

PLC Connect[™]

Field Service Bulletin

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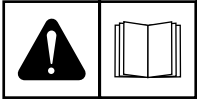
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Environmental stewardship is one of Hypertherm's core values. www.hypertherm.com/environment



ENGLISH

WARNING! Before operating any Hypertherm equipment, read the safety instructions in your product's manual, the *Safety and Compliance Manual* (80669C), *Waterjet Safety and Compliance Manual* (80943C), and *Radio Frequency Warning Manual* (80945C). Failure to follow safety instructions can result in personal injury or in damage to equipment.

Copies of the manuals can come with the product in electronic and printed formats. Electronic copies are also on our website. Many manuals are available in multiple languages at www.hypertherm.com/docs.

BG (БЪЛГАРСКИ/BULGARIAN)

ПРЕДУПРЕЖДЕНИЕ! Преди да работите с което и да е оборудване Hypertherm, прочетете инструкциите за безопасност в ръководството на вашия продукт, „Инструкция за безопасност и съответствие“ (80669C), „Инструкция за безопасност и съответствие на Waterjet“ (80943C) и „Инструкция за предупреждение за радиочестота“ (80945C).

Продуктът може да е съпроводен от копия на ръководствата в електронен и в печатен формат. Тези в електронен формат са достъпни също на уебсайта ни. Много ръководства са налице на няколко езика на адрес www.hypertherm.com/docs.

CS (ČESKY/CZECH)

VAROVÁNÍ! Před uvedením jakéhokoli zařízení Hypertherm do provozu si přečtěte bezpečnostní pokyny v příručce k produktu a v *Manuálu pro bezpečnost a dodržování předpisů* (80669C), *Manuálu pro bezpečnost a dodržování předpisů při řezání vodním paprskem* (80943C) a *Manuálu varování ohledně rádiových frekvencí* (80945C).

Kopie příruček mohou být součástí dodávky produktu, a to v elektronické i tištěné formě. Elektronické kopie jsou k dispozici i na našich webových stránkách. Mnoho příruček je k dispozici v různých jazycích na stránce www.hypertherm.com/docs.

DA (DANSK/DANISH)

ADVARSEL! Inden Hypertherm udstyr tages i brug skal sikkerhedsinstruktionerne i produktets manual og i *Manual om sikkerhed og overholdelse af krav* (80669C), *Manual om sikkerhed og overholdelse af krav for vandstråleskæring* (80943C), og *Manual om radiofrekvensadvarsel* (80945C), gennemlæses.

Kopier af manualerne kan leveres med produktet i elektronisk og trykt format. Elektroniske kopier findes også på vores hjemmeside. Mange manualer er tilgængelige på flere sprog på www.hypertherm.com/docs.

DE (DEUTSCH/GERMAN)

WARNUNG! Bevor Sie ein Hypertherm-Gerät in Betrieb nehmen, lesen Sie bitte die Sicherheitsanweisungen in Ihrer Bedienungsanleitung, das *Handbuch für Sicherheit und Übereinstimmung* (80669C), das *Handbuch für Sicherheit und Compliance bei Wasserstrahl-Schneidanlagen* (80943C) und das *Handbuch für Hochfrequenz-Warnung* (80945C).

Bedienungsanleitungen und Handbücher können dem Gerät in elektronischer Form oder als Druckversion beiliegen. In elektronischer Form liegen sie auch auf unserer Website vor. Viele Handbücher stehen in verschiedenen Sprachen auf www.hypertherm.com/docs zur Verfügung.

ES (ESPAÑOL/SPANISH)

¡ADVERTENCIA! Antes de operar cualquier equipo Hypertherm, lea las instrucciones de seguridad del manual de su producto, del *Manual de seguridad y cumplimiento* (80669C), del *Manual de seguridad y cumplimiento en corte con chorro de agua* (80943C) y del *Manual de advertencias de radiofrecuencia* (80945C).

El producto puede incluir copias de los manuales en formato digital e impreso. Las copias digitales también están en nuestra página web. Hay diversos manuales disponibles en varios idiomas en www.hypertherm.com/docs.

ET (EESTI/ESTONIAN)

HOIATUS! Enne Hyperthermi mis tahes seadme kasutamist lugege läbi toote kasutusjuhendis olevad ohutusjuhised ning *Ohutus- ja vastavusjuhend* (80669C), *Veejõa ohutuse ja vastavuse juhend* (80943C) ja *Raadiosageduse hoiatusjuhend* (80945C). Ohutusjuhiste eiramine võib põhjustada vigastusi ja kahjustada seadmeid.

Juhiste koopiad võivad tootega kaasas olla elektrooniliselt või trükituna. Elektroonilised koopiad on saadaval ka meie veebilehel. Paljud kasutusjuhendid on erinevates keeltes saadaval veebilehel www.hypertherm.com/docs.

FI (SUOMI/FINNISH)

VAROITUS! Ennen minkään Hypertherm-laitteen käyttöä lue tuotteen käyttöoppaassa olevat turvallisuusohjeet, *turvallisuuden ja vaatimustenmukaisuuden käsikirja* (80669C), *vesileikkauksen turvallisuuden ja vaatimustenmukaisuuden käsikirja* (80943C) ja *radiotaajuusvaroitusten käsikirja* (80945C).

Käyttöoppaiden kopiot voivat olla tuotteen mukana sähköisessä ja tulostetussa muodossa. Sähköiset kopiot ovat myös verkkosivustollamme. Monet käyttöoppaat ovat myös saatavissa useilla kielillä www.hypertherm.com/docs.

FR (FRANÇAIS/FRENCH)

AVERTISSEMENT! Avant d'utiliser tout équipement Hypertherm, lire les consignes de sécurité du manuel de votre produit, du *Manuel de sécurité et de conformité* (80669C), du *Manuel de sécurité et de conformité du jet d'eau* (80943C) et du *Manuel d'avertissement relatif aux radiofréquences* (80945C).

Les exemplaires des manuels qui accompagnent le produit peuvent être sous forme électronique ou papier. Les manuels sous forme électronique se trouvent également sur notre site Internet. Plusieurs manuels sont offerts en plusieurs langues à www.hypertherm.com/docs.

GR (ΕΛΛΗΝΙΚΑ/GREEK)

ΠΡΟΕΙΔΟΠΟΙΗΣΗ! Πριν θέσετε σε λειτουργία οποιονδήποτε εξοπλισμό της Hypertherm, διαβάστε τις οδηγίες ασφαλείας στο εγχειρίδιο του προϊόντος και στο *εγχειρίδιο ασφαλείας και συμμόρφωσης* (80669C), στο *εγχειρίδιο ασφαλείας και συμμόρφωσης του waterjet* (80943C) και στο *εγχειρίδιο προειδοποιήσεων για τις ραδιοσυχνότητες* (80945C).

Το προϊόν μπορεί να συνοδεύεται από αντίγραφα των εγχειριδίων σε ηλεκτρονική και έντυπη μορφή. Τα ηλεκτρονικά αντίγραφα υπάρχουν επίσης στον ιστότοπό μας. Πολλά εγχειρίδια είναι διαθέσιμα σε διάφορες γλώσσες στο www.hypertherm.com/docs.

HU (MAGYAR/HUNGARIAN)

VIGYÁZAT! Mielőtt bármilyen Hypertherm berendezést üzemeltetne, olvassa el a biztonsági információkat a termék kézikönyvében, a *Biztonsági és szabálykövetési kézikönyvben* (80669C), a *Vízugaras biztonsági és szabálykövetési kézikönyvben* (80943C) és a *Rádiófrekvenciás figyelmeztetéseket tartalmazó kézikönyvben* (80945C).

A termékhez a kézikönyv példányai elektronikus és nyomtatott formában is mellékelve lehetnek. Az elektronikus példányok webhelyünkön is megtalálhatók. Számos kézikönyv áll rendelkezésre több nyelven a www.hypertherm.com/docs weboldalon.

ID (BAHASA INDONESIA/INDONESIAN)

PERINGATAN! Sebelum mengoperasikan peralatan Hypertherm, bacalah petunjuk keselamatan dalam manual produk Anda, *Manual Keselamatan dan Kepatuhan* (80669C), *Manual Keselamatan dan Kepatuhan Jet Air* (80943C), dan *Manual Peringatan Frekuensi Radio* (80945C). Kegagalan mengikuti petunjuk keselamatan dapat menyebabkan cedera pribadi atau kerusakan pada peralatan.

Produk mungkin disertai salinan manual atau petunjuk dalam format elektronik maupun cetak. Salinan elektronik juga tersedia di situs web kami. Berbagai manual tersedia dalam beberapa bahasa di www.hypertherm.com/docs.

IT (ITALIANO/ITALIAN)

AVVERTENZA! Prima di usare un'attrezzatura Hypertherm, leggere le istruzioni sulla sicurezza nel manuale del prodotto, nel *Manuale sulla sicurezza e la conformità* (80669C), nel *Manuale sulla sicurezza e la conformità Waterjet* (80943C) e nel *Manuale di avvertenze sulla radiofrequenza* (80945C).

Copie del manuale possono accompagnare il prodotto in formato cartaceo o elettronico. Le copie elettroniche sono disponibili anche sul nostro sito web. Molti manuali sono disponibili in diverse lingue all'indirizzo www.hypertherm.com/docs.

JA (日本語/JAPANESE)

警告! Hypertherm 機器を操作する前に、この製品説明書にある安全情報、「安全とコンプライアンスマニュアル」(80669C)、「ウォータージェット的安全とコンプライアンス」(80943C)、「高周波警告」(80945C)をお読みください。

説明書のコピーは、電子フォーマット、または印刷物として製品に同梱されています。電子コピーは当社ウェブサイトにも掲載されています。説明書の多くは www.hypertherm.com/docs にて複数の言語でご用意しています。

KO (한국어/KOREAN)

경고! Hypertherm 장비를 사용하기 전에 제품 설명서와 안전 및 규정 준수 설명서(80669C), 워터젯 안전 및 규정 준수 설명서(80943C) 그리고 무선 주파수 경고 설명서(80945C)에 나와 있는 안전 지침을 읽으십시오.

전자 형식과 인쇄된 형식으로 설명서 사본이 제품과 함께 제공될 수 있습니다. 전자 사본도 Hypertherm 웹사이트에서 보실 수 있으며 설명서 사본은 www.hypertherm.com/docs 에서 여러 언어로 제공됩니다.

NE (NEDERLANDS/DUTCH)

WAARSCHUWING! Lees voordat u Hypertherm-apparaat gebruikt de veiligheidsinstructies in de producthandleiding, in de *Veiligheids- en nalevingshandleiding* (80669C) in de *Veiligheids- en nalevingshandleiding voor waterstralen* (80943C) en in de *Waarschuwingshandleiding radiofrequentie* (80945C).

De handleidingen kunnen in elektronische en gedrukte vorm met het product worden meegeleverd. Elektronische versies zijn ook beschikbaar op onze website. Veel handleidingen zijn in meerdere talen beschikbaar via www.hypertherm.com/docs.

NO (NORSK/NORWEGIAN)

ADVARSEL! Før du bruker noe Hypertherm-utstyr, må du lese sikkerhetsinstruksjonene i produktets håndbok, *håndboken om sikkerhet og samsvar* (80669C), *håndboken om vannjet sikkerhet og samsvar* (80943C), og *håndboken om radiofrekvensadvarslere* (80945C).

Eksemplarer av håndbøkene kan følge med produktet i elektronisk og trykt form. Elektroniske eksemplarer finnes også på nettstedet vårt. Mange håndbøker er tilgjengelig i flere språk på www.hypertherm.com/docs.

PL (POLSKI/POLISH)

OSTRZEŻENIE! Przed rozpoczęciem obsługi jakiegokolwiek systemu firmy Hypertherm należy się zapoznać z instrukcjami bezpieczeństwa zamieszczonymi w podręczniku produktu, w *podręczniku bezpieczeństwa i zgodności* (80669C), *podręczniku bezpieczeństwa i zgodności systemów strumienia wody* (80943C) oraz *podręczniku z ostrzeżeniem o częstotliwości radiowej* (80945C).

Do produktu mogą być dołączone podręczniki użytkownika w formie elektronicznej i drukowanej. Kopie elektroniczne znajdują się również w naszej witrynie internetowej. Wiele podręczników jest dostępnych w różnych językach pod adresem www.hypertherm.com/docs.

PT (PORTUGUÊS/PORTUGUESE)

ADVERTÊNCIA! Antes de operar qualquer equipamento Hypertherm, leia as instruções de segurança no manual do seu produto, no *Manual de Segurança e de Conformidade* (80669C), no *Manual de Segurança e de Conformidade do Waterjet* (80943C) e no *Manual de Advertência de radiofrequência* (80945C).

Cópias dos manuais podem vir com o produto nos formatos eletrônico e impresso. Cópias eletrônicas também são encontradas em nosso website. Muitos manuais estão disponíveis em vários idiomas em www.hypertherm.com/docs.

RO (ROMÂNĂ/ROMANIAN)

AVERTIZARE! Înainte de utilizarea oricărei echipament Hypertherm, citiți instrucțiunile de siguranță din manualul produsului, *manualul de siguranță și conformitate* (80669C), *manualul de siguranță și conformitate Waterjet* (80943C) și din *manualul de avertizare privind radiofrecvența* (80945C).

Produsul poate fi însoțit de copii ale manualelor în format tipărit și electronic. Exemplarele electronice sunt disponibile și pe site-ul nostru web. Numeroase manuale sunt disponibile în mai mult limbi la adresa: www.hypertherm.com/docs.

RU (РУССКИЙ/RUSSIAN)

БЕРЕГИТЬСЯ! Перед работой с любым оборудованием Hypertherm ознакомьтесь с инструкциями по безопасности, представленными в руководстве, которое поставляется вместе с продуктом, в *Руководстве по безопасности и соответствию* (80669C), в *Руководстве по безопасности и соответствию для водоструйной резки* (80943C) и *Руководстве по предупреждению о радиочастотном излучении* (80945C).

Копии руководств, которые поставляются вместе с продуктом, могут быть представлены в электронном и бумажном виде. Электронные копии также доступны на нашем веб-сайте. Целый ряд руководств доступны на нескольких языках по ссылке www.hypertherm.com/docs.

SK (SLOVENČINA/SLOVAK)

VÝSTRAHA! Pred použitím akéhokoľvek zariadenia od spoločnosti Hypertherm si prečítajte bezpečnostné pokyny v návode na obsluhu vášho zariadenia a v *Manuáli o bezpečnosti a súlade s normami* (80669C), *Manuáli o bezpečnosti a súlade s normami pre systém rezania vodou* (80943C) a v *Manuáli s informáciami o rádiových frekvenciách* (80945C).

Návod na obsluhu sa dodáva spolu s produktom v elektronickej a tlačenej podobe. Jeho elektronickej formát je dostupný aj na našej webovej stránke. Mnohé z návodov na obsluhu sú dostupné vo viacjazyčnej mutácii na stránke www.hypertherm.com/docs.

SL (SLOVENŠČINA/SLOVENIAN)

OPOZORILO! Pred uporabo katerekoli Hyperthermove opreme preberite varnostna navodila v priročniku vašega izdelka, v *Priročniku za varnost in skladnost* (80669C), v *Priročniku za varnost in skladnost sistemov rezanja z vodnim curkom* (80943C) in v *Priročniku Opozorilo o radijskih frekvencah* (80945C).

Izvodi priročnikov so lahko izdelku priloženi v elektronski in tiskani obliki. Elektronski izvodi so na voljo tudi na našem spletnem mestu. Številni priročniki so na voljo v različnih jezikih na naslovu www.hypertherm.com/docs.

SR (SRPSKI/SERBIAN)

UPOZORENJE! Pre rukovanja bilo kojom Hyperthermovom opremom pročitajte uputstva o bezbednosti u svom priručniku za proizvod, *Priručniku o bezbednosti i usaglašenosti* (80669C), *Priručniku o bezbednosti i usaglašenosti Waterjet tehnologije* (80943C) i *Priručniku sa upozorenjem o radio-frekvenciji* (80945C).

Uz proizvod se isporučuju kopije priručnika u elektronskom ili štampanom formatu. Elektronske kopije su takođe dostupne na našem web-sajtu. Mnogi priručnici su dostupni na više jezika na adresi www.hypertherm.com/docs.

SV (SVENSKA/SWEDISH)

VARNING! Läs häftet säkerhetsinformationen i din produkts *säkerhets- och efterlevnadsmanual* (80669C), *säkerhets- och efterlevnadsmanualen för Waterjet* (80943C) och *varningsmanualen för radiofrekvenser* (80945C) för viktig säkerhetsinformation innan du använder eller underhåller Hypertherm-utrustning.

Kopior av manualerna kan medfölja produkten i elektroniskt och tryckt format. Elektroniska kopior finns också på vår webbplats. Många manualer finns på flera språk på www.hypertherm.com/docs.

TH (ภาษาไทย/THAI)

คำเตือน! ก่อนการใช้งานอุปกรณ์ของ Hypertherm ทั้งหมด โปรดอ่านคำแนะนำด้านความปลอดภัยในคู่มือการใช้สินค้า คู่มือด้านความปลอดภัยและการปฏิบัติตาม (80669C), คู่มือด้านความปลอดภัยและการปฏิบัติตามสำหรับการใช้หัวตัดระบบวอเตอร์เจ็ต (80943C) และ คู่มือคำเตือนเกี่ยวกับความถี่วิทยุ (80945C) การไม่ปฏิบัติตามคำแนะนำด้านความปลอดภัยอาจส่งผลให้เกิดการบาดเจ็บหรือเกิดความเสียหายต่ออุปกรณ์

สำเนาคู่มือทั้งในรูปแบบอิเล็กทรอนิกส์และแบบสิ่งพิมพ์จะถูกแนบมาพร้อมกับผลิตภัณฑ์ สำหรับสำเนาคู่มือในรูปแบบอิเล็กทรอนิกส์ของผลิตภัณฑ์และสำเนาคู่มือต่างๆ ในหลากหลายภาษายังมีให้บริการบนเว็บไซต์ www.hypertherm.com/docs ของเรอีกด้วย

TR (TÜRKÇE/TURKISH)

UYARI! Bir Hypertherm ekipmanını çalıştırmadan önce, ürününüzün kullanım kılavuzunda, *Güvenlik ve Uyumluluk Kılavuzu'nda* (80669C), *Su Jeti Güvenlik ve Uyumluluk Kılavuzu'nda* (80943C) ve *Radyo Frekansı Uyarısı Kılavuzu'nda* (80945C) yer alan güvenlik talimatlarını okuyun.

Kılavuzların kopyaları, elektronik ve basılı formatta ürünle birlikte verilebilir. Elektronik kopyalar web sitemizde de yer alır. Kılavuzların birçokğu www.hypertherm.com/docs adresinde birçok dilde mevcuttur.

VI (TIẾNG VIỆT/VIETNAMESE)

CẢNH BÁO! Trước khi vận hành bất kỳ thiết bị Hypertherm nào, hãy đọc các hướng dẫn an toàn trong hướng dẫn sử dụng sản phẩm của bạn, *Sổ tay An toàn và Tuân thủ* (80669C), *Sổ tay An toàn và Tuân thủ Tia nước* (80943C), và *Hướng dẫn Cảnh báo Tần số Vô tuyến* (80945C). Không tuân thủ các hướng dẫn an toàn có thể dẫn đến thương tích cá nhân hoặc hư hỏng thiết bị.

Bản sao của sổ tay có thể đi kèm với sản phẩm ở định dạng điện tử và in. Bản điện tử cũng có trên trang web của chúng tôi. Nhiều sổ tay có sẵn bằng nhiều ngôn ngữ tại www.hypertherm.com/docs.

ZH-CN (简体中文/CHINESE SIMPLIFIED)

警告! 在操作任何海宝设备之前, 请阅读产品手册、《安全和法规遵守手册》(80669C)、《水射流安全和法规遵守手册》(80943C) 以及《射频警告手册》(80945C) 中的安全操作说明。

随产品提供的手册可提供电子版和印刷版两种格式。电子版本同时也在我们的网站上提供。很多手册有多种语言版本, 详见 www.hypertherm.com/docs。

ZH-TW (繁體中文/CHINESE TRADITIONAL)

警告! 在操作任何 Hypertherm 設備前, 請先閱讀您產品手冊內的安全指示, 包括《安全和法規遵從手冊》(80669C)、《水刀安全和法規遵從手冊》(80943C), 以及《無線電頻率警示訊號手冊》(80945C)。

電子版和印刷版手冊複本可能隨產品附上。您也可以前往我們的網站下載電子版手冊。我們的網站上還以多種語言形式提供多種手冊, 請造訪 www.hypertherm.com/docs。

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Overview

The EDGE Connect PLC interface supports discrete inputs and outputs, analog inputs and outputs, and dedicated function blocks. These dedicated function blocks allow the PLC program to change axis configuration settings, read and clear specific faults, and read information about individual axes and cutting tools.

PLC Connect versus PLC Connect LT

Hypertherm offers two versions of the PLC:

- **PLC Connect:** In this expanded-feature version, the PLC is integrated with the CNC. The PLC and CNC communicate using memory and function blocks. There is no need for dedicated physical I/O points.
 - Inputs can be read by both the CNC *and* the PLC.
 - Outputs can be written by either the CNC *or* the PLC, but not both.
 - Function blocks are supported.
- **PLC Connect LT:** In this free version, the PLC and the CNC are not integrated. The PLC functions like an external PLC, where communication between the CNC and the PLC must use dedicated physical I/O points.
 - Inputs can be read by either the CNC *or* the PLC, but not both.
 - Outputs can be written by either the CNC *or* the PLC, but not both.
 - Function blocks are not supported.

EDGE Connect I/O configuration

Below is an image of the new soft keys on the Machine Setup screen in Phoenix on the EDGE Connect CNC. There is now a soft key to set up digital I/O and a soft key to set up analog I/O.



Tips on assigning I/O points to the PLC

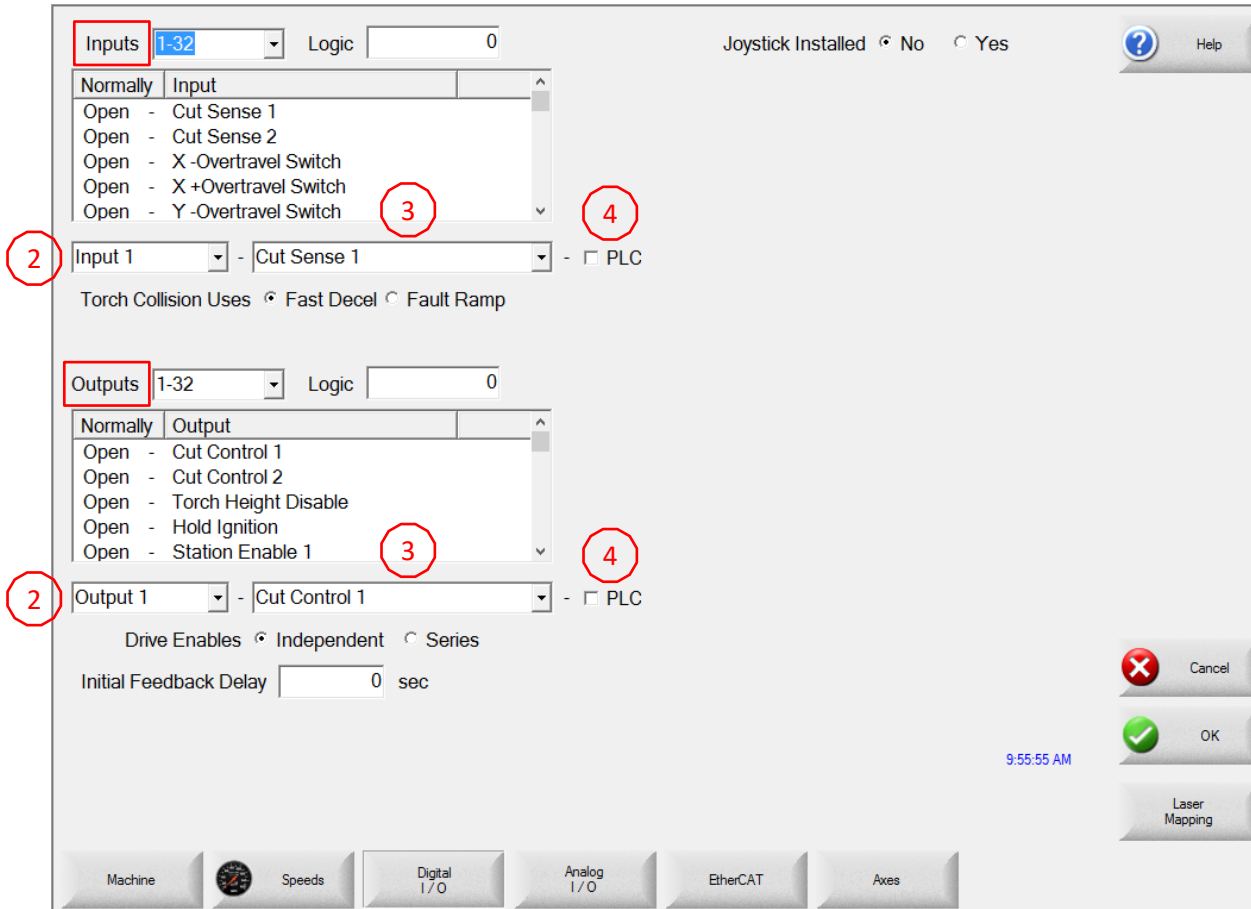
- A **PLC** checkbox determines if the I/O point is assigned to the CNC or the PLC. If the **PLC** box is selected, then the I/O point is assigned to the PLC. If the **PLC** box is left blank, then the I/O point is assigned to the CNC.
- If you are using the PLC Connect version, inputs can be read by both the CNC *and* the PLC. Therefore, if you assign an input to the PLC, both the CNC *and* the PLC can read that input.
- If you are using the PLC Connect LT version, inputs can be read by either the CNC *or* the PLC. Therefore, if you assign an input to the PLC, only the PLC can read that input.
- If you are using the PLC Connect LT version and you assign an input to the PLC, select **None** (analog input) or **Spare** (digital input) as the I/O function. The input will not be activated in the CNC, because the input value is only communicated to the PLC.
- In both versions of the PLC interface, outputs can be written by either the CNC *or* the PLC. Therefore, if you assign an output to the PLC, only the PLC can write to that output.
- If you assign an output to the PLC, select **None** (analog output) or **Spare** (digital output) as the I/O function. The CNC cannot write to that output.

Assigning digital I/O to the PLC

The EDGE Connect PLC interface supports 512 discrete inputs and 512 discrete outputs. To minimize the PLC program scan time and memory usage you should only designate the I/O that is needed for the application.

To assign a digital input or output to the PLC:

1. Choose the **Digital I/O** soft key. The following screen shows.



2. Select the digital input or output number from the drop-down list.
3. Select the function of the I/O point.
4. Review *Tips on assigning I/O points to the PLC* on page 7, and then either select the **PLC** box or leave it blank.
5. Repeat steps 2 through 4 for all the applicable I/O points.
6. When you are done, click **OK** and then click **Yes** when you are asked to save the changes.

Assigning analog I/O to the PLC

The EDGE Connect PLC interface supports 32 analog inputs and 32 analog outputs.

To assign an analog input or output to the PLC:

1. Choose the **Analog I/O** soft key. The following screen shows.

The screenshot shows the 'Analog I/O' configuration screen. It features two main sections: 'Inputs' and 'Outputs'. In the 'Inputs' section, a dropdown menu is set to 'Speed Pot 1', and the 'Installed on' dropdown is set to 'None'. A checkbox labeled 'PLC' is present. Below this, there is an 'Analog Input Offset 1' dropdown set to '0 volts'. The 'Outputs' section has a dropdown menu set to 'Cut Oxygen' and an 'Installed on' dropdown set to 'None', with a 'PLC' checkbox. Below these are radio buttons for 'Speed Pots Enabled' (with 'No' selected) and five override settings: Trial Override (0 to 120%), Oxy Fuel Override (0 to 120%), Plasma Override (70 to 130%), Laser Override (0 to 120%), and Waterjet Override (0 to 120%). At the bottom, there are navigation buttons: Machine, Speeds, Digital I/O, Analog I/O (highlighted), EtherCAT, and Axes. On the right side, there are 'Cancel', 'OK', and 'Laser Mapping' buttons, along with a timestamp '11:40:36 AM' and a 'Help' button at the top right.

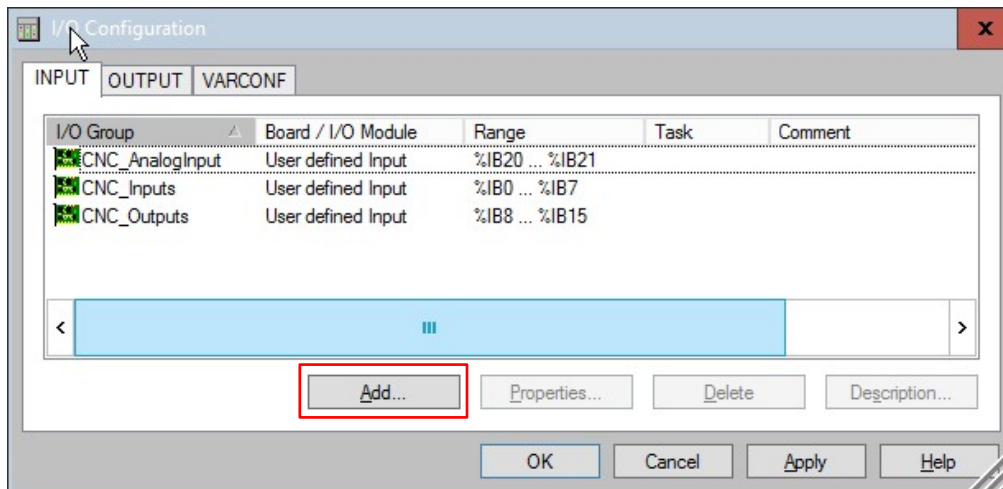
2. Select the physical analog input or output number from the drop-down list.
3. Select the function of the I/O point.
4. Review *Tips on assigning I/O points to the PLC* on page 7, and then either select the **PLC** box or leave it blank.
5. Repeat steps 2 through 4 for all the applicable analog I/O points.
6. When you are done, click **OK** and then click **Yes** when you are asked to save the changes.

MULTIPROG I/O configuration

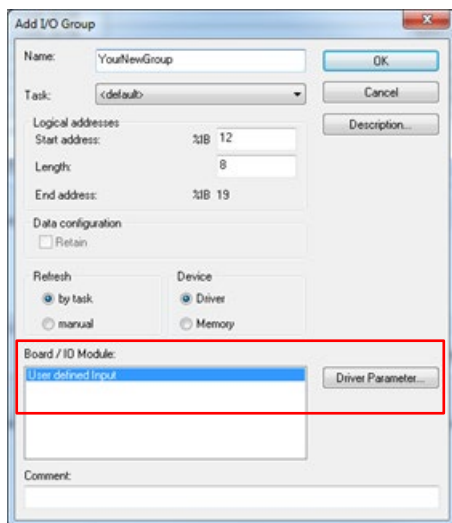
Note: A more complete discussion of I/O configuration in MULTIPROG is available in the MULTIPROG's online help under "I/O Configuration." The following information is meant to highlight the settings specific to the EDGE Connect PLC interface.

After assigning the I/O points to the PLC, the user must create a configuration in the PLC that places that I/O into the correct logical memory areas of the PLC.

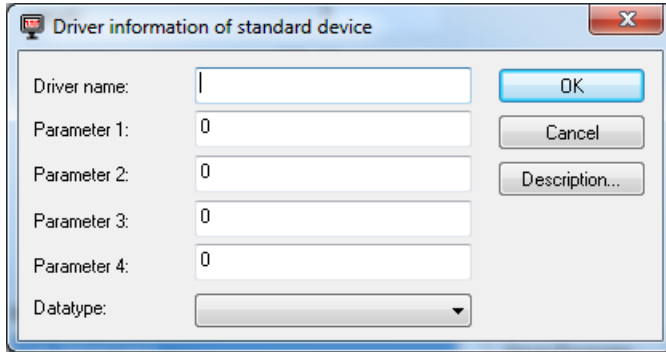
1. On the **I/O Configuration** window, click **Add**. The **Add I/O Group** window shows.



2. While all of the data in the **Add I/O Group** window is important to fill out, the only data that is specific to the PLC interface is configured separately. To configure this specific data, click **User defined Input** under **Board / IO Module**, and then click **Driver Parameter**.



3. The **Driver information of standard device** window shows.



The PLC interface only uses the Driver name and Parameter 1 values. All the other parameters must remain 0 or the configuration will error when downloaded to the PLC.

To define the **Driver name** value:

This value is a string and indicates what type of I/O is going to be assigned to this I/O group in the PLC. The following are the supported driver names, all of which are **case sensitive** and contain **no spaces**.

- **Digitallo:** This is a digital input/output driver for the PLC's physical I/O. When a digital I/O point is assigned to the PLC in the CNC's configuration this driver is used to read/write the digital inputs and outputs from the CNC into various %I (inputs) and %Q (outputs) memory in the PLC.
- **Analoglo:** This is an analog input/output driver for the PLC's physical I/O. When an analog I/O value is assigned to the PLC in the CNC's configuration this driver is used to read/write the analog inputs and outputs from the CNC into various %I (inputs) and %Q (outputs) memory in the PLC. Individual analog values are stored in 32-bit values in the PLC (REAL datatype). Therefore the configuration for this type of driver should be in increments of 4 bytes with a minimum of 4 bytes (one analog value).
- **CncDigitalOutputs:** This is an input-only driver in the PLC. This driver gives the PLC Connect version access to the current state of the CNC's digital outputs. This driver is not supported in the PLC Connect LT version.
- **CncAnalogOutputs:** This is an input-only driver in the PLC. This driver gives the PLC Connect version access to the current state of the CNC's analog outputs. Individual analog values are stored in 32-bit values in the PLC (REAL datatype). Therefore the configuration for this type of driver should be in increments of 4 bytes with a minimum of 4 bytes (one analog value). This driver is not supported in the PLC Connect LT version.

To define the **Parameter 1** value:

The **Parameter 1** value is an unsigned short (16 bits) and is used as a byte offset from the base of the CNC memory identified by the **Driver name** value. This is valid for all driver names.

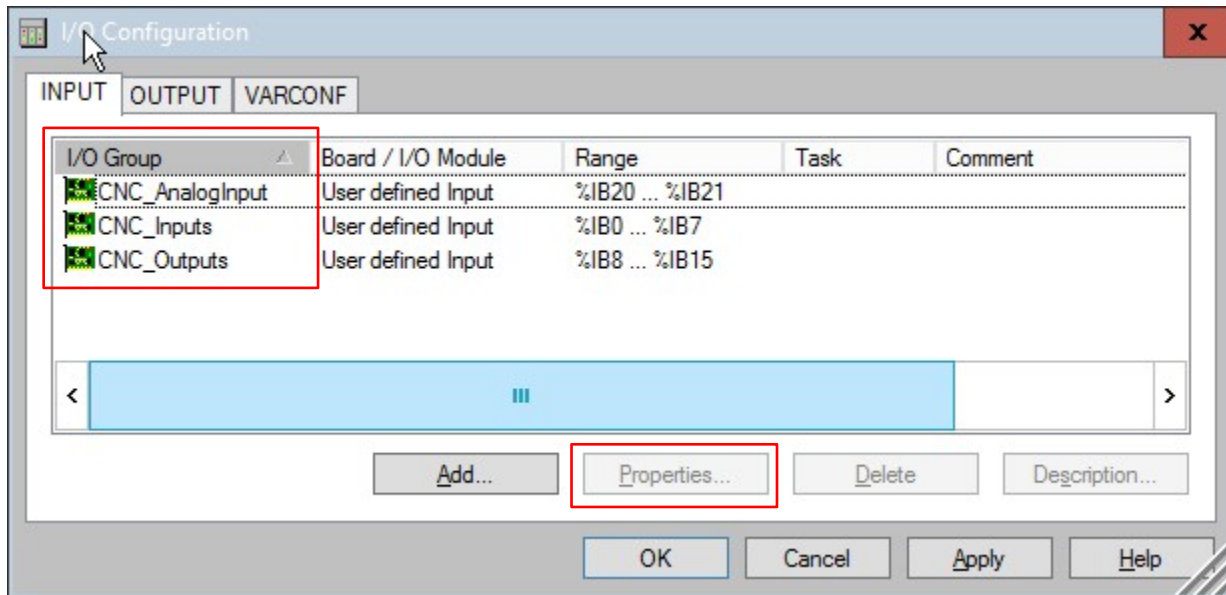
For example, if the PLC is assigned CNC digital I/O input point 33, then we could put a value of 4 into this location (assuming the driver name was Digitallo). This would offset the start of the PLC's access to the fourth byte of the CNC digital inputs (input point 33). Thus the first input to be placed in the PLC's %I (input) and %Q (output) memory would be 33.

Example MULTIPROG I/O configuration

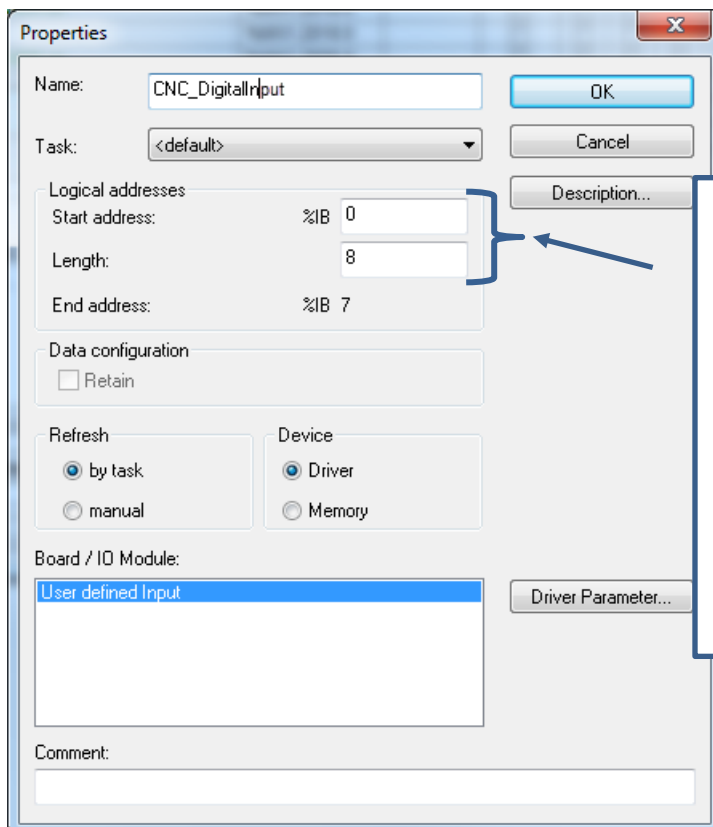
Below is an example of an I/O configuration that shows the defined CNC discrete inputs, outputs, and analog inputs.

CNC_DigitalInput example

1. To define the individual I/O ranges, click the **I/O Group** and then click **Properties**.



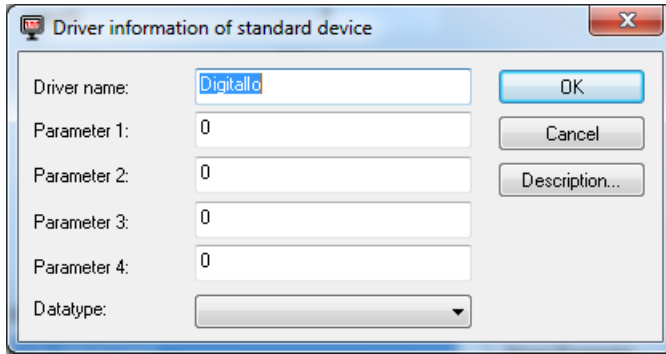
2. On the **Properties** window, make the following selections.



This example defines 8 bytes of CNC digital inputs for a total of 64 inputs. The first word, %IB0, is defined as the EDGE Connect inputs 1–8. The EDGE Connect inputs can also be addressed to the individual bit level.

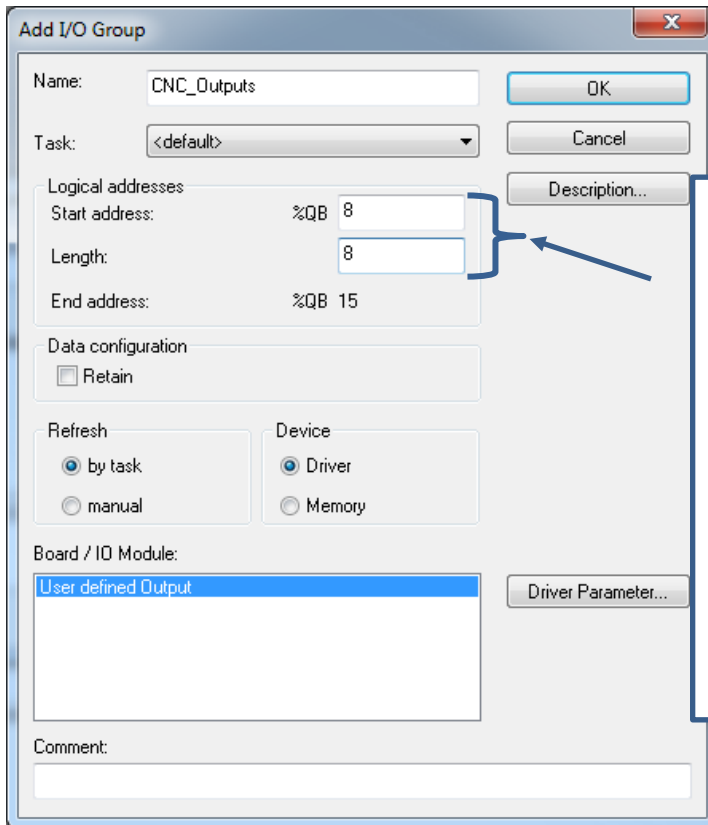
Example:
EDGE Connect input 1 = %IX0.0
and
EDGE Connect input 16 = %IX1.7

- Under **Board / IO Module**, click **User defined Input**, and then click **Driver Parameter**.
- On the **Driver information of standard device** window, make the following selections.



CNC_Outputs example

- Make the following I/O group selections.

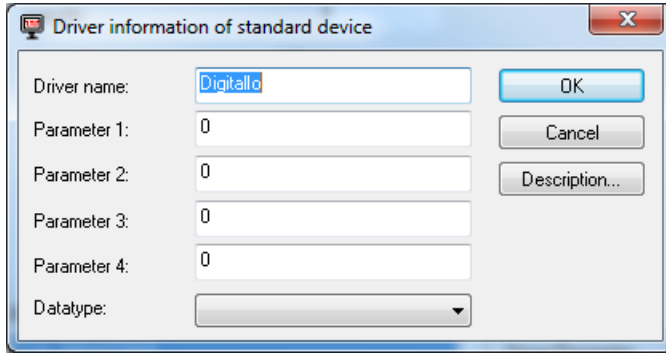


This example defines 8 bytes of CNC digital outputs for a total of 64 outputs. The first word, **%IQB8**, is defined as the EDGE Connect outputs 1–8. The EDGE Connect outputs can also be addressed to the individual bit level.

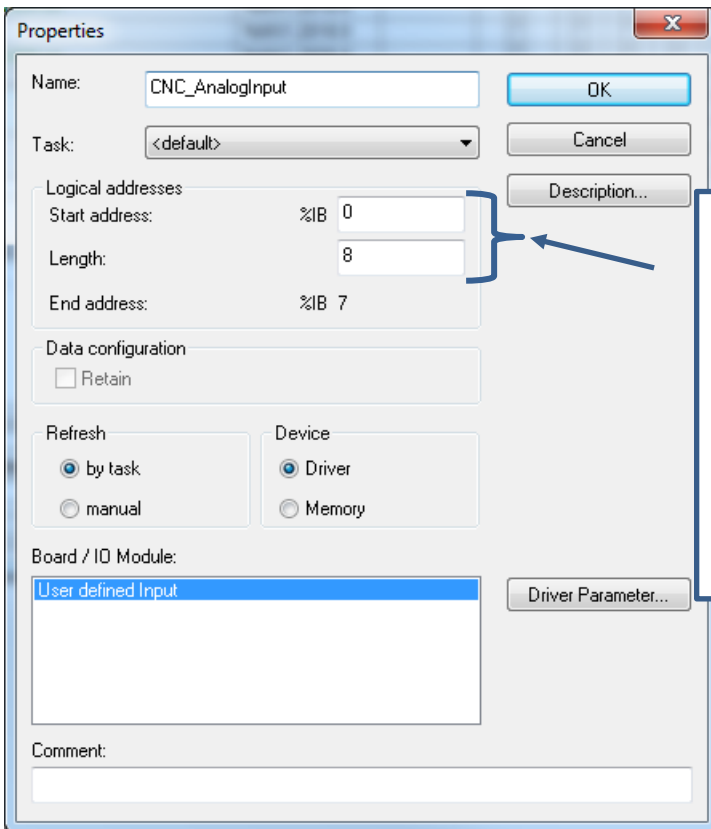
Example:
 EDGE Connect output 1 = %QX8.0
 and
 EDGE Connect output 16 = %QX9.7

- Under **Board / IO Module**, click **User defined Output**, and then click **Driver Parameter**.

- On the **Driver information of standard device** window, make the following selections. Notice that this is an output group but we have the same driver name. This is because the Digitallo driver supports both input and output.

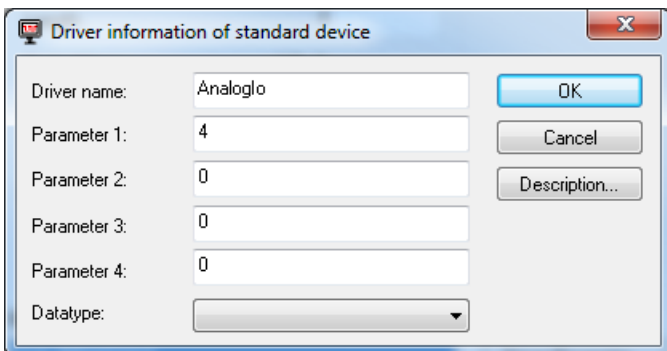


CNC_AnalogInput example



This example defines 2 DWords of CNC 32-bit analog inputs. The first DWord, starting at **%IB0**, is defined as the EDGE Connect analog input 2 (see Parameter 1 in the window below). The second DWord, starting at **%IB24**, is defined as the EDGE Connect analog input 3.

Here we have **Analoglo** configured and offset by 4 (size of one analog Input, 32 bits, 4 bytes) from the base of the CNC memory. So this means that analog input 2 is the first input referenced by this system.



CNC_AnalogOut example

These parameters are located on the **OUTPUT** tab of the I/O configuration window.

This example defines 2 DWords of PLC 32-bit analog outputs. The first DWord, **%QB64**, is defined as the EDGE Connect analog output 1. The second DWord, **%QB68**, is defined as the EDGE Connect analog output 2.

Driver name: AnalogId
Parameter 1: 0
Parameter 2: 0
Parameter 3: 0
Parameter 4: 0
Datatype:

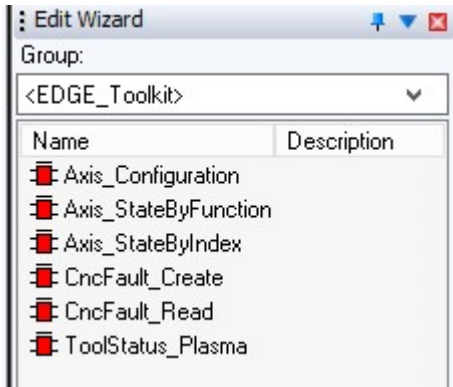
Function blocks

Note: Function blocks are supported in the expanded-feature PLC Connect version of the PLC. Function blocks are *not* supported in the free PLC Connect LT version.

Overview

Hypertherm function blocks are organized by the operations that they perform. In order to maintain that organization, the name is prefixed with a phrase indicating the function category when viewed in MULTIPROG. For example, CncFault_xxx indicates that the function block belongs to the grouping that deals with CNC fault operations.

The available function blocks are included with the **EDGE_Toolkit** firmware library.



Common set of inputs and outputs

While individual function blocks provide a means to collect specific data or perform a particular action, all of the function blocks have the same basic, intrinsic behavior. That is, they all contain a common set of inputs and outputs that operate congruently, regardless of the specific nature of the operation they might perform. These common inputs and outputs are referred to in MULTIPROG as *parameters*.

Common inputs:

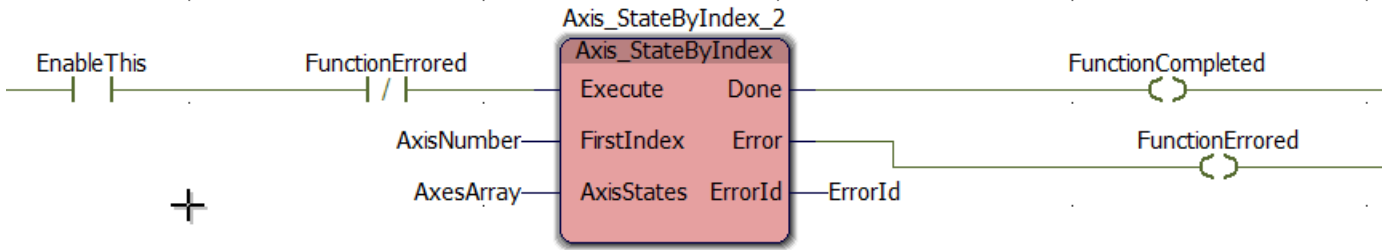
- **Execute** – Boolean – On a positive transition the function block is executed.

Common outputs:

- **Done** – Boolean – True when the function block finishes execution and remains so until the negative transition of the Execute input. False otherwise.
- **Error** – Boolean – True if an error is encountered during execution of the function block. False otherwise. A reset occurs on positive transition of the Execute input.
- **ErrorId** – Integer (16 bits) – If the Error output is True, it contains an integer value that provides feedback about the problem encountered. It is reset to 0 on a positive transition of the Execute input.

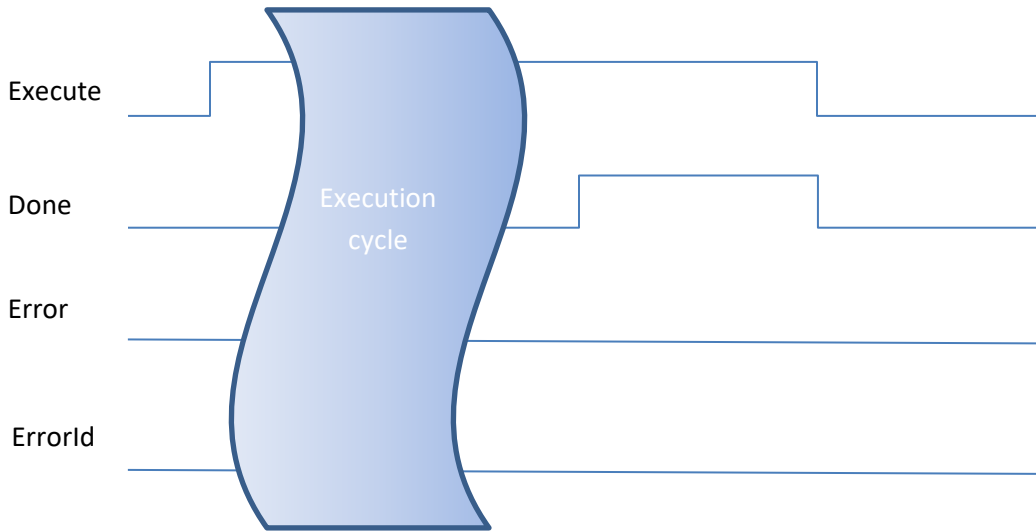
ErrorIds:

Value	Description
0	No errors
100	Operation is not supported in this block
101	Operation is not implemented
102	Licensing error
200	Input value is too large

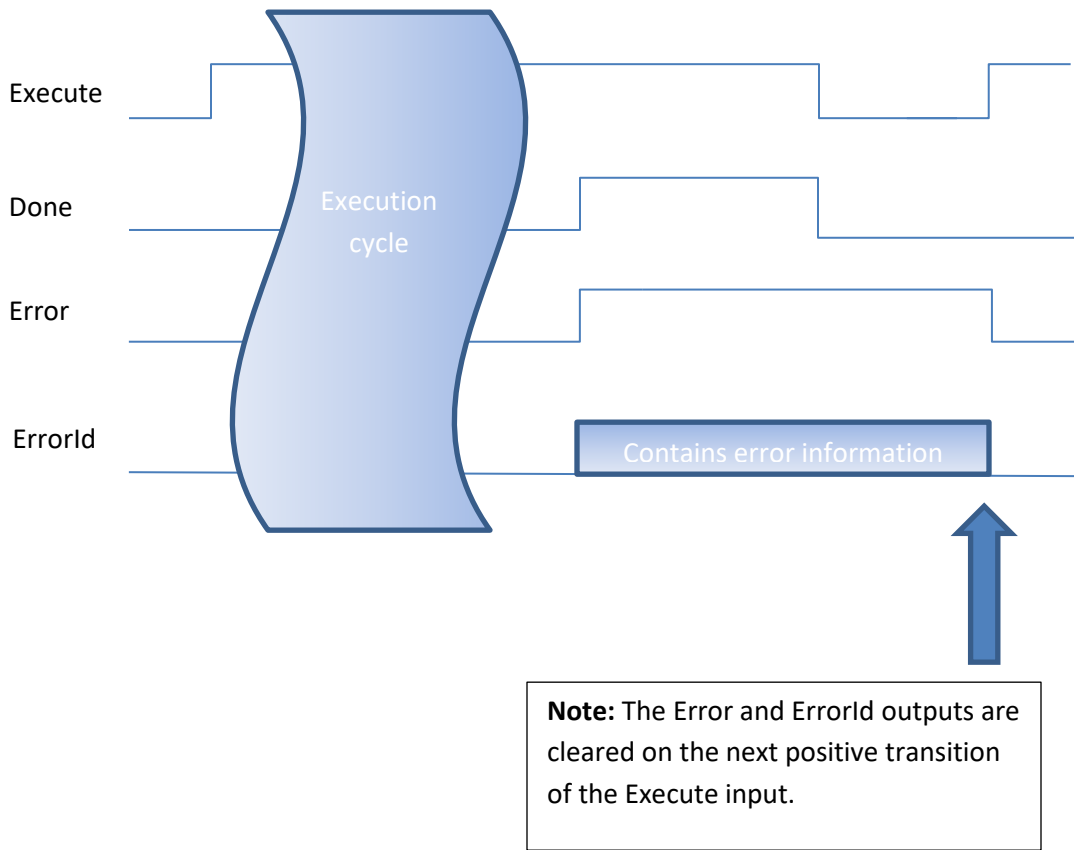


The operation of the common inputs and outputs for function blocks is more easily seen if you look at it through a timing diagram.

Successful function block operation timing diagram:



Errored function block operation timing diagram:



Latched Error and ErrorId outputs

The Error and ErrorId outputs are *latched*, which means that they are maintained even after negative transition of the Execute input. This creates a more convenient programming and debugging experience because the error output can be used to block further execution. Using the outputs for after-the-fact review of the error condition will highlight the errored instruction and retain the error code.

Related PLC events

The PLC Connect has a series of events that can be used to execute program tasks when they occur. See the MULTIPROG documentation for instructions on inserting and specifying a task.

Axis function blocks

Axis function blocks provide access to basic axis state data within the CNC.

General structures and enumerations

These datatype structures and enumerations are provided in Structured Text format so you can copy them directly into your PLC program.

Axis Functions Enumeration

```
TYPE
    AxisFunctionsEnum :
        (Undefined,
        Transverse,
        Rail,
        DualGantry,
        TorchHeightControl,
        ContourBevelHead,
        Rotate,
        Tilt,
        DualTransverse);
END_TYPE
```

Axis Configuration Structure

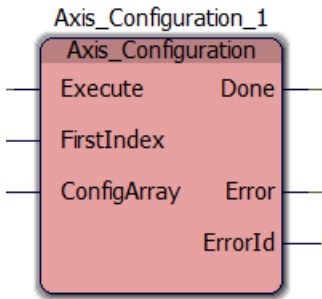
```
TYPE
    AxisConfigurationStruct :
    STRUCT
        Index : INT;
        Function : AxisFunctionsEnum;
        CountsPerInch : REAL;
        CountsPerMillimeter : REAL;
        HomePosition : DINT;
        Rotary : BOOL;
        RotaryUnwind : DINT;
    END_STRUCT;
END_TYPE
```

Axis State Structure

```
TYPE
    AxisStateStruct :
    STRUCT
        ActualPosition : DINT;
        CommandPosition : DINT;
        FollowingError : DINT;
        Index : INT;
        Function : AxisFunctionsEnum;
        StatusBits : DWORD;
        FaultBits : DWORD;
    END_STRUCT;
END_TYPE
```

Axis Configuration block

This function block is used to read specific setup and configuration parameters from the EDGE Connect CNC for any given axis or list of axes in the system. Axis configuration information is supplied in an **AxisConfigurationStruct** format for each axis. Axes are referenced by their index within the EDGE Connect CNC, starting with axis 1. Configuration information for multiple axes will be returned based on the provided array's size. If the array is larger than the number of axes present, the remaining space will be cleared. If insufficient space exists in the array for all axes then any excess axes will be ignored.



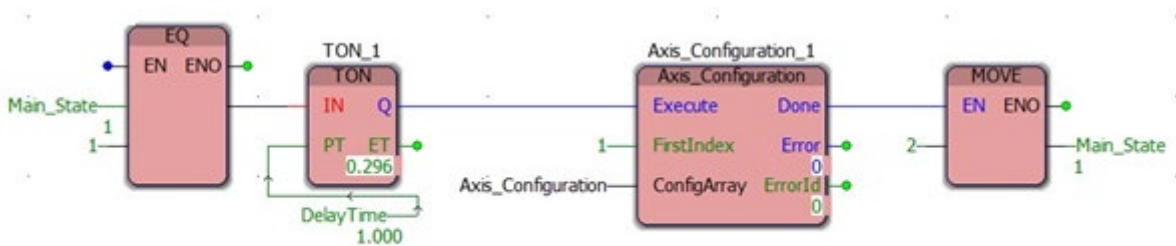
See the *Overview* on page 16 for information about basic function block inputs and outputs.

- **FirstIndex** – Integer (16 bits)
 - Indicates the 1 based index of the first axis on which to obtain configuration information.
- **ConfigArray** – Array of AxisConfigurationStruct
 - An array of structures that will be updated with the current information for the axes queried.

Related PLC events

The Axis Configuration function block can be executed at any time during the PLC's execution. However, the configuration of the CNC is typically static. Repeatedly reading the configuration will result in the same data being returned. The function block can be executed inside an Event Task that is associated with the **System Configuration Changed** event.

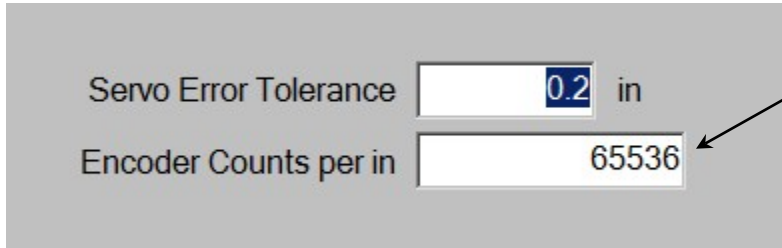
The following is example ladder logic using the Axis Configuration function block to read the Rail Axis configuration.



The following example shows the returned data of the Axis Configuration structure that is shown in the Watch Window.

Variable	Value	Default value	Type	Instance
Axis_Configuration			AxesConfi...	Configuration.Resource.Read.Main.Axis_Configuration
[0]			AxisConfig...	Configuration.Resource.Read.Main.Axis_Configuration.[0]
Index	0		INT	Configuration.Resource.Read.Main.Axis_Configuration.[0].Index
Function	Rail		AxisFuncti...	Configuration.Resource.Read.Main.Axis_Configuration.[0].Function
CountsPerInch	6.5536000E+004		REAL	Configuration.Resource.Read.Main.Axis_Configuration.[0].CountsPerInch
CountsPerMillimeter	2.5801575E+003		REAL	Configuration.Resource.Read.Main.Axis_Configuration.[0].CountsPerMillimeter
HomePosition	0		DINT	Configuration.Resource.Read.Main.Axis_Configuration.[0].HomePosition
Rotary	FALSE		BOOL	Configuration.Resource.Read.Main.Axis_Configuration.[0].Rotary
RotaryUnwind	0		DINT	Configuration.Resource.Read.Main.Axis_Configuration.[0].RotaryUnwind

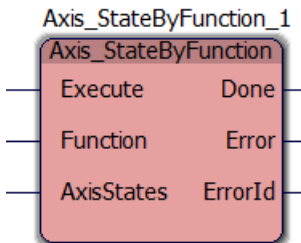
Rail Axis CNC settings:



Rail axis encoder counts per inch parameter

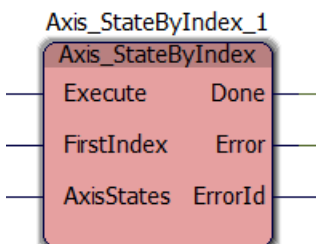
Axis State by Function block

This function block provides the same information as the previously discussed Axis State by Index block except that the axis is selected by its function rather than its index. So if you want the state information for THC axes you would pass the INT value 4 in the Function input, which corresponds to the value of the AxisFunctionsEnum::TorchHeightControl enumeration (described above). AxisFunctionsEnum::Transverse axes could be obtained by using the INT value of 1.



Axis State by Index block

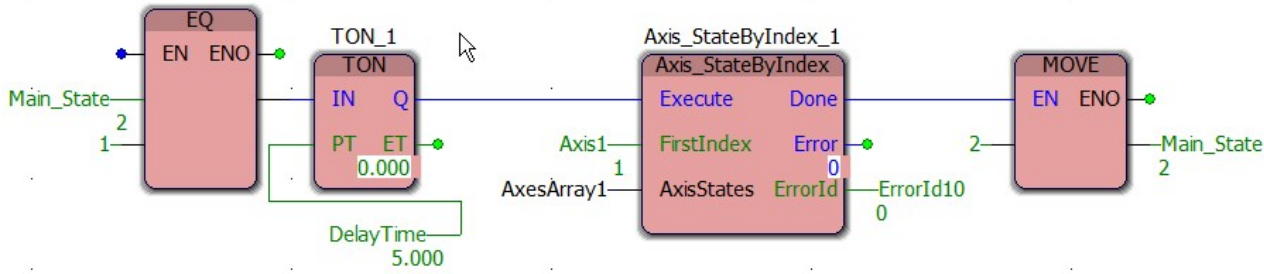
This function block is used to get a snapshot of the current state (at the time of execution) of any given axis or list of axes in the EDGE Connect CNC by their index. This snapshot includes information for the actual position, commanded position, following error, status, and fault information for the specific axis. State information for multiple axes will be returned based on the provided array's size. If the array is larger than the number of axes present, the remaining space will be cleared. If insufficient space exists in the array for all axes then any excess axes will be ignored.



See the *Overview* on page 16 for information about basic function block inputs and outputs.

- **FirstIndex** – Integer (16 bits)
 - Indicates the 1 based index of the first axis on which to obtain configuration information.
- **AxisStates** – Array of AxisStateStruct
 - An array of structures that will be updated with the current information for the axes that match the index.

The following is example ladder logic using the Axis_StateByIndex function block to read the current state of the Rail axis.



The following example shows the returned data of the AxisArray structure displayed in the Watch Window.

Variable	Value	Default value	Type	Instance
[-] AxesArray1			Axis	Configuration.Resource.Read.Main.AxesArray1
[-] [0]			AxisStateStruct	Configuration.Resource.Read.Main.AxesArray1.[0]
ActualPosition	327651		DINT	Configuration.Resource.Read.Main.AxesArray1.[0].ActualPosition
CommandPosition	327680		DINT	Configuration.Resource.Read.Main.AxesArray1.[0].CommandPosition
FollowingError	28		DINT	Configuration.Resource.Read.Main.AxesArray1.[0].FollowingError
Index	1		INT	Configuration.Resource.Read.Main.AxesArray1.[0].Index
Function	Rail		AxisFunctionsEnum	Configuration.Resource.Read.Main.AxesArray1.[0].Function
StatusBits	0		DINT	Configuration.Resource.Read.Main.AxesArray1.[0].StatusBits
FaultBits	0		DINT	Configuration.Resource.Read.Main.AxesArray1.[0].FaultBits

The actual position, commanded position, and following error values in the AxisArray structure are in encoder counts. To convert these values to user units divide them by the Encoder Counts per user unit setting in Phoenix on the EDGE Connect CNC for the specific axis. The following error value displayed above is equal to 28 encoder counts, which equates to 0.0004 inches of Rail axis following error (28 encoder counts / 65536 encoder counts per inch) = 0.0004 inches.

CNC Fault function blocks

These are function blocks to provide access to handle faults within the CNC.

General structures and enumerations

These datatype structures and enumerations are provided in Structured Text format so you can copy them directly into your PLC program.

Fault Classification Enumeration

```
TYPE
    FaultClassificationEnum :
        (NoFault,
         Information,
         Warning,
         Error,
         Critical);
END_TYPE
```

Fault Group Enumeration

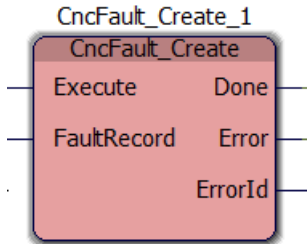
```
TYPE
    FaultGroupEnum :
        (Undefined,
         Phoenix,
         Plc,
         PlcApplication,
         Io,
         Network,
         Laser,
         Plasma,
         Waterjet,
         Ethernet);
END_TYPE
```

Fault Record Structure

```
TYPE
    FaultRecordStruct :
    STRUCT
        Classification : FaultClassificationEnum;
        Group : FaultGroupEnum;
        Id : DINT;
        Extra : DINT;
        TimeStamp : DINT;
        Number : DINT;
    END_STRUCT;
END_TYPE
```

Fault Create block

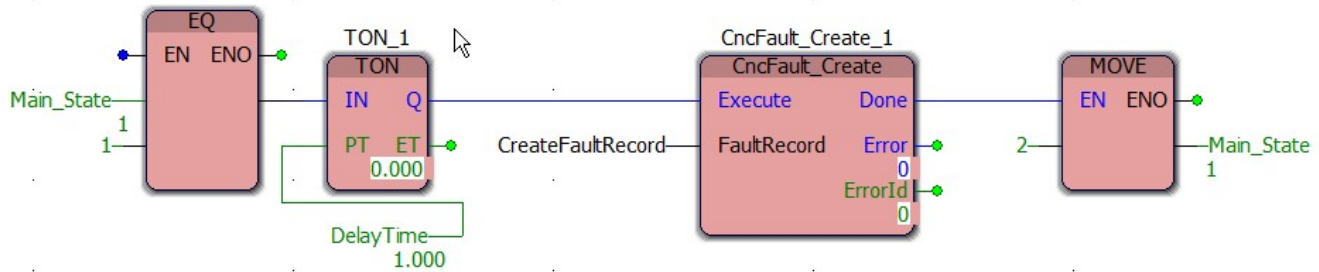
This function block is used to create CnC Faults from within the PLC program. This is useful when the PLC program is monitoring specific fault conditions and then needs to notify the CNC of a specific fault status.



- **FaultRecord** – Fault Record Structure

- A structure populated with the data to be used to generate a fault in the CNC. Note that the Number element is ignored and updated to the value for the actual fault generated.

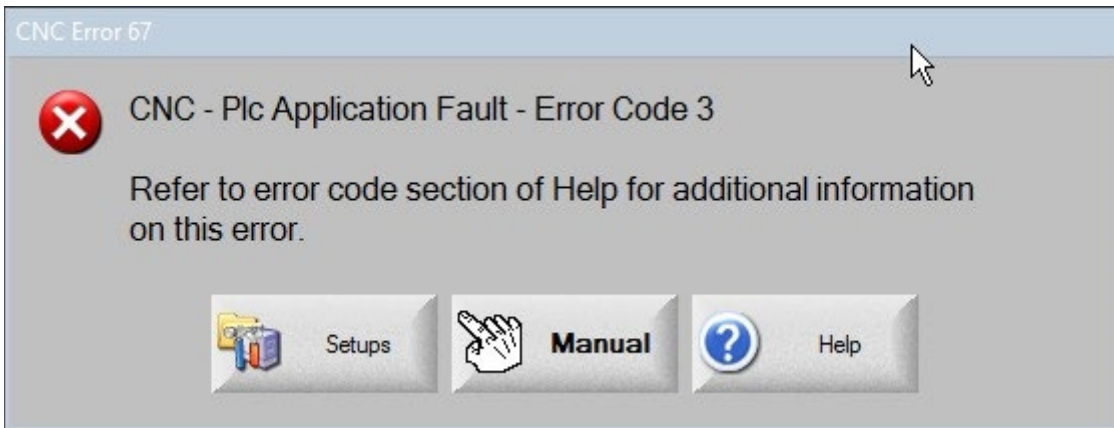
The following shows example ladder logic using the CncFaultCreate function block.



The following example shows the returned data of the CreateFaultRecord structure displayed in the Watch Window.

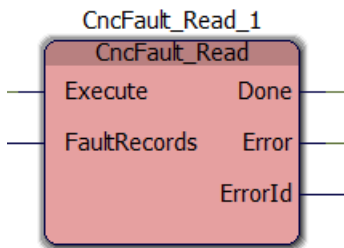
Variable	Value	Default value	Type	Instance
[-] CreateFaultRecord			FaultRecordStruct	Configuration.Resource.Read.Main.CreateFaultRecord
..... Classification	Undefined		FaultClassification...	Configuration.Resource.Read.Main.CreateFaultRecord.Classification
..... Group	Undefined		FaultGroupEnum	Configuration.Resource.Read.Main.CreateFaultRecord.Group
..... Id	1		DINT	Configuration.Resource.Read.Main.CreateFaultRecord.Id
..... Extra	3		DINT	Configuration.Resource.Read.Main.CreateFaultRecord.Extra
..... TimeStamp	1462988637		DINT	Configuration.Resource.Read.Main.CreateFaultRecord.TimeStamp
..... Number	200		DINT	Configuration.Resource.Read.Main.CreateFaultRecord.Number

This is the fault message shown in Phoenix on the EDGE Connect CNC:



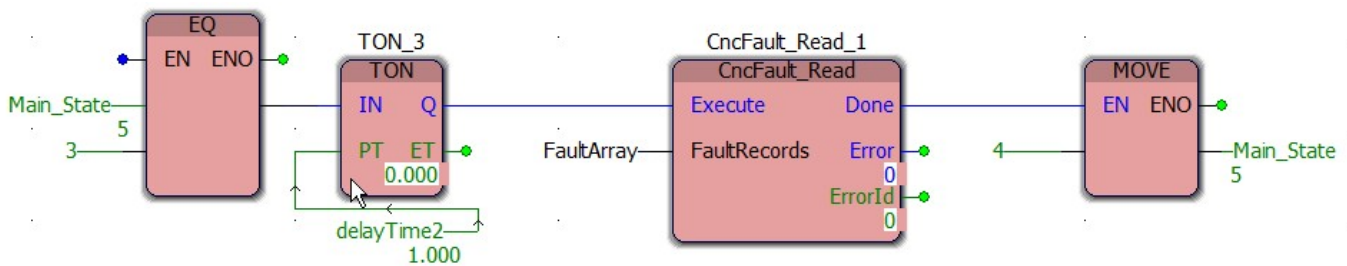
Fault Read block

A function block is used to read the faults on the CNC.



- **FaultRecords** – Array of Fault Record Structure
 - An array of structures that will be updated with the currently active faults within the CNC.

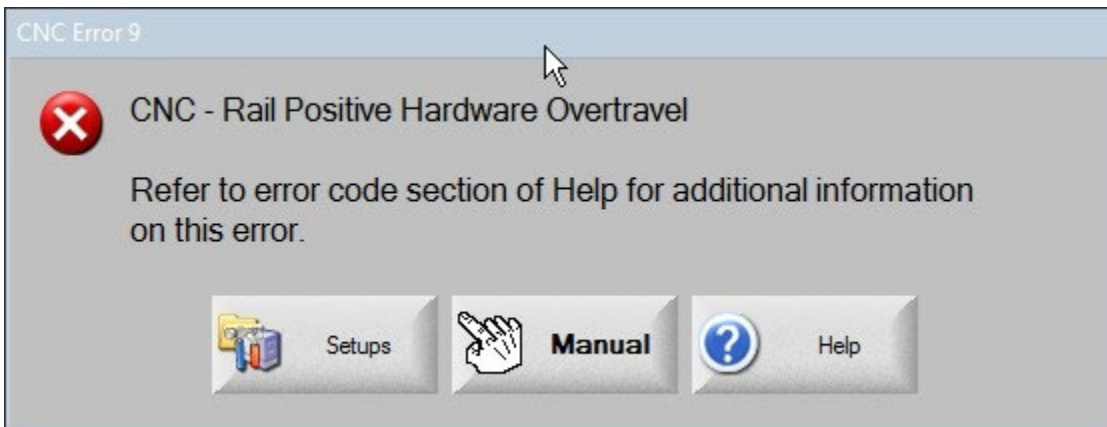
The following shows example ladder logic using the CncFaultRead function block.



The following example shows the returned data of the FaultArray structure displayed in the Watch Window.

Variable	Value	Default value	Type	Instance
[-] FaultArray			FaultRecords	Configuration.Resource.Read.Main.FaultArray
[-] [0]			FaultRecordStruct	Configuration.Resource.Read.Main.FaultArray.[0]
Classification	StopMotion		FaultClassificationEnum	Configuration.Resource.Read.Main.FaultArray.[0].Classification
Group	Phoenix		FaultGroupEnum	Configuration.Resource.Read.Main.FaultArray.[0].Group
Id	6		DINT	Configuration.Resource.Read.Main.FaultArray.[0].Id
Extra	0		DINT	Configuration.Resource.Read.Main.FaultArray.[0].Extra
Time Stamp	1462990608		DINT	Configuration.Resource.Read.Main.FaultArray.[0].Time Stamp
Number	206		DINT	Configuration.Resource.Read.Main.FaultArray.[0].Number
[+] [1]			FaultRecordStruct	Configuration.Resource.Read.Main.FaultArray.[1]

This is the fault message shown in Phoenix on the EDGE Connect CNC:



Tool Status function blocks

These are function blocks to provide information about the current status of any individual cutting tool that communicates via EtherCAT to the EDGE Connect CNC.

General structures and enumerations

These datatype structures and enumerations are provided in Structured Text format so you can copy them directly into your PLC program.

Tool Status Plasma Structure

```

TYPE
    ToolStatusPlasmaStruct :
    STRUCT
        ArcVoltage : REAL;
        StatusBits : DWORD;
        Index : INT;
        Unused : INT;
    END_STRUCT;
END_TYPE

```

StatusBits

Bit: 0 – Cut Sense

Bit: 2 – Not Ready To Start

Bit: 4 – Error

Bit: 5 – Process Ready

Bit: 8 – Nozzle Contact Sense

Bit: 16 – Cut Control

Bit: 17 – Hold Ignition

Bit: 18 – Pierce Complete

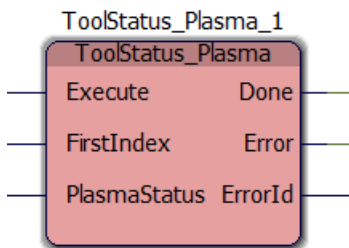
Bit: 19 – Loading Process

Bit: 21 – Remote On

Note: The bits that are not defined (1, 3, 6, 7, 9 – 15, 20, 22 and higher) are subject to further definition and inclusion in future releases. Therefore **ignore** these undefined bits and **do not** use them in programming.

Plasma block

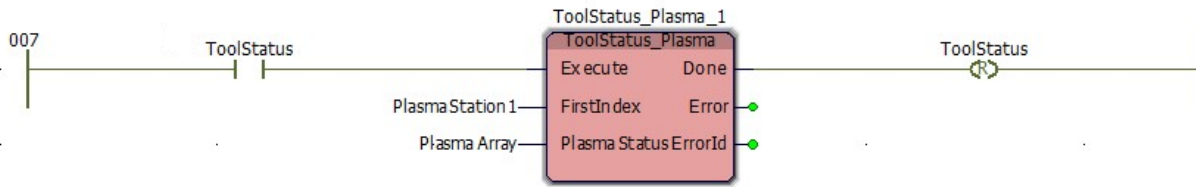
This is a function block used to get a snapshot of the current state of an individual or list of plasma cutting tools in the system by their index. The state of multiple tools will be returned based on the array size. If the array is larger than the number of tools, the remaining space will be cleared. If there is insufficient space in the array, then the excess devices will be ignored.



See the *Overview* on page 16 for information about basic function block inputs and outputs.

- **FirstIndex** – Integer (16 bits)
 - Indicates the 1 based index of the first tool on which to obtain status information.
- **PlasmaStatus** – Array of ToolStatusPlasmaStruct
 - An array of structures that will be updated with the current information for the tools that match the index.

The following is example ladder logic using the ToolStatus_Plasma function block to read the current status of Plasma Station 1.



The following example shows the returned data of the Plasma Array structure displayed in the Watch Window.

Variable	Value	Default value	Type	Instance
PlasmaArray			ToolStatusPlasmaStruct	Configuration.Resource.Task.Main.PlasmaArray
ArcVoltage	1.8937173E+002		REAL	Configuration.Resource.Task.Main.PlasmaArray.ArcVoltage
StatusBits	00000000101000010000000000100001		DWORD	Configuration.Resource.Task.Main.PlasmaArray.StatusBits
Index	000000000000000001		INT	Configuration.Resource.Task.Main.PlasmaArray.Index
Unused	0000000000000000		INT	Configuration.Resource.Task.Main.PlasmaArray.Unused

Watch Window	<		>
◀ ▶	Watch 1	Watch 2	Watch 3
	Watch 4	Watch 5	Watch 6
	Watch		