows for a quick and easy way to pick two points on the edge of a skewed plate. Performing this exercise will automatically rotate a part or program nest the same amount as the plate skew so that it will fit precisely onto the plate, reducing scrap or manual plate squaring.

To use the Plate Alignment feature, locate a corner or plate edge and click Set point 1 here. Select which direction the next point is relative to the first location, travel to the second point and click on Confirm point 2 here. This will automatically rotate the program to match the skewed plate.
5.10 Jog

When selecting the Jog Button, the Jog dialog box will appear.

You can use the Jog tool only when a cutting program is not running and the controller is not in Manual Mode. Use this tool to drive the machine to a position (X,Y) or to drive a distance (X,Y) from the current position. Driving is usually done in rapid speed. It's also possible to cut with this tool, if you have checked the Rip Cut box.

If “Use program rotation” is checked, the coordinates where you drive are corrected according to the program rotation. The program rotation is set in the parameter quick view screen.

Offsets

If there is a need to drive the same distance often (i.e. plasma torch to the same position where gas torch was) it's useful to save these kinds of distances as default offsets (offset 1 and 2). This way you can drive the default offset by just clicking one button.

Tables

It is possible to define several different home positions. These can be used to define the home positions of different plates on the cutting table, or different cutting tables. Select the Table Number from the list and click the Drive to button. The machine drives to the defined home position of the selected table.

Program Zeros

iCNC® XT will save the coordinates for last 5 program starts relative to the absolute 0.0 position. You can choose the wanted program zero point from the drop down list and click drive to.

Set absolute zero (home) position by clicking the Set absolute 0,0 here button. This tool is needed, if the programmed working area limits are in use. Those limits force the machine to stop before it hits the electrical limit switches. Setting absolute zero position can also be automatic, when the machine is driven to the pre-defined zero position every time the controller is turned on. Absolute zero position is also needed, if there is a need to set several home positions.
5.11 Parameter Quick View

The parameter quick view screen opens automatically when a program is sent to cutting from Promotion Nest or when the Setup button is clicked. The quick view screen allows the operator to change the most commonly used variable parameters quickly. It also provides options for plate alignment and advanced set up.

![Parameter Quick View Screen]

**Kerf Width**

Specifies the amount of kerf (compensation) that will be applied to the cutting program. Caution should be taken when selecting the amount of kerf. Too high a value can cause the program to be altered, especially when a radius of an arc is smaller than the kerf value.

**Cutting Speed**

This is the speed of the cutting process.

**Program Rotation**

Any value (degree) will rotate the cutting program. When a plate alignment is performed the rotation of the skewed plate is automatically entered here. Also, by clicking on the +/- 90 the part program will rotate at 90 degree intervals. Clicking on the zero box will clear any value of rotation to zero degrees.

**IHS/Plasma Start**

Time for the torch to go ignition height and ignite the plasma arc. Any excess time will be discarded and next delay will be performed (Pierce Delay).

**Pierce Delay**

This is a move delay after the pierce has started.

**Parameter Set (Plasma)**

If selected in the Advanced Setup screen, the material type, thickness and tool used will appear here to guide the operator on the current parameter selection.

---

**NOTE:**

Additional delays or adjustable time dialog boxes may appear, depending on how the controller has been set-up by an OEM or installer.
5.12 How To Proceed When Something Happens

5.12.1 How to Cancel a Cutting Program

1. Stop the machine movement and cutting by pressing TORCH ON/OFF or STOP BACKUP button.
2. Use the left mouse button to click the CANCEL PROGRAM button located at the top of the current job screen.
3. Wait until a new dialog box opens telling that the machine must return to 0,0-point. Click OK and machine runs back to 0,0-point (original starting point of the cancelled program).

If you want to terminate the program during the rapid movement, the procedure is mainly the same. The only difference is that you stop the machine using STOP BACKUP button instead of the TORCH ON/OFF.

5.12.2 Difficulties While Piercing

**NOTE**

If the piercing fails in Plasma Mode, the machine will stop.

1. Adjust the speed slower with the SPEED knob if necessary.
2. Drive slowly backwards by pressing and holding STOP BACKUP and the machine will reverse on program path.
3. Stop the movement after passing the missed piercing point by releasing STOP BACKUP again.
4. Turn the speed back to 100%.
5. Start the program again by pressing MOVE AHEAD.

If the piercing fails at the first programmed piercing point, the machine runs using this procedure backwards only to that piercing point and stops. Start a new piercing with start delays by pressing TORCH ON?OFF.

Please notice that the movement backwards without cutting may be adjusted so that the speed is automatically reduced.

5.12.3 If the Cutting Fails

If the cutting is terminated e.g. for too high speed:

1. Stop the movement and cutting by pressing TORCH ON/OFF or STOP BACKUP.
2. Adjust the speed slower with the SPEED knob if necessary.
3. Drive slowly backwards by pressing and holding STOP BACKUP and the machine will reverse.
4. Stop the movement by releasing STOP BACKUP.
5. Turn the SPEED back to 100%.
6. Click on READJUST CUT PARAMETERS button on the Current Job screen.
7. Readjust cutting speed to a lower value by clicking inside the box and use the mouse wheel to enter new value and click OK.
8. Start the cutting delays and the cutting with TORCH ON/OFF. After the start delays, machine movement starts automatically.
9. Adjust the starting speed with the SPEED knob if required.
10. While cutting, the cutting speed can be easily readjusted by pressing the blue SPEED UP/DOWN buttons. Every short press increases or decreases the speed about 1/2 ipm (10 mm/min).
5.12.4 Manual Cutting

1. Press and release the MANUAL MODE button.
2. Drive the machine to the wanted piercing point by using the jog buttons.
3. Press and release TORCH ON/OFF button to start the cutting cycle.
4. Press the jog buttons of the desired direction to start the movement.
5. Press TORCH ON/OFF to stop the cutting and release MANUAL MODE to stop the movement.
6. Press and release ZERO button if you want to stay in that place. MANUAL MODE ends automatically. If you want to return to that point where you started the MANUAL MODE, just press and release the MANUAL MODE button. The button starts to flash and machine runs back to that point.

5.12.5 Programmed Manual Cutting

**NOTE**

The MANUAL MODE button must be OFF when using this procedure.

On the Cut Screen, there is a JOG button for programmed manual cutting.

1. Drive the torch to the desired piercing point and press and release the ZERO button.
2. Open the dialog box by clicking JOG button. Use the mouse wheel to enter the exact distance X and Y you want the machine to move.
3. Click the Rip Cut box.
4. Click on Drive Machine. The machine starts the cutting cycle and drives the programmed path. At the end of that path the torch is turned off and the machine stops, both automatically.

5.12.6 Trial Run, No Cutting

This will allow faster set up to reposition a program on the plate, eliminating the need to reposition the plate.

1. Call up the wanted program on the Next JOB screen.
2. Bring the cutting program to CURRENT JOB window by clicking the Next Job Preview button
3. Press and release the MANUAL MODE button.
4. Drive the torch to the wanted starting point of the program by using the jog buttons. Press the ZERO button.
5. Click the ACT button on the cut screen and click on the Trial Run box.
6. Enter a trial mode speed and click GO.
7. The machine will perform the programmed path without commanding the plasma on.
8. If the torch runs off the plate, press and release the TORCH ON/OFF button.
9. Turn on the MANUAL MODE by pressing and releasing the MANUAL MODE button. Set a slow speed with the SPEED knob and use the jog key buttons to reposition the torch back on the plate.
10. Click the MOVE PROGRAM text on the Current Job Screen.
11. Turn off the MANUAL MODE by pressing and releasing the MANUAL MODE button.
12. Press the TORCH ON/OFF button again.
13. Repeat steps 8-12 if the torch runs off the plate again.
14. When the trial run is over, return to ZERO.
5.12.7 Other Way to Check the Cutting Area

You can check if the next cutting program fits on the plate this way as well.

1. Bring the cutting program to CURRENT JOB window by clicking the Next Job Preview button in it.
2. Set the torch on 0,0 point and press ZERO.
3. Move the mouse on this window and click the left mouse button. A window appears which shows the torch position with big numbers and the mouse cursor starts to follow the torch position.
4. Drive the torch on the critical corner of the program and check if there still is plate under the torch.
5. Use zoom to check the situation exactly. Zoom window follows the torch automatically.
6. If the program location is OK, press the MANUAL MODE button and the machine returns to the 0,0 point.
7. Free the mouse by pressing the left mouse button on the right screen area again. This also closes the Tool Position window.

5.12.8 Cut Path Recovery

This tool is used to return to cut path in the event the program was stopped and the torch was moved from the path.

1. Press and release the TORCH ON/OFF button to stop motion and cutting.
2. Turn on the MANUAL MODE by pressing and releasing the MANUAL MODE button and use the Jog key buttons to drive the torch to a convenient place to perform work on the torch.
3. Service the torch.
4. Turn off the MANUAL MODE by pressing and releasing the MANUAL MODE button - the button starts to flash and the torch travels back to exit point of the program path.
5. Press and release the TORCH ON/OFF button to ON and cutting will start again and continue cutting on programmed path.

5.12.9 How to pierce in the Scrap Area Prior to Finding the Cut Path.

1. After Step 4 turn on the MANUAL MODE again by pressing and releasing the MANUAL MODE button.
2. Use the Jog key buttons and reposition the torch close to the end of the cut. Stay on the scrap side. Click on Cut Path Recovery button located on the Current Job Screen and machine will automatically start the piercing at this point and pick up the cut path to continue cutting on the programmed path.
5.13 Advanced Setup

The Advanced Setup screen allows the operator the flexibility to change more parameters if needed. Advanced Setup has several folder tabs each containing different settings. You can change the tab by clicking its title. You can also build a material database of common materials being cut, and save different speeds and kerf values within each profile and for each process.

Advanced Setup also has buttons at the bottom of the window. The function of each button is described below.

**Plate alignment**

Clicking on this button will open ‘Plate alignment’ dialog. See more in chapter Plate Alignment.

**General**

Allows changes regarding kerf compensation loops. By default this box is checked. On rare occasions the kerf compensation calculation adds an extra loop which may be undesirable on certain parts with a very small radius. Un-checking this box will remove the loops created.

**OK**

Clicking the OK button accepts any temporary changes made and returns you to the Parameter Quick View screen.

**SAVE**

Clicking on Save after a change has been made will cause a password box to appear. After entering the password the changes will become permanent until changed and saved again.

**Close**

Clicking on this button will close this screen.
5.13.1. Parameters

On the 1 Parameters tab the parameter quick view settings are shown again, along with creep speed, mirror and tool location. In addition a cutting process database can be set up by selecting material, thickness and tool.

**Kerf, Cutting Speed, Pierce Height, Pierce Time, Program Rotation**

These settings are identical to those described in the parameter quick view screen. Changing the setting here will change the setting in the parameter quick view screen automatically.

**Tool Location**

If a laser pointer is installed on the machine, it is best to define tool locations relative to the laser pointer. This way you can position and set the zero point using the laser pointer and the system knows the location of all additional tools and can automatically handle them while cutting a program. Adding tool offset in your cutting program is not required.

**Mirror**

Checking the Mirror box will mirror your program in the X axis.

**Gas, Plasma and Plasma 2 Tabs**

Clicking these tabs will change your cutting tool and all associated parameters to that process.

**Process Database**

The iCNC® XT has a unique feature that allows building a data base for specific cutting parameters based on material, thickness and tool.

Based on material, thickness and tool selected, the cutting parameters can change automatically for kerf, cutting speeds and other parameters. Once a data base is built up with all the correct information, the guess work of where to set the cutting parameters will be minimized. This would be helpful when a new operator is trained to operate the cutting machine assuring consistent cut quality.
Note:

It is not necessary to use all three fields to set the database e.g. use material and thickness only and leave tool at Default.

Setting up the Database

A. Click inside the Add/Remove box to activate the “New” box and allow editing. Click New for Material and a new material dialog box opens. Click on Other then OK. Type in your description for Material, then OK. Repeat steps for Thickness and Tool.

B. Select the wanted material, thickness and tool and enter all correct corresponding values for cutting speed, kerf, pierce height, pierce time, etc. Review the entire screen making sure each field is correct, then click on the save button and enter the password to lock it in.

C. Repeat steps A & B to re-enter new parameter settings for new material, thickness and tool.

5.13.2. Aux. Parameters

This parameter file contains three parameters. Two frequently changed, user defined delays and the part scaling percentage.

Delay nr1: Select the delay from the drop down menu that you will most frequently adjust.

Delay nr2: Select a second delay from the drop down menu that you will adjust frequently.

Note: These two delays will then be displayed in the 1 Parameters and Parameter Quick View windows under the description which was assigned to them for quick adjustment. These values are usually frequently altered by the user and therefore assigned.

Scale %: This parameter allows the part to be scaled larger or smaller than the size originally created. 100 percent is the actual size as created. A scale factor of 200 doubles the size. A scale factor of 50 will reduce the size by half. If a part is scaled a message window will appear stating that the scale is not at 100 percent before running the part.
5.13.3. Line Marking

**Marking speed**
This is the speed selection for the marking tool.

**Tool location (X and Y)**
This is the marker location measured from the torch or laser pointer.

**SD1 and SD2**
These delays are typically not used, but are fully available and programmable.

**SD3**
Typically used for a marker down delay. This is the time that it takes for the marker to descend to marking height.

**SD4**
Typically used for igniting the marker.

**Move Delay**
This delay is typically not used.

**ED1**
Typically used for marker up.

**ED2**
This delay is typically not used.

**Move Delay**
This is the time that the controller waits after the marking is completed, before commanding the machine to move to the next position.
5.13.4. Point Marking

Tool location (X and Y)
This is the marker location measured from the torch or laser pointer.

SD1
This delay is typically not used but is fully available and programmable.

SD2
Typically used for a marker down delay. This is the time that it takes for the marker to descend to marking height.

SD3
This is the marking time, or the time the marking takes place.

SD4
This is a marker-up raise time, or the time it takes for the marker to climb up to travel height.

Move Delay
This delay is typically not used.

ED1
This delay is typically not used.

ED2
This delay is typically not used.

Move Delay
This delay is typically not used.
5.13.5. Cutting Parameters

Cutting speed
This is the machine cutting speed. This setting duplicates the cutting speed setting in folder 1 Parameters. Changing one, changes the other.

Rapid speed
The machine speed during a non-cutting or rapid traverse move.

Creep speed
The initial speed of the cutting torch immediately after the start command is given. The duration of this speed is determined by the setting of the Creep Time parameter. This “ramp-up” speed is used only shortly, to assist with piercing. After the creep time is over the torch accelerates up to the normal cutting speed.

Creep time
Length of the time limit for using the creep speed.

Prestop distance
With this parameter you can switch off the plasma slightly before the end of the programmed cut. This parameter is used with plasma power sources which ramp down the current at the end of a cut cycle. Prestop allows the plasma to shut off just prior to the program completing motion. As the power supply ramps down, the arc remains on long enough to finish the cut preventing dimpling and extending consumable life.

**NOTE:**
This feature must be enabled in the I/O before it will function. Typical values range from .040 to .1 inches.

SD1 is generally used for a primary torch down time, usually in conjunction with an automatic capacitive height sensor to lower the torch to the correct piercing height above the material. It can be used without a height sensor, but it is important to remember that the torch will first lower to the material once the sequence is started. To override this function set the timer value for SD1 to zero.

SD2 provides a time for igniting the torch. The ignition output is activated for this user selectable time. After time has elapsed the igniter will turn off. To override the feature in the event that the machine is not equipped with auto ignition, set timer value for SD2 to zero.

SD3 is generally used for a high preheat timer. This determines the time allocated for preheating the material before piercing. The time is user defined based on the type of material and thickness. The thicker the material, the higher the timer value. To override the feature in the event that the machine is not equipped with auto high preheat, set timer value for SD3 to zero.

SD4 is generally used for Cut Oxygen. This determines the time allocated for heating the material with cutting oxygen, normally with thicker materials. Best Used with the pierce Up/Down function (See below). To override the feature in the event that the machine does not need extra pierce with cutting oxygen, set timer value for SD4 to zero.

Pierce up/down event timing: Activating the feature.
1. **START**: Select the start delay at which the timing is to begin execution, eg. SD4.

2. **PIERCING UP**: Enter the desired time to raise the torch for piercing.

3. **STAY UP**: Enter the desired time to stay up before the pierce lowering time begins.

4. **PIERCING DOWN**: Enter the desired time to lower the torch to the cutting height.

**Note:**

The piercing up and piercing down timer values are usually set to equal amounts as not to create a ramping or stepping effect. This is also true with the primary raise and lowering of the torch when no automatic capacitive height sensor is installed.

Examples: SD4 starts the event timing sequence for piercing up/down routine. The initial values for piercing up time - stay up time and piercing down time are set to 1 second for this example.

1. Cutting oxygen turned on as torch raises to piercing height. Set SD4 value from 0.1-0.9 seconds.

2. Cutting oxygen turned on during stay up time. Set SD4 value from 1.1-1.9 seconds.

3. Cutting oxygen turned on while torch lowering to cutting height. Set SD4 value from 2.1-2.9 seconds.

**Start Move Delay** is the time allocated for the initial piercing through the material. After this time has expired, motion automatically begins.

**ED1** is the first delay executed after the program is finished or the cut manually interrupted by the operator. This delay is usually used for the primary raising of the torch after completion of the current cut. This allows the torch to clear any parts, which may have tipped up preventing damage or misalignment of the torch. Set the value to zero to prevent the torch from raising after completion of a cut.

**ED2** is typically not used.

**End Move Delay** is typically used to allow excess cutting oxygen to bleed off through the cutting tip before rapid traverse to the next piercing location occurs. This prevents the cutting stream from nicking prior cut parts when the traverse path is directed over a part. Typically set to 1-2 seconds when the cutting oxygen valve is located on the inlet of torch. If the cutting oxygen valve is located on the gas manifold, allow additional time.

### 5.13.6. Info

The info field is used for writing down notes about the current parameter set (material, thickness, tool).
A.1 Plasma and Height Controller Installation

**WARNINGS**

*DO NOT CONNECT the main power before all wiring is done and all cables are connected from both ends.*

*Always follow national wiring standard for wire sizes.*

This section provides a basic wiring guide for Ultra Cut XT plasma with auto gas console.

Accessories needed:
- Complete lifter with torch holder and motor
- iHC lifter motor cable 15-50XX (J104 iHCCAB1 - ft.)
- Voltage divider board
- Voltage divider and control wire harness 9-78XX (2 cables)
- Plasma enable and communication cable 12X5042

A.2 Mechanical dimensions iHC

A.2.1 Torch Collision Mounting Bracket

Height: 85mm [3.35in]
Width: 100mm [3.93in]
Depth: 125mm [4.92in]
A.2.3 Lifter Mounting Base

Height: 316/418mm [12.44/16.47in]
Width: 127mm [5.00in]
Depth: 100mm [3.93in]

- Dimensions are measurements without motor or other appliances.
- The base plate's first mounting holes are 38mm from the bottom. All other mounting holes are distributed evenly after that with 89mm spacing in accordance to the hole center line. Horizontally the distance between the holes is 114mm. Use M6 screws with the base plate.
- 8” stroke base plate is longer (418 mm instead of 316mm) and it has one more set of mounting holes on top for M6 screws (again 89 mm up from the pair below).
- Torch holder is available for both 50mm and 35mm torch heads.
- Torch holder mounting surface is 100 mm out from the bottom of the Lifter base plate.

A.3 iHC Lifter Installation

1. Mount the lifter to a flat straight surface. Mounting hole placement in the mechanical drawings in section 2. Verify that the lifter is plumb and true.

2. Connect the lifter motor cable, marked with a label motor, to the motor pig tail.

3. Connect the lifter limit cable, marked limits, to the 9pin male amp pig tail connector

4. Route the cable to the cable track on the opposite side from plasma torch lead, ohmic and other high noise cables. See routing example picture in section 2.

5. Connect the XT CNC end of the cable (37 pin CPC connector) to J104 connector at the back of the CNC.
A.4 iHC User Interface

The iHC can be almost invisible to the operator while the Height Control Parameters can come from the cutting program or fully automatically from the Material/Thickness/Tool parameter sets. Because this window does not hide any controls normally used to run the iCNC system it can be viewed at all times. This chapter describes the User Interface at the controller when the automatic parameter setting features are not in use. This allows for changes at the time of cutting and/or settings before starting to cut.

To start the software select “iHC.exe-Shortcut” from the Windows Start menu.

**Main Bar**

The large right pointing arrow can be used to make the iHC main bar smaller. This allow operator to see position and other information about the machine.

- On the left side of the main window there is a display showing the set value for Arc Voltage. The Arc Voltage can be modified using the left and right arrows on the sides of the slider. One click changes the voltage 1V or 0.1 volts.

- The “UP” and “DOWN” buttons can be used to move the torch in manual mode.

- “IHS Test button” causes the torch to drive down to find a plate. This feature can be used to test that the iHC plate sensing works properly. The text on IHS Test button changes to “OK”. Clicking “OK” returns the torch immediately to the home position. If “OK” isn’t clicked the torch returns to the home position after some time.

- IHS Set feature is used for two purposes. It can be used to set the Slowdown Height for the torch (where the torch starts to use lower Find Plate Speed) or it can be used to show the plate height for iHC. When thicker material is placed on the table this feature is used before the cutting process to make sure the torch will not collide to the plate on first piercing point. “IHS Set” uses the Find Plate Speed to conduct the Plate Contact Test. After finding the plate, the torch returns to Slowdown Height. If necessary, the Slowdown Height can now be changed by using the “Up” and “Down” buttons. Pressing “OK” will cause the torch to return to the Home Position and save the Slowdown Height parameter. When “IHS Set” is clicked, the text on the button changes to “OK”.

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Manual 0-5299  APPENDIX  A-3
• Clicking on “SETUP” opens the Setup window.

![Setup button]

• The iHC window can be minimized with the button on the far right that looks like a dash.

![Dash button]

• There are two text fields at the top right corner of the iHC window. In a normal situation it should read “SYSTEM RUNNING” in the upper field and “SYSTEM OK PARAMETERS READ” in the lower field. If the height control isn’t running or there is a connection problem it reads “WAITING FOR REPLY...” on the lower text field. This message is also seen when parameters are read to the iHC Processor.

![Text fields]

• You can monitor the status of the station by viewing colors changing on the screen. The number field after the cut height text shows when the AVC is active.

<table>
<thead>
<tr>
<th>Cut height</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start plasma</td>
<td>1</td>
</tr>
<tr>
<td>Start IHS</td>
<td>1</td>
</tr>
</tbody>
</table>
A.5  Main Settings

Clicking the “Setup” button will open the Setup Main screen under the iHC Info Bar.

This screen
- Continuously displays the actual Arc Voltage and the height of the torch from the plate (the height where the plate was sensed at the time of pierce).
- Has various tabs for more functions.

Most of the parameters of the iHC can be directed in the Setup window. The upper and rightmost part of the Setup-window consist of buttons and fields which are always displayed. The lower left part of the Setup consists of several tabs.

This screen is used for intuitive setting of iHC operation parameters. When setting any of these parameters the process diagram visually indicates what each parameter means.

- Slow Down Height is the distance from the last known plate height where the lifter should slow down the motion for plate sensing to avoid a hard hit.
- Ignition Height determines the distance from the plate where the torch will be ignited.
- Pierce Height determines the distance from the plate where the actual piercing will be done after igniting the torch.
- Pierce Height Time determines how long the torch will stay on pierce height.
- Pierce Down Speed determines the transfer speed from pierce height to cut height.
- Cut Height determines the torch height for cutting after piercing is complete.
- Cut Height AVC Delay determines the time given for the arc voltage to stabilize after reaching the cut height to allow for control of the torch height based on measured Arc Voltage (also proper cutting speed is required).
- Hold ON Cutting voltage increase required to freeze torch motion while crossing kerf
- Hold OFF Cutting voltage increase below while torch motion recovers to AVC control
- Transfer Height determines the height where the torch will be lifted after the cut for rapid transfer to the next pierce point. Use high enough value to avoid collisions.
- Transfer Height Timeout determines how long the system waits at this height for the new pierce command before lifting the torch all the way up to home position.
- Arc Voltage Display shows actual arc voltage in real time when cutting is active.
- Plate Position shows where the plate was last sensed in comparison to the Torch Lifter Home position.
System Setup & Diagnostic Menus

Advanced Tab

Provides the option for more detailed control of the system behavior.

### Default Values

<table>
<thead>
<tr>
<th>Feature</th>
<th>Imperial</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Jog Speed</td>
<td>59.06 IPM</td>
<td>1500 mm/min</td>
</tr>
<tr>
<td>Low Jog Speed</td>
<td>11.81 IPM</td>
<td>300 mm/min</td>
</tr>
<tr>
<td>Adjust Speed</td>
<td>118.11 IPM</td>
<td>3000 mm/min</td>
</tr>
<tr>
<td>Homing Speed</td>
<td>23.62 IPM</td>
<td>600 mm/min</td>
</tr>
<tr>
<td>Find Plate Speed</td>
<td>23.62 IPM</td>
<td>600 mm/min</td>
</tr>
<tr>
<td>Plate Contact Release Speed</td>
<td>2.36 IPM</td>
<td>60 mm/min</td>
</tr>
<tr>
<td>Main Arc Lost Time Out</td>
<td>1 s</td>
<td></td>
</tr>
<tr>
<td>Hold Off AVC Delay</td>
<td>0.0 s</td>
<td></td>
</tr>
<tr>
<td>Collision Retract Height</td>
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<td>1 mm</td>
</tr>
<tr>
<td>Collision Recovery Delay</td>
<td>1 s</td>
<td></td>
</tr>
<tr>
<td>Plate sensing force</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Max allowed force</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

- **Collision retract enable** Enables the collision retract feature that lifts the torch when plate contact has occurred while cutting. This feature is mainly used to protect torch consumables from hot slag emerging on top of the plate after piercing. Higher pierce height must be used to protect consumables while piercing. If Collision Rectract activates all the time while cutting, check system for proper cutting speed, arc voltage and gas pressure.

- **Collision retract height** Sets the height the torch retracts to after plate contact has occurred while cutting is active.
- **Collision recovery delay** Determines how long the torch will remain in the collision retract height until automatic height control is activated again.
- **Ohmic plate contact enable.** Using this function requires a connection between the torch shield cap and the voltage divider. This method is more accurate and sensitive than the Plate sensing by force. Ohmic plate contact should always be used as the main plate sensing feature if possible. This function is not usable when cutting under water.
• Plate sensing force enabled activates motor current based plate recognition. When enabled, Plate sensing force is used to recognize a plate. This feature can be used together with ohmic plate contact as a backup for the ohmic contact, or it can be used as primary plate sensing feature: i.e. cutting under water.

• Plate sensing force sets the contact force, range 1-190. Increasing the value will cause a plate to bend under pressure and makes plate sensing more inaccurate (in case, ohmic sensing is not active).

• Max allowed force sets the maximum allowed force used to drive the lifter, range 1-1000. This value is also used when Plate sensing force is disabled.

• MAX window Real time values of the maximum forces to the lifter.

• Drive force Real time value of applied force to the lifter.

• Reset Resets the max values.

A.7 I/O Bits Tab

This tab displays the status of various system signals for diagnostic purposes. I/O bits are separated to inputs (signals that come from other devices to iHC) and outputs (signals that go from the iHC to other devices).

• I/O bits are also separated to general I/O bits, lifter I/O bits, servo I/O bits.

• If the system has two torches, both lifters and servos have their own I/O bits.

General

Input

1. Hold - AVC turns off when Hold inbit turns active. Hold is used during cutting to prevent the torch from diving to the plate when movement slows down i.e. during tight corner.

2. Torch Collision - In case, lifter has a breakaway/collision sensor, signals from the sensor can be wired into Torch Collision input. Torch Collision will activate System Error output to CNC.

3. Maintain ARCV - Inbit used with bevel head cutting.

4. Spare - Reserved for future use.

Output

5. Main Arc - Outbit to CNC which becomes active when the main arc inbit is activated and the transfer delay has passed.

6. IHS Ready - Outbit becomes active when the lifter reaches the Ignition Height.

7. System Error (Inverted) – Can be connected to CNC controllers external stop.

Input Bits

9. IHS Start - Inbit from CNC becomes active when the IHS sequence starts.
10. Plate Contact - Inbit becomes active on plate contact during IHS or cutting sequence.
11. Main Arc - Inbit from plasma which indicates plasma arc has ignited.
12. Upper Limit Switch – Used to find home position when iHC is turned on
13. Up - Inbit from CNC that moves the torch up.
14. Down - Inbit from CNC that moves the torch down.

Output Bits

15. IHS Active - Outbit which is active form the time IHS Start turns active until Ignition Height has been reached.
16. Brake - Outbit used to control lifters brake.
17. Optional – Reserved for future use

Servo

I/O Bits Lifter 1

27. Drive Enable - Output to a servo which turns the servo on.
28. Not used
29. Not used
30. Drive Over Temperature
31. Drive Over Current
32. Drive General Error – Different kinds of error that may occur on drives

A.8 Service Tab

This window contains information about iHC software version, status and errors. Also displays the following:

- Save parameters Saves current parameters, only available in service mode
- Load parameters Loads saved parameters, only available in service mode
- Enter service mode Enables the use of functions and parameters only available in service mode
- Select language Selects the language in use
A.9 Installation Tab

These parameters are password protected. Some parameters are the same as on the Advanced Tab.

- Encoder pulse edges per meter - Determined by the type of encoder and the threaded shaft of the lifter.
- Full Speed - The maximum speed of the lifter. Full Speed is used above Slow Down Height.
- Home Distance - The distance of the home position from the limit switch.
- Manual Acceleration & Manual Deceleration - used on jog, when AVC is on.
- Machine Acceleration & Machine Deceleration – used when the software drives the lifter.
- Homing Speed - The speed used in the homing process.
- Out Of Limit Speed - The speed used when the torch is moving out of limit switch.
- Plate Contact Release Speed - The speed used when driving out of plate until contact is released.
- Adjust Speed - Used in arc-voltage control process to determine the maximum control speed of the lifter
- Up Limit Timeout - When moving up, the torch halts after this timeout if the limit switch is not found.
- Main Arc Lost Timeout - typically 0.1s to avoid loosing the cut without real cause.
- Hold OFF AVC Delay - Additional delay after Hold OFF which can be useful after piercing and in corners.
- Upper Soft Limit Distance – Upper soft limit which is located above the limit switch. The position of the upper soft limit is determined by adding the Upper Soft Limit Distance to the position of the limit switch.
- Lower Soft Limit Distance – Lower soft limit which is located below the plate. The position of the lower soft limit is determined by subtracting the Lower Soft Limit Distance from the position of the limit switch. Lower soft limit is supposed to be determined so that short motion below table surface is allowed but limiting the lifter from hitting the hard stop of the lifter.
- Reference Position Error Limit - If there is a cumulative error in the position of the limit switch, the Reference Position Error Limit determines how large of an error can be tolerated. If the Reference Position Error Limit is exceeded, the torch performs homing
- Voltage Gain - Determines how much force the system uses to correct the difference between the actual voltage and the target voltage.
- P-gain - Used to tune the movement. Too large of a value can cause the lifter to oscillate and too small of a value makes the movement soft and inaccurate.
- I-gain - Used to fine-tune the movement of the lifter.
- Torch collision polarity inverted – Select NC or NO use of a collision sensor.
## Parameter Limits

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Default</th>
<th>MIN</th>
<th>MAX</th>
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</thead>
<tbody>
<tr>
<td>Adjust speed</td>
<td>3000mm/min</td>
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<td>18000</td>
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